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ABSTRACT

This proceedings contains papers from the 2001 Society for Information Technology & Teacher Education (SITE) conference. Papers are organized in the following sections: (1) Concepts and Procedures (24 papers); (2) Distance Education (42 papers); (3) Diversity and International (15 papers); (4) Educational Computing Course (19 papers); (5) Educational Leadership (24 papers); (6) Electronic Portfolios (12 papers); (7) Faculty Development (41 papers); (8) Graduate and Inservice (52 papers); (9) Instructional Design (50 papers); (10) International (13 papers); (11) Mathematics (25 papers); (12) New Media (28 papers); (13) Preservice Teacher Education (73 papers); (14) PT3 (Preparing Tomorrow's Teachers To Use Technology) Papers (82 papers); (15) Reading, Language Arts, and Literacy (16 papers); (16) Research (51 papers); (17) Science (18 papers); (18) Simulations (3 papers); (19) Social Studies (9 papers); (20) Special Needs (11 papers); (21) Technology Diffusion (37 papers); (22) Telecommunications: Graduate and Inservice (32 papers); (23) Telecommunications: Preservice Applications (14 papers); (24) Telecommunications: Systems and Services (13 papers); (25) Theory (12 papers); and (26) Young Child (6 papers). Abstracts of the papers and an author index are included. (MES)

Proceedings of Society for Information Technology & Teacher Education (SITE) 2001 International Conference

(12th, Orlando, Florida, March 5-10, 2001)

Jerry Price, Dee Anna Willis, Niki Davis, and Jerry Willis, Editors

Society for Information Technology & Teacher Education 2001

12th International Conference

Proceedings of SITE 2001–
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General Editors –

Jerry Price
DeeAnna Willis
Niki Davis
Jerry Willis

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From the Outgoing President: We've come a long way!

As I step down from two very enjoyable years as president of SITE, I am once again reminded of the privilege involved in leading an organization that is growing and developing at an amazing rate. The number, breadth and depth of the articles in these Proceedings provides one more indication of the rapid and exciting development of this organization and the field of technology in teacher education.

The 2001 Society for Information Technology and Teacher Education Annual Proceedings marks the 12th set of SITE annual conference proceedings. Most readers probably know the story of the first SITE meeting in 1989. Under the leadership of Jerry and Dee Anna Willis, a small group of visionary educators interested in technology in teacher education gathered in Greensville, North Carolina and papers from that meeting were included in the first SITE Proceedings. In 1989, technology in teacher education as a field of study was a new idea to most educators and few individuals or programs identified this as their major field of study and development. Right from the beginning of SITE, there was a vision for the potential of technology to expand and enhance teacher education programs. In addition, the founders of SITE visioned a truly international organization where teacher educators from around the world could share their work and knowledge.

Since that 1989 meeting, both SITE and the Proceedings have continued to grow at an almost unbelievable rate. Technology in teacher education has moved into the national and international spotlight as an area of major emphasis. Colleges and universities around the country are seeking scholars in technology in teacher education and an increasing number of Ph.D. programs are working to prepare these scholars.

The research and development work reported in the 2001 Proceedings reflects the progress of our field and the increased emphasis on technology in teacher education. Our field has moved to a place where most of the scholarship involves using technology in meaningful ways to improve both learning and teaching in teacher education programs. Current work reflects the centrality of technology in teacher education programs and movement away from regarding technology as a separate subject of study.

The positive impact of the Department of Education PT3 initiative is clearly reflected in this annual. The first PT3 projects were funded in 1999, with more projects funded and 2000 and a third set in 2001. The annual serves as an important vehicle for dissemination of results from this important work.

As technology in teacher education continues to develop as a scholarly focus area, the international emphasis in SITE becomes even more important. As scholars around the world to use technology to strengthen teacher education it is important that we have the opportunity to share what we are learning. A quick review of authors of papers in the Proceedings indicates that this sharing is in fact happening and that the initial international vision of the founders of SITE is a reality.

I am honored to have had the opportunity to lead SITE for 2 years, and I look forward to continuing involvement in my favorite national organization.

Ann

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Modeling Instruction with Modern Information and Communications Technology: the Mimic Project

Ronald Abate, Cleveland State University, USA; Jennifer Cutler-Merritt, John Carroll University, USA; James Meinke, Baldwin Wallace College, USA; Mary Jo Cherry, Ursuline College, USA; David Shutkin, John Carroll University, USA

This paper describes the MIMIC Project a U. S. Department of Education Preparing Tomorrow's Teachers to Use Technology implementation grant. In this project colleges of education at five Ohio universities are collaborating to increase the modeling of technology in pre-service teacher education. The underlying premise of the partnership is that teachers teach as they were taught. As such, the partner institutions have developed a variety of processes where technology proficient educators mentor university faculty on the integration of technology into undergraduate teaching. The faculty in turn model best practice with technology in pre-service teacher education programs. Students enrolled in the pre-service teacher education programs encounter further technology modeling from cooperating teachers who have received technology training and the pre-service students are provided with opportunities to implement technology in field placements and student teaching.

Beyond the Status Quo in Preparing Tomorrow's Teachers

Ronald J. Abate, Cleveland State University, USA

This paper presents a case for rethinking the existing paradigm of the personal computer in educational technology. In particular it examines the nature of failure, the evolution of technology, and the general lack of acceptance of educational technology in today's classrooms. The paper asks the question what is the role of teacher educators in the development of new technology implementation paradigm, and provides a rationale for a more critical analysis of existing educational technologies.

Practicing the Skills of Online Communication

Gertrude (Trudy) Abramson, Nova Southeastern University, USA; Shelley Bibeau, St. Paul Technical College, USA; Susan Birrell, Lowell Public Schools, USA, Deborah Cohen, Freelance Instructional Designer, USA; Jo Lynne Lundy, Baptist Memorial Hospital, USA; Mava Norton, Lee University, USA; Lisa Star, South Dakota State University, USA; Pilar Toral, University of Puerto Rico at Carolina, Puerto Rico

Too much of what is considered conversation is little more than taking turns speaking. When this process is translated to a print medium, such as an electronic forum or bulletin board, it quickly becomes evident that keeping on track is very difficult. The current literature extols the virtues of collaborative learning and the Internet that makes possible collaborative learning across the miles. However, learning is much more than discussion and a good discussion is rare indeed. As part of a graduate course in online learning environments, distant students took turns mentoring and participating in online conversations that adhered to specific guidelines. This institutional session will be of great interest to everyone involved in online learning. Graduate students, who are actively employed in distance learning initiatives, will share lessons learned and skills mastered in the art of online communication in a learning environment. Each presenter will begin by describing the process of preparation, posting, and mentoring and will end by reflecting with an emphasis on sharing best practices.

Toward an Adaptive e-Framework for Teacher Training

Massimiliano Adamo, Italian National Research Council- IAC, Italy; Mario Giacomo Dutto, Italian Ministry of Education, Italy; Irene Gatti, Italian Ministry of Education, Italy; Maurizio Lancia, Italian National Research Council-CED, Italy; Gianfranco Mascari, Italian National Research Council- IAC, Italy

The Italian Ministry of Education in collaboration of the Italian National Research Council are engaged in joint activities concerning the modelling, design and prototype implementation of an adaptive e-framework supporting the interactions of the various actors of the national teacher training system.

Transforming the Face of Computer Coursework for Pre-Service Teachers - A Working Model

Angelle Adams, University of Houston, USA; Leslie Starcke, University of Houston, USA; Melissa Pierson, University of Houston, USA

Like most universities, prior to Fall 2000, the College of Education at the University of Houston, required its undergraduate education majors to enroll in a three-hour course, CUIN 3312, "Information Technology for Young Children." The original one semester course was divided into three one-hour courses spanning three semesters. The elimination of prescribed assignments is a major change in the requirements for the newly structured technology course. In the new model, technology assignments support required education course activities, thereby demonstrating through practical applications how technology should be integrated into classrooms. The new class format is driven by students' needs and is based on individualized learning activities. Education professors are beginning to restructure their course requirements to allow for increased technological use. Students are searching out ways to meet course requirements using technology even when they are not specifically required to do so by their professors. Early indications are that this model may in fact fulfill the intent of the restructuring effort. Future study of implementation and outcomes will continue to better determine the impact on the skills of pre-service teachers in the use of technology as an integrated instructional tool.

Trek 21: A PT3 Project to Facilitate Teachers' Design Of Engaging Learning Environments

Laura Adams, West Virginia University, USA; Trey Dunham, West Virginia University, USA; John Wells, West Virginia University, USA; Neal Shambaugh, West Virginia University, USA

The goal of "Trek 21: Educating Teachers As Agents Of Technological Change," West Virginia University's PT3 project, is to build within those educators participating in WVU's teacher education program, the capacity to use and integrate instructional technologies (IT) for teaching and learning. Trek 21 provides direction for capitalizing on WVU's restructured 5-year teacher preparation program, consortia of Professional Development Schools, and Instructional Design and Technology program that works at integrating instructional technologies into the educational process. This session would brief participants on project design and outcomes through exchanges focused on: (1) visualizing the partnerships in the Trek 21 model - the collaborative process necessary for sustained, systemic change in practice, (2) briefly describing the year-long cycle of activities involving these constituents - on-going professional development, and (3) initial findings -data analyses designed to inform the change process. Our presentation looks to inform others of the process Trek 21 employed for the integration of instructional technologies into the practice of those teachers responsible for preparing future educators. Through discussion and structured feedback, we look to share our approach to IT integration in teacher preparation and receive insight through audience participation that will inform and improve on the Trek 21 model of professional development.

Contextual Levers: An Embedded Approach to Faculty Technology Development

Peter Adamy, University of Rhode Island, USA; Ted Kellogg, University of Rhode Island, USA

While much has been written about the potential benefits of technology integration for teacher education, not all university faculty members embrace the process willingly. This paper describes efforts at the University of Rhode Island to create a unified approach to teacher education across disciplines that incorporates faculty technology development in routine practice. Through the use of standards of practice, an electronic student portfolio system, and the support of innovative practices through a PT3 implementation grant, the School of Education is attempting to integrate faculty technology training into the key aspects of regular operating procedures.

Teaching Technology with Technology

Michelle Adelman, New School University, USA; Susan Luftschein, New School University, USA

"Teaching Technology with Technology" provides an overview of an on-line course to teach practicing urban high school teachers to use computer technology in their own classrooms. A combination of theory and practice is delivered in an asynchronous environment.

Assessing the Integration of Technology into the Curriculum

Mac Adkins, Troy State University College of Education, USA

The online Technology Integration Assessment is a self-assessment which allows faculty members to quickly and conveniently report the integration of various technologies into each of their courses. The instrument not only measures what technology items are being used, but also how they are being used. The real data resulting from this authentic assessment has guided our data-driven decision process for future technology purchases and training. Several similar assessments currently exist which measure an individual's current technology competency levels. Assessments also exist which measure faculty and student perceptions of the impact which technology is making. But instruments designed to measure precisely which pieces of technology are being and how they are being used were lacking. This void led to the development of the Technology Integration Assessment. TSU identified the following twelve technology items for which we wanted to track integration: Internet, e-mail, discussion boards, listservs, chat, PowerPoint, word processing, spread sheet, database, digital camera, video camera, and video tape. We also identified the following nine integration categories: instructor presentation, instructor administration, instructor research, instructor-instructor collaboration, instructor-student collaboration, student-student collaboration, student presentation, student administration, student research.

Improving the Teaching of Reading, Language Arts and Literacy through WebCT: A Work in Progress

Linda Akanbi, Kennesaw State University, USA

This session will describe how WebCT technology is being used to enhance the professional development and literacy teaching strategies of PreK-12 teachers enrolled in a Reading Endorsement program.

Using Computer Simulation Before Dissection to Help Students Learn Anatomy

Joseph Akpan, Morehead State University, Department of Leadership and Secondary Education, USA

The scientific community and the nation's schools have been experiencing a self-proclaimed ethical crisis over animal dissection in classrooms. While this issue involves intractable ethical and philosophical positions, one ethical implication of the debate is that if dissection is used in schools, it should be used for maximum educational benefit. One intriguing previous finding was that use of an interactive videodisc dissection learning from subsequent actual dissection. This study examined the prior use of simulation of frog dissection in improving students' learning of frog anatomy and morphology. There were four experimental conditions: simulation before dissection (SBD), dissection before simulation (DBS), simulation-only (SO), or dissection-only (DO). Results of the study indicated that students receiving SBD and SO learned significantly more anatomy than students receiving DBS, DO. The genders did not differ in achievement.

Interactive multimedia problem-based learning: Evaluating its use in pre-service teacher education

Peter Albion, University of Southern Queensland, Australia

Interactive multimedia (IMM) using problem-based learning (PBL) as a design framework has been developed for the purpose of enhancing pre-service teachers' self-efficacy for teaching with computers. Evaluation of the materials in use with a group of pre-service teachers (N = 24) has confirmed that users respond positively to both the content and the presentation of the IMM-PBL materials. Statistically significant increases in self-efficacy for teaching with computers were recorded for users who had initially low values of self-efficacy for teaching with computers. The study confirmed the potential of PBL as a design framework for development of multimedia.

Talking with teachers about computer use: Insights for pre-service teachers

Peter Albion, University of Southern Queensland, Australia

Teacher educators face the challenge of ensuring that pre-service teachers have access to appropriate models for the integration of information and communication technologies (ICTs) in teaching. Field experience in classrooms can be supplemented by presentations of models in interactive multimedia. The CD-ROM project on which this paper is based included materials prepared by and interviews with ICT-using teachers. Analysis of the interview transcripts and trials with the CD-ROM confirms that the interviews are likely to be effective in presenting pre-service teachers with appropriate messages about the use of ICTs in teaching.

GIS (Geographic Infomration Systems) in Teacher Education

Marsha Alibrandi, North Carolina State University, USA; Shannon White, North Carolina State University, USA; Rita Hagevik, North Carolina State University, USA

In Spring 2000, we piloted an experimental preservice teacher education course based on integrating Geographic Information Systems (GIS) in interdisciplinary applications. Participants co-constructed the course by providing fedback via email, discussions, and evaluations. Collaborative instruction of the course included a university professor, an inservice teacher in Instructinal Technology, graduate students and a middle school student. We report on this first of a kind, full semester course, sharing what we've learned, the products developed, and invite the audience to share the products and processes. GIS is a digital mapping software application that combines database information with spatial formats. You see GIS every day on TV weather forecasts. Our students developed social studies/interdisciplinary applications for both classroom and administrative uses.

The Distance Education Degree Program for The Master of Mathematics with a Teaching Option at Texas A&M University

G. Donald Allen, Texas A&M University, USA; Michael Pilant, Texas A&M University, USA

This paper is a report on the planning, development, and implementation of the online Masters degree program offered by the Mathematics Department at Texas A&M University. The degree, which is completely online, is targeted primarily to secondary high school teachers that desire to sharpen their mathematical skills or advance their overall learning, particularly to qualify for teaching positions in community colleges. The issues, far exceeding those of a new program in the traditional form, range from recruitment of students to negotiating intellectual property contracts.

Secondary Mathematics Methods Course With Technology Units - Encouraging Pre-Service Teachers to Use Technology

Rajee Amarasinghe, California State University Fresno, USA

Although technological tools that can be used in the mathematics classroom were introduced to prospective teachers at various stages in their undergraduate curriculum, they seldom use them in their actual teaching. This paper will describe efforts taken to encourage secondary mathematics teachers to use technology in their teaching by introducing highly structured, five technology units into the secondary method class. The five units are designed to use Internet, Graphing Calculators, Geometer's Sketchpad, Computer Based Laboratories (CBL), and Spreadsheets. The intent of these units is to make students aware of the existing resources, provide hands on experience, look at the resources critically, and collectively develop ways to integrate these resources to mathematics teaching effectively.

Tools of the trade:Integrating Technology in Research & Methods Courses for Preservice Teachers

Valerie Amber, National University, USA

This paper examines and describes one approach of integrating technology into research and methodology courses for teacher education. Each course is complimented with a web site that serves as a virtual office and learning resource center. The instructor used the resources at Blackboard.com to build the framework for each site. They were designed upon the premise that it is acceptable to not under go a total systematic change in delivery but a hybrid where technology supports the learning environment is preferable. The courses have produced students that are competent and knowledgeable about the subject matter and technology, its use and instruction integration.

Digital Cameras in Education

Valerie Amber, National University, USA; Sharon Thies, Shandin Middle School, USA

Intended for convenience, digital cameras are an inexpensive learning technology schools may easily benefit from. Once captured, digital photographs are already in a universal format that makes them exceedingly uncomplicated to distribute and use with PC or MAC computers. There versatile usage makes including visual images in word processing documents, e-mail, class projects or on web sites effortless. Digital camera technology brings about a totally new innovative and motivational approach to teaching and learning.

Teaching, Learning and Technology —— Providing for Higher Education Faculty Professional Development

Valeria Amburgey, Northern Kentucky University, USA

This session will outline the activities involved in the implementation of our project goals for our Teaching, Learning and Technology (TLT) Project: (1) Technology-Rich Environments (2) Faculty Professional Development and (3) Student Professional Development. Access to technology, training on how to use the technology and time to redesign courses are needs that were identified by our faculty that affect their infusion of technology in their classes. This session will place primary emphasis on how we are addressing these needs.

Using School District Standards to Develop Thematic Lessons for Electronic Portfolios

Cindy L. Anderson, National-Louis University, USA, Kevin M. Anderson, Kenosha Unified School District, USA; Joan Briscoe, National-Louis University, USA; Beth Ann Smith, National-Louis University, USA

NCATE has adopted a list of minimum competencies for a preservice teacher that includes an ability to use technology effectively in teaching (NCATE, 2000). Most teacher education institutions are using preservice teacher portfolios to represent a student?s ability in this area, requiring artifacts as performance indicators for the various competencies recognized by NCATE. An artifact often included in the portfolio is the thematic lesson. Thematic lessons must reflect the ability of the preservice teacher to integrate technology in a lesson.

A Response to Technology Integration in Teacher Education for Merit, Tenure, and, Promotion

Cindy L. Anderson, National-Louis University, USA; David Starrett, Southeast Missouri State University, USA;

At Southeast Missouri State University, an effort to reward the infusion of technology into the university and its teacher preparation program resulted in a document providing recommendations for individuals involved in the merit, tenure, and promotion process, the

Information Technology Promotion, Tenure, and Merit Guidelines. This document was intended to encourage technology infusion by providing recognition within the current reward structure of the university. The document was developed by a committee including of one member from the College of Education and other colleges at the university involved in training teachers and active in technology infusion. The document was designed to provide guidelines for developing merit, tenure, and promotion reports. This paper will summarize the recommendations of the document and provide two case studies that describe faculty efforts to infuse technology into their classroom instruction for the preservice teacher. One of these case studies will be an education faculty member, while the other will be a biology professor involved in the training of secondary content teachers. The paper will describe how these efforts to infuse technology are included in their documentation for merit, tenure, and promotion. The URL containing the location of the actual document will be included in this paper.

Electronic Curriculum Development and Assessment

Kevin Anderson, Kenosha Unified School District No. 1, USA; Cindy Anderson, National-Louis University, USA

This poster presentation by Kenosha (WI) Schools will show screen shots from a Filemaker Pro curriculum database representing the official academic curriculum of the district, provide samples of grade reporting formats using Easy Grade Pro, and demonstrate hands-on use of the programs through the use of two laptop computers. Visitors will be able to examine the formats and offer suggestions about future improvements to the system. The intent of this session is to provide K-12 schools and teacher education institutions with a look at how one public school district is developing electronic methods for developing curricula, assessing student performance, and reporting out to parents and the community.

Helping teachers and students use advanced technology in teaching high school science: A preliminary feasibility study of the use of a WWW-controlled atomic force microscope in high school science

Thomas Andre, Iowa State University, USA; Gail Jones, Richard Superfine & Russell M. Taylor II, University of North Carolina, USA

This exploratory study investigated the use of an Internet controlled nanoManipulator and atomic force microscope to allow students to explore properties of viruses. The activity was embedded in a week long learning experience in which students interacted with scientists. The study demonstrated the technical feasibility of using such advanced equipment in classrooms. It also demonstrated that students gained in the understanding of the structure and functioning of viruses and changed their conception of scientists as people and science as an activity. A majority of the students were excited about the activity.

CPR Lessons for Teachers: Current Trends, Practice, and Research in Educational Technology

James Ang, Cathy Matuszak, Terri Edwards, Steve Simmons, Hee-Young Kim, Samantha Stinson, Sue C. Little & Melissa E. Pierson, University of Houston, USA

Young scholars introduce a diverse selection of current trends, practices, and research findings A discussion of constructivist-oriented practices that support K-12 technology use is followed by discussions of the implications of technology integration and the cost-effectiveness of technology use in elementary and secondary settings. Technology application issues are addressed next, including the effectiveness of virtual field trips, instructional courseware, online discussion tools, and computerized tests. These areas represent just some of the research on educational of technology that effective teachers must remain aware of.

CECI: A Computer-Assisted Coeducational and Transdisciplinary Experience

Rocio Anguita, Universidad de Valladolid, Spain; Cesar Osuna, Universidad Autonoma de Guadalajara, Mexico; Alejandra Martinez, Universidad de Valladolid, Spain; Yannis Dimitriadis, Universidad de Valladolid, Spain

This paper describes a CSCL application named CECI (Co-Edición de Cuentos en Inglés. Co-Edition of Tales in English), which assists would-be teachers in the development of multimedia educational resources aimed at learning the English language. These resources are used by students with a basic or elementary level and are accessed through a computer net. Those would-be teachers write a children's tale and then add a methodology and collaborative activities that describe the prospective use of that tale in the classroom.

Issues in structuring long-term electronic portfolios with web-based document management tools

Eric Aplyn & Carl Hoagland, University of Missouri – St. Louis, USA

As a way of overcoming these barriers, we are developing experimental portfolios with a web-based knowledge sharing technology developed by Xerox Corporation. Similar products are available from other software developers with varying costs and varying capabilities. We will provide an overview of our work to date, provide our research on other technologies with similar capabilities, and hope to launch a discussion that explores the broader issues associated with institutional and regional implementation of electronic portfolios using this strategy. One primary concern is the need to address inter-institutional standards, particularly for 2-year to 4-year college transitions and transitions to long-term professional development. Other key issues include student/faculty trust, usability and stability, long-term management, security, and ownership of portfolios.

Concerns of administrators and teachers in the diffusion of IT in schools: A case study from Turkey

Petek Askar, Hacettepe University, Turkey; Yasemin Usluel, Hacettepe University, Turkey

Use of information technology in schools for the purpose of teaching and learning is a kind of diffusion process in which IT is an innovation which is defined by Rogers (1995, p. 11) as "any idea, practice or object that is perceived as new by an individual or other unit of adoption ". In fact, IT as a relatively new building block in the educational system, causes innovations which ranges from way of communications, and interactions to teaching methods, and materials.

EARTH2CLASS: A UNIQUE WORKSHOP/ON-LINE/DISTANCE-LEARNING TEACHER TRAINING PROJECT

Cristiana Assumpção, Frederico Baggio & Joseph Ortiz, Columbia University, USA; Michael J. Passow, White Plains Middle School, New York, USA; Kelly Corder, New Economy Networks, USA

"Earth2Class" (E2C) is a unique science, math, and technology learning resource for K-12 students, teachers, and administrators created through the collaboration of researchers at the Lamont-Doherty Earth Observatory, curriculum and technology integration specialists at the Institute for Learning Technologies, a Maury Project Peer Trainer, and teachers from the New York City metropolitan area and rural upstate New York. During the winter and spring of 2000, E2C presented workshops for teachers at the Lamont-Doherty campus in Palisades NY that were transmitted live to others in Glens Falls. Before, during, and after each workshop, participants and others were able to utilize the resources available on the E2C Internet site, www.earth2class.org. E2C relies on a unique synergy of specialists in curriculum, educational technology, and scientific research, but the key feature is involvement of the Lamont scientists. Their availability through workshops, web site postings, and e-mail expose teachers to stimulating cutting-edge research that help the teachers develop K-12 curriculum activities linked directly to "real world questions." Drawing on the scientists' expertise, teachers can show students how the science they are learning applies outside the classroom, as well as to other aspects of their studies.

Competency Exams in College Mathematics

Kathy Autrey, Northwestern State University of Louisiana, USA; Leigh Myers, Northwestern State University of Louisiana, USA

The idea of competency exams as an integral part of a college mathematics course started at Northwestern State University because of the move to reform based calculus. Further changes in our curriculum have led to a more widespread use of competency exams. While implementation of these exams has been successful in our calculus courses and a course for elementary education majors, we wish to expand our competency exams into developmental mathematics and College Algebra. These exams will ensure that our students have basic analytical skills, while allowing us to maintain reform based courses. We hope to use computer and internet based exams in order to manage a competency exam program throughout the department. We are currently testing a computer based, self-paced program in one developmental math class. We will report on the process we use for these exams and the results we have seen from competency exams across the mathematics curriculum.

Developing and Nurturing a Dynamic On-Line Learning Community

Kathleen Bacer,Ed.D, Azusa Pacific University, USA

Critical to on-line courses is the ability to create an environment that embraces the community of learners. Learn and experience effective strategies to enhance your on-line teaching. Outcome objectives: Participants will learn how to capitalize on the on-line environment and its wealth of resources in a way that will allow them to utilize more effective strategies in their on-line classes. The main focus will be on developing and nurturing a dynamic learning community. Issues such as face-to-face, feedback, community building, technology barriers, and the unique challenges surrounding teaching on-line classes will be discussed. Key components of an effective on-line learning environment will be discussed along with exploration and utilization of interactive technology tools and resources available. The interactive session will also include a look at effective interfaces for on-line classes and an interactive virtual classroom. Intended Audience: Partcipants who have an active interest in creating and maintaining a unique environment for their on-line classess will benefit the most from this session.

Comparing a Local School District's Teacher Use of Computing With National Survey Results

Frances Bailie, Iona College, USA

Funded by the National Science Foundation and the U.S. Department of Education, the Center for Research on Information Technology and Organizations conducted a national survey of schools and teachers entitled, "Teaching, Learning, and Computing 1998." More than 4,000 teachers in grades 4 through 12 in over 1,100 schools throughout the country completed the survey questionnaire. This national teacher survey posed questions on teaching philosophy, teaching practice in a single class, use of computers, general teaching experiences, and work environment. This paper will discuss a modified local version of this survey administered to a large diverse suburban school district. The purpose of this local survey was to provide a comprehensive needs assessment focusing on the usage patterns and opinions of teachers toward computing. This paper will summarize the local survey results from teachers in the high school, two middle schools, and six elementary schools in the district and then go on to compare the local results with the national survey results drawn from selected reports posted on the Internet. The paper will conclude with the highlights of those areas where the local schools surpassed national results as well as those areas of concern where the local results fell short of the national results. An outline of district plans to use the survey results in guiding the implementation of its technology plan will also be presented.

Rage Towards the Machine: Technology and Standards in 2001

Lawrence Baines, Berry College, USA; Lynnwood Belvin, Berry College, USA

"Rage Towards the Machine" describes, analyzes, and evaluates how technology is represented in a variety of national standards (including standards promulgated by TEAC, NCATE, and INTASC), professional organizations (such as NCTE, NCTM, NCSS, NAME, and ISTE), and state standards (such as those in Texas, Georgia, Florida, and Tennessee).

Attitides of Malaysian Vocational Trainee Teachers Towards the Integration of Computers in Teaching

Ab. Rahim Bakar, Department of Education, University Putra Malaysia, Malaysia; Shamsiah Mohamed, Deoartment of Mathematics, University Putra Malaysia, Malaysia

A descriptive correlational study was conducted using a sampel of 200 vocational trainee teachers in Malaysia. The purpose of the study was to assess the vocational trainee teachers attitudes towards the integration of computers in teaching. The study also attempted to examine the relatinships between their atitudes towards the integration of computers in teaching with selected independent variables such as: (a) level of confident, (b) level of knowledge about computers, (c) interest towwads computers, (d) whether or not they own a computer, (e) whether or not they plan to integrate computers in their teaching.

Integrating Technology into Courses for Pre-Service Teachers

Elizabeth Balser, Saint Vincent College

Using a multimedia format, the presenter will first describe a unique collaboration involving college faculty, in-service teachers, and student teachers. Demonstrations will include integrating appropriate technology applications and national standards into course syllabi and lesson plans and establishing electronic mentoring experiences that involve college faculty, in-service teachers, and education

The Road Ahead: The Evolution of Online Learning

Alicia F. Balsera, University of South Florida, USA

This paper will focus on the structural and interfacing mechanics of the software that will facilitate support efforts and minimize the frustrations encountered by new users whether they are students, faculty, or course creators. The course shell creation process, student enrollment, passwords, faculty loading, role definitions, reusability, reliability, scalability, all provide potential challenges—even for the best pedagogical designs. The goal is to define a comfortable environment for technology application to classes so that online instructional tools may be assumed as much a part of the academic environment as classrooms and chalkboards.

IT with Integrity

Savilla Banister, Indiana University, USA

In the past three decades, the use of computers in education has continued to grow and develop. With the introduction and expansion of the Internet, K-12 schools, as well as colleges and universities are tapping into the resources of the World Wide Web. "Technology" is the buzz word on the lips of educators across America and few seem to question its appropriateness. There are, however, signs that the manner in which technologies are impacting education is not always as positive as many claim (Olson, 2000; Stroh, 1999). It is time for teachers to critically examine the phenomenon of instructional technology with a commitment to honestly relating the shortcomings and dangers, as well as the benefits. Decisions based on such examination have the potential to focus the use of computers in education more productively (Bromley, 1998). Areas for consideration include an emphasis on teacher and learner needs, rather than computer system needs, an awareness of environmental consequences of our computer technology habits, and an acknowledgement of the economic factors that drive many of the choices being made today in the educational technology realm.

Eureka Science Academy: A 2 year progress report on technology integration in reading and science

Dale Banks, Saint Mary's College, USA; MaryAnn Traxler, Saint Mary's College, USA

The Eureka Science Academy is in year 2 of a 3 year grant. This a report on the 2 groups of preservice teachers that have taught in the program and how they integrated reading, writing, science, and technology in the project.This paper is intended for an audience of education faculty who are interested in a program that has demonstrated an improvement in the attitude of the preservice teachers and the students they served.

Computer aided personality assessment of mathematics teachers

Pamela Barber-Freeman, Prairie View A&M University, USA; Cheryle Snead-Greene, Prairie View A&M University, USA; Michael McFrazier, Prairie View A&M University, USA

Mathematics teachers from the state of Mississippi were invited to participate in a training seminar, Technology, Reading, Riting, Rithmetic (TR3), during the month of July 2000. The overall purpose of TR3 was to provide mathematics teachers with effective teaching strategies for improving achievement of Mississippi students. In addition, teachers were provided intensive training with a "hands&#64979;on" curriculum, based on the belief that the learner must be an active participant in the learning process and must construct his/her own ideas through reflective thought. This objective was met through the utilization of personality assessments. Research suggests teachers realize that optimal learning is impacted by understanding personality preference (Alcock, 1998). Thus, the purpose of this research was to examine personality test that assessed personality, teaching and learning styles of middle school and secondary mathematics teachers.

Preservice Teachers' Experiences in a Technology-Rich Urban K-12 School Setting

Gina Barclay-McLaughlin, University of Tennessee, USA; Aileen Nonis, University of Tennessee, USA

This presentation will focus on the experiences of preservice teachers in a technology-rich magnet elementary school during their internship year. This program is part of a grant designed to better prepare preservice teachers to work in urban settings. This study is part of a larger research project designed to investigate the effectiveness of training and support for pre-service teachers and the extent to which various technology tools and applications are used in their assigned schools and classrooms. It is our expectation that this insight will improve teacher preparation at the University of Tennessee and reduce the growing exit of educators leaving urban settings. The current study is based on a series of focus groups that examine the perceptions of a group of students enrolled in a five-year teacher preparation program in the College of Education.

Designing Tasks for Networked Technologies using Intentional Acts

Michael Barner-Rasmussen, University of Aarhus, Denmark

Teachers all over are finding that designing tasks for networked technologies requires more than setting up a web-server with class schedules, a few links to related materials, e-mail, discussion areas and so on. All too often on-line-materials are not read, on-line-discussions die out and teacher-mailboxes remain empty. What is happening, when no mails to the teacher arrive? When a conference dies? When a carefully prepared volume of on-line-papers is not applied to the student-task at hand? We need a better way to model/understand/connect the various elements of the on-line learning experience to understand these failures in more detail. The theoretical framework described in this paper greatly expand the analytic understanding of student-student and student-teacher interaction in the educational context to allow for a better founded planning of these when designing online courses or course-support. From this outset a number of specific teaching situations using networked technologies are analyzed in order to show the depth and breath of the frameworks capabilities.

Infusing Authentic, Content-Based Technology During Teacher Preparation: A Team Approach

Steven Barnhart, Rutgers University, USA

Focused teams of professors, K-12 teachers, graduate students and educational technology staff help faculty and teacher candidates infuse technology into academic activities. The faculty integrate technology into instruction, use technology in mentoring teaching candidates in their disciplines, and collaborate with K-12 teachers in technology rich schools. A team is assigned to each certification subject area and has as a high priority the development of interdisciplinary partnerships among faculty in teacher preparation programs and the faculty of arts and sciences. Teaching candidates collaborate with teachers in public and private schools who have been identified for skills in integrating technology into learning. The goal is to ensure that all teaching candidates graduate with a demonstrated ability to provide innovative and authentic technological support for learning. A 3-year cross sequential design has been implemented to evaluate the influence of the project on the abilities and attitudes of teaching candidates.

Using Adobe Acrobat for Electronic Portfolio Development

Helen Barrett, University of Alaska Anchorage, USA

Learn how Adobe Acrobat's Portable Document Format can support the Electronic Portfolio Development Process and provide the ideal container for digital artifacts or performance assessments in many media types.

Teacher's Guide to the Holocaust: An Extensive Online Resource for Teachers

Ann Barron, University of South Florida, USA; Brendan Calandra, University of South Florida, USA; Kate Kemker, University of South Florida, USA

The Teacher's Guide to the Holocaust is a large, instructional website with over 7,000 HTML pages (650 megabytes). It was designed and developed by graduate students in the Instructional Technology program and the staff of the Florida Center for Instructional Technology, College of Education, at the University of South Florida. The site provides an overview of the Holocaust through text, original source documents, graphics, photographs, art, movies, and music. The primary audience of the Teacher's Guide to the Holocaust is preservice and inservice teachers. The site allows them to view the Holocaust through three different "lenses"—Timeline, People, and the Arts. Additional resources are provided in the Student Activities and Teacher Resources sections. Now in its 4th year, the site receives over two million hits per month from educators and students all over the world. This presentation will provide background information on the evolution of the project, design considerations, development issues, and research studies related to the site.

Magnetic Connections: Better Preparing Preservice Teachers to Use Technology in Teaching and Learning

Carol Bartell, California Lutheran University, USA; James Mahler, California Lutheran University, USA; Beverly Bryde, California Lutheran University, USA; Mildred Murray-Ward, California Lutheran University, USA; Paul Gathercoal, California Lutheran University, USA;

Technology provides opportunities to link students, faculty, partners in education, and the wider communities together to expand, improve, develop, and enhance the learning experience for all. It is this challenge that has led California Lutheran University's (CLU) School of Education to conceive and implement Project MAGNETIC CONNECTIONS. Progress on the project can be measured through five major activities. These activities include development of a teacher/scholar in residence program, use of an electronic portfolio system and other distance learning technologies, faculty development workshops, and revision of the Teacher Preparation Program curriculum. Results indicate that CLU is better preparing preservice teachers to use technology in teaching and learning and they are provided with better models and mentors for integrating technology into the curriculum. As well, preservice teachers are held accountable for meeting state and CLU standards for beginning teachers through the use of a web-based electronic portfolio system and distance learning technologies.

A Summary Look at Internet Based Distance Education

Emad Bataineh, Zayed University, College of Information Systems, United Arab Emirates

The Internet has truly and significantly changed the way we live, learn, work, and communicate. In today's digital information age, electronic services are constantly growing and becoming an integral part of our daily life. One of these popular electronic services is e-education through distance learning, and in particular Internet-based learning, which uses the Internet technology as a medium to deliver instructions as well as a communication tool to support interaction between faculty and learners. Distance education is originally designed as a self-paced alternative to traditional classroom instructions and becoming a major trend in higher education. Community colleges seem to be leading the way in the application of Internet based distance education technology by providing more educational opportunities to adult learners than those in four-year institutions, should four-year universities pursue this trend? especially small and private liberal arts colleges who are suffering financially as a result of low students enrollment, should they consider investing in electronic instruction delivery methods to expand their classroom-based academic programs.

Digital Audio Production for the Web

Jeffrey Bauer, University of Northern Colorado, USA; Marianne Bauer, Weld County School District RE-1, USA

Examine most web-based courses and you will find that very few of them make use of audio support for instruction. Quality audio on the web once meant large files and clogged bandwidth. However, new data reduction formats such as MP3 make it possible to include quality audio support for instructional materials. Most computers come equipped with the necessary hardware and software for web developers to use their existing equipment to produce good quality audio programming. This paper presents a brief overview of the advantages of audio as an instructional medium. Information regarding basic audio capturing and editing on a typical PC is presented, followed by recommendations for processing audio for web and CD-ROM development. Samples of the author's work can be found at www.mp3.com/jeffreybauer.

Teaching & Learning Online: Lessons Learned

Donna Baumbach, University of Central Florida, USA; Mary Bird, University of Central Florida, USA; Janet Eastman, University of Central Florida, USA; Kathy Katz, University of Central Florida, USA

The Florida Instructional Technology Resource Center at the University of Central Florida has been supporting educators statewide for 18 years. Recent efforts have focused on web-based tools and staff development. The ITRC staff has developed online staff development components in integrating the Internet into the classroom, school library automation and national and state standards, online learning online, and web-based tools for teachers. As a result of developing and offering these components, our staff has learned a great deal about what leads to successful online teaching and learning in the context of staff development for professional educators. A review of the literature and a survey of participants from a variety of online staff development programs resulted in a compilation of "lessons learned" in online staff development for professional educators. While not all "lessons" apply to all courses or components, educators involved—or contemplating involvement—in any way in online staff development should consider each lesson. As educators know, "learning never ends." And now, through online staff development, there are more and more opportunities for educators themselves to continue to learn and to grow.

Factors influencing technology integration: A quantitative nationwide study

Amy Baylor, Florida State University, USA; Donn Ritchie, San Diego State University, USA;

Based on a comprehensive study of 94 classrooms nationwide, this quantitative study investigated the impact of several factors (planning, leadership, curriculum alignment, professional development, technology use, teacher openness to change, teacher non-school computer use) on five outcome measures in the areas of teacher skill, teacher morale, and perceived student learning (level of teacher technology competency, technology integration, level of teacher morale, impact on student content acquisition, impact on student higher order thinking skills). Through step-wise regression analyses, results indicated that teacher technology competency was predicted by teacher openness to change ($R2 = .164$). Technology integration was predicted by teacher openness to change and the percentage of technology use with others ($R2 = .391$). Teacher morale was predicted by professional development and constructivist use of technology ($R2 = .559$). Technology impact on content acquisition is predicted by the strength of leadership, teacher openness to change, and negatively influenced by teacher non-school computer use ($R2 = .589$). Technology impact on higher-order thinking skills was predicted by teacher openness to change, negatively influenced by percentage of technology use where students work alone, creating, and the constructivist use of technology ($R2 = .608$).

PROMOTING INSTRUCTIONAL PLANNING: AN EXPERIMENT

Amy L. Baylor & Anastasia Kitsantas, Florida State University, USA

This study investigated the impact of the Instructional Planning Self-Reflective Tool (IPSRT), on students' attitudes toward instructional planning with 114 pre-service teachers from seven sections of an introductory educational technology course. All participants in the experimental and control groups were taught how to develop an instructional plan as part of the course. For the intervention, the experimental group was provided with instruction how to use the IPSRT while instructional planning, whereas the control group received a review of instructional planning. It was hypothesized that the IPSRT would positively affect students' performance, attitudes, and self-efficacy beliefs towards instructional planning. It was found that the experimental group showed greater skill acquisition, more positive attitudes and higher perceived importance of instructional planning. In terms of self-efficacy, participants who were initially high in self-efficacy reported significantly lower self-efficacy following the tool intervention. In contrast, participants initially low in self-efficacy showed significantly higher self-efficacy following the tool intervention. Findings are discussed from a social-cognitive perspective.

Using Technology to Help Strike a Blow for Education and the Environment — A Case Study in

candy beal, North Carolina State University, USA

This paper presentation will address the importance of learning and using technology in the context of "real world" issues. It documents a service learning project that involved preservice teachers, classroom teachers, eighth grade students and university faculty. In an effort to save an inner city wetland, the team used computer technology to research the issue and built a case for preservation which they presented to at a university wide symposium. You will learn of the roles played by all participants as they became empowered by technology and action research to fight for environmental justice. This paper presentation is intended for the technology challenged, university professors and teachers alike, who need encouragement to begin using technology in the classroom. It shows the power of teaching and learning to use technology, especially when it is used to address "real world" issues.

Learning and Using Web Page Construction as a Vehicle to Teach Pre-Service Teachers How to Develop and Design Integrative Middle School Curricula Appropriate for Early Adolescents

Candy Beal, North Carolina State University, USA

This paper examines how one introduces web page construction in the context of an undergraduate teacher education foundations class on middle school education. Those attending the session will learn about the process used to teach web page construction that results in a product that is appropriate for early adolescent use. The paper suggests ways to use web page construction as a vehicle for developing and designing integrative curricula appropriate for middle school use. This paper is intended for novice technology educators who wish to integrate technology not just teach it for the sake of fulfilling a skill requirement needed by their students. This is NO FEAR technology integration at its best, by one who knows.

Preparing a Virtual Field Trip to Teach Value of Community and Sense of Place

candy beal, North Carolina State University, USA

This paper offers participants a chance to discover the value of engaging preservice teachers in the development of a virtual field trip. Research in psychology, sociology and education suggests the importance of engaging both teachers and students in "sense of place" building. The process for doing a virtual field trip as well as the justification for this activity will be thoroughly discussed. The paper is intended for novices in technology who want to incorporate a meaningful technology activity in their curriculum. It shows the value of technology when it is used in the context of a "real world" learning experience. In addition to technology, it addresses issues of character education, service learning and community building.

AnimalWatch: An intelligent computer tutor for elementary mathematics

Carole Beal, UMass Amherst, USA; Beverly Woolf, UMass Amherst, USA; Joseph Beck, UMass Amherst, USA; Ivon Arroyo, UMass Amherst; USA

The goal of this poster demonstration is to introduce teachers of elementary and middle school students to AnimalWatch, a computer-based tutor that incorporates artificial intelligence techniques to deliver effective, highly individualized math instruction to 10-12 year olds. With the support of the National Science Foundation, a team of computer scientists, child development researchers, and classroom teachers developed AnimalWatch to be an effective educational tool that would engage both girls and boys in mathematics learning, and increase their interest in pursuing mathematics training. The result of our 4 year project is a self-contained mathematics tutor that receives high ratings by teachers and students, and provides effective mathematics instruction for students with a wide range of skills.

Prospective K-6 Educators Attitudes about Technology

Brian Beaudrie, Northern Arizona University, USA

Since the late 1970's, the use of technology in the classroom has been increasing at an almost exponential rate. The use of computers and calculators is so prevalent in the modern classroom that it is rarely challenged today, whereas twenty years ago the very idea was practically unthinkable. In that short time frame, most educators and parents have gone from asking themselves whether calculators and computers should be in the classrooms at all to how they may be best used to maximize the learning potential of students.

Preservice and Inservice Teachers Collaborate to Integrate Technology into K-8 Classroom.

E. Carol Beckett, Arizona State University West, USA; Keith Wetzel, Arizona State University West, USA; Ray Buss, Arizona State University West, USA; Ines Marquez-Chisholm, Arizona State University West, USA; Eva Midobuche, Arizona State University West, USA

Preservice teachers are graduating from teacher training programs feeling unprepared to integrate technology into their classrooms. This hesitation of new teachers to integrate technology is due in part to a lack of modeling technology use by university and college faculty in preservice classes and limited opportunities for students to observe teachers using exemplary technology practices in internship classrooms. The Arizona State University West faculty, through a PT3 Grant, is addressing this issue by providing workshops on integration of technology in instructional planning for cohort teams made up of ASUW preservice teachers and mentor teachers from school districts working in partnership with the ASU West preservice-teacher-intern program. During the workshops cohort teams collaborated in development of curricular units of practice integrating technology that will be jointly implemented by the teams in field placement classrooms. During the workshops preservice and mentor teachers were exposed to a variety of technology and technology resources that can be incorporated into unit and lesson planning including use of the Internet, digital cameras, Inspiration software and Power Point applications. Preliminary results indicated participants benefited greatly from the information and practical applications of the workshops. Handouts will be provided.

Unique Collaborations in Preservice Teachers Programs

Bette Begeron, Arizona State University East College, USA; James Wenhart, ASUE, USA; Lee Ann Hopper, ASUE, USA; Brenda Larson, Chandler-Gilbert Community College, USA; Gina Vukovich, Chandler Unified School District, USA

In an effort to provide quality teacher training and help to ease the teacher shortage crisis, traditional teacher education classes need to be redeveloped. Collaboration between a local school district, community college and university education department has produced a new concept in preservice education. This program has advantages for the non-traditional student. Substitutes and teacher assistants for the district are encouraged to continue with their daytime profession and study in night and week-end classes to complete their teacher certification courses.

A Hybrid Online Course to Enhance Technology Competencies of School Principals

Sally Beisser, Drake University, USA; Peggy Steinbronn, Drake University, USA

Administrative leaders do not necessarily perceive themselves as leaders in technology in schools. Educational administration graduate students in this study acknowledged that their computer skills were often surpassed by their own faculty, staff, or students. This paper describes an online graduate level course for future administrators, "Principles of Curriculum" (EDUC 276), taught at Drake University. The course was developed with on-campus face-to-face classroom meetings to build future administrator's skills and confidence followed by completion of the course using online web based instruction. Results suggest that administrators who completed the hybrid online course report lack of technology proficiency, have greater willingness to engage in distance learning, and provide technology leadership and support for teachers.

Young Children and Technology: Building Computer Literacy

Michael Bell, University of Houston - Clear Lake, USA; Caroline M. Crawford, University of Houston - Clear Lake, USA

Building upon the young child's prior knowledge and developmental level, computer literacy must be addressed early in the child's educational career. A comfort level is important to develop for both the young children as well as the instructor, which is why the importance of instructional technology is stressed within the preservice teacher's educational experience.

Developing Communities of Learners in Distance Education Courses

Elizabeth Kirby Bennett, State University of West Georgia, USA; Leticia Ekhaml, State University of West Georgia, USA

This presentation describes and demonstrates strategies that contribute to the development of learning communities in distance education courses. These techniques have been used successfully in distance education courses to help students become active participants and contributors in online and mediated courses. Examples include online debates where students form teams to tackle the pros and cons of controversial issues and real world case study problems identified by student research and collaboratively solved through chat room interactions. Strategies for building camaraderie, collaboration, and mediated communication skills in distance settings are also shared.

Links to the Classroom: Technology in Early Field Experience for Elementary Social Studies

Linda Bennett, University of Missouri-Columbia, USA

This paper describes a model for integrating technology into early field experiences. The focus of the paper is on what technologies were used and how prospective teachers utilized technology in early field experience. Two recommendations are for diverse models of integrating technology into field experience are developed and those diverse strategies for integrating technology into social studies be designed.

Exploiting and Evaluating A Web-based Learning System: Six Days and Seven Nights in the Basement

Bob Bermant, University of Wisconsin, USA; John Knight, University of Wisconsin, USA

To evaluate a web based learning system as an adjunct to traditional "live" instruction, sixty students participated in a new interdisciplinary course that required sending email, posting to a discussion forum, investigating web-sites, constructing a home page, and completing several web-based "projects." Each week's activities were documented in individual logs. We will share our students' perception of this experience and our own assessment of its pedagogical value.

Examining Technology Education and Practices of Preservice Teachers: Lessons Learned from a Large, Urban College of Education

Michael Berson, University of South Florida, USA; Roberta Armstrong, University of South Florida, USA

Exiting seniors from a College of Education were administered a survey to assess their academic preparation and final internship experiences, technology preparation and perceptions, and research-related preparation and perceptions. Students completed the survey 'on-line' during their final internship seminars. This presentation summarizes findings on student technology education, frequency of use, confidence using technology for teaching, and confidence in teaching technology content. The results suggest that those students who have the opportunity to apply technology during their internship are more confident in their ability to use technology in the future for instruction. Student-generated recommendations for enhancing technology training in teacher education will be discussed.

Hypergroups as a Community-Building Tool

Evelyn Beyer, University of Houston, USA; Mary Frances Thompson, University of Houston, USA; Melissa Pierson, PhD, University of Houston, USA

For anyone restructuring their undergraduate technology course for pre-service teachers, an important consideration should be the inclusion of a communication tool that promotes positive peer interactions. Using their recent award of a PT3 grant the University of Houston has implemented many changes in the teacher education core technology course including the offering of a hypergroup, a web-based communication tool. By the second month participation in the hypergroup was going strong with future teachers sharing ideas, posting resources, and communicating common concerns. The hypergroup, originally intended as an example of a mode for teacher communication, has turned into a true community-building tool. The hypergroup will stay intact for these pre-service teachers throughout their teacher education program and into their first year of teaching where it is hoped that these teachers will become a part of other online peer resource groups.

Using Technology to Support Teaching for Social Justice in a Preservice Program

Barbara Beyerbach, SUNY Oswego, US; Pat Russo, SUNY Oswego, US

This paper will describe how we have attempted to use technology to support teaching for social justice in an educational foundations and in an elementary methods course in our teacher education program. Programs, class activities, and analysis of student work will be shared and implications for practice derived.

A Survey of Educational Software for Bilingual Educators and Hispanic Families

Maria Bhattacharjee, University of Houston Downtown, USA; Linlin Irene Chen, University of Houston Downtown, USA

This paper concerns computer software currently available in the market for bilingual children. The purpose is to survey the software options available to bilingual children, parents, and teachers. This paper will approach the topic from the following perspectives: Sources for Purchasing Software, Bilingual Reading and Writing Software, and Bilingual Educational Games/Tutorial/Drill, and Practice.

Innovative Course Design as Action Research: Instructional Technology for Teacher Education

Madhumita Bhattacharya & Cameron Richards, Nanyang Technological University, Singapore

This paper reports on an innovative approach adopted in the training of tertiary education teachers in instructional technology. An integrated approach was adopted to increase the motivation of teachers to use Information and Communication Technologies (ICTs) in their teaching-learning practices. The researchers describe their 'action research' efforts to design a course where participants learn and apply new ICT skills in a context of becoming 'designers' themselves of online learning resources. The notion of 'course design as action research' provided a focus for a flexibly structured course relevant to students needs and responsive to ongoing feedback in terms of a more proactive reflective practice. The paper argues that in the fast changing Internet age all teachers need to go beyond traditional approaches if they are to use ICTs well in their educational practices.

Using Constructionist Principals In Designing And Integrating Online Collaborative Interactions

J. Michael Blocher, Northern Arizona University, USA; Gary Tucker, Northern Arizona University, USA

This paper describes a study that took an action research approach to investigate learners' experience using CMC to engage in a collaborative project in an online learning environment. Communication messages were archived for analysis and a post-questionnaire was administered to provide feedback on the students' experience with the project. Findings from the study were then used by faculty at Northern Arizona University (NAU), a small institution that serves mostly rural students in Arizona, to design and implement one of the foundational web-based courses in their online Master's of Education in Educational Technology degree. The course design for ETC 567: Technology, Society, and Education was based on findings from the described study investigating online collaborative interactions and founded on constructionist principals to enhance learner interaction through collaborative writing projects in the online learning environment. Furthermore this paper provides examples for practitioners desiring to integrate collaborative projects in online learning environments.

Discetech: Advanced Training on Technologies and Didactic for Italian Teachers

Mario A. Bochicchio, University of Lecce, Italy; Roberto Paiano, University of Lecce, Italy; Giuseppina Marselli, University of Lecce, Italy; Paolo Paolini, Politecnico di Milano, Italy;

The Discetech project was born in 1996 at "Politecnico di Milano"; in the first year it was applied to the high schools of Como, then, in 1997 it was extended to the high schools of Lecce (in the South East of Italy) in collaboration with the University of Lecce. Discetech is an experimental project rather than a simple upgrading course, and it is conceived to observe different aspects of the Italian School. An original aspect of Discetech is in the coordinated application of technological training and didactic project at the same level. Concisely, in Discetech we train teachers on the use of computers (CD's, Internet, ...), then we prepare it to design a didactic activity to be performed in their own classrooms. This didactic project is observed and measured by adopting a number of parameters (about the training process, the educational aspects, the knowledge acquisition and the contents selection). In the final phase of each year the results are evaluated and shared among all participants in order to gain the largest possible amount of knowledge about the adopted didactic modalities.

Factors That Promote and Inhibit Discourse With Preservice Teachers on a Non-Restrictive, Public Web-Based Forum

Alec Bodzin, Lehigh University, USA

This study investigated asynchronous communication factors that influence the discourse of preservice science teachers on a non-restrictive, public Web-based forum. Salient elements that promoted discourse among the participants included the level of interest in a topic, the immediate relevancy of a topic to a participant at a particular time, and interpersonal factors among participants. Limitations using asynchronous communication perceived by preservice teachers included receiving feedback too late to be of use and issues pertaining to the absence of visual cues during discourse exchanges. The linear, temporal interface of the Web-based forum appeared to be a factor that limited the depth of the discussion.

Designing Web-Based Inquiry Simulations: Carolina Coastal Science

Alec Bodzin, Lehigh University, USA

In this paper, the design of Web-based inquiry simulations used in science classrooms for students to explore coastal science issues is discussed. In response to the demand of reform efforts and the lack of an appropriate design model approach, the Carolina Coastal Science project commenced with an idea to develop a Web site that was an organized, non-linear information resource in the context of an inquiry-based constructivist learning environment. Several modes of learning and teaching strategies were developed to be available to the users, including a role-playing simulation-debate, open-ended inquiries, guided inquiries, independent research, and cooperative group learning. The paper concludes with the claim that creating an instructional system in an online environment promotes the use constructivist theories in student learning due to the nature of their engagement within a hypermedia environment.

A System of Faculty Development

Harriett Bohannon, Florida Gulf Coast University,

The goal of Course and Faculty Development at Florida Gulf Coast University is to promote and support the use of learning-centered teaching practices, integration of technology, and delivery of distance learning by removing barriers to teaching innovation. As one of three interdependent support units, Course and faculty development has contributed to the university-wide support system that allows faculty to achieve these goals. This model of faculty development uses ten distinct service strategies to accommodate the needs of a diverse, multicultural faculty. Having ten ways to access support allows faculty to engage in continuous learning in spite of equipment limitations, time constraints, preferred learning modalities, or technology skill limitations. As a result, during the first three years of operation 71% of the full-time faculty participated in one or more faculty development projects or activities, and 24% participated in six or more. The staff of one director, three instructional designers, and a part-time student worker has contributed to the design of 113 web-based or web-enhanced courses, and over 65% of the full-time faculty report that they use the key technology tools for teaching and learning - email, Internet resources, electronic message boards, classroom podiums, library databases, and presentation software. When asked if the instructional technology used in courses contributes to learning, 85% of the students agreed that it did.

Principles for Designing Online Instruction

Harriett Bohannon, Florida Gulf Coast University, USA; Peggy Bradley, Florida Gulf Coast University, USA; Joan Glacken, Florida Gulf Coast University, USA; Roberta McKnight, Florida Gulf Coast University, USA.

Integration of technology in teaching and learning is part of the unique mission of Florida Gulf Cost University to increase access to higher education, not only in Southwest Florida, but beyond. To gain a better understanding of the web in education, the University organized a study group to review learning theories and reflect on the courses designed and taught at FGCU. The group identified guiding principles and best practices for teaching, managing, and supporting web-based instruction at the university. This presentation will share experiences by addressing issues in web course design and development, web course management and institutional support. The issues will be examined from the perspective of faculty, administrators, and support staff. The goal of this work was to bring a better understanding of the use of the web in higher education, its impact on teaching and learning, and implications for support staff, faculty, and administrators in the university.

THE DILEMMA OF TEACHER TRANING

Alfred Bork, University of California, USA

In 1957 the Soviets put up the first earth satellite, Sputnik I. For education in the United States this was a traumatic event. Until that time, many (but not all) people, including the popular press commonly denounced Soviet science as ineffective. The fact that it achieved this major technological development, visible in many parts of the country, before we did led to much trauma about the quality of science education in the United States.

Helping third grade low achievers through dynamical modelling software: An experimental study

Xavier Bornas, University of the Balearic Islands, Spain; Jordi Llabres, University of the Balearic Islands, Spain

Low achieving students (LA) need an individualized instruction to learn what high achievers learn in the classroom through regular teaching. Computers can deliver such instruction if an appropraite software is used. The aim of our study was to evaluate the instructional effectiveness of a curriculum based software for LA students. In order to test the importance of the type of help, two versions of the same software were developed (static vs dynamic help). Furthermore, the dynamical version was used in two ways (computer alone vs computer and psychologist's support). Sixty students participated in the research. The results of our study clearly suggest that computer technology can help teachers to attend the LA students, at least when the instructional software has been developed regarding the school curriculum and the teaching style of the regular teacher. However, LA students working with the computer alone (without teacher assistance) did not learn the more advanced specific strategies that learned the LA students who, in addition to using the same software, got that assistance. Therefore, our results recommend to put computers into the regular classroom (instead of being located in a different one) so that teachers can "be there" if the student needs help.

Academic achievement problems: Developing curriculum based software to help low achievers

Xavier Bornas, University of the Balearic Islands, Spain; Jordi Llabres, University of the Balearic Islands, Spain

Low achieving children (LA) usually need a very individualized instruction. Teachers rarely can give them this kind of instruction because they have too many children in the classroom. Computer technology may be extremely helpful for those students. However instructional software is often independent of the school curriculum. The lack of contact between developers and school teachers leads to several problems: lack of motivation, cognitive confusion, and teachers' resistance. If computer technology has to help LA, the instructional software must be based on the school curriculum. From our own experience in developing curriculum based software we can underline several guidelines: The LA students were selected not only because of their poor performance on the evaluation tests but also because their teachers considered them as LA. We looked at the curriculum materials that students were using regularly in the school, and we took them as the base for the software we were going to develop. Teachers told us what specific contents they were going to teach, and these contents were the ones the software included. The curriculum based software we have developed proved to be useful to teach LA the selected academic contents and strategies.

Our Own Tower of Babel: Describing Instructional Technology or Educational Technology Doctoral Programs

Arlene Borthwick, National-Louis University, USA; Marianne Handler, National-Louis University, USA; Diane McGrath, Kansas State University, USA

Many of us who teach those who will become tomorrow's professors have not found a way to clearly share what we do and find out what others are doing in their doctoral programs. Information the authors gathered about a variety of educational/instructional technology programs demonstrated the complexity and richness of doctoral programs in this area. This appears to be the right time for discussion of how we are alike and different and for the possible development of additional doctoral programs in the area. A better understanding of our missions, visions and language within this community will assist us in our conversations. Further, clarity in our program foci is reflected in program goals, university/grant-funded research opportunities for graduate students, employment options for graduates, and the hiring of appropriate faculty. This round table will discuss a project that aims to help build a common vocabulary and common understandings to encourage the conversation.

Teacher-Developed Video for Classroom Use: The Transition from VCR to Digital Format

Eugene Borzov, Iowa State University, USA

This presentation will examine the ways to integrate digital video technology into a language classroom. The process of shooting, editing and formatting educational video films for students learning English as a second language will be discussed. The focus will be on a comparative analysis of traditional VCR/Camcorder technology versus digital cameras and modern CD-ROM/DVD/Web technology for disseminating the resulting video. The examples of effective techniques and original QuickTime movie clips will be included in the presentation.

Using Databases in Teaching Advanced Mathematics Courses

Mikhail Bouniaev, Southern Utah University, USA

This paper is a follow up of the papers that discussed how information technologies could be used in teaching Advanced Mathematics (Bouniaev, 1995) and in developing general logic actions (Bouniaev, 1999). Here we discuss the possibility of using databases in teaching Advanced Calculus. The psychological foundations of our considerations are Stage-by-Stage Development of Mental Actions Theory and Constructivism.

Democracy in America: Rural America Takes an Adventure Through the American Mind

Beth Braboy, Montreat College, USA; Wendy Trivette, Montreat College, USA

The use of electronic primary sources provides authentic pieces of the past for students and teachers alike, but these primary sources pose a new challenge for teachers. Teachers need to be trained in techniques for analyzing historical documents and strategies for raising the intellectual and emotional questions that will draw the students' interest. Misuse of electronic primary sources can create a greater distance between students and learning if the teacher is not prepared in both technology, primary source evaluation, and their integration into the curriculum. The "An Adventure of the American Mind" project is the first to meet this challenge head on. A major USA initiative in our field, "An Adventure of the American Mind" continues in rural western North Carolina. In October 1999, the project began recruitment of local area in-service teachers to participate in a graduate-level course in Spring 2000. Collaborating with Mars Hill and Brevard College, Montreat recruited 48 teachers to be the pilot group for the program. The graduate course began in January 2000 with 28 teachers traveling to Montreat College and 20 traveling to Mars Hill College. Laptops were given to each teacher to provide them with the basic technology resources they would need. The teachers were introduced to the Library of Congress' website American Memory, which contains over three million digitized items from the Library's collection, and built interactive lessons using these primary sources and Microsoft PowerPoint and FrontPage.

Technology and Higher Education Administration

Ray Braswell, Auburn University Montgomery, Alabama USA; Marcus Childress, Emporia State University, USA

This paper reports the findings of a study on the use of technology by administrators at two universities. Instrumentation included a survey and interviews which investigated various factors (including time spent using technology, types of technology used, how administrators used technology in any classes in which they were teaching, and their awareness of how university faculty are using technology.

An Assessment of Technology Skills and Classroom Technology Integration Experience in Preservice and Practicing Teachers

Jonathan Brinkerhoff, Arizona State University, USA; Heng-Yu Ku, Arizona State University, USA; Krista Glazewski, Arizona State University, USA; Thomas Brush, Arizona State University, USA

This study comprised the initial phase of a Preparing for Tomorrow's Teachers to Use Technology (PT3) funded investigation into the effects of integrating technology skills acquisition and preservice teacher methods courses on preservice teachers' use of technology during subsequent student teaching experiences. Two versions of a Technology Beliefs and Competencies Survey were administered, one for preservice teachers and one for practicing teachers. The results of baseline data on preservice and practicing teachers' technology skills and beliefs are identified and discussed. Also examined are preservice teachers' perceived technology barriers, and classroom teachers' technology integration practices.

Reader response pedagogy in the information age

Kelvin Broad, Northern Arizona University, USA; George Labercane, University of Calgary, Canada

This paper reports an investigation into the use of web-based, interactive computer technologies in the achievement of curricular outcomes in reader response-based literature instruction. The primary purpose of the study was to explore the use of computers as tools for implementing classroom reader response instruction. Rosenblatt's (1978) Transactional Theory of the Literary Work and pedagogical approaches developed from this theory were used as the basis for developing and implementing computer-based literature exploration. The study used a network-based software application called Zebu as a venue for conducting reader response-based instructional initiatives. A portrait of fifth grade student's reading, writing and responding in computer environments is presented. The nature of students' responses is discussed and key characteristics of effective web-based reader response environments are outlined. Findings suggest that computer environments represent one venue where students can engage in collaborative conversations about literature.

Advanced Technology Opportunities For Education Students: The SIMMS Example

Abbie Brown, Washington State University, USA; Bob Appelman, Indiana University, USA

In a department or school of education, how does one set up an environment that acknowledges the importance of developing instructional design solutions in the least obtrusive manner, while simultaneously offering students the opportunity to experiment with cutting-edge technologies? One approach is the creation of an extra-curricular organization that focuses on exploring technological innovations and the development of a supportive atmosphere for people interested in expanding their skills beyond those required for standard instructional design situations. The organization of Students in Multimedia Studies (SIMMS) at Indiana University is one example of this approach; the recent creation of the SIMMS 'beta chapter' at Washington State University is a second example. Both groups face interesting challenges in administration of the organization, developing and maintaining activities of interest to the membership and bridging the gap between group members who are highly technologically proficient and those who aspire to greater technological proficiency. This paper should prove of interest to educators facing similar challenges in providing advanced "techno-geek" opportunities in environments that primarily focus on instructional design and basic tech skills.

Technology and Pedagogy: The Evolution of A Curriculum

Margaret Brown & Gregory MacKinnon, Acadia University, Canada

Acadia University was the first laptop university in Canada. Being first has had its challenges. This paper discusses how between 1996 and 2000 a School of Education has adapted to the new technologies and made efforts to incorporate them pedagogically in their two-year after-degree teacher education program. Data gathered from review of equipment and facility inventories, demographic and curriculum documents, and surveys of students and faculty regarding background computer knowledge, attitudes, skill development, application, and innovations have formed the basis for this analysis. An examination of the first four years since initial implementation of laptop technology infusion into the teacher education program demonstrates an interesting evolution of curriculum and its impact on education students and faculty. The conference presentation graphically illustrates various survey results, and raises discussion questions about the technology/pedagogy/curriculum linkages.

After the Pilots: Media Literacy Across the Curriculum

Gregg Brownell, Bowling Green State University, USA; Nancy Brownell, Bowling Green State University, USA

This paper traces experiences in the development of EDTL 630 Media Literacy Across the Curriculum through three pilot offerings. The course is now a part of an M.Ed. in Classroom Technology program and an elective in an M.Ed. in Teaching and Learning program. Differences in the two target populations are identified and discussed. A detailed schedule/activity-set for the course is presented. Equipment availability issues, course coverage, the importance of course topics, and further development, are also covered.

A Field-Based Model for Integrating Technology into Preservice Teacher Education

Thomas Brush, Arizona State University, USA; Ann Igoe, Arizona State University, USA

The College of Education at Arizona State University is committed to providing future teachers with the most innovative and effective training possible. This commitment includes the belief that technology needs to be infused into all aspects of teacher preparation and applied in authentic situations. The purpose of this paper is to provide an overview of a field-based model for integrating technology into pre-service teacher education; a model that provides pre-service teachers with opportunities to develop and implement technology-rich instructional activities in authentic teaching situations, and provides these individuals with guidance, support, and critical formative evaluation during their experiences so that they leave ASU with the ability to integrate appropriate technologies in their future professional placements.

Using Excel to Explore a Thematic Mathematics Unit

Dolores Brzycki, Indiana University of PA, USA; Judi Hechtman, Indiana University of PA, USA

Fifth-graders can "Excel" at spending a million dollars! The fifth grade mathematics curriculum at the University School of Indiana University of PA contained a long-term project to enable students to experience the real world concept of budgeting. Students were to develop a budget to spend $1 million on a specific interest. Combining this project with learning how to track expenditures on a spreadsheet was a natural pairing. Using PowerPoint to communicate the results to classmates added yet another technological dimension as well as language arts integration. Along the way, students learned a variety of lessons. They learned or reviewed financial concepts such as budget and unit price. They reviewed percentages, means, and other mathematical concepts in a way that supports NCTM standards, and applied them in the real-world context of budgeting. As they gained confidence with Excel, students went beyond what was taught and made and shared their own discoveries about how to do things. The instructors gained valuable reflections about what works in infusing technology into the curriculum, and the project proved the efficacy of Donald Schoen's model of the reflective practitioner.

Models of Technology Diffusion at Public Universities

Dolores Brzycki, Indiana University of Pennsylvania, USA; Nancy Yost, Indiana University of Pennsylvania, USA; Kurt Dudt, Indiana University of Pennsylvania, USA

"Preparing Teachers for the Digital Age: Implementing a Dynamic Model of Pedagogical Change" is funded by a PT3 grant from the U.S. Department of Education. The proposal was written by a consortium of three public universities in rural areas of Western Pennsylvania. The goal is to infuse technology into our pre-service teachers core curriculum and several teacher education programs. Together we graduate some 1500 future teachers per year placed throughout the U.S. and abroad, guaranteeing that technology diffusion here will have an impact across the country. Our universities provide excellent faculty-student ratios but have limited support staff and departmental budgets, and faculty have little time for training. Peer mentoring, appealing workshop topics, incentives and prizes, and convenient formats are helping us overcome obstacles to technology diffusion. Incentives and convenient formats help overcome the lack of time. Incentives meet the needs caused by limited budgets for small items like scanners and webcams and for professional travel. The grant also helps overcome the limited number of support staff on these campuses, both by funding positions and by facilitating peer mentoring. This approach has resulted in increased technology integration in teacher education, as intended in the grant.

Learning Styles and Potential Relations to Distance Education

Walter Buboltz, Louisiana Tech University, USA; Lamar Wilkinson, Louisiana Tech University, USA; Adrian Thomas, Louisiana Tech University, USA; Steve Jenkins, Louisiana Tech University, USA

Distance education is becoming a force in the educational realm and appears to be increasing at an astonishing rate as a viable form of education. With this quick to adopt philosophy that appears to sweeping the educational community many important variables in this new form of education are being overlooked. By focusing on these variables, especially learner characteristics (cognitive/learning styles) we can develop and implement distance education in a format and form that appeals and accomplishes its goal, namely the education of students. Without focusing on these variables, students may be disenchanted with this educational format and feel that they are not getting the education that they deserve and may seek fulfillment through other methods of education or not seek to advance their knowledge at all.

Using a Flexible Format to Create a Constructivist Learning Environment in the Educational Computing Course

Wren M. Bump, University of Houston, USA

This paper describes the restructuring of the Educational Computing Course CUIN 6320 Technology in the Classroom, a graduate class at the University of Houston. The purpose of the restructuring was to model to the students appropriate, constructivist teaching methods and activities used in the integration of technology for instructional purposes. By experiencing a constructivist approach, the students were able to make their own connections between technology and its use in the classroom and reflectively evaluate their progress and growth. It is hoped, since there was much growth and improvement in their knowledge of technology and its applications, that they will use these strategies and activities in their own classrooms.

Using Electronic Portfolios to Support Accountability and Preservice Teacher Preparation

Gerald W. Burgess & Barbara D. Holmes, Albany State University, USA

The demand for accountability establishes the framework for educational reform in the new millennium. The portfolio process represents a more authentic form of assessment in that it allows the teacher to judiciously select those work products and artifacts that portray the full range of the teacher's work. In an interactive discussion, participants will identify standards, course competencies, develop rubrics, and determine quality statements that support the evaluation and assessment of the electronic portfolio. The result constitutes not the "how to" develop an electronic portfolio but an understanding of the importance of integrating this strategy into the preparation of teachers who are more proficient in using technology to improve student learning.

Contextual Learning: Learning About Information Technology through Information Technology

Kathleen Burnett, Laurie Bonnici, Eliza T. Dresang & Margie Thomas, Florida State University, USA

The purpose of this institutional session is to acquaint the audience with the opportunities for contextual learning through web-based instruction for school library media specialists by the Florida State University School of Information Studies. It includes a justification of need and an overview of the certificate and degree programs that meet these needs. The web-based interface and tools employed are demonstrated and their pedagogical framework is discussed. Finally, specific examples of the ways that contextual learning principles are incorporated into a sampling of four of the courses included in the program is provided.

Education and Technology - A Faculty Development Program for Medical Educators

Margaret Burrows, University of Manitoba, Canada; Margaret Ford, University of Manitoba, Canada

A faculty development model for the integration of education and technology was designed and implemented to enhance teaching and learning. There is a great need to assist and provide support to medical faculty who wish to integrate technology into the learning environment. The Faculty of Medicine TIPs Group (Teaching Improvement Programs) proposed to enhance the skills of their TIPs faculty developers in the use of educational technology with the goal of subsequently transferring these same skills to the broader faculty at the Bannatyne Campus of the University of Manitoba. A consortium was formed and included Tips faculty as well as representatives from the Academic Computing Network (ACN), the Neil John McLean Library and Educational Support Services. The educational framework for the Education and Technology Workshop was the Seven Principles for Good Practice in Undergraduate Education (Chickering and Gamson, 1987). Experiential learning theory provided the framework for understanding how technology can be integrated with the principles of teaching and learning (Kolb, 1994, 1971). The workshop model was thus based on a "train the trainer" concept. We will discuss the successes and failures of this model and supply some reflection on future interventions and support strategies.

Mul;tiple Delivery Systems—A New Approach to Education Courses

Henri Sue Bynum, Indian River Community College, USA; Raymond Considine, Indian River Community College, USA

Indian River Community College (IRCC) is addressing the needs of non-traditional pre-service education students by developing multi-media Internet-based courses in education. These courses are learner-centered and combine the synchronous format required to develop social interaction skills with the asynchronous access to information and to assignments. We also address multiple learning styles and promote active student learning, while facilitating student success by providing web-based college support services online. An example of the courses developed, "Introduction to Education," features instructional lesson summaries and lectures using streaming video and graphics, graphic support materials, e-mail, chat rooms, message boards, and multi-media technology to address auditory, visual, and kinesthetic learning styles. Technology is used to promote synchronous and asynchronous active student learning and to support effective teacher facilitation. Our presentation will include a demonstration of the web-based course and an introduction to the student support services available to students. We will present the rationale for the course components along with a description of the learning styles addressed. We will also address the development of additional courses and staff development programs.

Technological Diversity: Managing Differing Technology Skills in the EdTech Course

David Byrum, Southwest Texas State University, USA

Students are coming to EdTech classes with more diverse technology skills than ever before. This presentation/paper will discuss varying ways to structure classes or instruction to work with these varying groups. The author will detail several of the strategies used in past classes, the results, and other methods the instructor may wish to consider depending on the situation. This paper/presentation will discuss strategies such as: student as expert/assistant, student as teacher, differentiated assignments, multiple paths, testing out, independent study, and technology portfolios.

Technology Standards for Preservice Teachers: Where are We Headed?

Edward P. Caffarella, University of Northern Colorado, USA

This presentation is a discussion of the implications for preservice teacher education programs of (a) the new National Educational Technology Standards for Teachers (NETS), (b) the Commitment to Technology indicator within the NCATE 2000 Standards, and (c) the new Colorado Technology Standards for Preservice Teacher Education Students. The standards will be discussed from the national perspective and from the perspective of the responses of one institution to the standards through a Preparing Tomorrow's Teachers to Use Technology (PT3) grant.

Implementing an Instructional Management System: Final Report

Ralph Cafolla, Fl, USA; Perry Schoon, Florida Atlantic University, USA

The national trend toward the use of high-stakes testing to make schools accountable for the standards students have mastered has forced school district to make sure that the curriculum taught in the schools is based upon the standards the students will be tested on. This paper discusses the results of implementing a sophisticated Instructional Management System (IMS) to help accomplish this task. IMSeries is a sophisticated relational database that was implemented to change the paradigm of how teachers think about the lesson planning process. Rather than concentrating on what the students will do, this project encouraged teachers to begin by thinking about what the students will learn. By using this system, teachers were able to track which standards mastered by each of their students and design their lessons based on objectives each students needs. This paper presents an overview of this three year project in the hope that the lessons learned will be beneficial to other districts interested in exploring using computer systems to support instructional decisions.

Distance Education and What is Coming Next.

Kemal,Cakici, The George Washington University, United States

In the last decade distance education has gained more importance and attention in its century long history. The more technology and society develops, the greater need for qualified and educated people exist. In order to support this demand for education, schools at all levels started developing and implementing distance education programs. Distance education helps people to work and complete their degrees anywhere while supporting them to become more qualified. As the technology is evolving everyday, the way these programs are delivered change and become more sophisticated. This paper will give a brief history of distance education and try to explain the latest developments in higher education institutions.

IT in teacher education

Sarma Cakula, Vidzeme University College, Latvia

We have idea for further education of teachers using new informatic technologies as a complex course in combination with attitudes and values and teaching methods

A Holocaust Web Site: Effects on Preservice Teachers' Factual Knowledge and Attitudes Toward Traditionally Marginalized Groups

Brendan Calandra, University of South Florida, USA; John Fitzpatrick, University of South Florida, USA;

The Holocaust remains one of the most effective and extensively documented subjects for an examination of basic humanitarian issues. Knowledge is the key to an intelligent understanding of such a tragic passage in human history, the key to a wisdom that will never let it happen again. To address the need for quality, accessible information about the Holocaust, the Florida Center for Instructional Technology developed an extensive website titled The Teacher's Guide to the Holocaust. This study was designed to investigate the effectiveness of the website. Specifically, data were collected via pre and posttest measures to determine if access to The Teacher's Guide to the Holocaust significantly impacted the knowledge level or attitudes of pre-service teachers.

Online Portfolios vs. Traditional Portfolios

Renee' L. Cambiano, Northeastern State University, Tahlequah, Oklahoma. USA; Alejandra Fernandez, Universidad Central de Venezuela, Venezuela; Ana Beatriz Martinez, Universidad Central de Venezuela, Venezuela;

Portfolio is a methodology for teaching and evaluation. A certain time and requirement must be followed when developing a portfolios must. It implies different activities such as: homework, presentations, research, projects, interviews, comments and others. This methodology demands students to compromise the process of learning, being the ultimate goal to fulfillment the program objectives. For this study, two groups were compared using online portfolios and traditional portfolios. The populations were composed of 58 college students from two different universities. Data were collected from September 1999 to January 2000.

Developing a Faculty of Education Technology Integration Plan: Initial Stages of a Large Scale Faculty Professional Development Program

Mike Carbonaro, Fern Snart & Cheryel Goodale, University of Alberta, Canada

There is a strong consensus among many educators that the teaching of technology should be incorporated across the curriculum at the earliest levels of education (Logan, 1995). Although Faculties of Education tend to realize the importance of technology, they have been slow to respond to the needs of the field (Barksdale, 1996). Thus schools have been forced to compensate for this lack of leadership by developing their own in-service technology programs for teachers. There are a number of reasons why Faculties of Education have been slow to respond to the impact of technology. First, many faculty members require extensive professional development in the area of technology integration so that they can model appropriate uses of technology (Rogers, 2000). Second, faculty professional development programs must be designed so that these programs fit into a Faculty's overall Technology Integration Plan (TIP)—the development of a Faculty TIP is a difficult process, especially given the complex political nature of any university environment. Finally, regardless of the TIP, each Faculty must find the resources to carry out the action items defined in the TIP in order to achieve the goals of the TIP. This paper will describe the University of Alberta's Faculty of Education TIP and its importance in a comprehensive effort to foster Faculty Professional Development. It will also discuss a newly funded research study of our 120 faculty members with respect to technology integration for teaching, learning, and research.

E3-Learning: More Than On-line Education

Roger "Bucky" Carlsen, Bonnie Mathies, Steve Hawley & Maggie Veres, Wright State University, USA

This paper describes the decisions and procedures that occurred when a traditional graduate level technology course was moved from the classroom lab setting to a partially on-line course with web enhancements. What we developed was an expansion of our initial plan and something quite different, far more complex, and more labor intensive. We knew that if we wanted schools to be different, we must prepare teachers differently ... significantly differently (Carroll, 2000). Our web enhancement efforts quickly triggered the development of an on-line educational support hub and the establishment of several on-line communities. Our on-line hub "E3-Learning" quickly expanded to provide resources and discussion boards for faculty, students, along with technology directors, library and media directors, and classroom teachers from 35 school districts. Within six weeks of the decision to initially "take one course on-line" the enhancement site e3-learning agreed to provide statewide technology standards discussion boards for 13 participating universities, Ohio SchoolNet, Ohio Board of Regents, and the Ohio Board of Education.

PT3: Changing the Climate for Technology in an EdSchool

Randal D. Carlson, Georgia Southern University, USA; Gene Franks, Georgia Southern University, USA; Kenneth Clark, Georgia Southern University, USA; Alice Hosticka, Georgia Southern University, USA; Mark Kostin, Georgia Southern University, USA

This paper describes the results of efforts to enhance the technology components of the undergraduate teacher education program at Georgia Southern University. Preparing Tomorrows Teachers to Use Technology (PT3) provided incentive to faculty through increased access to hardware and software, faculty support and mentorship by technology proficient teachers, release time to assist in the course and curriculum development process, technology training for pre-service teacher education faculty and demonstration teachers in K-12 schools, and mini-grants to pre-service teacher education faculty to enable significant change to the pre-service curriculum. Results showed that these efforts could increase the quantity and quality of the technology use in pre-service teacher training.

Field Experiences at a Distance: Virtual Internships

Randal D. Carlson, Georgia Southern University, USA; Judi Repman, Georgia Southern University, USA; Elizabeth Downs, Georgia Southern University, USA

Online instructors face the dilemma of providing meaningful field experiences for learners. In the Social Life of Information, John Seely Brown and Paul Duguid revisit Jerome Bruner's distinction between "learning about" and "learning to be." Brown and Duguid state (p. 128) "In the age of the web, learning about is easier than ever before." The real challenge for internet-based education is to help students learn how "to be." Field experiences and internships move students away from focusing solely on information toward an understanding of how knowledge informs practice. This paper explores creative ways to facilitate meaningful experiences in the field of practice for students-at-a-distance.

Working Side-by-Side: Preservice Teachers & Children Meet at the Computer

Nancy Casey, St. Bonaventure University, USA; Lisa Scriven, St. Bonaventure University, USA

This paper describes the effects of an after-school program where preservice teachers and elementary school children play and work together using computer games and other technologies and then complete activities based on those games. The program, based on the 5th Dimension, a project developed at the University of California, San Diego, is designed to give preservice teachers experiences using and evaluating a variety of technologies. It also, of course provides preservice teachers with opportunities to get to know children, learn to interact with them and guide their learning. The enthusiasm of the children often helps sometimes technologically-reticent college students. The paper will describe the project and highlight how this experience can help preservice teachers begin to meet national standards for new teachers.

Online Discussion as Catalyst for Metacognition by Students and Professors

Nancy Casey, St. Bonaventure University, USA; Philip Payne, St. Bonaventure University, USA; Patrick Casey, St. Bonaventure University, USA; Shandra Vacanti, St. Bonaventure University, USA

This session will discuss a variety of online discussion "settings" and present preliminary analyses of discussions in terms of what they tell us about student thinking and professors' responses. We will discuss how the use of online discussion can influence what and how we teach, and how that, in the long run, can affect preservice teachers' development.

Creating Collegial Networks

Micki M. Caskey, Portland State University, USA; Susan M. Bert, Portland State University, USA; David Bullock, Portland State University, USA;

This paper examines how web-based educational environments were used to foster collegial conversations in three case studies conducted in the Graduate School of Education at Portland State University. The cases describe instructors' and graduate students' experiences with interactive, online discussions. Two cases center on interactions in cohorts (groups) of preservice teachers, while the third case highlights the course-based exchanges of inservice and preservice teachers. Reactions to online interactions are analyzed. Several important considerations are shared about how to cultivate peer collaboration and encounter success when teaching and learning with web-based environments.

Historical Perspectives on Teachers, Technology, and American Public Education

Margaret Cassidy, Adelphi University, USA

New technology is one of the most frequently named components in, or rationales for, school reform. Many of the hopes expressed today for educational technology sound reasonable and desirable, but history suggests that integrating technology into classroom practice is a very complex process, profoundly affected by trends in educational policy, curriculum theory, and pedagogy. In particular, inadequate attention has been given to the ways in which debates over the use of educational technology are grounded in debates about the purposes and priorities of public education, and the role and status of teachers. This presentation will examine some of the common themes that run through the history of educational technology, with particular attention given to overlaps with trends in educational policy and theories about curriculum, teaching, and learning.

Preparing Educational Leaders to Cultivate the Meaningful Use of Instructional Technology: Beyond Budgets and Basic Training

Margaret Cassidy, Adelphi University, USA

Bringing new technology into schools is a complex, challenging process for teachers and administrators alike. There is an overwhelming volume of literature on issues like selecting hardware and software, planning budgets, and providing teachers with the basic technology training they need to get started. However, effective leadership requires a sophisticated knowledge of, and sensitivity to, a myriad of other issues, such as the privacy and First Amendment rights of teachers and students, questions of unequal student access to technology outside the home, potential gender inequalities in technology use, and the proper role of commercial and corporate entities in public schools. This presentation will explore some of those issues, and suggest ways for educational leaders to consider them in their day-to-day decisionmaking.

Comparison of face-to-face and online for introduction to educational technology courses for preservice and inservice educators

Cathy Cavanaugh, University of North Florida, USA; Terence Cavanaugh, University of North Florida, USA; Zella Boulware, University of North Florida, USA

An important experience for educators is learning to use computer technology as a teaching and learning tool. A requirement in many education programs is a course in educational technology. In Florida, a course for undergraduates and a similar graduate class fulfill that requirement. The courses include an overview of educational hardware, software, multimedia, Internet, and ethical and legal issues. Both courses have two main goals: building technology skills, and background for students to become integrators of technology into teaching. This year, six simultaneous sections of the courses were offered using a range of approaches. Two course sections were taught fully face-to-face. Three course sections were taught with students meeting in person for 50% of the time, and working in a web-based environment the rest of the time. One course section met only online. Surveys of all students were conducted at the beginning and the end of the course, and student performance on class activities and assessments was tracked. Comparisons were made on student attitudes and self-reported technology abilities, as well as course grades. The results of the comparisons will be used to determine the most effective teaching approach, and to incorporate that knowledge into planning for future semesters.

Online Technical Support Database for Educators

Cathy Cavanaugh, University of North Florida, USA

As educators depend more on technology, demand has grown for school technical support. Timely, convenient support is needed for schools to most effectively use technology. An online database was developed to provide immediate easy access to technical assistance. Developed for Florida educators, TLC: Tech Links for Classrooms, is a searchable web archive of assistance. TLC offers troubleshooting tips for hardware, software, operating systems and networking; steps for performing hardware upgrades; multimedia tutorials; and access to updates from vendors. Existing web resources were linked from the database and additional materials such as tip sheets and help files were created. Presentations related to using school computer networks, and tools to streamline the work of school technology coordinators were developed. Users may view all resources, or search the database by selecting from a list of six broad categories of resources: hardware, software, networks, general technology information, technology management, or technology training. Keyword searching locates specific topics. Search results list the resources with a link to the full resource, and a link to more detail about the resource. Resources are available as web pages, PDF files, PowerPoint presentations, database files, spreadsheets, word processing files, or multimedia SMIL presentations.

Standards of Practice: Online Educator Inservice Workshop

Cathy Cavanaugh, University of North Florida, USA; Terry Cavanaugh, University of North Florida, USA

"Standards of Practice" is a 10-hour, asynchronous web-based workshop designed for a broad range of educators. The workshop provides an overview of national and state curriculum standards and educational technology standards, and practice with choosing and integrating effective technology into standards-based teaching. Topics include effective searching, how to evaluate web sites, and how to do research on the web. The workshop was developed by university education faculty under a professional development schools grant to meet specific needs of area schools. "Standards of Practice" was offered free of charge to any teacher in the university's professional development schools, and teachers earned a stipend during the grant period upon completion of the workshop. After completing the workshop, teachers received an automatically generated certificate that they submitted for school district inservice credit toward renewing their teaching certificates. The workshop was delivered using WebCT, and is composed of six one to two hour modules: Introduction to Technology Standards, Sunshine State Standards, Searching the Web, Evaluating Web Resources, Research using the Web, Best Practices in Integrating Technology into Standards-Based Instruction. Each module includes instructional information on the topic, links to web materials, self-paced practice activities, and suggestions for finding further information on the topic.

The Need for Assistive Technology in Educational Technology

Terence Cavanaugh, University of North Florida, USA

This paper will address definitions, services, levels of technology and application of assistive technology concepts as they relates to education. An overview of the NCATE and ISTE guidelines concerning assistive technology, and the current elements of the graduate educational degrees concerning assistive technology is provided. Federal legislation concerns the application of assistive technology in an educational setting and its possible impact on educational technologists. A model is proposed for a course concerning assistive technology and universal design to better prepare instructional technology graduates to enhance the performance of students with disabilities and design educational material for increased accessibility. This session is intended for educators in instructional technology and exceptional education programs.

Effective Presentation Design

Terence Cavanaugh, University of North Florida, USA; Cathy Cavanaugh, University of North Florida, USA

Increasing use of desktop presentation software has created the need for understanding basic concepts of presentation design. Software such as web page editors, Inspiration and PowerPoint now support branching navigation, custom buttons, interactive menus, program control, and web interactions. These features can make a presentation software tool powerful and adaptable for custom lesson and presentations. It is easy to incorporate multimedia elements such as sound, graphics, animation, photos, and movies into a presentation. In addition, a presentation can include Web links, and files created in other programs, such as databases, spreadsheets, and charts. This session will provide an overview of design guidelines to enhance the use of text, sound, images, video, and slide layout. Suggestions for optimizing the display of the presentation will be addressed, along with ideas for testing presentations before delivery with a variety of equipment. This information is useful for beginning and experienced presentation developers who are interested in proven principles of effective visual and multimedia design.

Mathematics Teachers on Track with Technnology

Laurie Cavey, North Carolina State University, USA; Tiffany Barnes, North Carolina State University, USA

Participants will actively engage in mathematical investigations that integrate information technologies into the teaching and learning of mathematics, with the goal of maximizing the learner experience and minimizing the difficulty of its implementation. The investigations you will experience were developed for Algebra I students, but can be modified to other levels of mathematics. Discussion time will address some of the important issues in training teachers in this technology-rich instructional technique. By the end of the session, participants will be able to formulate similar instructional techniques using technology that is available to their local schools.

Modeling and Implementing Effective Technology Practices

María Victoria Pérez Cereijo, University of North Texas, USA; Mark Mortensen, University of North Texas, USA; Terry Holcomb, University of North Texas, USA

Faculty in the department of Technology and Cognition at the University of North Texas have identified several strategies to enhance students' use of technology and students' level of technology proficiency. In our instructional technology classes, future teachers are being introduced to the effective use of old and new technologies to deliver their lessons. In other courses in the department, innovations in the faster delivery of video on the Internet have allowed department faculty to store portions of videotaped class lectures on the department's server and make a sample of these available to prospective students. Thus, students may read about a class and also view a lecture before deciding whether or not to enroll in a course. Distributed learning models being used in the department make use of multiple platforms. One approach the department has developed is a program for the delivery of asynchronous and synchronous class-lecture videos with the use of streaming media and the Internet.

Letting teachers to interact with the idea of "Interactivity": What is "Interactive?"

Ozlem Cezikturk, University at Albany, USA; Gulcin Cirik, San Diego State University, USA; Murat Kahveci, Florida State University, USA

This report is the findings of the research on Interactivity, to find the possible characteristics, contexts, limitations, and ideals, of Interactive Learning Environments for future mathematics and science education areas respectively. A web-based survey was used to gather data on diverse views of the academicians, researchers, and teachers. With the help of their answers and our own questioning, we were able to come up with a four-leave model for Interactivity, with social, intellectual, technical, and physical dimensions constituting the four leaves. We hope that this research would give an idea to teachers for what they should expect from "Interactivity" or not.

Instructional Strategies for Adobe Photoshop: Developing Teacher Training that Works

Barbara Chamberlin, University of Virginia, USA

Adobe Photoshop is a powerful image-editing program with extended capabilities. Unfortunately, the power and versatility of the program can result in teacher training that is too broad, difficult to apply immediately to classroom resource development, and overwhelming to those new to image editing. Instructional conditions often place additional constraints on Photoshop instruction, such as lack of adequate lab facilities and short training periods. Skill-based training in Photoshop should be relevant, easy to learn and implement, well documented with tutorials for further exploration, and should build confidence and develop problem-solving capabilities.

Supporting the Development of IT Skills of Education Faculty Staff: An Australian Case Study

Dianne Chambers, The University of Melbourne, AUSTRALIA; Richard Holbeach, The University of Melbourne, AUSTRALIA

This paper will explore the ways one Faculty of Education has approached the challenge of increasing the uses, in particular the more advanced uses, of information technology (IT) to support teaching through the professional development (PD) of staff. A range of models of professional development (such as individual consultations, group workshops, paying to attend external training) was offered to staff to assist in developing IT skills. The uptake of these different PD models is investigated, and the staff members' perceptions of the development of IT skills, and the preferred PD models for developing IT skills are explored.

Predictive Relationships Among Certain Personality Factors and Novice Teachers' Use of the Newer Technologies

Sharon Chambers, Texas A&M University-Commerce, USA; Brenda Smith, Texas A&M University-Commerce, USA; Sarah Sienty, Texas A&M University-Commerce, USA; Jim Hardy, Texas A&M University-Commerce, USA

Because of the emerging demand for teachers, the research data may add to the body of knowledge on professional development and be used by teacher educators and staff development programs to modify and adapt curriculum through the identification and individualization of the different personality types. Based on a better understanding of personality differences and their use or disuse of technology in the classroom, educators may be better equipped to understand how each individual approaches technology, understand students who are reluctant to learn and provide assistance to those individuals so they may better utilize technology in their teaching process.

LEADING ACADEMIC CHANGE - Through Connective Leadership and Learning

Manoj Chandra-Handa, Knox Grammar School, AUSTRALIA

Leading academic change in our educational organisations requires a paradigm shift at two levels - both in learning as well as educational leadership. The learning paradigm needs to shift from teacher-centred, "broadcast" learning to interactive, connective learning. It is an environment that focuses on learner-centred education; and the educational institution becoming a learning organisation where teachers share learning with students; and students are exposed to a curriculum infused with technology rich learning programs. To reach that colourful, compelling dream of learner-centred education, we need visionary, connective leadership in our educational institutions - a leadership that connects by two-way arrows, with a paradigm shift from independence to interdependence, from control to connection, from individual to group.

Student Satisfaction with Online Math Courses and Its Impact on Enrollments

Faith Chao, Golden Gate University, USA; Jim Davis, Golden Gate University, USA

Convenience is the most important benefit perceived by online students of the asynchronous online delivery format. Students appreciate the flexibility of course access at any time and in the comfort of their homes or at the office. That online courses are well received by Golden Gate University students is not surprising, as our student body is predominately composed of part time students who work full time. Three years ago the math faculty was asked to put a number of courses online. Anticipating difficulties, the math faculty worked hard to design courses that somehow transcend these problems. In the initial stages of development we feared that the online popularity would not extend to graphics-based courses such as those typically taught in the Math department. How would the student draw a graph or write a formula over the Internet without first learning sophisticated software packages? How would they communicate with faculty and classmates other without this capability? In this paper we will present enrollment trends of online math classes verses traditionally delivered classes in relationship to enrollment trends university-wide. In addition, we will present an overview of the characteristics of our online courses and present findings from recent research on online instruction.

Teacher's stages of development in using visualization tools for inquiry-based science: The case of Project VISM

Michael T. Charles, Eastern Michigan University, USA; Robert A. Kolvoord, James Madison University, USA

Scientific visualization tools have shown tremendous promise in drawing today's increasingly visual learners into in-depth inquiries in mathematics and science. One of the critical questions surrounding the use of these relatively advanced tools is the stages which teachers go through in moving these tools into their own practice. In this paper we examine existing schemas for these stages of development. Then we relate one of those schemas to Project VISM, an ongoing NSF-funded project intended to help middle school and high school math and science teachers learn the techniques and application of data visualization for their own classroom. We describe these stages of development for each of four different scientific visualization tools. Then we conclude the paper by proposing some further development of the models based on our experience followed by a brief discussion of related issues.

Technology and Teacher Preparation: A Case Study

Regina Chatel, Saint Joseph College, USA

Over the past several years, I have attempted to raise both the computer knowledge level and the computer comfort level of preservice teachers by: 1) integrating technology into my own teaching, 2) using technology to foster preservice teacher inquiry and high level thinking, and 3) using technology to encourage preservice teachers to become educational leaders. However, I have found that many students in my literacy education classes are terrified at the mention of computers, and feel that they cannot master computer-related activities. This report describes several of the activities and assignments and their impact on preservice teachers' perceptions of the role, use and purpose of technology in the classroom. As a result of participation in this session, participants will (a) examine preservice teacher existing attitudes toward the use and role of technology in their own learning , (b) examine the effect of courses which have integrated technology into the teaching and learning processes on preservice teacher attitudes, (c) examine which instructional strategies appear to have a positive effect on these attitudes, (d) examine the extent to which preservice teachers can speculate on the use and role of technology in their future teaching.

Co-operative Teaching and Learning in Information Technology and Modern Foreign Languages

John Chatterton, Sheffield Hallam University, England; Christopher Willan, Sheffield Hallam University, England

This paper examines three years' experience of collaborative teaching and learning of ICT on a PGCE course leading to qualified Teacher Status. Groups of students intending to teach ICT as their subject specialism have worked with groups training to teach Modern Foreign Languages to develop MFL teaching and learning materials that make effective use of ICT. They have then worked together in local secondary schools, using the materials to teach pupils from across the secondary age range (11 - 19). This paper examines how these experiences change the attitudes to ICT of Modern Foreign Language students and how it affects their subsequent use of ICT to deliver MFL teaching and learning in the secondary school classroom.

Reform in graduate school technology program

cellestine cheeks, towson University, usa

This paper presented a summary of research that was collected over a two year period for the purpose of evaluating a graduate School Library Media Program. Reform in professional education programs that train school library media specialists provides opportunities to eliminate disparity between job competencies taught and job competencies required by school library media sepcialists in their jobs. Because school library media services radically changed its emphasis at the end of the second millennium, from focusing on resources to students to creating a community of lifelong learners, it is essential that professional programs that train school library specialists keep pace with current job demands. Program evaluation that leads to a redesign model that prepares graduate students for their roles as leaders and directors in today's technology-centered schools was needed. This process of evaluation and redisign was undertaken and will be highlighted. The results of this study is the basis for program reform.

Analyzing Bilingual Education Preservice Teachers' Learning Outcomes in a Computer Literacy Course; From the Technological Perspective and the Pedagogical Content Perspective

Irene Chen, University of Houston - Downtown, USA; Sandy Cmajdalka, University of Houston - Downtown, USA

This paper presents findings of a study designed to analyze student performance from two unique perspectives: the technological perspective and the pedagogical content perspective. The student population consisted of three separate cohort groups enrolled in a computer literacy course (CS 1105) and a bilingual instructional reading course (READ 3303) concurrently. Students were enrolled in the courses during the fall 1999, spring 2000, or summer 2000 semesters. All students were preservice teachers in the bilingual education program at the University of Houston-Downtown's Department of Urban Education. During the semester enrolled, the students were required to complete several major assignments integrating technological content knowledge with pedagogical content knowledge. Assignments included the creation of an instructional lesson plan, a World Wide Web search for information to be used instructionally, and the production of a graphic organizer to present educational information. For each assignment, students were to show their mastery of the technological tool while also showing competence in a pedagogical content area. All student assignments were evaluated by both the technology professor and the bilingual reading professor. This study collected information on the similarities and differences between the grades received and comments noted by the two professors, each from a different perspective.

Redesigning an Educational Computing Course to Meet New State Technology Initiatives

Linlin Irene Chen, University of Houston Downtown, USA

The Department of Urban Education (UE) at University of Houston Downtown first began in the fall semester of 1995. It has just started along the technology trail to learn from other institutions that have already addressed some of the issues and found some answers. The shared goal of the faculty in the department is to offer an educational computing course that falls on the end of "teaching with technology across the curriculum". The one credit hour educational computing class CS1105 is in the process of being redesigned by the UE faculty as a 3 credit hours class ETC 3301. The brand new ETC 3301 is proposed to open to all entering pre-service teachers starting spring 2001. Texas Education Agency, State Board for Educator Certification, and several other governing institutes of teacher education programs in Texas are raising standards for computer literacy for new teachers. It was suggested to all computer literacy courses to conform to the current versions of the national and state frameworks and guidelines. On the survey, the students were asked to evaluate their skill levels on using programs such as spreadsheet, database, and philosophy of using technology. This paper will also analyze results from students' self-reports completed on the first day of class for three semesters. The students' input will be implemented into the redesign of the CS1105 to ETC 3301. The paper will discuss the processes of redesigning the educational computing course to meet new state technology application initiatives.

The Great Digital Divide Found in American Education: The increasing technological disparity in America's schools

Linlin Irene Chen, University of Houston Downtown, USA; Jane Thielemann, University of Houston Downtown, USA

Within the past decade, a growing body of evidence supports the ever-widening technological gap among American school children (U.S. Department of Commerce, 1998). The "Digital Divide," a leading economic and civil rights issue, is defined as the divide between those with access to new technologies and those without. Disparity in computer use can be found among rural, urban and suburban students, with the division drawn upon socio-economic lines. This trend indicates that the "haves" possess increasingly more information and economic opportunity, while the "have-nots" are lagging even further behind. Groups that lack access to information resources include: minorities, low-income people, less education people, children of single parents, and residents of rural areas or inner-cities (http://www.ntia.doc.gov/ntiahome/fttn99/contents.html). Since many people do not have knowledge of technology to pass onto their children, schools will serve as the catalyst for preparing America's youth for the age of technology. Data indicate that outside of work, schools are the second most frequent place where people access the Internet, 33% of access is made from schools (http://www.digitaldivide.gov). Since schools are so important for technological education and access, the U.S. Department of Commerce has arranged for additional funds to aid American schools in purchasing technology. These funds are now available for nonprofit educational organizations and public school districts. Educators must recognize the manifestations of the technical inequality as it affects the lives of America's school children and must become aware of initiatives, both federal and private, that will provide the means and methods to narrow this gap. The purpose of this paper is to describe the "Digital Divide" and explain the steps needed to be taken by America's educators to close this gap.

Project Learning Links: A Model for Integrating Technology into Teacher Education

Christine O. Cheney, University of Nevada, Reno, USA; Steven E. Cavote, University of Nevada, Reno, USA

"Learning Links" is a PT3 project housed at the University of Nevada, Reno. The project uses a four-component model to infuse technology in all aspects of the undergraduate teacher education program: (1) modeling, (2) integrating, (3) enhancing, and (4) applying. University faculty are given technological assistance and incentives to develop the skills and uses for technology within their existing education courses. Data describing the current level of technology use by the faculty, as well as their attitudes toward technology, will also be shared and the implications discussed.

The Technology in Education Competency Survey (TECS):A Self-Appraisal Instrument for NCATE Standards

Rhonda Christensen, University of North Texas, USA; Gerald Knezek, University of North Texas,

The Technology in Education Competency Survey (TECS v1.1) (Christensen, 1999) is a self-assessment rating form covering teacher competencies in major areas addressed by the National Council for the Accreditation of Teacher Education (NCATE) standards for the USA.

Portfolios: The Plan, The Purpose, A Preview

Val Christensen, Valley City State University, USA; Patricia Gegelman, Valley City State University, USA; Larry Grooters, Valley City State University, USA; Linda Holcomb, Valley City State University, USA

Valley City State University provides each and every student with a laptop computer. This access to technology was the impetus for encouraging students to produce an electronic portfolio. Recent university requirements state that all graduating education majors will produce an electronic portfolio as a graduation requirement. This portfolio showcases the skills and abilities adopted by the university. Presentation of portfolios is evaluated by small groups of faculty as an exit exam.

The Effects of Web Pages Design Instruction on Computer Self-Efficacy of Preservice Teachers

LiLi Chu, National College of Physical Education and Sports, Taiwan, R.O.C.

This study tested the effects of web pages design instruction on improving computer self-efficacy of preservice teachers. A sample of 206 preservice teachers who registered in five sections of a course related to computer network application in instruction participated in this research. Demographic data, prior computer experiences, and computer self-efficacy measure were collected in the first class section. Then a 14-week instruction of web pages design proceeded. Computer self-efficacy scale, computer network anxiety scale, and software self-efficacy measure were processed again at the end. The instruction of web pages design did significantly improve the computer self-efficacy of preservice teacher. Various computer experiences, including computer use time, internet link time, the use rate of word processor, e-mail, game, presentation software, were significantly related to computer self-efficacy. A negative relationship between computer self-efficacy and computer network anxiety was found. Generally, it is confirmed that most educators believe to increase the opportunities to learn and use computer may facilitate the confidence and competence of preservice teachers.

The role of teacher mediation in the development of hypertextual projects

Maria Vittoria Civiletti, Universidade Gama Filho and Universidade Federal Fluminense, Brazil; Ana Maria Santos, Universidade Gama Filho, Brazil; Luciene Santoro, Universidade Gama Filho, Brazil.

This research aims to investigate the role of teacher's mediation in the development of cooperative learning and autonomy. It was based on the constructivist and social interactional learning teaching conception. In order to do that, we accomplished a longitudinal case study with genetic analysis of the occurrence of situations involving co-operation and autonomy among 8-10 year old children in the course of a work project using Micromundos software. The teacher organized a field journal and four categories were used in its analysis: "Cooperative learning", "Autonomy", "Non-existent cooperative learning" and "Heteronomy". The increase of the two first categories and the extinction of the last ones were verified during the intervention, demonstrating the importance of teacher's intervention in the development of those characteristics.

Brasilian National Computer Program for Education and its Contribution to a Constructivist Educational Process

Maria Vittoria Civiletti, Universidade Gama Filho and Universidade Federal Fluminense, Brazil; Maria das Graças Silva, Secretaria Municipal de Educação/RJ, Brazil

The current study aimed to evaluate the 'Computer Course Applied to Education' addressed to teachers from Brazilian public schools and offered by PROINFO (National Computer Program for Education), attempting to promote a social/interactional and constructivist teaching-learning attitude. The analysis was developed through a case study model and the used research technique was 'Illuminative Evaluation' (Parlett, 1990). Three categories (Cooperative work, Autonomy and Suitability) and their indicators were separately observed and evaluated throughout the three stages of the course. The analysis of frequency evolution throughout the course demonstrated a progressive rise of category occurrence. "Cooperative work" was identified in 75% initial observations and 91.6%, towards the end. The same happened to "Autonomy", increasing from 59% to 91.6%, and "Course suitability", from 70.3% to 94.4%. Through the analyzed data, it was attested that the educational computer course offered by PROINFO in NTE II/RJ could stimulate the adoption of a social-interactional and constructivist attitude by the teachers, concerning their pedagogic practice. Concluding so, we recommend the promotion and extension of similar training programs; an annual diagnose of how the professionals are adapting to new working proposals and the development of researches about inserting new technology in the school environment.

Teacher Created Virtual Field Trips

Kenneth Clark, Georgia Southern University, USA; Alice Hosticka, Georgia Southern University, USA; Marti Schriver, Georgia Southern University, USA; Jackie Bedell, Georgia Southern University, USA

This paper will discuss the use of technologies, commonly found in schools, to develop and create virtual field trips. The discussion will focus on the advantages of both using and creating these field trips for an instructional situation. A virtual field trip to Cumberland Island National Seashore, St. Mary's, GA will be used to discuss the technologies involved and the value of their use for instruction in a science classroom. While this field trip is being used as a discussion point, the techniques and advantages identified can be applied over a P-16 grade range in all subject areas. This of creating a virtual field trip can be as simple as using digital pictures and text in Microsoft Powerpoint or Hyperstudio or as complex as using digital video and panoramas in MacroMedia Director. The level of complexity will depend on the technology available and skills of the developers.

Tech Ambassadors: The Next Generation of Professional Development

Joanne Clemente, New York Inst. of Technology, USA; possible grad assistant, New York Inst. of Technology, USA

This paper will focus on the results of an ongoing project that involves training both pre-service and in-service teachers, as well as K-12 students, in the utilization of technology in the classroom. Through the institution of the "Tech Ambassador" program, students in our undergraduate education program team up with in-service teachers and use a problem solving approach to provide technology enriched lessons in these teachers' classrooms. Through observation of and active listening to the needs of current teachers, these pre-service teachers brainstorm lesson ideas with their college classmates, research appropriate technology solutions, practice delivery, and finally model the integration of technology in the K-12 classroom under college faculty supervision. The project exemplifies a constructivist approach to learning that uses real-world problems, project-based curricula, and an active learning environment.

Qualitative Data Analysis to Ascertain the Benefits of a Web-Based, Teacher Oriented Project

April A. Cleveland & John Park, North Carolina State University, USA

Qualitative data is often overlooked when judging the success or failure of a web-based project, but can be a valuable resource in evaluating the potential needs and experiences of the participants. Research has determined that the use of both qualitative and quantitative data as an analysis tool to determine the success or failure of a venture provides a holistic look that provides insights that may not have been obvious in a quantitative only type evaluation. This paper will analyze the use of qualitative data to determine the benefit of a teacher oriented web-based project. The participants, who were upper level elementary, middle and high school teachers, participated in the web project in one of two ways. One, by attending a three-hour workshop in which they were introduced to the online project and instructed in its use. Secondly, they could participate online, by completing a registration form and receiving a password that allowed them to access a web tutorial as an introduction to the project. The purpose of this analysis is to determine if and to what extent peer-to-peer interaction and face-to-face interaction with a workshop leader affects the involvement and participation in a teacher oriented web-based project.

Teaching & Technology: A Natural Integration

Carole Cobb, Ph.D., Bellarmine University, Jefferson; Ivan Baugh, Bellarmine University, Jefferson; Jan Goings, Bellarmine University, Jefferson

In keeping with the School's theme Teachers as Reflective Learners, the Middle/Secondary MAT Program's aim is to produce forward-thinking professional educators who are culturally responsive, inclusive and reflective in their teaching. The Program provides high quality educational experiences which enable pre-service teachers to gain conceptual proficiencies for creating a secure, caring, learning environment that appeals to a wide variety of students; and that supports both a sense of collective purpose and individual construction of complex responses. This is achieved through the use of instruction and management tools; create activities used throughout the curriculum for teaching and learning and for assessing and evaluating student progress; and through use of on-line discussion group assignments. Our constructivist educational approach stresses teaching for meaning-making rather than memorization or practice of rote skills. It calls the MAT students to construct their knowledge as active inquirers into the subjects they are studying. Some memorization and rote-skill may be incorporated into their learning, but only to assist the overall goal of furthering their students' active understanding.

Change as the Constant in Creating Technology Rich Learning Environments

Connie S. Collier & Theresa A. Minick, Kent State University, USA

As members of the implementation team for the Preparing Tomorrow's Teachers to Use Technology (PT3), we regularly participate in meetings focused on strategies for intensifying and broadening the use of technology rich practices in teacher preparation. Essential to our successful experiences with technology and innovative teacher preparation has been our willingness to participate in ongoing change. This change is multidimensional as it relates to the nature of our classroom, course content, and technological strategies used to accomplish our goals for student learning. If we have come to know anything as a result of our participation with technology integration it is that change is the constant.

The role of IT in the classroom and its implications for pre-services teacher education.

Lorraine Connell, NTU, Australia

IT in the classroom and its implications for pre-service education. A return to the classroom to explore how IT can be used as an educational tool with a class of Yr1/2/3 children. What I discovered has implications for the content of the IT unit in the pre-service teacher education course.

Applications of Knowledge Based Evaluation in Educational Technology.

Michael Connell, University of Houston, USA

In an emerging system, one of the primary functions of the founders should be to explore acceptable justification systems. Consider, for example, intuition, logic, or causality. In doing this, it is helpful to recognize that each choice of systems—even if only made on a temporary basis—will have significant impacts on which true items may be proven and which false items may be disproved. When this is done a case is easily made that a meaningful evaluation is possible with only a shared justification system present. Items of truth and belief, although of extreme interest to the parties of most evaluations, are shown to be irrelevant to the advancement of knowledge that may come about as a result of the evaluation itself.

A Planning Model for Integrating Technology and Educational Methodologies in the Pre-Service Teacher Education Program

Pamela Cook, Notre Dame College, USA

The Modeling Instruction with Modern Information and Communication Technologies (MIMIC) Project involves a consortium of 5 Cleveland Area colleges, including Notre Dame College, which provides pre-service teacher education. MIMIC, funded by a US DOE Preparing Tomorrow's Teachers to use Technology (PT3) grant, targets three populations as teaching models for pre-service teachers:

(1) Higher education faculty who deliver methods and foundations instruction; (2) K-12 teachers who supervise pre-service field experiences; and (3) Higher education Arts and Sciences faculty. As coordinator of the Notre Dame technology endorsement and the MIMIC project, my challenge is to help each of the target populations use a consistent, effective process when planning and revising curriculum to integrate technology. As such, I developed a 3-stage planning model to blend constructivist and directed teaching paradigms with a technology component. The development, description and the model's use in practice will be discussed. The planning model is designed for teachers modeling technology in higher education programs. It can also be used for teaching integration of technology to pre-service teachers. The following benefits of using the model will be highlighted: (1) a clear starting point for planning (2) a system for customizing individual components (content area, grade level, assessment methods, etc.) (3) a way of identifying choices made in each stage of planning (4) a way of identifying technology skills needed for chosen components; and (5) a method for developing independence in planning

Integrating ISTE & NCATE Standards into Educational Technology Masters Programs

Steven Coombs, Sonoma State University, USA

Educational Technology Masters programs are coming of age! The International Society for Technology in Education (ISTE) has published a five-step blueprint outlining the curriculum standards requirement for all advanced programs in educational computing and technology (ECT) leadership. This paper examines these standards and explains how they've been recently interpreted for all future Ed. Tech.-related Masters courses at Sonoma State University (SSU).

Growing the Learning Landscape: Experience in Environment and Process

Peter Cooper, Sam Houston State University, USA; Jeannine Hirtle, University of Texas-Arlington, USA;

Teachers are faced with implementing technology provided without consultation, often without consideration of the infrastructure, much less the technical or curricular training necessary to make full use of it. Too often we focus our attention on the Mountains of Technology forgetting that landscape is more than just the one prominent feature; it encompasses the Streams of Curricular Change, the Evergreens of Knowledge, the High Plains of Critical Thinking, the Safe Arbors of the Community. Through all this rich environment blow winds of administrative, political and social change that can make barren former gardens of thought and pile rich soil in new areas. Should we as teacher educators help them scale the mountain to obtain a different perspective or encourage them to skirt around, treating the intruder as a stumbling block to their journey and as eyesore that hides and overshadows part of the landscape? What follows is a descriptive case study that examines one university program's attempt to resolve apparent disparities between the learning and integration of technology into K-12 environments.

Views from an Asian Bridge How International Students See Us and Still Survive

Richard Cornell, Corey Lee, Sam Pan Chang, Michael Tsai & Terry Tao, University of Central Florida, USA; Andy Ku, Arizona State University, USA

Increasing numbers of international students are entering the graduate programs in the area of Instructional Technology at the University of Central Florida. With this influx comes a series of communications and miscommunications between American faculty, staff, and students with their Asian and other international peers. This article and presentation describe the problems encountered and efforts being made to resolve them. It is our hope that other faculty, staff and students from North America will benefit from our experiences.

Towards a reading and text production practice with FL learners: a collaborative text construction with FL groups of French, English, and Spanish in the Web via the EquiText

Janete Sander Costa, Joice Armani Galli, Lara Oleques de Almeida & Paulo Coimbra Guedes, Universidade Federal do Rio Grande do Sul, Brazil

An FL pedagogy, integrating reading and writing skills in foreign language teaching, associated with Web resources, may contribute to the development of those skills while producing collective texts. The EquiText, a collaborative writing tool, allows for innovations in text production either through teamwork or individually, mostly asynchronously. The readers/writers' participation in text construction may promote virtual interlocutions among the writers (FL learners), and their readers (the lecturer, the other fellow writers, researchers/ observers). Another perspective of the current sole text reader, writer and evaluator is suggested. We propose to analyze the usefulness of the Equitext in significant written discourse as a result of the interactions in the tool. Three foreign language productions sustain our assumptions: texts produced by intermediate Brazilian college learners of French, English and Spanish as FLs, either individually, in paper, or in teams, using the EquiText, with significant results.

The Quest for scientific inquiry: A document analysis of Quest projects.

Gregory Coverdale, St. Cloud State University, USA

The 1996 release of the National Science Education Standards (NRC, 1996) energized the national focus on improving U.S. science education in K-12 schools. The standards provide a strong emphasis on inquiry as the primary pedagogical framework in promoting science literacy. Similarly, the recent release of the National Educational Technology Standards (ISTE, 2000) has catalyzed the process of integrating information technology across the curriculum. The ISTE standards provide a curricular framework for technology integration and correlate technology-rich learning activities to standards in several content areas. Thus, these two policy documents provide teachers and students a detailed roadmap for pursuing science and technology literacy; the cornerstone of both literacies being the inquiry process. This paper is a qualitative document analysis of one commercially produced Quest project: AsiaQuest. The paper also examines preservice teachers' reflections on their participation in Quests as part of their professional preparation.

Developing an understanding of the social studies through technology-rich Quest projects

Gregory Coverdale, St. Cloud State University, USA

One of the difficulties of teaching and learning in K-12 social studies classrooms is the "fuzziness" of the discipline. What do we mean by social studies? The Curriculum Standards for Social Studies: Expectations of Excellence (NCSS 1994) provide a detailed framework for describing the curricular foci of the social studies by dividing the social studies into ten thematic organizational units. These themes are further delineated by performance standards for the early grades, middle grades, and high school. This paper is a qualitative document analysis of a technology-rich, interdisciplinary curriculum produced by Classroom Connect, a major producer of technology education products. This analysis focuses on the social studies themes present in one specific Quest project: AsiaQuest.

Welcome to the Virtual Library! Are You Prepared to Enter?

Fannie Cox, University of Louisville Libraries - Ekstrom Library, USA

Like so many other university libraries, the University of Louisville Libraries is creating an environment where the university community, its students, faculty and staff can access information from "virtually" anywhere in the universe. No longer does one have to physically go to a building and search the card catalog. One can search the University Libraries electronic resources from home as well. But, with this new level of access come pitfalls. Faculty and students were already amazed with the abundance of information available from the Internet and now the University Libraries has increased the level of access by making electronic resources (journals, books, and databases) accessible using Internet technology through the University Libraries gateway and online catalog. This paper will discuss the differences between the Internet, the University of Louisville's gateway and the online catalog, by demonstrating a few of the major electronic resources accessible through the Internet. And, it will enlighten faculty and graduate students on the differences and similarities of searching the Internet, the University Library's gateway and the online catalog to become knowledgeable and efficient searchers for information in today's virtual library.

The Integration of Assistive and Adaptive Technologies Into the Preservice and Advanced-Level Courses of Instructional Technology and Special Education

Caroline M. Crawford & Sylvia S. Martin, University of Houston-Clear Lake, USA

Instructional technology has become a tool that is integral to the preservice teacher educators' bag of tricks; however, the integration of assistive and adaptive technologies into the learning environment to meet the needs of special education learners is sometimes perceived as more cumbersome. The integration of assistive and adaptive technologies into the preservice and advanced-level instructional technology courses is discussed.

Supporting the Professional Development of Preservice and Inservice Instructors: Aspects Toward a Nurturing, Creative Learning Environment

Caroline M. Crawford, University of Houston - Clear Lake, USA; Terri Edwards, University of Houston, USA

Professional development opportunities must offer a learning environment that creates a nurturing, creative, successful atmosphere for the learners. Instructional design models, learning styles and technology implementation strategies impact this supportive environment.

Integrating Technology into the Young Child Lesson Plan

Michael Bell, University of Houston - Clear Lake, USA; Caroline M. Crawford, University of Houston - Clear Lake, USA

The support of the early childhood and instructional technology faculty members offer the teacher candidates a supportive environment through which to design, develop, discuss and revise a lesson plan. Such a learning experience offers the teacher candidate the opportunity to think through the real-world process of integrating instructional technologies in appropriate and successful student-centered manners.

Maryland Technology Outcomes and Performance Assessments for the Beginning Teacher

Marcia B. Cushall, Frostburg State University, USA

A Maryland task force consisting of K-12 teachers and coordinators, higher education faculty, Maryland State Department of Education personnel, and personnel from the Maryland Higher Education Commission convened in April 1998 to begin to develop technology outcomes and performance assessment tasks for beginning teachers in Maryland. The draft outcomes developed by this task force were distributed to schools and professional organizations for feedback. The task force, lead by the Maryland State Department of Education, applied for and received a PT3 Catalyst Grant to continue its work. Supported by funding from the grant, the outcomes were revised and draft performance assessment tasks were developed for three of the seven outcomes. In fall 2000, these tasks were piloted on several campuses and work began on the assessments for the remaining four outcomes. Participants will be encouraged to offer feedback on the content and form of the outcomes and assessments.

Integrating Technology into a Teacher Education Diversity Course

Ramona Maile Cutri, Department of Teacher Education, Brigham Young University, USA

This paper presents initial insights gained from integrating technology into a required multicultural education course. Students were required to include sources from the Internet in an assignment where they explored how a cultural group other than their own was represented in the media, curriculum, and policy. The range of Internet sources students found included easy to locate sites such as the state department of education site to highly specialized sites focused on a particular cultural group. Students' ability to critically analyze the on-line content they found greatly varied. Some students merely summarized content. Others students applied terms and concepts from multicultural education to identify the messages conveyed through the sites and the potential impact of these messages on students and teachers. Greater attention must be devoted to teaching students how to critically analyze on-line material if the Internet is to serve as a teaching tool for diversity.

The Challenges of Interfacing Between Face-To-Face and Online Instruction

Nada Dabbagh, George Mason University, USA

The use of the Web for instructional purposes at higher education institutions has crossed the spectrum of distance education delivery contexts, ranging from the Web being used to supplement face-to-face instruction to a primary delivery mechanism for instruction. This article discusses the migration from face-to-face classroom instruction to Web-Based Instruction (WBI) through the experience of a faculty member in the creation and teaching of Web-based courses at a higher education institution. Specifically, four areas which represent challenges for faculty will be discussed: issues surrounding course content; technological assumptions; logistical and implementation challenges; and interfacing between face-to-face and online learning environments. Guidelines for effectively integrating components of a WBI system to support the teaching and learning process in each of these areas will be provided.

Developing Professional Development Schools: An Integrated Model

Evelyn M. Dailey, Towson University, USA; Sally McNelis, Towson University, USA; Robert Wall, Towson University, USA; Miriam Struck, Towson University, USA

The creation of Professional Development Schools (PDS) is a key component of the Conceptual Framework for Professional Education at Towson University and the Redesign of Teacher Education (MHEC, 1995). Since 1994 Towson University has been committed to the development of the PDS. Although the PDS model occurs at the elementary and secondary levels, for the most part it has been limited to general education environments (Berry & Cotoe, 1994). The PDS movement has invigorated teacher eudcation programs across the country, but as yet its effectiveness is in doubt (Byrd & McIntyre, 1999). Similarly, most of the PDS information is acrquired from general education classrooms. The effectiveness of the PDS model has not been validated for special education. The purpose of this paper will be to present preliminary findings validating an integrated PDS model for secondary level students with special needs.

A Partnership for Training Teachers: Using Technology-Rich Cohorts

Daniel Ryan, National-Louis University, USA; Kathy Onarheim, Milwaukee Public Schools, USA; Cindy L. Anderson, National-Louis University, USA

Today's preservice teachers will be teaching the workers of tomorrow. These future workers must be trained for a world where projections indicate that five of the ten fastest growing job areas will be computer related (College Planning Network 1996). In response to the need for training technology-adept teachers, a partnership between National-Louis University and the Milwaukee Public Schools in Wisconsin, Prince George's County Schools in Maryland, and Prince William's County Schools in Virginia was made with the goal of combining their efforts to train teachers who will be fluent in technology integration for the participating schools districts. Funded by a PT3 grant, Transforming Learning and Teacher Preparation through Technology-Rich Cohorts, National-Louis University (NLU) is providing the faculty to teach the courses and is recruiting the preservice teachers who each have a laptop computer to use. The participating school districts are providing the location for the teacher education classes, the necessary computer labs for the training, and the clinical placements in technology-rich classrooms for the preservice teachers. This presentation will be a report on the current progress of the grant. During this first year, the grant actively involves the Milwaukee Public Schools. Representatives from both the district and National-Louis will describe the part that each institution has played to begin the training of technology-proficient preservice teachers. Samples of selected student electronic portfolio artifacts developed as part of the program will be demonstrated also.

Creating Virtual Learning Communities in Africa: Issues and Challenges

Osei K. Darkwa, University of Illinois at Chicago, USA

This paper discusses the growing application of information communications technologies in Africa and other parts of the world. It examines the growing global information technology revolution and how it is transforming educational institutions. It then discusses the state of distance education in Africa, identifying the institutions offering distance education and the nature of the delivery platform used. The prospects and challenges in introducing distance education to tertiary institutions in Africa is discussed. Finally, it offers suggestions to overcome the challenges confronting technology-based education in Africa.

Establishing a New Paradigm for On-line Education

Anthony R. Davidson, Anne Stanton & Steve Albanese, New York University, USA

The steady evolution of communications technology (radio, television, interactive video, audio-graphics, electronic mail, Internet, intranet) has considerably influenced the development of distance learning. This third generation of distance education, which includes interactive video, email, Internet, intranet, and audio graphics technologies, learning activities via these distance education systems has been redefined to include and focus on teacher-student interaction. This paper examines technology, student lifestyles, faculty characteristics and continuity, quality and quantity of courses, quality and quantity of students, and interactivity as the primary ingredients of a successful and effective on-line education program. In particular, the program at the Information Technologies Institute in the School of Continuing and Professional Studies at New York University, an asynchronous education programs, is demonstrated and evaluated. Instructional design principles and novel authoring concepts are introduced to the online course environment.

Dilemma Analysis of Constructive Case-based Approach to Distance Learning

Niki Davis, Qian Li & Rema Nilakanta, Iowa State University, USA

This study explores the dilemmas faced while teaching a course on distance learning based on constructivist learning principles using case studies. The course is open to undergraduate as well as graduate students. It is a hybrid course. The class meets once a week for two hours and the remaining time interacts online using WebCT, an online course management software. The course design draws on constructivist learning theories of Vygotsky and Lave and Wenger's theory of authentic learning. The students are introduced to concepts of distance learning by studying real-life cases and also developing and analyzing their own cases of distance learning. Such an approach presents dilemmas at every stage of its development, for example, the need to strike a balance between breadth and depth of content to be covered. The authors continue to struggle with similar issues causing them to constantly review and revise their design leading to a fuller, richer learning experience.

Infusing technology in K-12 classrooms: A study of one method used to evaluate the impact of a teacher-focused technology integration program

David Dean, Eastern Washington University, USA

The purpose of this presentation is to describe one method used to evaluate a program designed to prepare teachers to integrate technology into the classroom so that children will become capable and confident users of technology. A quasi-experimental evaluation method, which was used to evaluate the Gates Foundation's Teacher Leadership Project in Washington state, will be presented and discussed. Goals of this presentation include: (a) describe one method to evaluate technology infusion efforts; (b) demonstrate the kinds of findings which can result from this evaluation method; (c) describe some of the logistics associate with administration of technology infusion efforts.

Curriculum Models for Computing and Information Technology: Are We keeping Up with The Changes?

Fadi P. Deek, New Jersey Institute of Technology, USA; Howard Kimmel, New Jersey Institute of Technology, USA

Recent efforts in the development of national and state curriculum standards focus mostly on the content taught in each discipline and are meant to define the skills and knowledge of the discipline to be acquired by every student. For this to happen, school curricula must be aligned with these standards. In order for the students to gain these skills and knowledge, teachers must acquire a body of knowledge that encompasses what is defined by content standards plus the pedagogical skills that will allow teachers to guide their students in the acquisition of the discipline's skills and knowledge. This paper focuses on the current state of teacher preparation programs and the requirements needed to teach computing and information technology.

Teachers' perceptions of self efficacy and beliefs regarding information and communication technology (ICT)

Francine deMontigny, University of Quebec in Hull, Canada; Lyne Cloutier, University of Quebec in Trois-Rivières, Canada; Nicole Ouellet, University of Quebec in Rimouski, Canada; Françoise Courville, University of Quebec in Chicoutimi, Canada; Ginette Rondeau, University of Quebec in Abitibi-Témiscamingue, Canada

Since September 2000, five universities spread out over the Quebec province (Canada) are working together as networked learning environments (Chute, Sayers, Gardner, 1997), offering a joint master's degree in nursing. This geographic layout represents a big challenge in terms of allowing a specific teacher's expertise to be available to students from all five institutions. Integrating information and communication technology (ICT) in the program appears to present interesting possibilities in terms of enhancing access to knowledge but also in term of promoting networking activities. In order to implement technologies into this graduate program a three year project aimed to develop ICT competencies in both students and teaching staff. Other colleagues' experience and the literature has taught us that actors' motivation is essential for the success of such projects. It thus appeared obvious that our first step had to be the proper identification of teachers' perceptions of efficacy and beliefs. An exploratory research with a mixed research design examined both concepts with twenty four nursing professors as participants. We will present nursing teachers' self-efficacy perceptions (Bandura, 1996) and beliefs (Wright, Watson & Bell, 1996) in regards to information technology and recommendations for education, research and practice.

Scoring for Preservice Teachers' Electronic Portfolios: Issues of Feasibility and Reliability

Carol Derham, Lehigh University, USA; Alec Bodzin, Lehigh University, USA.

Electronic portfolios are becoming popular tools in teacher education programs across the country. Little research exists, however, on the reliability of attempts at scoring electronic portfolios. This paper will share results of a study investigating the feasibility and reliability of scoring preservice teachers' electronic portfolios. Using a well-defined rubric, specific portfolio guidelines, and multiple raters, the researchers examined the extent to which electronic portfolios can be reliability assessed. Collected data include inter-rater reliabilities, rater agreement percentages, and perceptions of both participants and scorers regarding the process. Implications for electronic portfolio development in teacher education programs will be discussed.

The JASON Academy: Explorations in Online Science for Middle School Teachers

Marily DeWall, JASON Academy for Science Teaching and Learning, USA

The JASON Foundation for Education supports the award-winning JASON Project, a year-long, multimedia, interdisciplinary program involving students and teachers in real-time science expeditions and exciting interactive curricula linked to the national geography and science standards. The JASON Academy, the Foundations's newest initiative, will offer online science content courses to middle level teachers, beginning in Fall 2001, for graduate credit and advanced certification. Intended audience: middle school teachers, administrators, and teacher educators.

APPLICATIONS OF A BEST PRACTICE STUDY: IMPLICATIONS FOR TECHNOLOGY INTEGRATION IN THE ELEMENTARY CLASSROOM

Laurie Dias, Georgia State University, USA

Best practice literature asserts that both the social aspect of learning by collaboration and an individual's need to explore and experiment are best directed through pedagogies based on constructivist theory. Leaders in the field of instructional technology also recognize that an instructional context based on these principles has significant implications for uses of technology that promote meaningful learning. Nevertheless, it is not media that influences learning; rather, it is the instructional design that employs effective teaching strategies that makes an impact. With the emphasis on National Educational Technology Standards for Teachers (NETS-T) and its performance indicators, it will be important for school administrators and others in leadership roles to understand what constitutes best practice in technology integration. When administrators evaluate teachers using technology, it is imperative that they know what to look for. They should not be overly impressed by the mere use of technology. They should be discerning about the pedagogy that accompanies its integration. This paper presents the results of a study on four teachers' technology integration practices. It concludes by calling for informed appraisals of teachers as they diffuse technology into their curriculum.

An N-dimensional Model for Digital Resources

Charles Dickens, Tennessee State University, USA

Information technologies currently available to our teachers have the power to transform the nature of the communication process for instruction. This paper explores an n-dimensional concept model for meaningful classroom instruction. The n-dimensional concept for instuctional communication is developed and examples presented which demonstrate ways in which teachers can model knowledge creation appropriate to a digitally mediated information environment. Combining constuctivist learning theory, multiple modes of knowledge representation, visual thinking, and the mathematical concept of multiple dimensionality (i. e., n-dimensional or hyperspace) the theoretical foundations and classroom application of these principles with examples for elementary and middle grade curriculum content are presented.

Economics, Information Literacy, and Teacher Education

JoAnna Dickey, Eastern Kentuckey University, USA; Steven W. Dickey, Eastern Kentucky University, USA

When preparing future educaters to teach the concepts and principles of economics to K-12 students, it is recomended that not only should these preservice teachers be provided with experiences in economic theory and thinking skills, but also be provided with skills in the area of information literacy. Information literacy skills include reading, evaluating, etc. data from print and non-print sources. The use of computers, networks, and other technologies is essential in the development of this type of literacy. A brief presentation of information concerning the basic economic concepts and principles recommended for K-12 study in the state of Kentucky will be provided. A demonstration of classroom applications of economic concepts and the use of information literacy will be given. And, an explanation of how economic theory can be presented to preservice teachers through the use of information technology.

Cost Effectiveness and Distance Education: A Perspective

Steven Dickey, Eastern Kentucky University, USA; JoAnna Dickey, Eastern Kentucky University, USA

This paper begins by examining the possible motivations for distance education as a prelude to considerations of cost effectiveness. Alternate methods for delivering distance education are compared in terms of perceived needs and cost effectiveness. Problems associated with on-campus vs off-campus courses are also discussed.

Yekioyd Statistics and Their Interpretation

Steven Dickey, Eastern Kentucky University, USA; Kevin Zachary, Eastern Kentucky University, USA

This paper introduces three new statistics for item analysis. The statisitcs are presented at the level of their construction with numerical examples. They are then compared to other statistics that are commonly uesd for assessment design. Their advantages as diagnostic tools are discussed. Free software for implimenting these statistics is discussed and offered to participants in the session.

A comparative project: web-based faculty development versus print-based faculty development.

Melissa Diers, University of Nebraska Medical Center, USA

This presentation reports the findings, research methodologies, and lessons learned of a Master of Arts in Education: Instructional Technology Thesis research project. The research determined whether randomly selected University of Nebraska Medical Center faculty who completed a web-based faculty development tutorial performed equal or better on an awareness questionnaire than faculty who completed a print-based faculty development tutorial and awareness questionnaire.

Teaching Mathematics by Means of MathTrainer

Fernando Díez, Universidad Antonio de Nebrija & Universidad Autónoma de Madrid, Spain; Roberto Moriyón, Universidad Autónoma de Madrid, Spain

This paper describes MathTrainer, a system that guides the student while learning mathematical concepts that involve symbolic manipulation, like the resolution of Ordinary Differential Equations. MathTrainer shows students the steps that are required to solve exercises with symbolic calculations. The exercises are posed by the system. The student can also modify some of the formulae that appear in a statement and ask MathTrainer how to solve it. MathTrainer identifies the type of exercise by means of a pattern matching mechanism and then it shows successively the tasks that have to be accomplished in order to solve the exercise. MathTrainer has been integrated in the MathEdu teaching environment which includes an authoring tool for the design and interactive resolution of exercises of mathematics. Thanks to this integration, MathEdu allows the student to learn first how to solve problems of different types; after this, s/he can practice and get feedback about his/her actions.

MU Partnership for Preparing Tomorrow's Teachers to Use Technology

Laura Diggs, Ph.D., University of Missouri-Columbia, USA; Judy Wedman, Ph.D., University of Missouri-Columbia, USA; Rose Marra, Ph.D., University of Missouri-Columbia, USA; Herbert Remidez, University of Missouri-Columbia, USA; Linda Lynch, University of Missouri-Columbia, USA

This interactive session will describe the processes, instruments, and data collected from the University of Missouri-Columbia College of Education Preparing Tomorrow's Teachers to Use Technology (PT3) grant. The goals of the grant include: Faculty fluency with technology as a tool for themselves as instructors and as a subject for improving and changing methods of teaching in K-12; A revised curriculum for teacher education that utilizes technology (ISTE NETS Standards) and prepares future teachers to be technology users; A set of internet-based tools for enabling the teaching and learning processes of teacher education (ShadowPD netWorkspace); A total quality management (TQM) process modeled after continuous improvement processes that are proving effective in sustaining change and improvements in business and industry. The expected outcomes of this project are: faculty and teacher education students who are fluent in the use of technology in teaching, high quality experiences with technology in teacher education curriculum, tight integration of the curriculum with exemplary technology-using practices of K12 teachers, and a program that is sustainable, owned by faculty, and continuously improving.

Constructivist Use of Technology: Encouraging Preservice Teachers to Construct an Understanding of their Leadership Role in Promoting Reading Outside the Classroom

Keith Dils, King's College, USA; Laurie Ayre, King's College, USA

In order to facilitate preservice teachers' understanding of the importance of reading aloud to children and of their role as educators of parents and community members, a project utilizing the constructivist use of technology was undertaken. Preservice students were presented with research concerning the correlation between the amount of reading done at home and reading achievement in school (Anderson, Hiebert, Scott, and Wilkinson, 1985). These preservice students were then asked to formulate their own understanding of how they could educate parents about their role in the educational process. The students then converted their ideas into a digital video public service announcement to be run on the local media. This paper/presentation will share how this project was undertaken and will model the use of the digital technology.

Cyber Spaces and Learning Places: The Role of Technology in Inquiry

Juli K. Dixon, University of Central Florida, USA; Judith Johnson, University of Central Florida, USA

This paper describes a course designed for K-8 science and mathematics teachers to learn how to teach using an inquiry approach within a technology-rich environment. The World Wide Web and calculator-based data collection devices are the primary sources of inquiry-based technology we will share. We will describe the World Wide Web as a resource for assisting teachers to learn the art of problem posing, to increase their repertoire of problem solving strategies, and to enrich their sources for data collection. The calculator-based data collection devices are useful tools for generating real data from natural phenomena. Elementary and middle level teachers are often unfamiliar with the use of these tools much less their effectiveness as tools for inquiry. Our research in using technology to assist teachers to learn the inquiry approach is helping us uncover the relationship between finding patterns and posing problem in the process of designing authentic investigations and reaching logical conclusions. Using technology that is available to these teachers, but has not previously been used in these ways, has opened new avenues for assisting teachers to become more effective in the teaching of science and mathematics in their own classrooms.

The Internet as a tool for a revolution in education in Africa: A dream or reality

Nomusa Dlodlo, National University of Science and Technology, Zimbabwe; Nompilo Sithole, Solusi University, Zimbabwe

In this paper the author looks at how the Internet can help Africa develop educationally. The research highlights the benefits that can be derived from access to the Internet for educational purposes in Africa and the problems which have caused the slow growth of Internet access in education in Africa.The author then suggests solutions to these problems in an effort to bring full Internet access to Africa as quickly as possible, thereby improving the quality of education

Impact of Asynchronous Discussion on a Preservice Teacher Education Practicum Experiences

Aaron Doering, University of MN, USA; Marc Johnson, University of MN, USA; Sara Dexter, University of MN, USA

Teacher education programs have long recognized that in order to develop their pedagogical capacity, pre-service teachers must have teaching experiences and interactions with students during their program of preparation. At the University of Minnesota we implemented the use of web-based asynchronous discussion areas to increase the quality and quantity of English education initial licensure program students' interactions with middle school students during a practicum experience. We describe here the necessary coordination and communication among methods and technology course faculty, technical support personnel, and the cooperating middle school teacher in identifying and implementing this technological support to a collaborative project. We also describe the preservice teachers' positive and negative impressions of this mode of communication.

gLearning: The New e-Learning Frontier

Steven Donahue, 10Tongues, inc, USA

Emerging technologies have always had an innovative impact upon the language : horse-less carriage became car ; steamship became ship; wireless cell phone is becoming just phone. Eventually the "distance" portion of distance learning will also fall away and become just "learning". But, will e-learning be the same mode of learning? Or will it necessarily take on a new meaning; hence, a new linguistic form?

Real-time Learning in a Virtual World

Patricia Donohue, Dakota Science Center, USA; Coy Ison, Southeastern Education Service Center, USA

Using a powerful, proprietary internet software for creating instructional materials on-line, session participants will generate multimedia slide shows in 10 minutes or less, create an interactive quiz in under five minutes, and learn how to build a curriculum unit on-line. The software is easy to learn, has how-to tutorials, and links to a powerful dynamic database of instructional resources covering a variety of topics. Session participants will become proficient in each of the four on-line tools available in the software: Resource Collections, Media Shows, Tests, and Learning Segments. Participants will: select a topic for instruction from among the resource collections, create their own slide show and on-line quiz, then construct a web-based learning unit based upon a learning objective and a set of standards. Resources and interactive curriculum from the companion website of the NatureShift-Linking Learning to Life project are available for innovative instruction ideas and examples. The software can be used easily by students to create digital portfolios or write their own teaching units. Participants need not be proficient in web-based instructional technologies and need only minimum of basic computer skills. However, advanced technology users will find a ripe field for development of their ideas.

Technological capacitation of distance education teachers

Sharon Ellen dos Anjos, Universidade Federal de Santa Catarina, Brazil; Marialice de Moraes, Universidade Federal de Santa Catarina, Brazil; Leslie Christine Paas, Universidade Federal de Santa Catarina, Brazil; Ricardo Miranda Barcia, Universidade Federal de Santa Catarina, Brazil

This article reviews current literature on the technical know-how of teachers working with Distance Education (DE) and presents an argument for the importance teacher training. Based on research being conducted at the Distance Education Laboratory (LED) of the Federal University of Santa Catarina (UFSC), in Brazil, the authors show that there is a shortage of teachers with knowledge of educational technology and the background needed to work as distance educators.

Science Investigations: Onsite - Online - On the Mark!

Marianne Dove, Youngstown State University, USA; Joyce Zitkovich, Boardman Local Schools, USA

The evolution of Internet-based communications and capabilities of mobile digital technologies have empowered teachers and students to move beyond "click and learn" science classroom environments to one whereby learners can conduct onsite science expeditions and showcase their investigations online. This paper documents the collaborative efforts of a public school system, a county joint vocational school, a non-profit outdoor learning organization, telecom corporations, a state park system, a state division of wildlife, and universities to launch a digital expedition to study environmental conditions. The paper examines the opportunities related to these emergent technologies and elementary students' abilities to engage in onsite group investigations at the Lake Erie shoreline. The Our Lake Online project involved more than a year of collaborative planning and was funded by a foundation grant, telecom corporate financial support, and non-profit organizational sponsorship. The expedition can be viewed at [http://www.digitalexplorers.tzo.com/erie/default.htm].

Tales,Trials,Triumphs,&Trends: The Evolution of a Preservice Multimedia Course

Thomas Drazdowski, King's College, USA

With the introduction of our new multimedia computer lab in the Spring of 1996 (Drazdowski, 1997), our preservice teacher education program at King's College began the transition of its traditional "Media Design" course to one in "Multimedia Design." This paper will discuss the evolution of this course over the past five years, including ideas and recommendations for other teacher educators seeking such changes in their preservice curriculum.

Beliefs, experiences,and reflections that affect the development of techno-mathematical knowledge

Hollylynne Drier, North Carolina State University,

The purpose of this paper is twofold. First, the author discusses her views on teachers' development of techno-mathematical knowledge. Second, the author presents key elements from a course and key course experiences that appear to impact preservice teachers' beliefs about teaching and learning with technology, including those activities that allowed preservice teachers to gain a deeper understanding of mathematics using technology tools.

National University PT3 Project

Jane Duckett, National University, USA; Katie Klinger, National University, USA; Bill McGrath, National University, USA; Catherine MacDonald, National University, USA

In the 1999-2000 school year, National University's PT3 Project staff trained 8 NU faculty members and 14 master teachers in a weeklong training series. The training covered a great deal of information, ranging from databases and word processing to publishing and multimedia. The evaluation data indicate that the majority of participants, both faculty and master teachers, were satisfied with the training (with the exception of three novice teachers from one school site). However, follow-up data suggest that faculty members and teachers have had mixed success in implementing their new skills within their classrooms. Some participants enthusiastically reported using their new skills in both their classrooms (primarily using the Internet to locate resources and lesson plans) and in personal activities such as finance and communicating with friends via email. Other master teachers reported that availability of appropriate hardware and time constraints hindered their implementation of the skills learned. Faculty members also reported using resources found on the Internet to enhance their course content, and others reported integrating PowerPoint presentations into their lectures. A CD-ROM containing trial versions of multimedia software used in the PT3 Grant Training will be distributed to attendees.

EVALUATINGTHEINCORPORATIONOFTECHNOLOGYINHIGHEREDUCATIONINWESTERNPA

Kurt Dudt & William F. Barker, Indiana University of Pennsylvania, USA

Three Pennsylvania state universities (Indiana, Clarion and Edinboro) successfully obtained a 1.73 million PT3 grant. We developed a plan to infuse technology into teacher education programs. We present the evaluation plan for review and comment. The audience consists of people who have a PT3 grant and/or those who are interested.

Technology Integration into Preservice Teacher Preparation: Recommendations for Practice

Mesut Duran, The University of Michigan-Dearborn, USA

The purpose of this paper is to provide recommendations for practice to integrate information technology into teacher preparation programs. The author describes a model for technology integration into teacher preparation programs. This model is based on what he has learned inhis recent studies and his beliefs about the things that teacher preparation institutions must do in order to increase the level of technology integration in their own programs. Based on the integration model discussed, the author provides specific recommendations for practice.

The Challenge of Developing College Wide Technology Standards

Karen Dutt-Doner, University of Southern Maine, USA; Desi Larson, University of Southern Maine, USA; India Broyles, University of Southern Maine, USA

The technology requirements prescribed by NCATE for teacher education programs pose unique challenges when all programs within a college of education and human development enter the self-examination process together. As technology competencies become integrated within the curriculum, faculty and student proficiency becomes an immediate rather than long-term necessity. Moreover, professors of education must model the use of technology throughout the curriculum. At the University of Southern Maine, the College of Education and Human Development enrollment shows that 80% of the students are in graduate programs and 25% are in non-teacher education programs including school counseling, clinical counseling, school psychologist, school administration, and adult education. Many graduate students do not have a technology rich background and, as commuting students, have little opportunity to use the university resources. Both students and faculty struggle with the technological changes in curriculum and instruction. This case study examines the growing pains of one university/ college of education in designing and implementing technology standards.

Standards Based Reflection: The Virtual Teacher Project

Karen Dutt-Doner, University of Southern Maine, US; Susan Powers, Indiana State University, US

In Indiana, the current dilemma facing teacher education programs is how to best teach about and assess students on the standards adopted by the Indiana Professional Standards Board (IPSB), and in particular, the dispositional component found in those standards. The Virtual Teacher Project combined over 32 inservice teachers representing 30 different schools, 170 preservice teachers representing six teacher preparation programs and 8 teacher educators representing 4 universities in an electronic discussion group that focused on connecting standards adopted by the IPSB and INTASC.

Assessing Best Practices in Online Learning: A Review of the Literature

William Dwyer, University of Alabama, USA; Dennis Sunal, University of Alabama, USA; Judy Giesen, University of Alabama, USA; Cynthia Sunal, University of Alabama, USA; Kathy Trundle, University of Alabama, USA

This literature review provides an overview of research that has been conducted on online learning, as well as indicating the extent and type of research being carried out. The review focuses on recent research at a time when online learning has become a common part of the use and development of the Internet. From a list of 400 citations, 25 representative studies were selected and categorized by type of study and comparison basis; number of subjects; data collection instruments; outcome variables measured; courses studied; and results and conclusions based on evidence obtained from student outcomes. Addressing four questions can best summarize the review of research on online learning. They are: 1) What scientific research design criteria and types of theory can be applied to evaluate the quality of research on online learning environments? 2) How do the online learning research examples that have been sampled meet the criteria for scientific research? 3) What can we learn from the results of the review of research on online learning based on the type of research performed? 4) What can we conclude from the results of research on online learning environments to date?

Simulations in the Learning Cycle: A Case Study Involving

William Dwyer, University of Alabama, USA; Valesca Lopez, The Capitol School, USA

This study of involved students using simulation software in all phases of the learning cycle. Research on the use of simulations in science education has shown that the simulations can be used effectively in preinstructional (Hargrave & Kenton, 2000; Gokhale, 1996) and exploratory activities (De Jong & van Joolingen, 1998). Preinstructional and exploratory activities elicit and challenge students' alternative conceptions. Having set the context for formal instruction, simulations then can be used to learn new concepts in the invention phase of the learning cycle. With the specific guidance in simulations such as Exploring the Nardoo (Harper, n. d.; Harper & Hedberg, 1996), students perform better (Lee, 1999). Simulations can be used again to apply newly learned concepts in different contexts in the expansion phase of the learning cycle. In this study, middle school science students were observed using the simulations as they engaged in a learning cycle lesson on environmental systems. The students were tested for their understanding of the concepts before and after completing the learning cycle lesson. Interviews also were made of the students and the instructor.

The Interactive Classroom

Richard Eckert, SUNY Binghamton, USA

Computer programs have been developed that enable students in a classroom to interact with and take control of the computer the instructor is using to present the class material. From their seats students can request to connect their laptop computers over the network to the main computer that is being used to project the course material. Once connected, at any time they can send messages to the instructor and request control of the main computer's mouse and/or keyboard. This enables students do perform actions such as: unobtrusively ask questions, move to another slide in the presentation, make annotations on the main screen to help clarify their questions, participate actively in online simulations, type in answers to questions, and an almost endless number of other tasks that require remote manipulation of the computer the instructor is using. At all times the instructor determines whether a student is permitted to take control of the system and can override that control as needed. The server program running on the main computer also allows the instructor to easily perform administrative tasks such as maintaining a list of authorized students, their logon Ids and passwords, as well as the IP addresses to be used.

Problem-Based Learning Resources for College/University Professors

Leticia Ekhaml, Professor of Education, Department of Media and Instructional Technology, State University of West Georgia, Carrollton, GA 30118 lekhaml@westga.edu; Virginia (Jan) Ruskell, Professor/Reference Librarian, Ingram Library, State University of West Georgia, Carrollton, GA 30118 jruskell@westga.edu

The authors define problem-based learning (PBL), an instructional method used by teachers and professors to teach problem solving and to replace rote memorization and passive learning. PBL's process is explained. The historic association with John Dewey's progressive movement and constructivism are also included. Questions are answered that deal with the changes from a traditional classroom to problem-based learning. Academic achievement, the roles of teacher and student, generating problems and assessment tools are covered. Examples are given for further study.

Academic Product Assessment: A tool for graduate action research assessment

Charles Elliott & Florence Elliott, Gannon University, USA

This research project examines a systematic assessment process as part of the Educational System Design (ESD) model, derived from work at Vanderbilt University by the Cognition Research Team and by Charles Reigeluth at Indiana University at Bloomington. The ESD model outlines four principles of effective learning environments: Problem-Based Learning, Scaffolding, Deepening Learning, and Collaboration. The research will explore the use of a formative assessment tool within this educational model. As part of Gannon University's M.Ed. Cohort program, academic portfolios are required as a final synthesizing activity. A part of this portfolio is the Applied Master's Project (AMP), an ongoing action research project. Students in the cohort program are to design, construct, and implement a research project over the course of the 18 months of cohort coursework. The AMP project is to be incorporated as a component of each of the six core courses, advancing the project from design and construction, through implementation and culmination. Research indicates that feedback, provided at key stages in the portfolio development process, results in improved final products. Providing effective feedback during this course should contribute to product improvement. Questions are raised however, about the type of feedback provided and the mechanism for providing this feedback.

Orchestrating Virtual Learning

Charles Elliott, Gannon University, USA; Florence Elliott, Gannon University, USA; Yvonne Waern, Linkoeping University, Sweden; Tersa Cerratto, Royal Institute of Technology, Sweden

In this paper, one case study of instruction in a virtual learning environment (VLE) will be presented. The instruction is aimed at adult learning as part of a professional development initiative for practicing K-12 teachers. Further, it concerns using the Internet as a text medium for supporting synchronous communication and the coordination of learning activities between teacher and students. The aim is to provide some conclusions that are useful for the future as the Internet becomes a knowledge and learning resource. This paper focuses on the challenges that instructional designers must consider and teachers have to manage in order to make sure that their students get the benefits of learning in virtual environments.

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VisionQuest©: Teacher Development Model for Scaffolding Technology Integration

Ertmer Peggy A., Purdue University, USA

The professional development model proposed here builds on, and extends, the use of VisionQuest©, a CD-ROM teacher development tool designed to help teachers envision and achieve technology integration. Responsive professional development is based on the assumption that teachers are more likely to embrace pedagogical and classroom change if these changes address the actual issues they face in practice. Teachers are challenged to reflect on their current knowledge and classroom practices, relative to technology integration, and then, after observing exemplary models included on VisionQuest©, develop and pilot their own solutions to relevant classroom issues. Through this process teachers gradually develop their own understandings about how to integrate technology in ways that address relevant curricular and pedagogical issues within their classrooms. The VisionQuest professional development model facilitates reflection on, and the transformation of, classroom practice. The six-step model facilitates the growth of teachers' visions for teaching and learning with technology and engages them in reflective activities that nurture and sustain their professional development.

Technology — Stand Alone or Integrated?

Sue Espinoza, Madeline Justice & Connie Greiner, Texas A&M University-Commerce, USA

What technology should be included in teacher preparation programs, and where should it be taught and/or practiced? As states (and other entities) establish technology standards to be addressed in teacher education, programs are looking for the best way to integrate these standards into existing (or new) courses. Three faculty members share their recent experiences, from their examination of the Texas Technology Applications Standards, to a determination of where each is addressed in the professional development sequence of courses as well as in the technology courses, to the development of activities to assure that all students address all of the proficiencies that are included in the standards. Included are the standards, the procedures used to determine and/or add needed technologies, and student activities.

Using the Course Management System Blackboard 5 with the Computer Algebra System Maple in the Mathematics Classroom

Rosemary Farley, Manhattan College, USA; Patrice Tiffany, Manhattan College, USA

We propose to introduce the course management system Blackboard 5 at our session. This software allows faculty members to put course material online. For example, assignments can be created and updated, a grade book can be created, or students can participate in an online discussion. Throughout the presentation, we will illustrate some of the difficulties we found while using this software and we will make suggestions as to how we managed to circumvent these problems. We will also discuss the very difficult problem associated with trying to communicate electronically in the language of mathematics. Although the present technology does not support interactive Maple worksheets, we will demonstrate how to upload Maple worksheets into Blackboard courses. The students will be able to view the worksheets and their output, including animation. We will not require previous knowledge of Maple, or of HTML. We are also assuming that this presentation is for people who have not used Blackboard.

Infusing Technology into Preservice Teacher Education

Josephine Farrell & Barbara Beyerbach, State University of New York at Oswego, USA

As Oswego State University education programs have worked closely with school districts over many years, it became evident that most preservice teachers were entering the workforce without adequate technology skills and without the ability to utilize technology as a teaching tool to enhance student learning. Likewise, further investigation uncovered the fact that most education faculty were neither updating their own instructional technology skills nor integrating technology into their courses as models for preservice teachers to follow. Consequently, a Technology Needs Assessment was administered to all education faculty. The assessment revealed that most faculty see a lack of time and knowledge of technology as the primary reasons for not integrating technology into their instruction. This project will help to address these faculty needs, as well as provide both education faculty and preservice teachers opportunities to observe exemplary technology-infused K-12 lessons so that they are better able to provide technology-infused instruction for their students.

Anchored Instruction Using WebQuests in Post-Baccalaureate Teacher Educations Courses

Donna Ferguson, University of Northern Colorado, USA

Teacher education coursework traditionally has required students to learn software tools that will support their future role in the K12 Learning environment. These courses have usually been taught in a didactic manner where the instructor demonstrates the software and then asks students to replicate the product. A didactic approach is in contrast to the technology infusion model the instructor hoped to achieve in post-baccalaureate teacher education courses. The process of designing this class followed that advocated by Dodge (1997) in order to bridge the transition between the traditional didactic approach and the desired student-centered focus.

Implementing a Pre-service Teacher Technology Infusion Model

Donna Ferguson, University of Northern Colorado, USA; Chris Mahoney, University of Northern Colorado, USA

In June of 2000, the Department of Educational Technology at the University of Northern Colorado received a PT3 grant. One of the most difficult, crucial, and comprehensive aspects of the PT3 grant implementation at this university pivots on how well the university's pre-service teachers are taught the fundamental concepts of technology have been integrated into the teacher's thoughts and practices. The presentation will encompass the data collection and evaluation, the integration of CDE's Standard 7, and one aspect of the PT3 grant implementation process. The presentation will illuminate the trials and tribulations of all aspects of the evaluation, course redesign, implementation, and field-testing processes.

Computer Science Children

Claudia Santos Fernandes, UNOESTE - Universidade do Oeste Paulista, Brazil; Paulo Blauth Menezes, UFRGS- Universidade Federal do Rio Grande do Sul, Brazil

This work shows a propose of teaching computer science for children. It is intended that the "Information Technology Teaching" sharpens the critical sense and capacitate students to learn not only to use currents technologies, but to understand how it works. To find out which Computer Science Topics are more suitable to teach children, it was realized a quiz, answered by Computer Science and Information Technology teachers which thought disciplines. A solid basis to the practice of Computer Science has the objective to develop the demanded abilities to think, to express clearly and precisely, to answer problems and create concepts.

Breaking Down the Walls in Teacher Education Programs

William R. Fisk, Clemson University, USA; Lynn Nolan, School District of Greenville County, USA

Is your teacher preparation "program" really a team of education faculty, content faculty, and K-12 teachers? These groups face the same doubts, promises, and problems related to technology integration. Rather than a frontal assault on teaching technology usage to them, "Project Jericho: Breaking Down the Walls" took a back door approach, getting these groups talking, sharing, and cooperating with regards to technology. Results include professional development and program changes. English/Language Arts, Science, Math, and Social Studies Innovation Teams of nine K-12 teachers, three teacher educators, and three content faculty match up technology skills with state-mandated curriculum, then develop technology-rich units for integration in all parts of teacher preparation. Innovation Teams share on-line and meet monthly to analyze standards, develop a curriculum/technology matrix, work on lesson plans, and work in triads exploring and analyzing websites, lesson plans, and collaborations. Team members share and implement Innovation Team ideas and suggestions.

Virtual Leaning, Web Videos, and Elementary Mathematics Teacher Education

Janice Flake, Florida State University, USA

The proposed presentation will illustrate the use of web-based videos of children illustrating their understanding of mathematics concepts and problems. Interviews with twenty-three children in grades K - 5 were video taped concerning their understandings of mathematics content identified in major state and national standards recommendations. These videos were placed on the web in approximately 5-minute segments and categorized according to the child's pseudo name, grade level, and task/content area. Prospective teachers used the videotapes to analyze behaviors, illustrating certain theoretical concepts, such as scaffolding, visualization, and imagery development. Samples of the prospective teachers responses will be provided. The presentation will also discuss the design and the potential of such use of videos. By having the videos on the web users can watch them in their homes, or other places of convenience, as well as the videos can be used for distance learning.

Comparison of Student Rating of Instruction in Distance Education and Traditional Courses

Claudia Flowers, UNC Charlotte, USA; LuAnn Jordan, UNC Charlotte, USA; Bob Algozzine, UNC Charlotte, USA; Fred Spooner, UNC Charlotte, USA; Ashlee Fisher, UNC Charlotte,USA

This study examined differences in student perceptions of course and instructor effectiveness in distance education and traditional courses. The type of distance education examined was a two-way interactive TV. Three different modes of course delivery were studied: (1) distance education off-campus, (2) distance education on-campus, and (3) traditional on-campus. Eight instructors taught a course using each method of delivery. On-campus students in traditional courses perceived the course and the instructor as being more effective than their off-campus peers in distance education courses. The magnitude of difference between the means was large.

Accountability, Technology, Flexibility: Ensuring Student Success

Kathryn Floyd, Ed.D, Pickens County Schools (Ret.), USA; John T. Moore, South Dakota Department of Education & Cultural Affairs, USA; Terry Bailey, Ball State University, USA; Cheryl Reed, Ph.D., EdVISION.com, USA

When school systems find they must adjust what they are delivering because their performance measures show they are "low performing," how can a system efficiently and effectively adjust the curriculum? Can the web help us test students more efficiently? How can teachers and administrators get meaningful, timely guidance so that they know what is expected, whether or not they are providing needed instruction, and which resources target those needs? This paper describes software applications that provide critical assistance to school systems in responding to the changing expectations being experienced in the emphasis on accountability and meeting "standards" or expectations.

Why Technology is Being Integrated into the Classroom at Such a Slow Rate: A Discussion of Self-Efficacy, Motivation, and Utility

Jesse J. Foster, II, University of Alabama, USA

In the past fifteen years, there has been much attention paid to the issue of integrating computers into the classrooms. The CEO Forum on Education Technology in Washington, D.C., polled nearly 80,000 public schools and found that only about 3 percent of the schools are successfully integrating technology into the curriculum. Why is the technology not being integrated at a faster pace? Researchers have seemingly asked every question but one; "Are teachers motivated to use technology in their classrooms?" I contend that the integration of technology is not an issue of the availability of resources or information. It is an issue of whether or not teachers motivation, and their belief that the integration of the technology into the curriculum will bring about a level of instruction and learning greater then otherwise possible. This is an issue about some teachers' need to avoid negative images. Consequently, too many teachers are struggling everyday, not to master the technology, but instead to invent ways to avoid failing at using the technology.

The Anatomy of an Educational Technology Seminar

Sebastian Foti, School of Teaching and Learning, College of Education, University of Florida, Gainesville, Florida USA

In this case study, a group of advanced educational technology students "invent" methods that infuse technology into a dry, research based history course. In the process, the students develop several products, and create educational software for other students to use.

Teaching electronic information research skills to teachers

Ina Fourie, University of South Africa, South Africa

In 1998 the Department of Information Science in collaboration with the Library Services of the University of South Africa (Unisa) - a distance education institution - introduced a module in Research Information Skills. The course is offered to master's students specializing in Chemistry Education and Environmental Education. The target group includes students who are highly computer literate, as well as students who have never touched a computer. The paper will deal with the course content, course outcomes, the learning events (including the use of computer-assisted instruction, workshops and a web-site), and the special problems experienced with distance education. Emphasise will also be on support to students who lack computer skills and the use of portfolio assessment. Students experiences as monitored through their feedback in their portfolios, focus group interviews and personal observation will also be dealt with, before making recommendations for further aspects to be addressed by the course.

Constructing an Enhanced Instructional Presentation

Leslee Francis Pelton, University of Victoria, Canada; Tim Pelton, Brigham Young University, USA

In this document we describe the development of an Enhanced Instructional Presentation (EIP). "If a good educational presentation is like a fine string of pearls, then an Enhanced Instructional Presentation puts that fine string of pearls, along with access to any supplementary information needed, into the hands of the learner in order to ensure full appreciation." (Pelton & Francis Pelton, 2000)

Technology Integration: A Collaborative Model among the College of Education faculty, preservice teachers, and local K-8 teachers

Cheryl Franklin, University of Virginia, USA; Betsy Kean, California State University, Sacramento, USA

The purpose of this project was to design and implement a collaborative model for technology integration. The teacher preparation program along with its school district partners redesigned existing curricula and field placements by simultaneously implementing technology-based lessons into preservice teacher education coursework and K-8 classrooms.

MENTORING OVERCOMES BARRIERS TO TECHNOLOGY INTEGRATION

Teresa Franklin, Ohio University, USA; Mesut Duran, The University of Michigan-Dearborn, USA; Mumbi Kariuki, Ohio University, USA

This paper examines the use of Instructional Technology graduate students as mentors to K-6 elementary teachers in a rural community in the use of technology and the integration of technology into the daily curriculum. Mentors were able to support the elementary teachers in overcoming the barriers to technology use by modeling a vision for integration, just in time learning, access to equipment, professional development opportunities and methods for assessing student work involving technology use.

Together and Alone:The Instructional, Technical, and Psychological Outcomes of Faculty Building Online Courses

Teresa Franklin, College of Education, Ohio University, USA; Joseph Blankson, College of Education, Ohio University, USA

The College of Education and Music have developed online courses in support of their mission to provide ongoing opportunities to teachers for certification or renewed certification, to superintendents for administrative certification, to undergraduates for "high demand" courses, and to graduates in support of linkages with international universities. This proposal seeks to investigate the use of a cohort model in which faculty within a colleges work together to provide curriculum design and implementation support, online development expertise, shared technology skill improvement, and emotional support for the implementation of online courses. The instructional, technical and psychological support issues of online course development can be critical to the success or failure of courses.

Teachers as Multimedia Authors: A Workshop Developer's Experience

Joseph Frantiska, Jr., University of Massachusetts, USA

This paper describes the design and development of a workshop to instruct educators on the creation of educational hypermedia. Hand-on development techniques were combined with appropriate technical and pedagogical decision-making to provide educators with a basic ability to create substantive hypermedia-based teaching materials. The intended audience are K-12 educators who possess basic computer knowledge.

ICTs for Learning. An International Perspective on the Irish Initiative

Eileen Freeman, University of Dublin, Trinity College, Ireland; Bryn Holmes, University of Dublin, Trinity College, Ireland; Brendan Tangney, University of Dublin, Trinity College, Ireland

Around the world governments are investing heavily in promoting the use of ICTs within the school system. This research explores the Irish Policy Framework (IT 2000) and the National Action Strategies of two European countries, Finland and Sweden. The focus is on curriculum and assessment, and evaluation of the use of ICTs in the classroom, as these are key factors in forming policies to influence the use of ICTs as tools to reshape learning. An underlying aspect of the research is that, due the use of ICTs by governments for the dissemination of their national strategies, concerned individuals can be empowered to compare and contrast policies, identify best practice and make a contribution to the formation of the policies of their own nation by publishing in turn their research.

The self learning system to support the teacher of Japanese language education

Makio Fukuda, Osaka International University for Women, Japan; Tamiaki Nakamura, Tami Laboratory for Education of Information Technology, Japan

In the countries except Japan, according to Japanese government investigation in 2000, learner of Japanese language are about 2,090,000 people. However, most of these learner are beginner grade. Middle grade learner are an extremely little. In a beginner grade, they learn the character of kind of "Hiragana" of a phonogram. It is easy to understand this Hiragana which is the simple character. Other way, middle grade learner must learn the character of kind of "Kanji". "Kanji" is the ideograph character. And it is a hieroglyph of one kind of Chinese. In Japan, the communication that we used only Hiragana for is difficult. In a field of Japanese business, people must use 2,000 kinds of Kanji characters. It is a big burden for the learner to memorize many complicated Kanji. In addition, Japanese language teacher oneself do not understand all Kanji characters, too. So we developed the Kanji learning systems which worked with the PC. We were able to do "Memorizing by Writing" not to use handwriting input device in this learning system. This learning system is a system for self-study, we think that we let Japanese language teacher reduce the burden of education.

A Model for Courseware's Design (MCD)

David Fuller, Pontificia Universidad Catolica de Chile, College of Engineering, Chile; Sergio Ochoa, Pontificia Universidad Catolica de Chile, College of Engineering, Chile; Nelson Baloian, Chile University, College of Engineering, Chile

Today's educational requirements have forced the traditional institutions to introduce technology in the education and modify the teaching-learning process in order to maintain curricula updated and cope with the constant changes. Although this is a costly and time consuming task there is still not a proper methodology which would help authors to carry out this task. The model proposed in this paper (MCD) is a systematized way for designing/redesigning computer technology-based courses (coursewares), based on their learning goals. This model is a formalization of a set of successful strategies applied by the authors, in the design/redesign courses in the computer science area.

Proactive Faculty Technology Training and Support

Kristy Funderburk, University of South Florida, USA; Shauna Schullo, University of South Florida, USA

Faculty do not always get the luxury of time or money to attend professional computer training sessions and read computing trade publications cover to cover. Yet, there is an expectation for continued professional development, often beyond their area of expertise. Academic Computing at the University of South Florida will present the current best practices utilized for faculty training, support and professional development. This presentation will also cover an overview of how Academic Computing integrates into the VITAL consortium and an evolution of faculty computing services. IT support professionals, and faculty will leave this presentation with abundant and diverse ideas to make faculty learning tailored, yet quick and effective.

Is Anybody Listening? Inherent but Typically Ignored Problems in Distance Learning

Paula Furr, Northwestern State University, USA; Ron McBride, Northwestern State University, USA

Over the last fifteen years, higher education initiatives for distance learning have had profound effects. Years of research and practice have paved the way for expanding course offerings and, in some cases, degree programs to students at a distance. Yet, despite Herculean efforts to implement these programs, two vital components to ensure long-term success have largely been ignored: formalized faculty feedback and formative evaluations. The focus of this research is to reassert a seemingly ignored obvious: Those who teach using technologies of the trade discover and identify the problems related to teaching students at a distance. They, and not technologists, are in a better position to observe and evaluate the process. A program's success or failure depends in large measure on their experiences while interacting with students and the technology. The purpose of the paper is to enlighten educators, including administrators, who currently provide or plan to offer courses at a distance about probable inherent problems that will arise if institutions do not incorporate faculty feedback into ongoing formative evaluations of distance learning programs.

Distance Learning: An Examination of Perceived Effectiveness and Student Satisfaction in Higher Education

Donna M. Gabrielle, The Florida State University, USA

Distance learning is a tremendous issue due to paradigm shifts in pedagogy and business. Data was collected from eight Florida postsecondary institutions, then multiple regression and conditional regression analyses were conducted. Findings indicated that technical quality and student interaction were significant predictors of effectiveness and satisfaction for distance students. When using personal characteristics as predictors, younger students, males, and students with higher levels of education were more likely to report higher levels of both instructional effectiveness and satisfaction. Finally, distance students indicated less satisfaction and effectiveness than traditional students. These differences, as well as student-material interaction, perceived quality, and prior distance experience, were found to be statistically significant using two-tailed t-tests. This research suggests that there are distinct factors that predict satisfaction levels and perceptions by distance students of the effectiveness of instruction they are receiving, stressing the importance of focusing on quality and interaction between students and instructors.

Electronic Portfolios: A How To Guide

Jerry Galloway, Indiana University Northwest, USA

This paper outlines a number of specific issues and procedures for the development and maintenance of electronic portfolios. It maintains a generic approach to portfolio content while addressing a myriad of portfolio components and multimedia technologies. This paper takes the position that virtually every pre and inservice teacher student should have an electronic portfolio. A guiding principle is suggested: Virtually anything can be represented electronically. The reader is guided to focus on methods and solutions on the basis of this principle. The paper further describes technology formats, hard and soft, for creating and managing portfolio entries. Details from file names to disk organization and more are discussed in detail.

Technology education and integration: A position paper on attitude, perspective and commitment

Jerry Galloway, Indiana University Northwest, USA

This paper outlines teachers' notions about and desires for educational computing courses. Teachers' perspectives skew their expectations and attitudes about computing experiences and limit if not preclude the achievement and acquisition of computing knowledge and problem solving skills. The paper suggests and discusses a relational link between (a) teachers' educational expectations, (b) computer educators' notions of how teachers learn computing, (c) what administrators believe teachers need, and (d) teachers' personal commitments to computing. It is suggested that this association of inter-related ideas and issues accounts for the 25 year failure of technology integration.

Metaphorical Representation Within a Distributed Learning Environment

Ruth Gannoncook, University of Houston Clear Lake, USA; Caroline Crawford, University of Houston Clear Lake, USA

The design and development of preservice and inservice teacher education distributed learning environments, specifically World Wide Web-based (Web-based) courses, emphasize the need to think through numerous issues that may not be apparent within traditional face-to-face environments. One such issue is the emphasis placed upon developing a conceptual framework through which the learners will begin to develop an understanding of the knowledge presented. A metaphorical representation that emphasizes the conceptual framework through out the Web-based course environment offers the preservice and inservice teacher educators a consistent with the knowledge being presented and based upon the prior knowledge of the learner.

Object: An important concept for preservice teachers to learn technology

Tianguang Gao, Purdue University, USA

This paper discusses an important concept, object
in preservice teacher education. Five commonly used objects are discussed. The concept map of each kind of objects is illustrated and discussed. The benefits of employing object concept maps are listed in the last section.

problem-solving-based model of WBI

Tianguang Gao, Purdue University, USA

This article discribes a project using problem-soving-based model of Web-based instruction to foster students' ability of solving problems and building models.

Sustainable Environmental Education for Brazilian Teachers

Lenise Aparecida Martins Garcia, Universidade de Brasilia, Brazil; Doris Santos Faria, Universidade de Brasilia, Brazil

Environmental Education (EE) is considered, in international declarations and in brazilian laws, as a dimension of the Education itself. In Brazil, only recently EE is reaching the schools. It is more given as isolated initiatives, by GNOs and other institutions, in informal education. Environmental Education National Policy is now regulated by 9795 law, April 27 1999. This law determines that all teachers have to study EE, when they are in graduation or - for whom that are already teachers - by inservice studies. But how can teachers from all the country take inservice studies? Thinking about that, we began at Brasilia University an online course in EE for teachers. The objective of this course is to capacitate teachers at any place in Brazil to insert EE in his own school discipline. Along the course teachers learn fundaments in EE and in pedagogic methodology, making also practical exercises. At the end of the course, they have a study program (made by themselves) to apply with their students. Although everybody needs EE, some need it in a very urgent way. We are reaching regions of Brazil that are at environmental risk and that have the greatest overall biodiversity of the planet. Capacitating teachers, we can multiply our effort to preserve our environment and to have a real sustainable development.

Traeger Technology Target: Completing the Circle of Community

Penny Garcia, University of Wisconsin Oshkosh, USA

The goal of the Traeger Technology Target project is to provide the opportunity for pre-service educators, K-12 faculty, and university faculty to form a learning community. The project facilitates the following objectives: university undergraduates will begin to bridge theory and practice through the authentic learning experiences afforded only through classroom practice; K-12 faculty will share their expertise in the areas of curriculum development, instructional strategies, and classroom management with pre-service teachers; and, university faculty will facilitate the interactions between the pre-service and in-service educators while providing appropriate technology skills in a just-in-time setting for both groups. The theoretical framework for this project is profoundly constructivist and supports the notion of service learning.

The Development of a Web-based Multicultural Course for Teacher Education

Viola Garcia, University of Houston Downtown, USA; Linlin Irene Chen, University of Houston Downtown, USA

Social Sciences-Education, SOSE 3306 Culture of the Urban School, is a prerequisite introductory course required of all students in the teacher preparation program at the Department of Urban Education (UE) at University of Houston Downtown (UHD). The course investigates urban culture as the dominant form of community life in contemporary schools. Students explore characteristics, unique properties, and problems of urban schools. The online course presents a unique opportunity for a more comprehensive investigation and understanding of urban culture and urban schools in training future teachers to facilitate the academic achievement of students from diverse racial, cultural, gender, and social-class groups. The purpose of the paper is to share the proposed instructional telecommunication (IT) format that would meet the same standards, prerequisites, and requirements of on?campus sections.

JavaScript for Teachers

Stephen Gareau, North Carolina A&T State University, USA

Increasingly, teachers at all levels are making use of the Internet—both as a source of instructional information, as well as a medium for instructional delivery. Some instructors develop their own Web pages, which are typically written in HyperText Markup Language (HTML). JavaScript™, a browser scripting language originally developed by Netscape Communications, is a valuable tool that can enhance the functionality of any Web page. This paper examines the nature of JavaScript, and investigates how it can be used to enhance education-oriented Web sites of today's teachers.

Integration or Innoculation?: Selected large-scale professional studies

Abigail Garthwait, University of Maine, USA

This paper highlights a selection of research studies on multi-district professional development projects producing a clear call for more long-term involvement on the part of administrators and the intellectual, social and philosophical benefits for educators when using a mentoring system.

Operationalizing a Technology Standards with Proficiency Skill Sets

David Georgi, California State University, Bakersfield, USA

The presentation of this interactive session will begin with an overview of the existing program which operationalizes the California technology standard for K-12 teachers with the California Technology Assistance Program (CTAP) Region 8 technology proficiencies. Lecture will be supplemented by a PowerPoint presentation and demonstrations of the following web sites: 1) the CTAP Region 8 site (http://www.ctap.org/ctc/) includes a rubric for three levels of certification and digitized video examples of exhibits at Levels 1 and 2; 2) the California technology standard (http://www.csub.edu/~dgeorgi/contents/techstand.htm); 3) the PT3 grant that helped coordinate these efforts (www.projecttnt.com). Next, a description of the process involved in coordinating this certification process with K-12 districts and teacher credential programs. To date, over 500 teachers have been certified including growing a cadre of Level 3 leader/mentors. An interactive discussion on implications for those present will conclude the session.

Using the Internet in the Classroom

Sheila Offman Gersh, Ed.D., City College of New York, School of Education, Center for School Development, New York, NY, USA

Learn to Integrate the Internet into classroom instruction. During this session, participants will learn how to "Internetize" their traditional classroom lessons, create online collaborative projects and create WebQuests that meet statewide learning standards and assessment criteria. Participants will also become familiar with the huge amount of resources on the Internet that are available for "internetizing" classroom instruction. A website that has links to hundreds of resources has been created to be used during this session (and after). In addition, templates will be used to create the final products.

Audio on the Web: Enhance On-line Instruction with Digital Audio

Brenda J. Gerth, University of Victoria, Canada

People only retain 20% of what they see and 30% of what they hear. But they remember 50% of what they see and hear, and as much as 80% of what they see, hear and do simultaneously (Computer Technology Research, 1993). Internet-based audio and video tools are now used by educators to support instructional, research and administrative activities. Incorporating Web-based multimedia elements such as video, animation and audio into the delivery of on-line course materials can enrich learning by facilitating and encouraging active student participation in the learning process. However, if not designed properly, the addition of audio and other multimedia elements will detract rather than enhance Web-based instruction. The focus of this paper details the design techniques and strategies educators can employ to record digital audio and add audio clips to their instructional Web pages to enhance their on-line course materials.

Infusing Technology into Pre-Service Teacher Education

Amy Gibbons & Kathy Burleson, West Texas A&M University, USA

Ensuring that pre-service teachers are prepared to integrate technology into their teaching is a top priority for teacher education programs today. One way to help achieve this goal is to model the integration of technology throughout the teacher preparation program. This pilot study examines the integration of technology into a language arts methods course and the effects of this integration on pre-service teachers.

Online Personal Learning in Teacher Preparation

David Gibson, National Institute for Community Innovations, USA

Work by the National Institute for Community Innovations (NICI at http://nici-mc2.org) is leading to new web-based tools for enhancing preservice education and supporting increase use of technology, especially in Professional Development Schools. One of the tools, the NICI Online Personal Learning Plan (PLP) for preservice students, is intended to assist learners through the processes of: 1) Self-assessment of strengths, interests and aspirations; 2) Planning preservice education learning goals and projects; 3) Linking goals and projects to valued outcome standards; 4) Creating original work and sharing the work with others; 5) Receiving high quality feedback for the improvement of their work; 6) Documenting and validating the achievement of learning goals; and 7) Assisting in the selection and preparation of exhibits of learning. This paper discusses the roots and rationale of the project, and presents some of the details of the thinking that is guiding the web-tool development.

Educational leadership, community partnerships and 24/7 access to educational technology: Bridging the technology gap in small rural communities with anytime, anywhere learning.

Ian W. Gibson, Wichita State University, USA

This paper describes a project providing school children with 24/7 access to laptop computer technology in a small rural school community in western Kansas. Based upon the visionary leadership of school and community figures, this collaborative venture incorporates creative approaches to financing the project, a focus on actively changing approaches to pedagogy and the learning process, and an analysis of the impact of the project upon the school community. Key features of the project incorporate a focus on educational leadership, community partnerships, anytime anywhere learning, the digital divide in rural communities, 24/7 access to computers, and constructivist learning in a technology dependent learning environment.

Ensuring Technology Leaders for Classrooms and Beyond: Technology Training in a Graduate Teacher Education Program

Kay Gibson, Wichita State University, USA

This paper discusses the integration of the ISTE foundation standards into the Master of Education in Curriculum and Instruction teacher education program and the resulting impact on the teachers' acquisition of technology knowledge and skills, their classroom teaching, their students' learning, and in a broader sense their schools and districts. The program is described with particular attention given to the way in which students acquired and demonstrated technology knowledge and competencies. Successful integration of the ISTE standards into the program is viewed in terms of the quality and variety of products / assessment pieces using technology that have been generated by the students. Finally, the paper examines the resulting benefits to school districts that employ the teachers participating in this master of education program.

What We Wish Our Teachers Knew

Molly Gibson, Stowe Middle School, USA; Hannah Marshall, Stowe Middle School, USA; George Bennum, Stowe Middle School, USA; Will Courtney, Stowe Middle School, USA

What do teachers need to know and be able to do with technology in a middle-grades classroom? This research project by four middle-grades students set out to accomplish two objectives: 1. Survey the staff of a middle school to develop a table of main themes taught during a school year, and 2. Find and organize outstanding resources from a student's point of view that would support learning across the curriculum. Secondary objectives of the research included 1. Providing students with a chance to apply what they had recently learned in an online course "Introduction to html" and 2. Demonstrating that both students and teachers can learn something new about teaching with technology. Parents, working with online resources, have been the impetus and primary supports for the project. The school administration also assisted by making time and space for the activity to be included during the school day.

Community Innovations for SITE: Who is doing what with Clearinghouses and On-line Tools Development?

David Gibson & Bob McLaughlin, National Interagency Civil-Military Institute (NICI), USA; Deborah Sprague, George Mason University, USA; Niki Davis & Marv Howard, Iowa State University, USA; Christina Preston, London University, UK; Gary Marks, Association for the Advancement of Computing in Education, USA

This interactive panel session aims to inform the further creative development of SITE's web sites. It will be particularly relevant to groups within and beyond the USA who are developing "clearinghouses" and/or new "on-line tool sets" for technology in pre-service and graduate teacher education. The session will also consider ways in which SITE can collaborate with related on-line communities.

The role of school administrators in the process of effectively integrating educational technology into school learning environments: An evaluation in progress

Ian W. Gibson, Wichita State University, USA

The study reported in this paper examines the role of administrators in the integration of technology in three school districts. The outcome of the study provides information that will assist school district and building administrators in developing a greater awareness of their role in supporting the use of technology in the instructional environment. School administrators, instructional staff and technology coordinators participated in this qualitative study. Data collection strategies incorporated the use of focus groups and interviews.

Teachers, Technology, and Staff Development: Planning for Sustained Change

Victoria Giordano, Barry University, USA

Teacher staff development implies change. Staff development for teachers to incorporate a new technology into their classroom practice assumes that changes in student and teacher behaviors will occur in the form of teachers and students using technology in the teaching and learning process. Technology training for teachers often falls short of its anticipated outcomes. This paper will describe an instructional design model for teacher staff development to train teachers to integrate the Internet into their classroom routine. It is proposed that a staff development program designed to effect change in a participants' values and beliefs, provide knowledge of skills and strategies for immediate application in the classroom, and acknowledge the stages of development in the adult learning process will result in sustained change in classroom activities. The instructional design for the teacher staff development delivered through Project REFLECT offers such a model.

Models, Mentors, and Mobility in the Teacher Education Program

Marsha Gladhart, Wichita State University, USA; Jeri Carroll, Wichita State University, USA

Project M3 (Models, Mentors, and Mobility) is a PT3 Implementation Grant with three major goals. 1) To identify and develop model practitioners to work with teacher education students, 2) To develop a network of mentors to support and train students, faculty, and partner school teachers, and 3) To utilize laptop computers, personal digital assistants, and online support and instruction to improve student access to technology. For each of these goals, Project M3 reaches out to the university community, private and public schools, and private businesses to maintain a network of models and mentors and to support integration of technology in the college classroom and partner schools. Project M3 also uses new advances in mobile computing to improve accessibility to technology by creating and modeling the use of wireless laptops and personal digital assistants in the classrooms in the College of Education and in PreK-12 schools. On-line instruction and support are also used to provide better access to learning experiences, training, and support.

The Creation of a Nexus between Telelearning and Teleteaching

Marc Glassman,Faculty of Education, Memorial University of Newfoundland, Canada

This paper discusses the "links" between telelearning and teleteaching, and recounts the "rites of passage" in the creation and implementation of six university-level web-based courses. It is hoped that the participants to this presentation will become aware of the process involved in the creation of web-based courses, along with the benefits and problems associated with the implementation and delivery of this form of instruction. The intended audience would be those university-level professors teaching undergraduate and graduate level courses online. The focus of the courses are in the area of education, specifically pertaining to literacy. However, anyone involved in the creation of interactive text-based and multimedia web-based courses might find this presentation enlightening.

Teaching on the Web: A Constructivist Approach to Faculty Development

Sanford Gold, Columbia University, USA

One of the affordances of the new online learning movement is the opportunity it presents to reexamine the ways in which some aspects of traditional instruction can be re-conceived to operate effectively in the online asynchronous environment. This technological shift — from knowledge being fixed to a certain time and place, to knowledge being accessible at anytime and at anyplace — creates the potential for a change in the way learning is transacted from those who provide information (i.e. teachers or facilitators) to those who receive it (i.e. students).

Breaking Down Barriers: Integrating Technology in Teacher Education and Distributing it to K-12 Schools

Constance Golden, Marietta College, USA; Dorothy Erb, Marietta College, USA

Integrating technology into the Teacher Education program at Marietta College has been a priority for the last decade. However, while the college worked diligently to secure hardware, software, lab equipment, network services, course requirements, and pedagogical acceptance among faculty to facilitate this integration, our students failed to utilize their knowledge of technology in their K-12 fieldwork. Problems facing students were numerous: lack of equipment in the schools, lack of commitment to technology among local teachers, lack of knowledge of technology, mismatch of platform knowledge, and less than enthusiastic belief that technology could be integrated meaningfully into the K-12 curriculum. Because of these obstacles, the Education Department created new strategies, methods, and activities for addressing this lack of connection between higher education and K-12 educational technology. This presentation and paper will discuss the specific strategies used by the Marietta College Education Department to make meaningful the integration of technology into the teacher education curriculum and the K-12 curriculum. Additionally, methods and activities for distributing this integration to K-12 classrooms will be addressed. Activities, assignments, curriculum structure, and special projects from both higher education and K-12 education will be shared with the audience. Actual examples of student work created with such cross platform software as HyperStudio, SiteCentral, Kid Pix, and Amazing Writing Machine will be shown.

Making geometry on a virtual environment: a proposal of continuous distance education for teachers

Márcia Campos, Alex Sandro Gomes and Hermíno Borges Neto, Universidade Federal do Ceara, Brazil

Tele-ambiente 1 is an environment composed of a virtual site linked to applications that favor the cooperative work, in which the interaction among participants is mediated by tele-conference resources (image, sound, text and mail) plus an efficient protocol of real-time file and software sharing among the the working group participants (for instance student-student and teacher-student).

Implementation of an Electronic Tutorship Support System in a School of Business Administration: a Case Study

Oscar M. González, University of Valladolid, Spain; David Pérez, University of Valladolid, Spain; F. Victoria Cánovas, University of Valladolid, Spain

This paper analyses and describes the implementation of a tutorship system based on a telecommunication network that pays attention to the different interests and requirements of students and teachers of the School of Business Administration (University of Valladolid

– Spain). The system has been designed to modify and improve the traditional tutorship system by the use of Internet. In this way, the system supports the "learning process" without the necessity of physical presence of the different agents implied. Using the electronic tutorship support system it is possible to solve problems and queries related to academic subjects of the Business Administration Degree. Actually, we are evaluating and analyzing the impact and acceptance of the system for both, students and teachers. Besides, we are attempting to involve as professors as possible in the test and evaluation phase, as well as in the redesign and implementation of other telematic services applied to education in a collaborative form.

Electronic Portfolios as a Capstone Experience

Jeffry Gordon, University of Cincinnati, USA; Joyce Pittman, University of Cincinnati, USA;Danielle Dani, Univ of Cincinnati, USA

This Short Paper presentation will demonstrate examples of the digital portfolio created by students in our five year teacher education program. These portfolios include videoclips of their teaching, and demonstrate their philosophy of teaching. These portfolios will be contrasted with the paper portfolios which are currently required in the program. This session will also demonstrate representative examples of the technology plans of the college based faculty. These plans were created to demonstrate a commitment to infusing technology throughout the methods of teaching sequence.

The West Chester University Teaching and Learning with Technology Program: Aligning Graduate Credit Courses with NETS-T Standards

Marlene Goss, West Chester University, USA; John Kinslow, West Chester University, USA; Lesley Welsh, West Chester University, USA

NETS-T standards were the guiding principles we used as we structured and developed a graduate program at our university. The Teaching and Learning with Technology Program was created for educators to learn the dynamic relationship among teaching, learning, and technology integration. It is important to note that our program encourages teaching with technology rather than teaching about technology and is directly linked to classrooms in K-12 schools. Consistent with a Professional Development School initiative, and/ or the teacher-scholar model, our graduate program will be offered through alternative delivery mechanisms such as use of the web, 2-way video and on-site classes in participating school sites. This presentation will lead others through the process we used, starting with creating a matrix aligning our course objectives and assessments with NETS-T standards to the implementation of the courses.

Focusing on the Learner: Interactive Environments for University Faculty, Inservice and Preservice Educators

Lee Gotcher, University of Houston - Clear Lake, USA; Caroline M. Crawford, University of Houston - Clear Lake, USA

The impact a World Wide Web (Web) site may have on any community may be either of two extremes, integrated into the daily activities or barely tolerated, or somewhere in between. The impact a Web site would have if focused specifically upon university faculty, inservice and preservice teacher educators could be beyond the hopes of the creators; however, the usefulness of the Web site must be extremely user-friendly and directly impact the user's daily experiences.

Balancing on shifting sands: Teaching in the information age

Lisa Grable, NC State University, USA

Teachers trying the Internet for the first time can get the feeling that their career base is suddenly wildly shifting. Teachers adopting the Web into their teaching toolkit have a wide range of entry points for methodology and a large set of possible teaching techniques.Suggestions for helping teachers find a starting level within their comfort zone will be described, along with examples of classroom practice and ideas for workshop planning.

Ridges and Bridges: MentorNet Collaboration yields a watershed of preserviceinfusion

Lisa Grable, NC State University, USA; Hiller Spires, NC State University, USA; Judy Lambert, NC State University, USA; Candy Beal, NC State University, USA; John Park, NC State University, USA; Hollylynne Drier, NC State University, USA; Marsha Alibrandi, NC State University, USA

MentorNet is a consortium of current and future educators whose mission is to challenge and support each other in the creation and critical application of emerging technologies for 21st century classrooms. This panel discussion will show how NC State faculty in the College of Education are using technology in all levels of classes (foundations through clinical semester) and across disciplines. We will share a technology thread that runs through Content Area Reading, middle school interdisciplinary projects, a science education technology methods course, a mathematics education technology methods course, and a high school social studies professional semester.

Helping Elementary Education Majors Brush Up on Mathematical Modeling: Insights from a Field Test of a New Online Learning Prototype

Neal Grandgenett, University of Nebraska at Omaha, USA; Art Zygielbaum, Nebraska Educational Telecommunications, USA; Elliott Ostler, University of Nebraska at Omaha, USA; Steve Hamersky, Omaha Gross High School, USA; Bob Pawloski, University of Nebraska at Omaha,

This paper and corresponding presentation describes a field test of a new online learning module, developed within a National Science Foundation Proof-of-Concept project, with 40 elementary education pre-service teachers at the University of Nebraska at Omaha. Various studies and national reports have suggested that elementary education majors are often weak within academic content areas, and particularly mathematics and science. The approach of using online learning modules, may be particularly useful for filling this remedial content need. The module described in this project represents several innovations in such online instruction, and uses a node-based database structure for the instructional pieces. The paper is further supported by an extensive url address which includes notes, background documents, and various demonstration pieces of the prototype module.

Subject-Specific Technology Integration Training: Lessons in Planning, Administering, and Follow-up

Regan Grandy, Idaho State University, USA; Jane Strickland, Idaho State University, USA; Dorothy Sammons, Idaho State University, USA; A.W. Strickland, Idaho State University, USA

Strickland (1999) reported the results of a Teacher Technology Mentor program in southeastern Idaho, which strongly indicated that the school mentors were not transferring their technology knowledge into classroom practice. Strickland recommended that subject-specific technology integration programs be developed to insure better integration of technology in the classroom. Based upon this recommendation, Idaho State University's FOCUS program was developed, targeting three specific areas: fourth grade, secondary language arts, and junior high earth science. This research focuses on the planning, administering and follow-up of one of these programs—the junior high earth science program. The goal of this research was to determine if the subject-specific technology integration training of earth science educators makes a difference in teachers' attitude and use of technology in classroom teaching practices. Data from attitude surveys of earth science educators involved in the FOCUS program suggest that teachers' attitude and use of technology in the classroom increase when in-service technology training is subject-specific.

Regional list servers as a mean of peer support for an on-line learning community

John Green, The Open Polytechnic of New Zealand, New Zealand.

This paper describes an on-going experience of using regional and national-ethnic list servers as a means of creating and providing peer support to an on-line learning community of 248 students already using an electronic forum to study by distance. A regional list server is defined as a list server that provides peer support to students in a specific geographic region. There are currently 13 regional list servers for the course. One of the problems of using a list server with a large number of students is that if even only a small number post messages and those messages are responded to the list participants have too many messages to digest. Students using an electronic forum in previous semesters had commented that they wanted to work in smaller groups. By providing regional list servers students were provided with a more intimate experience and reduced message load. The underlying principles behind this are discussed and an explanation is given of how the interactions on the 15 list servers are stimulated and monitored. An indication of the current success of the project is provided.

Developing Intercultural Understanding Via the Internet: Canadian Student Teachers and English Students in China Study World Literature Together

Jim Greenlaw, St. Francis Xavier University, Canada

In this project English students at a Chinese university and Secondary English Education student teachers at a Canadian University used e-mail to discuss with each other their interpretations of short stories from fifteen different countries. The purpose of this activity was to develop the participants' intercultural understanding and literary critical skills through collaborative responses to world literature. At the same time the Canadian student teachers gained valuable experience at tutoring ESL students. Through the application of postcolonial pedagogical theory, I attempt in this paper to explain what the students have learned from each other.

Infusing Technology into the Teacher Education Program

Eileen Gregory, Rollins College, USA; Linda DeTure, Rollins College, USA

Success in the elementary classroom demands that teachers understand and have a working knowledge of educational technology. In 1999 the Education Department at Rollins College set the goal that all education students would graduate with the skills needed to effectively use technology in the K-12 classroom. Using the competencies as a guide, a new educational technology course was designed and implemented in Fall 2000. This paperless, self-paced course uses e-mail messages to guide the students through the basics of a specific software program such as Word, Internet and databases searches, Excel, PowerPoint, and Netscape Composer. These exercises are designed to develop the skills necessary for performing similar activities in their other education courses. Pre and post surveys are being used to measure student perception of changes in their computer skills and their confidence in using technology. Long-term assessment will involve evaluation of the students throughout their academic program and in post-graduation follow-up studies. The design of this course was intended to be dynamic in order to incorporate the latest technological advances as they occur and thus provide pre-service teachers with the foundation necessary to adapt their knowledge to new technology as it develops.

Faculty Development for ACTIVE Learning

Gail Gruber, Western New Mexico University, USA; Donna Rees, Western New Mexico University, USA; Deborah McCormick, New Mexico State University, USA

The ACTIVE project addresses the need to improve the preparation of preservice teachers by providing instruction that models the integration of technology into classroom delivery throughout the Teacher Education Program. The focus of this project is ACTIVE—Authentic, Competency-based, Technology-enhanced, Integrated, Versatile, and Evaluative—curriculum. ACTIVE teams include two faculty members and one preservice teacher who have come together for the purpose of necessary training and designing of curriculum. The teams are supported by university faculty/staff and advised by inservice teachers as the technology-rich curriculum is developed. This project was funded by a Title II Teacher Quality sub-grant and began in fall 2000. Teams develop their own training goals using twenty technology competencies New Mexico preservice teachers must possess in order to obtain licensure. The teams will also create rubrics for these twenty competencies, for the purpose of rating their own level of competency and for use by preservice teachers throughout the Teacher Education Program. Although this work is in progress and final products will not be available, examples will be available to share at the conference.

WebSave - Archiving the Web for Scholar Work

Christian, Guetl, Institute for Information processing and Computer supported new Media (IICM), Graz University of Technology, Austria, (cguetl@iicm.edu), Infodelio Information Discovery, Co-Initiator of the xFIND Project and Member of the ACM, (cguetl@acm.org); Wilfried, Lackner, Institute for Information processing and Computer supported new Media (IICM), Graz University of Technology, Austria, (wlackner@iicm.edu)

The WWW provides a variety of scholar information, like theses, studies, etc, which may be valuable basics for further and new scholarly work. Referred information of the WWW has to be archived (at the time of writing) for further usage because Internet resources could be changed. The working prototype WebSave - described in this paper - support users in their research process. The advanced and novel system manages relevant information of the WWW by importing bookmark files from common browser clients. The system allows adding a wide range of local metadata, storing the referred resources and generates a literature list. Furthermore, it is capable of interacting with other services like preparation for building a background library on CD ROM, building a document archive using Hyperwave, building a scholar dynamic Web library by quality metadata exchange to xFIND.

A STUDY OF SOCIAL AND ACADEMIC USES OF THE INTERNET BY HIGH SCHOOL STUDENTS

Jenka Guevara, American School Foundation, Mexico City, MEXICO

This research studies how ninth-grade students in a fully computerized, K-12, affluent school use computers for educational purposes and in their personal lives. The target population for the study was the student body from the American School Foundation of Mexico City (ASF), a K to 12 American-type school with an American curriculum for over 100 years, and 2,400 students. The survey also included parents and teachers. The qualitative and quantitative surveys revealed that students use the Internet from one to three hours daily, and the predominant use is as a personal communications tool. Students are knowledgeable about precautionary measures that are required in conversations with strangers in the Internet social space. Parents believe computers and the Internet help their children with school assignments, and that the lack of Internet connection at home would put their teenagers at a disadvantage with their peers. The students' use of computers and the Internet at the ASF is meeting their parents' expectations. Most teachers give daily assignments to be done on the computer and require Internet searches for their assignments. The majority of the students say they use the Internet for research. Gender and nationality are not differentiating factors with respect to the use of computers and the Internet by high school students at the ASF for school-related work. However, there are some variations in other applications. For example, male students use the Internet more than females for games and for accessing sexually explicit images. The study sheds some light about the potential benefits of the introduction of computers and the Internet into U.S. classrooms. However, it also reveals that full integration of the technology into the curriculum is an elusive goal. Fundamental transformation in education, as in any major social change, certainly requires clear vision, hard work, and time.

Analysis, Design, Implementation and Evaluation of Instructional Software by Computer Science Students and Public School Teachers

Mario Guimaraes, Kennesaw State University, USA

This paper describes how computer science students of Texas A&M-CC (TAMUCC) and public school teachers benefited from an Eisenhower Funded Project "Training k-3 teachers on how to best use educational technology in the classroom" and were able to evaluate and construct educational software. During the first phase, teachers were exposed to educational technology. The next step was to evaluate educational software to teach science and rank the top software. They used a tool constructed by a computer science graduate student. In a third phase, they designed storyboards for computer science students from a Visual Programming Language Course to implement the software.

Bilingual Web Based Learning: To know the world and to be known by the world

Firman,Gunawan,Teleeducation Laboratory, Divisi RisTI PT TELKOM Indonesia

Web is a simplest and a cheapest technology to deliver a knowledge to all over the world. This presentation paper would tell you about our concept about bilingual web based learning (our way to know the world and to be known by the world), type of services, research and development steps in developing bilingual web based learning ,development time-line, how the human resources organized in development and operational stage ,collaborative work with other institutions, and our future plan in web based learning concept.

Teachers Discovering and Integrating Technology: An National Online Success Story

Glenda A.Gunter, University of Central Florida, USA

The purpose of this study was to determine if teachers could be taught to use and much more importantly integrate technology into their specific classroom curriculum in a national online graduate level educational technology course for K-12 teachers, Teachers Discovering Computers. Both quantitative and qualitative data were collected and analyzed. The pretest and posttest surveys included fourteen, five-point Likert items, and the posttest contained five open-ended questions. Analyst of quantitative data revealed there was a significant difference between the mean scores of the pretest and posttest scores, $p = .000$. Qualitative data revealed that 100% of the student had a positive experience in the class and learned how to use and integrate technology into their specific classroom curriculum. The combination of both the statistical and qualitative analysis lead the researcher to conclude that the impact of the course on the student's perception and integration of technology into the curriculum was dramatic.

The Role of Assessment in Online Instruction

Robert J. Hall, Texas A&M University, USA; G. Donald Allen, Texas A&M University, USA; Michael S. Pilant, Texas A&M University, USA; R. Arlen Strader, Texas A&M University, USA

The topic for this panel discussion is how assessment can be used to inform instruction in an asynchronous environment. We will explore how technology can add to our understanding of human learning and performance and how carefully designed web-based supplemental study-aids can impact the relationship between confidence and "classroom" performance as measured by course exams. In that regard, we are interested in questions such as "How will performance and confidence metrics for a web-based course be assessed?" and "How can we determine the rate at which learning is taking place?" It is clear that some kind of assessment strategy is necessary in order to deliver material in the right sequence and at an appropriate rate. In this roundtable discussion, we will focus on four issues:

Technology-Rich Education for Tomorrow's Teachers

Burnette Hamil, Mississippi State University, USA; Taha Mzouoghi, Mississippi State University, USA; Weber, James, Mississippi State University USA.

"Preparing Teachers to Deliver Technology-Rich, Problem-Based Learning Experiences" is a PT3 catalyst grant for the state of Mississippi. The project is a collaboration between the Mississippi Research Consortium members, partner community colleges, and school districts. It is funded through a grant by the US Department of Education, Preparing Tomorrow's Teachers to Use Technology program and the various collaborating institutions. The main goal of the project is to infuse technology and hands on science practices in the Mississippi Education System. This is being accomplished by training Elementary Education candidates in a technology rich environment.

TRES FACIUNT COLLEGIUM - Paderborn's Collaboration Centred Approach for New Forms of Learning

Thorsten Hampel, University of Paderborn, Germany;

This paper defines several key requirements for successful cooperative learning, which we have elaborated during the last years with goal to set up new forms of cooperative learning. Without bringing them into a special order, these main design criteria are the integration of synchronous and asynchronous forms of cooperation and the persistence of a learning process, the formation of a common group context or common information room, roles and access rights, annotations and structured chat as well as rooms as places for collaboration.

iMovie and Educators: the Right Partnership for Making Digital Movies

Marianne Handler, National-Louis University, USA; Otto Benavides, California State University, Fresno, USA; Kathryn Morgan, Bemidji State University, USA; Robert Houghton, Western Carolina University, USA

The use of digital video and video desktop applications is spreading. So is the word about the ease of use of iMovie, the Macintosh software, used for creating finished digital video products. IMovie is a digital video editing application to help beginning users create digital movies from existing digital video footage. Beginning moviemakers can transfer clips from their digital camcorders, edit and arrange them into stories, add transitions, animated on-screen titles and publish them to the web.

Assessing Distance Learning Tools and Techniques: A Case Study

J. Christine Harmes, University of South Florida, USA; Ann E. Barron, Universtiy of South Florida, USA

Most of the research on distance education has focused on its effectiveness, i.e. comparing student course grades or performance on exams between traditional on-campus and distance-based instruction. Little mention has been given in the literature to students' attitudes and reactions after experiencing distance education. This study was designed to explore student reactions to a course delivered entirely on the World Wide Web, with the goal being to gather information for use in improving course design and delivery to help work toward improving distance education. Thus, objectives of this study were to investigate tools and techniques for the delivery of effective instruction via the Web.

The Modern Classroom: Using Portable Wireless Computer Networking in the Classroom

Virgil Varvel, University of Illinois at Urbana-Champaign, USA; Delwyn Harnisch, University of Nebraska at Lincoln, USA

In the Spring semester of 2000, the College of Education at the University of Illinois sought to alleviate the lack of available class-time in a standard computer lab by implementing a laptop computer lab that could be transported throughout the building and connected to the World Wide Web via a wireless network connection. This paper reports on the usefulness of such a system in a higher education classroom and on the support aspects necessary to implement such a system and control for user needs. Views by our learners from a one-semester course in advanced statistics reveal that a wireless computer lab is effective in providing students with motivation, mobility, and learning while providing the instructor with increased pedagogical choices.

Teacher Education Changes, Transitions, and Substitutions: Technology to the Rescue!

Lynn Hartle, University of Central Florida, USA

When, a new updated Early Childhood teacher education program with an entirely different set of courses had to be created to meet a new set of state competencies, a a flexible course - Early Childhood Practicum was crafted to ease the transition and provide coursework for twenty-three students who needed a total of seven different courses in to graduate. The course individualized the learning so each student could complete the required competencies.

Technologically Enhanced Cornerstone Courses: A High Impact Low Cost Approach to Modeling Technology for Pre-service Teachers

Kendall Hartley, University of Nevada, Las Vegas, USA

This paper reports on the project rationale and design of one initiative to better prepare preservice teachers to integrate technology into their future teaching. This project, technologically enhanced cornerstone courses, brings together teams of teacher educators to redesign large courses taken by most of our preservice teachers. These teams also worked to develop research questions related to the project. By focusing on the large courses taken by most of the preservice teachers the impact of the project is high.

Developing Standards of Quality for Online Courses

Kendall Hartley, University of Nevada, Las Vegas, USA; Terresa Gibney, University of Nevada, Las Vegas, USA; David Heflich, University of Nevada, Las Vegas, USA; Neal Strudler, University of Nevada, Las Vegas, USA

This paper will report on the development of a "Standards of Quality" document for educational technology distance learning courses. This project resulted from a concern that the courses were viewed as less rigorous by other faculty and our own desire to insure quality in current and future course offerings.

On-line Exams: Design, Development and Implementation

Taralynn Hartsell, The University of Southern Mississippi, USA; Steve Chi-Yin Yuen, The University of Southern Mississippi, USA

Testing has always been an important part of the instructional process in traditional classroom courses. However, testing is also an integral part for on-line learning. The goal of testing is to determine if learning objectives have been accomplished. The use of computers in teaching and learning has a considerable history within education. However, the rise of the Internet presents new opportunities for many aspects of education, particularly assessment. The presentation will provide information and resources concerning the development and implementation of on-line exams. Audience members attending this session should be familiar with the Internet and its educational implications as the presenters will discuss the benefits and drawbacks on using Web-based assessment in education. In addition, the presenters will compare various methods and development tools used for creating Web-based exams by offering samples to demonstrate the resources that are available to educators who plan to deliver on-line exams. Finally, the presenters will discuss the thrills and agonies that may accompany the implementation phase of on-line assessment in education.

Technology Strategies for the College Classroom - Preparing Teachers

Betty Hatcher, Gerald Burgess, K. C. Chan, Barbara Holmes, Rani George, Samuel Masih, Rosemary Mundy-Shephard, Chiou-Pirng Wang, Onetta Williams, Carolyn Williams, Albany State University, USA

Technology in the College Classroom - Preparing Teachers to use TechnologyThe panel presentation herein shares strategies and outcomes of the implementation of the SOWEGA PT3 (Preparing Tomorrow's Teacher to use Technology) Project at Albany State University (ASU). The strategies are: (1) Infusing technology into core courses that will serve as models for future teacher, (2) providing technology training to faculty in collaboration with the Education Technology Training Center to strengthen technology competence system-wide; (3) encouraging the development of technology intense course materials, (4) awarding mini-grants to faculty members who will promote the interests of the SOWEGA PT3 project; (5) targeting pre-service teacher for Intensive Technology (InTech) training, and (6) collaborating with area schools to encourage student teachers utilizing technology at schools where they are doing student teaching. The PT3 project has fostered multi-disciplinary activities that promote active use of technology.

Technology and Character Education of the Younger Generation

Shujia He, Shanghai Qibao High School, P.R.China; Yuehua Zhang, Washburn University, USA

This paper intends to provide a variety of examples for teachers to recognize the possibility of utilizing technology to create a student-centered interactive learning environment and to show how some high schools in Shanghai, China have been successful in cultivating in their students healthy personalities and strong characters, so as to produce a generation of young people who are ready to contribute to their society. The presentation will include a variety of ways in which to apply technology to create this beneficial learning environment, which will not only enhance students' learning of basic knowledge and skills within subject areas, but also to enrich their self awareness and capability to strive for success.

Technology and the Academic and Social Culture of a University Campus

Tina Heafner, University of North Carolina at Greensboro, USA; Leah McCoy, Wake Forest University, USA

This presentation reports the results of a study of 800 university students who had been exposed to a technology-rich environment for their four years of college. Narrative comments were analyzed and synthesized to describe students' attitudes toward the influence of technology on the social and academic culture of the campus.

Applying Technology to Restructuring and Learning: An Analysi of A Professional Development Intervention

Marilyn Heath, Mary Burns & K. Victoria Dimock, Southwest Educational Development Laboratory, USA; Jason Ravitz, University of California at Berkeley, USA

The Applying Technology to Restructuring and Learning (ATRL) study was carried out over a two year period to document and assist 150 teachers in six schools during the process of creating constructivist learning environments (CLEs) supported by technology. The research component of this project involved an intervention study with a two-tiered research design. Tier One was a collective case study of the approximately 150 classrooms, located across six school sites, whose teachers participated in 72 hours of ATRL professional development. Tier Two consisted of six detailed case studies of individual teachers whose experiences represented the process and the practices they employed in creating a constructivist learning environment within their classrooms. This paper will summarize the findings from the Teaching, Learning, and Computing (Becker & Anderson, 1998) teacher survey regarding the impact of the professional development intervention that was provided for the teachers in the project.

South Central Regional Technology in Education Consortium

Marilyn Heath, K. Victoria Dimock & Jackie Burniske, Southwest Educational Development Laboratory, USA

The Regional Technology in Education Consortia (R*TEC) program was established by the US Department of Education to help states, local educational agencies, teachers, school library and media personnel, administrators, and other education entities successfully integrate technologies into K-12th grade classrooms, library media centers, and other educational settings, including adult literacy centers. To provide such help, the R*TEC establishes and funds several regional consortia that address professional development, technical assistance, and information resource dissemination. The 2000-2005 South Central Regional Technology in Education Consortium (SouthCentral R*TEC) serving Arkansas, Louisiana, New Mexico, Oklahoma, and Texas is now located at the Southwest Educational Development Laboratory in Austin, Texas. Through a program of focused professional development and information services for teachers and administrators, the South Central R*TEC will enable educational systems in its five state region to use technology to foster student success in achieving state content standards, particularly in schools serving high population of disadvantaged students.

Classrooms Under Construction: A Video Series

Marilyn Heath, K. Victoria Dimock & Jackie Burniske, Southwest Educational Development Laboratory, USA

Professional development that supports teachers as they create constructivist learning environments supported by technology allows them to construct professional knowledge about pedagogy, content, and technology, as well as strategies for managing a changing classroom environment. By providing the very experiences promoted for constructivist learning environments in the classroom, through professional development, it is possible that teachers will confront their "theories in use" to enable them to create learning experiences appropriate for the children of the Information Age. For this purpose, the Technology Assistance Group at the Southwest Educational Development Laboratory created six videos that portray several K-8 classroom teachers as they grew through the process of creating constructivist classrooms supported by technology. Featured in these videos are vignettes of students, teachers, and principals who share their experiences in learning, supporting, and the use technology to change teaching practices.

Creating a Web-Based Curriculum Tool: Helping K12 Teachers Harness the Potential of the World Wide Web

Lisa Heaton, Marshall University Graduate College, USA; Kurt Stemhagen, University of Virginia, USA

The World Wide Web offers a great deal of potential for enriching the teaching and learning experience in the K12 classroom. In many cases, however, teachers lack the time and skills to locate resources on their own. What can be done to help teachers and students take better advantage of the Web? Using the Algebra Resource Center (ARC) as an example, this paper will describe three areas of focus that can improve the effectiveness of sites designed as content area portals for classroom teachers-filtering, organizing, and correlating content to state standards; providing "real world" context for exploring content; and working to build a community of new and returning users.

Reflections of reality: Online conversation in a teacher education seminar

David Heflich, University of Nevada, Las Vegas, USA; LeAnn Putney, University of Nevada, Las Vegas, USA

Seminars in teacher education have often been used to stimulate reflective thought and moral development among the participants. The use of online resources, listservs and electronic mail, expand the scope and range of seminars by allowing students to participate at any time and from any place. This study examines the use of an online seminar with a cohort of students involved in a field-based practicum at a Professional Development School (PDS) on the university campus. The methodology of the seminar is explored as are the topics discussed by participants. Particular attention is given to the ways in which student attitudes develop during the conversation.

Activities for Integrating the Internet in Teacher Education Classes

Marie Hegwer-DiVita, California State University, Long Beach, USA

This presentation will outline three categories of Internet activities: Direct, WebQuests, and Complex. Activities for K-12 students utilizing the Internet are featured in journal articles, websites, and books. Teacher education classes also increasingly use the Internet and can benefit from utilizing the same sort of activities. A taxonomy of a number of Internet activities may be useful for teacher educators who are new to using the Internet in instruction. Instructors may begin with simpler activities and add more complex assignments as their own skills develop. Using different types of tasks increases motivation through variety and demonstrates variety in instructional planning. Tasks representing each of the category will be discussed, including examples and resources; examples from special education teacher education courses are emphasized. This taxonomy and the examples are being developed for use by a faculty "tech buddy" to aide in supporting colleagues participating in a PT3 Implementation Grant.

StarFestival: A Multilinear Approach to Cultural Identity

Kari Heistad, StarFestival, USA; Shigeru Miyagawa, MIT, USA

StarFestival is a multimedia K-12 educational package developed at the Massachusetts Institute of Technology that engages students and their teachers in the issues of diversity and cultural identity. It is based on the personal narrative of its developer, Shigeru Miyagawa, who returned to Japan after a 30 year absence, to answer his own personal question of Who Am I? StarFestival engages the students in answering their own questions of Who am I? Where did I come from? and Where do I fit in?

Workplace Literacy with Online Discussions

Heather, Hemming, School of Education, Acadia University, Canada, hhemming@acadiau.ca; Sonya, Symons, Department of Psychology, Acadia University, Canada, ssymons@acadiau.ca; Lisa, Langille, School of Education, Acadia University, Canada, lisalangille@yahoo.ca

Many workplaces require individuals to collaborate electronically to solve on-the-job problems with others who may be down the hall, in a building close-by, or in another geographical place altogether. As a consequence, adult literacy programs need to be developed based on effective ways to teach individuals to use literacy skills in a technological context. This paper discusses the importance of integrating electronic writing into workplace literacy programs, describes an approach to instruction based on reciprocal teaching, situated learning and strategy instruction and offers some evaluative commentary on the effectiveness of the program.

Going the Distance: Developing Guidelines for the Creation of Online Courses

Norma Henderson, University of Nevada, Reno, USA; LaMont Johnson, University of Nevada, Reno, USA

This paper reports preliminary findings of a study assessing the quality of existing online courses at five Internet sites including three university institutions, and two commercial sites that provide software packages for educational online course development. This study was performed in two graduate-level information technology in education courses. Findings indicated that, overall, students were dissatisfied with the quality of online courses available. In fact, this study indicated that many of the purported online courses were merely traditional course syllabi placed online, or traditional correspondence courses where the study materials are obtained online. Suggested guidelines for the development of an online course include: a comprehensive description of the course, including purpose and objectives; time required to complete the course; tuition costs; grading policy; accreditation/degree fulfillment; prerequisites, including technology skills; minimum system requirements; and testimonials. Also important is inclusion of a brief demonstration of a course module for student evaluation prior to registration.

Graphic Representations for Learning: Developing a Learner's Conceptual Framework

Anne Henry, University of Houston - Clear Lake, USA; Caroline M. Crawford, University of Houston - Clear Lake, USA

The emphasis on knowledge attainment, higher order thinking skills and real-world learning opportunities within teacher education offers numerous opportunities for preservice teachers to develop a conceptual framework through which their future educational profession is viewed. The introduction of instructional technology into the educational environment offers the opportunity to represent such knowledge and understanding within a graphic format.

Creating Multimedia Web Sites in a Flash

Nanette Hert, Florida Atlantic University, USA; Ralph Cafolla, Florida Atlantic University, USA

This session will provide an overview of how to use Macromedia's Flash to develop engaging, interactive web sites. Flash makes it possible to develop fully animated web pages that allow learners to discover concepts that are not readily accessible on pages in a textbook or on static web pages. Educators can use Flash to create sophisticated presentations for the Web. For example, animation can be used to show water flowing into a beaker or to show shapes dividing to illustrate the concept of halves. With the help of Flash, web sites can contain interactive timelines and maps. Today's teachers need to be trained how to create educational Web sites where users are able to interact with the information. Davitt (2000) states, "the use of Flash and other interactive animation software as a visual thinking tool looks set to take off in schools." The session will provide a discussion of the advantages and disadvantages of Flash and provide participants with specific examples.

Using student projects to meet the information needs of teachers on the Internet

Danielle Heyns, Teacher Training College, South Africa

Teachers in South Africa are confronted with a new educational paradigm and rapid development in information communication technologies. In South Africa there is still a considerable lack of locally developed and relevant educational resources on the Internet. Students from the Teacher Training College in Pretoria were involved in a project to develop relevant online learning support material for Afrikaans First Language teachers. Their participation in this project not only empowered them with ICT skills, but also made them possible facilitators of change who can help to disseminate educational technology throughout the entire school system.

Creating a Culture Shift: Establishing a Technology and Learning Center

Carl Hoagland & Eric Aplyn, University of Missouri-St. Louis, USA

A culture shift is a change in the rules of conduct. The College of Education (COE) at the University of Missouri-St. Louis needed a cultural shift. With the university certifying over 500 teachers a year, these students need to be technologically literate. The evidence was that the students were not being adequately prepared to integrate technology into the curriculum. Pressure for technologically literate graduates was coming from the Missouri Department of Elementary and Secondary Education and from school districts. Students at the university also have practicums in technology rich classrooms and they may end up working in a technology rich classroom or MINTS * classroom. In the 21 st Century, students hired from the University of Missouri-St. Louis must know how to integrate technology.

Effective Technology Staff Development: A Grass-Roots Approach

Mark Hofer, University of Virginia, USA

Training to support the integration of technology into the curriculum can be difficult. Research suggests that on-site, just-in-time instruction is more effective than one-time workshops in facilitating meaningful technology integration into the classroom. The Teacher Technology Leadership Academy in the Archdiocese of Indianapolis is a grass-roots approach to staff development in technology. It is a cost effective, train-the-trainer approach that provides research-based staff development in technology for classroom teachers. This model can be transferred to any school or district.

Virtual Literature Circles: Message Board Discussions for

David Hofmeister, Central Missouri State University, USA; Matt Thomas, Central Missouri State University, USA

This paper reports current findings from an ongoing research project that is an offshoot of a three-year, $155,000 "Best Practices in the Use of Technology" grant awarded to one of the co-authors, 1998-2000. The portion of the study reported here focuses on the cognitive complexity of student written responses in Virtual Literature Circles or electronic message boards utilized according to the structure of more traditional classroom literature circles. The ex-post-facto research question examined was: Did the cognitive complexity of student responses increase with continued use of Virtual Literature Circles? The findings of this simple study suggest that this research question is best answered in the negative, and shed light on existing higher-order literacy theory and on the effectiveness of Virtual Literature Circles in their current pilot state. Additionally, knowledge was gained in this study regarding new instrumentation being developed to help with the unique challenges of assessing student message board responses.

Observations of the computer use of pre-service teachers

Brad Hokanson, University of Minnesota, USA

The major portion of the impact of instructional designers will come through improved and continued education of in- and pre- service teachers through courses dealing with computers, technology, and the use of the internet. Understanding learners' existing knowledge is an important aspect of education. Surveying learners at the beginning of class is a good means to understand their skills and experience. This study examines survey data from pre-service teachers and makes observations from that data regarding technology use which may help improve instruction in the use of technology.

The Results of a Learning Software Competition

Brad Hokanson, University of Minnesota, USA; Simon Hooper, University of Minnesota, USA

This presentation will highlight the process, results and observations from the recent Learning Software Design Competition sponsored by the University of Minnesota. Winners of the competition will be demonstrated and observations from the process and the pool of winners will be presented.

Communal Constructivism: Students constructing learning for as well as with others.

Bryn Holmes, Brendan Tangney, Ann FitzGibbon, Tim Savage & Siobhan Mehan, Trinity College Dublin, Ireland

We believe there is a need for an expanded definition of social constructivism that takes into account the synergy between the more recent advances in information technology - which are increasing our potential for communication and the ability to store a variety of data types - and advances in virtual learning environments. In particular we are still at an early stage in trying to construct knowledge as to how to teach and learn effectively with ICTs. What we argue for is a communal constructivism where students and teachers are not simply engaged in developing their own information but actively involved in creating knowledge that will benefit other students. In this model students will not simply pass through a course like water through a sieve but instead leave their own imprint in the development of the course, their school or university, and ideally the discipline.

Using CD-ROM to Guide the Development of Professional Portfolios

Dennis Holt, University of North Florida, USA

The session will present an evaluation of the CD-ROM project, "Developing Your Professional Portfolio for Internship and Beyond". It will include feedback from interns, supervising professors, directing teachers and education personnel from across the USA and abroad. The session will include the display of professional portfolios, electronic portfolios, K-12 electronic folders and multimedia portfolios.

Electronic Portfolios: A Glimpse into a Child's Education

Claire Smith Hornung, Lehigh University, USA

Electronic portfolios use the purposeful collection of students' work, progress and the achievements of the paper portfolio and puts them together using technology that enhances and expands the delivery of the portfolio. As one can only imagine, a collection of multi-media work is far easier to present electronically than to find the perfect container to hold a students artifacts from preK-5. Indeed, electronic portfolios can include graphics, video, and sound, in addition to all that is included in a paper portfolio. There is no limit to these portfolios. Its creation is guided by the imagination of the creator. Similar to the paper portfolio, students can often take a lead role in using technology to develop their own electronic portfolios. The Moravian Project involves incorporating electronic portfolios as an assessment tool for students and teachers alike.

LUMA: The Next Step in a Partnership to Enhance Technology Integration

Claire Smith Hornung, Lehigh University, USA; Steve Bronack, Lehigh University, USA

Technology enriched learning environments have a positive effect on the achievement of students. It would seem, therefore, that the environments of in-service educators must also be rich in technology and technology integration. After developing a partnership that focuses specifically on technology integration with pre-service and in-service educators, a second partnership developed to work with specific academic departments at the Upper School level integrating technology within an established curriculum. The goal of this partnership, LUMA (Lehigh University/Moravian Academy), was to give teachers in specific academic areas access to materials, plans, ideas, and support for integrating appropriate technologies into their class activities. From experience, the developers of this partnership know what doesn't work-the one-day, one-shot, show-and-tell workshop developed by outside consultants and delivered to teachers. Instead, these workshops were designed to be spread out over an academic semester, involve the teachers in the design and development, and provide support for the teachers between workshops.

Integrating Mathematics Education Technologies into Teacher Education at the University of Colorado-Boulder

Jeffrey Hovermill, University of Colorado, USA; Michael Meloth, University of Colorado, USA

Technology is transforming the face of mathematics education. The National Council of Teachers of Mathematics' Principles and Standards for School Mathematics (Standards) states "the existence, versatility, and power of technology make it possible and necessary to reexamine what mathematics students should learn as well as how they can best learn it" (NCTM, 2000). Furthermore, NCTM describes that "the effective use of technology in the mathematics classroom depends on the teacher. Technology is not a panacea. As with any teaching tool, it can be used well or poorly" (NCTM, 2000). Evidence suggests that teachers frequently have difficulty aligning their practice with these Standards and that they need financial, cognitive and technical support in order to do so (OTA, 1995). This paper describes ways that the University of Colorado-Boulder has infused technology into their teacher education program in general, and their mathematics education program, in particular, in order to "prepare tomorrow's teachers today" to effectively teach with mathematics education technology.

Ways to Integrate Technology in Your Classroom

Choong L. How, East Hartford Middle School, USA

This educational web site creates a framework for understanding technology tools and how they can be used for teaching different subjects in the classroom. The site provides links to general education, subject-specific and community sites. Its distinct features are the integrated language arts thematic units developed by teachers in a Connecticut school system to help their students meet the objectives of the Connecticut Achievement Performance Test (10 th grade CAPT) and a template to submit your favorite lesson. The web site is organized into four sections: I. Technology Tools II. WWW Educational Resources III. Lessons Database IV. Reading Strategies.

Use of Development Teams in Problem Finding

Judith B. Howard & Deborah Thurlow, Elon College, USA

Educators emphasize unit construction as an important part of teacher preparation. Technology-enhanced problem-based learning units are particularly exciting because they have the potential to involve students in complex, realistic problems that are both engaging and cognitively challenging. These units are difficult to develop, however, particularly for elementary education teacher candidates who often have limited content knowledge. The authors have enlisted arts and science faculty experts to participate as members of "development teams" to assist in the design of problem-based units in science and social studies. This collaboration produced units in which content is richer, problems are more complex, and resources are more substantive.

Internet Uses by Senior High School Teachers: A Case Study

Ying-Shao Hsu, Yeong-Jing Cheng & Guey-Fa Chiou, National Taiwan Normal University, Taiwan; Chi-Chuan Chen, ARGIS Company, U.S.A

This research project employs the case study method to investigate the effects of instruction and learning with the Internet at the senior high school level. In the first year of this study, the main focus is to explore the current status of integrating the Internet into school management, teaching and learning. Some teachers were selected in six subjects, Chinese, Geology, English, Mathematics, Biology and Earth sciences, to use the Internet for their professional activities. The data collection instruments included the Teachers' Professional Use questionnaire and The Students' Computer Use questionnaire. The survey data showed that (a) more teachers and students knew how to access the Internet for instructional or learning purposes after the researchers intervened, and that (b) more teachers reported that they needed assistance for designing a web-based database and Instructional strategies for their Internet use.

Creating a Methodology for Using the Internet as a Source of Data for Qualitative Research in the Social Sciences

Malcolm Hughes, University of the West of England, UK

At a time of much increased use of the Internet as a source of data for research, there is concern about how best to do this. This short theoretical paper seeks to characterise some uses of web page data.. Can the Internet deliver what we are looking for and how will we know when we have found it? A methodology is suggested, drawing heavily upon 'Grounded Theory', and some principles of good practice are recommended.

ICT Training for Teachers: a University response to a National Training Initiative in the United Kingdom

Malcolm Hughes, University of the West of England, UK; Lynne Walker, University of the West of England, UK

This paper seeks to describe a national training scheme currently operating in the United Kingdom, the main aim of which is 'To raise the standard of pupils' achievements by increasing the expertise of serving teachers in the use of ICT in subject teaching, to the level expected of Newly Qualified Teachers who enter the profession, and by improving the competence and confidence of school librarians in their use of ICT'. An analysis of the requirements and learning intentions of the scheme are offered and examples shown of how one training provider has met the challenge using a combination of multimedia CD-ROMs, on-line training modules, in-school support and the development of a virtual learning community.

Just Another Evaluation Paper: Working Towards a Shared Methodology for Evaluation of Information Technology Courses in Teacher Education

Malcolm Hughes, University of the West of England, UK; Lynne Walker, University of the West of England, UK

In response to a perceived increase in the amount of course evaluations being presented at conferences and appearing in the journals, this short paper seeks to characterise the methodology adopted during the evaluation of information technology courses forming part of teacher pre-service education. An attempt is made to discover the strengths and weaknesses of the most common procedures by the review of course evaluations readily available in the public domain. Elements of course evaluation are described in a short taxonomy under the main headings of curriculum effectiveness, learning effectiveness and cost effectiveness.

Networked Learning: A Project-based Approach in building up the Working Knowledge of Multimedia Teaching Resource Bank

Vincent HK Hung & Winnie WM So, Hong Kong Institute of Education, Hong Kong; Jacky WC Pow, City University of Hong Kong, Hong Kong

This is a working paper describing a proposal for the development of a networked learning program for participants taking "General Studies" as their elective in the part-time Postgraduate Diploma in Education (PGDE) course offered by the Hong Kong Institute of Education. The objective of the networked learning program is to develop a local multimedia teaching resource bank for the subject "General Studies" in the primary curriculum through collaborative learning. The paper describes the rationale and concept of the networked learning program. The mechanism with 4 stages of development is outlined to illustrate how the networked learning program should be designed. The outcomes, and limitations of the use of the networked learning in developing multimedia teaching resource bank are discussed too.

Black Bear, Black Bear. What Do You See? We See Teacher Educators Integrating Technology

Cynthia J. Hutchinson, University of Central Florida, USA; Sherron Killingsworth Roberts, University of Central Florida, USA; J. Susan Lynch, University of Central Florida, USA; Mary Little, University of Central Florida, USA; Mary Palmer, University of Central Florida, USA, Shelia Smalley, University of Central Florida, USA

This paper describes a staff development process used to support technology development of both faculty and preservice teachers at a large state university. The authors explain the progressive and innovative slant of the integration model, the three-day training and writing workshop for faculty, and the description of a pilot project using a technology-rich, integrated curriculum on Florida Black Bears to train preservice teachers.

Wholetheme Learning in the Internet Virtual Community: Some Encouraging Preliminary Results

Asghar Iran-Nejad, University of Alabama, USA; Yuejin Xu, University of Alabama, Gopakumar Venugopalan, University of Alabama

This study compares data from two different applications of a theoretically grounded wholetheme learning portfolio. The portfolios came from four different sections of the same undergraduate educational psychology course for teacher education students. All students wrote a critical reflection essay on three of their major insights in the course of the semester according to a common schedule and set of guidelines prescribed in their syllabus. Each of the students in two of the sections did and in the other two did not participate in the internet virtual community (IVC) we created. Quantitative results suggest that the IVC participants improved in critical reflection in the course of the semester. Qualitative analysis of the third insight data suggested a trend in favor of an interaction in which better students did better in IVC and poorer students did better in non-IVC conditions.

The R.O.A.D Learnig System (Read, Own, Apply, Discuss) An On-line Method for Enhancing Teacher Pre-service and In-service Professional Growth

Geoff Irvine, NEWTcom, Canada

We (NEWTcom: a non-profit organization) have been developing a state of the art, Web-based, interactive, multimedia enhanced web-service to support the training and on-going development of teachers. We aim to serve both in-service and pre-service educator needs. The service is being built in collaboration with the Ottawa Carleton District School Board, the Ottawa Center for Research and Innovation (OCRI) and the Communications Research Center of Canada (CRC). We would like to show the resource to staff-developers and teacher-trainers to get their feedback and advice for further development. The goal of this session is to introduce this type of training medium to leading educators.

Constructing Knowledge Networks: Integrating Science, Math,Language, and Technology in the Middle School Classroom

Sarah Irvine, American University, USA; Teresa Larkin-Hein, American University, USA; Andrea Prejean, American University, USA

This session will present how the use of the constructivist theory, national standards in Math, Science, and Language arts were into a technology-based workshop for in-service teachers in Washington, DC. Elements of the workshop will be presented, along with sample instruction web-sites designed by the teachers. Evaluation of this workshop provides recommendations for providing professional development for teachers already in the field.

Virtual Learning Center: Online Tools Support In-class Teaching

Barbara K. Iverson & Janell Baxter, Columbia College Chicago, USA

This interactive session presents "old teaching techniques in new packages." It presents an approach to transforming teaching activities, which is economical and does not require too much extra time on the teacher's part exceptions in the world of modern faculty development in technology use and application. It demonstrates how teachers can create a Virtual Learning Community of online tools and resources to provide an electronic infrastructure to support their in-class teaching. This Virtual Learning Community can be used by elementary, secondary and post-secondary teachers, as well as teacher educators to transform traditional teaching practices into more effective "asynchronous" online activities, that frees up valuable class time for higher order cognitive activities and for social learning experiences. The tools we demonstrate are low-cost, free, or widely available already in schools, so our Virtual Learning Communities approach can be implemented in almost any teaching setting by any teacher who uses email and the Internet on their own. This is a practical, no-frills approach to modernizing your teaching.

Using Internet Technology to Facilitate Anonymous Communication in World Wide Web Delivered Multiculturalism in Education Courseware

James G. Izat, West Texas A&M University, USA; Terry Hargrave, West Texas A&M University, USA; Robert D. Brammer, West Texas A&M University, USA; Gwen Williams, West Texas A&M University, USA;

Between 1999 and 2000, a study was conducted at West Texas A&M University whose purpose was to design and utilize an anonymous communication technology through which graduate online Multiculturalism in Education students might answer challenging questions on issues that students are traditionally reticent to discuss in an open, identified forum. The anonymous comment box was introduced to online students and has been in use for three consecutive semesters in the 1999 and 2000 calendar year. Approximately 100 students have responded to the eight questions posted in the assignment pages of instructional units. These responses were archived, coded and analyzed to reveal the following preliminary conclusions: first, the utilization of the anonymous comments box technology allowed students to openly express their thoughts and opinions; second, the anonymous structure limits the instructor to a general knowledge about the class section.

How Information Technology Can Help Education, Distance Learning

Hossein Jahankhani, University of East London, UK

The aim of this paper is to review how information technology i.e. computer based studies can help education particularly in distance learning. Although this review will concentrate on distance learning it will also discuss and compare ideas such as open learning and flexible learning. The economy behind, and advantage, disadvantage of the distance learning will be analysed and compared between conventional, distance, open and flexible learning.

Computer Confidence and Attitudes of College Students Attending A Notebook or Traditional University

Kenneth Janz, Indiana State University, USA

This study attempts to determine how the use of a notebook computer impacts a student's computer confidence and attitude when compared to those of a traditional university student. This descriptive study used a survey research instrument to gather quantitative data concerning computer confidence and attitudes. Forty-six students at a notebook university and 64 students at a traditional university were surveyed during the summer semester of 1999. Data were collected on computer attitudes to determine students' perceptions of computer usefulness, and comfort or anxiety. The study found that notebook university students had significantly higher levels of computer usage, confidence, and positive attitudes than did students at a traditional university.

An In-Service Program in Applied Linguistics for Language Teachers

Diana Jenkins, National Autonomous University of Mexico, Mexico; Dulce María Gilbón, National Autonomous University of Mexico, Mexico; Carmen Contijoch, National Autonomous University of Mexico,Mexico

Given the recent rapid changes in the educational field in Mexico many language teachers face new challenges for which even recent graduates of training programs may be ill-equipped to deal with effectively. Among other new challenges, teachers are being expected to take an ever more active role in syllabus, program and materials design. They are also increasingly expected to be able to manage new technologies. In order to participate they need to transform themselves from technicians to professionals and to do this they need updating in the theoretical and practical bases of their field. This project, sponsored by the National University's Support Program for Institutional Projects for the Improvement of Teaching, hopes to address these needs through a model which combines the applied linguistic content with experience in the use of educational technology.

Matching Distance Education with Cognitive Styles in Various Levels of Higher Education

Steve Jenkins, Louisiana Tech University, USA; Watler Buboltz, Louisiana Tech University, USA; Lamar Wilkinson, Louisiana Tech University, USA; Sonia Beatty, Louisiana Tech University, USA

With advances in computer and other technology it appears that we now have the capabilities to design and deliver distance education learning experiences that will allow students to maximize their potential and learning. However, as we implement these new technologies we can not lose sight of the individual learner. Students present with a variety of capabilities and preferences for learning (cognitive/learning styles), which appear to vary with age and previous learning. Based on this, distance education needs to be designed with this in mind in order to maximize its efficacy. Different cognitive/learning styles require different types of material presentation, format, evaluation and feedback for students to have the greatest chance to succeed. For distance education to be successful for the most number of student's developers and designers of distance education need to meet the unique style and needs of each student. This article addresses the cognitive/learning styles of students at various educational levels and how these styles should be considered when designing and implementing distance education to help meet the uniqueness of each learner.

Creating Technology Mentors for Rural School Districts: An Examination of the T.I.M.E. Mentor Program

Michael Jenks, Idaho State University, USA; Jane Strickland, Idaho State University, USA

This study examines the strengths and difficulties of the Technology Integration Mentors in Education (T.I.M.E.) program through accounts given by participants. The T.I.M.E. program, at its peak in 97-98, included approximately 400 inservice teachers from 55 school districts in eastern Idaho. Several inservice teachers who have successfully completed two years of the program were asked to participate in an extensive online interview and survey format (via WebCt) designed to pinpoint major characteristics of the program as well as attitudes. This research explores three areas of the T.I.M.E. participants' experiences: Workshop training experience, implementation of technology into their own curriculum, and peer mentoring activities. The detailed perspectives of these participants are critical to understanding the successes and difficulties of the program. The results of this current research will inform improvements in the implementation of the T.I.M.E. program.

Teaching Technology With Technology: A Case Study. How One Faculty Member is Integrating Technology Into His Pre-Service Mathematics Methods Classes.

Ken Jensen, University of Nebraska, USA

This case study tracks a secondary mathematics pre-service class. The professor's thoughts give insight into why he is incorporating technology into his curriculum. The pre-service mathematics class is also participating in a pilot project in which wireless Macintosh® iBook computers are put to use. Classroom observations, interviews and documentation of student feedback were used for analysis. This professor's philosophy is that technology should be an instructional tool, a contribution to productivity. This faculty member is pleased with the results of technologies utilized in the course. Students reveal they benefits of technologies used in this methods course. The interesting concern of students was not the use of technology, but "which brand" would offer the best results.

Beyond the workshop: Models of Professional IT Development for Practicing Teachers

Jennifer Jenson, Brian Lewis & Richard Smith, Simon Fraser University, Canada

This study examines an often over-looked aspect of the implementation of computer technologies in schools, across Canada and elsewhere: we have sought to identify, describe and clarify "successful" models of teacher professional development.

Mentoring Collaboration to Integrate Technology into Science Curriculum: A PT3 Project

Seung H. Jin, Cleveland State University, USA

This paper describes an exemplary case in mentoring collaboration between the student teacher and cooperating teachers to integrate technology into the curriculum and discusses various activities that have occurred during the project. The educational technologist provided one-on-one and just-in-time coaching customized to needs in the context/placement classroom for a semester through the whole technology integration process. The project addresses three important problems/issues including: 1) collaboration between student teachers and cooperating teachers, 2) a model for integrating technology into the curriculum, and 3) communication among faculty in higher education, cooperating teachers, and student teachers.

Diversity through Co-Operation: Creating and Delivering Content in In-service Teacher Education

Monica Johannesen & Leikny Øgrim, Oslo University College, Norway

This paper describes some Norwegian experiences from the Co-operation Network project in teacher education. Through the network, students in the study programme "ICT for Teachers", are offered a diversity of web based optional subjects from several university colleges. Different forms of collaboration are applied in the network, and Tony Bates' three categories of inter-organisational co-operation are used to discuss the alternative forms. An organisational and economic model of co-operation is presented and discussed according to diversity.

VisionQuest©: Creating Visions and Strategies for Technology Integration

Tristan Johnson, Purdue University, USA; Peggy Ertmer, Purdue University, USA; Molly Lane, Purdue University, USA

As the need for meaningful technology integration has increased, various programs have been developed to support and help pre-service teachers accomplish this complex task. Decisions-makers for teacher-education programs could benefit from instructional information that highlights the strengths of these various development programs. This paper describes VisionQuest©, a CD-ROM teacher development tool, designed specifically to help teachers gain the critical skills needed to effectively use technology in classroom learning environments. VisionQuest© uses an instructional method that focuses on creating a vision and developing a personalized implementation strategy to achieve sound technology integration. This tool helps users reflect on exemplary cases, thereby engendering thoughtful consideration of the visions and strategies that enable exemplary use.

Mentoring and Assessment: A Case Study of Initial Teacher Education and In-Service Development.

Chris Jones, University of Sunderland, United Kingdom

This paper concentrates on the issues pertaining to the determination and accreditation for Qualified Teacher Status in Information Technology in England and Wales, and the role that School Based Tutors have in this process. The major problem faced in initial teacher preparation is that while there is broad agreement that high levels of practicum are important, the lack of suitably qualified teacher mentors in Information Technology is hampering the effective preparation of newly qualified teachers. This paper looks at one model for effective mentor support.

USING AN ELECTRONIC DISCUSSION BOARD TO SUPPLEMENT CLASSROOM SESSIONS WITH POST GRADUATE TEACHER EDUCATION STUDENTS

DONALD JOYCE, CAROLYN NODDER & ALISON YOUNG, UNITEC INSTITUTE OF TECHNOLOGY, NEW ZEALAND

When the postgraduate computer education programme at UNITEC Institute of Technology was developed it was considered essential that it be accessible to students in full time employment. Consequently all classes are held at weekends and Blackboard Course Info is used to facilitate student-student and student-teacher interactions between classes. This paper outlines the structure of the programme, profiles the students, explains the approach taken by the lecturers, and reviews the learning experiences of staff and students in three classes.

Science Concepts, Technology, and Higher Order Thinking Skills- What's the Connection?

Margarete Juliana, Research Center for Educational Technology, USA

Using the scientific process involves ample opportunity for complex higher-level thinking. Integrating technology into the unit can support and enhance these same critical thinking skills. This qualitative study was designed to examine students' understanding of a science problem involving human habitation of wetlands, woodlands, and grasslands. Four fourth grade students and their teacher were observed during a six-week period in which they spent two hours a day in a technology immersed classroom. Researchers observed how students used technology to proceed through defining, investigating, and drawing conclusions about the problem. Student interviews revealed how useful they felt technology had been for completing each stage of the process. Teacher interviews revealed how she believed technology was supporting and enhancing students' complex thinking. For the purposes of this study, the scientific process has been limited to the following four main stages: identify the problem; collect information; analyze information; and draw/present conclusions.

Virtual Exchange Program: Coming to a Computer Near You?

Chris Junghans, Montana State University, USA

In the spring of 2000, a"Virtual Exchange Program" was piloted by the Koerber Foundation's Transatlantic Classroom project. The intent of the program, initiated by the author, was to allow American high school students of German to electronically correspond with Americans of the same age who were in Germany on a one-year, U.S. Congress-Bundestag Exchange Program.

Is A Paradigm Shift Required In Order to Effectively Teach Web Based Instruction?

Michael G. Kadlubowski, Northern Illinois University, USA

The hypothesis of this thesis is to present to the reader an argument as to whether existing educational paradigm's, philosophies, pedagogy, and practices require revision to effectively teach web based instruction. Due to the length restrictions of this paper the reader is advised that not all paradigm's, philosophies, and practices are included, and those that are evaluated as to their usefulness in web based instruction are very limited in scope, definition, and explanation. In all probability you will find that this paper will ask more questions than it answers, but in doing so will hopefully stimulate each of us to view and analyze the effectiveness of the current practices employed in web-based instruction.

The Integration of Technology into Classroom Lessons in the Teacher Preparation Program at the University of Houston-Clear Lake

Lawrence Kajs, University of Houston-Clear Lake, USA; David Underwood, University of Houston-Clear Lake, USA; Anne Coppenhaver, University of Houston-Clear Lake, USA; Trudy Driskell, University of Houston-Clear Lake, USA; Caroline M. Crawford, University of Houston-Clear Lake, USA

This session describes the qualitative and quantitative results of a one-year PT3 capacity building grant which focused on the preparation of teacher candidates to develop lesson plans that incorporated technology.

Peer status and self-efficacy: Effects on technology-based small group interactions

Rachel Kamb, Univeristy of Utah, USA; Dale Niederhauser, University of Utah, USA

The use of computers in schools is moving away from individual learning environments in lab settings, to group learning environments, as more computers are integrated into classrooms. This shift is causing teachers to reevaluate computer use as not just a tool for tutoring individual students, but as a potential medium for group-learning situations. This study looked at some of the factors that influence interactions in learning groups working on a computer-centered activity. Twelve groups of three high school students each worked together around one computer to solve a mystery presented in a problem-based learning program. Prior to the activity, all students were tested for prior knowledge, self-efficacy, and were ranked by academic and peer-status by the other members in their group. The results of this study indicate that high-ranking peer status of an individual group member positively influences that individual's participation. However, unless the other members of the group had high self-efficacy and prior knowledge, the highest-ranking individual in a group would dominate the discussion and make most of the group's decisions. The individual characteristics of students then, may be important for teachers to consider when trying to create effective technology-based group learning situations.

Influence of Computer Assisted Teaching on Development of Faculty Staff Members at Atatürk University

Melih Karakuzu, Atatürk University, Turkey

With the intention of determining the attitudes of faculty instructors to Computer Assisted Teaching (CAT) in their own major fields of study I attempted to carry out this survey. This study is based on the collected data via a questionnaire applied on 98 staff members currently teaching at Atatürk University, Erzurum, Turkey. The survey intends to determine and analyze various opinions of the staff members about the effects of Computer Assisted Teaching (CAT) on their development. Collected data from the replied questionnaire items were analyzed using frequency- percent and a report of the study that investigated the affect of Computer Assisted Teaching (CAT) on the development of the staff members at the university. In conclusion, evidence based on the staff members' opinions was found that Computer Assisted Teaching (CAT) has a significant effect on the development of staff members.

Using Anchored Instruction to Teach Preservice Teachers to Integrate Technology in the Curriculum

Mumbi Kariuki, University College of Cape Breton, Canada; Mesut Duran, University of Michigan, USA

Twenty-two preservice teachers involved in a cohort group were enrolled in both an educational computing class and a curriculum development class in the same academic quarter. The instructors for both courses collaborated their teaching efforts whereby the preservice teachers used the educational computing class to research, record, and document their experiences in the curriculum development course. The theme of the curriculum class was therefore used as an anchor for the educational computing class. This paper describes how the technology instructor structured the educational computing class around this anchor. It also describes the lessons learned from this collaborative experience. The paper includes some reflections from the preservice teachers that highlight some advantages of this collaborative process from the preservice teachers' perspective. The paper concludes with suggestions for implementation of similar teaching designs to allow other technology instructors to take advantage of the benefits of anchored instruction in teaching technology to preservice teachers.

Instructional Technology as a Support System for Principal Certification

Cathy Kaufman, Indiana University of PA, USA

The session examines how establishing an electronic community of learners aided the professional development of veteran educators moving to the position of school administrator.

Managing Change To Flexible Learning Using Online Technologies: Bridges To Cross, Lessons To Learn

Marie Kavanagh, The University of Queensland (Ipswich Campus), Australita

Universities around the world are involved in dynamic change as they seek to take advantage of the potential of the internet and information technology to provide learning opportunities which are independent of time and location. They must develop creative solutions in order to cope with changing educational requirements in an increasingly demanding global market. Yet many of the early attempts to use information technology and the internet for teaching have been nothing more that unreflective rebadging of material or repackaging of the more traditional modes of learning. To be successful, effective educational methodologies need to be anchored to the diverse material circumstances characterising different groups of learners. The challenge for universities offering programs of study is to provide avenues for learning which are reflective of the needs of its 'learning community', take advantage of the benefits which information technology provides while keeping in mind the outcomes desired for programs.

A tutor's advice trains a student's self-regulation skill

Michiko Kayashima, Tamagawa University, Japan

We propose that a tutor's appropriate advice trains a student's self-regulation skill. Through analysis of the tutoring interaction between academic departments, we discovered that a tutor's advice transformed a student's questionings. Our hypothesis by the analysis is that this transformation indicates an appropriation by the student of the tutor's self-regulation skill. We propose a training model of a student's self-regulation skill, which is based on the appropriation by the student of the tutor's self-regulation skill.

Three Computers in the Back of the Classroom: Pre-Service Teacher's Conceptions of Technology Integration

Thomas Keating, Boston College, USA; Ellen Evans, Boston College, USA

Faced with a new generation of pre-service teachers, teacher educators may easily assume that these young men and women are technology savvy and have mastered the skills required to word process, create presentations, surf the web, email professors and friends, and conduct their research online. Nevertheless, these same pre-service teachers may express anxiety and doubt about their ability to incorporate technology into their future classrooms. Our study, based on interviews with pre-service teachers, looks at this disconnect between using technology with confidence for personal use and using technology as an educator. We consider possible sources for this disconnect, and offer an alternative conception of technology in education we call "technological pedagogical content knowledge" (TPCK) which extends beyond computer proficiency to understanding the effect technology may have on student's conceptions of subject matter, the inevitable challenges that accompany technology, and the judicious use of technology when new forms of representation are most appropriate.

Using Dreamweaver 3 for generating preservice web-based teaching portfolios

Robert Keeley, Calvin College, USA; Ronald Sjoerdsma, Calvin College, USA;

One of the tasks that our students have in our Educational Psychology / Introduction to Teaching sequence is that of creating an assessment and professional portfolio. This assignment becomes the foundation for their continuing portfolio, which they build on in the remainder of their Education coursework, and becomes the basis for their professional portfolio. Last year, for the first time, we changed our format from a portfolio that was stored in a binder to one that is stored on the World Wide Web. We found that this allowed us to assess our students in a way that also gave them an important tool as they enter the teaching profession. Challenges that we faced in this having our students complete this assignment, responses to those challenges and outstanding questions are addressed.

Preparing Today's Faculty to Prepare Tomorrow's Teachers to Use Technology: Lessons from a PT3 Project

Mario Kelly, Hunter College of the City University of New York, USA; Sherryl Graves, Hunter College of the City University of New York, USA

This paper will provide a description of an ongoing PT3 project at a comprehensive teacher education institution. The primary focus of the project is to provide faculty development in knowledge and skills to infuse technology into courses across the teacher education curriculum. The paper will describe the steps that were taken to objectively identify faculty development needs, including equipment, the strategies developed to effectively respond to identified needs in a systemic and systematic manner, the obstacles encountered in the initial implementation of these strategies, and the solutions developed to overcome these obstacles. Finally, there will be recommendations for comparable institutions engaging in similar activities.

The Florida Center for Instructional Technology

Kate Kemker, Florida Center for Instructional Technology, USA; Shauna Schullo, Florida Center for Instructional Technology, USA; John Fitzpatrick, Florida Center for Instructional Technology, USA

Technology preview centers are an avenue to provide in-service and pre-service teachers with the opportunity to preview software before purchasing it for their schools. A preview center can supply in-service teachers and administrators with training in the latest technology. The Florida Center for Instructional Technology (FCIT) is a preview center located at the University of South Florida and serves the ten county surrounding district. FCIT is equipped with thirty computers (Macintosh and Windows), thousands of donated software titles, and many other related hardware devices. As part of university wide consortium, FCIT supports training of faculty to integrate technology into their classroom and provides opportunities for education majors to visit the center to evaluate software as a part of their course of study. This session will focus on establishing and maintaining a preview center, including methods of building relationships with major software and hardware vendors to provide technology training for teachers. This session will also focus on the products that are produced at the Florida Center for Instructional Technology including "Teacher's Guide to the Holocaust", "FCAT 8 Grade Reading Tool", "FCAT 4 Grade Reading Tool" and additional products.

Working Toward National Technology Standards: Teacher Use of Computers in the Classroom

Kate Kemker, University of South Florida, USA; J. Christine Harmes, University of South Florida, USA; Kimberly S. Kalaydjian, University of South Florida, USA; Ann E. Barron, University of South Florida, USA

Technology, when properly implemented, can bring a new dimension to education. In addition to automating some applications, it can be used "to help us do things in education that were heretofore impossible" (Thornburg, 1999, p.1). This paper focuses on the results of a survey of almost two thousand teachers. The survey focuses on the teachers' attitudes toward and use of computers in instruction, with specific emphasis on classroom uses. The sutdy investigated the extent to which classroom teachers are prepared for meeting national standards through their use of technology for educational applications and instruction.

A Framework for Designing Professional Development Courses in Instructional Technology for Teachers

Colleen S. Kennedy, University of Utah, USA

How do faculty in colleges of education gear their instruction in Instructional Technology courses to accommodate the varying levels of knowledge, skills, and abilities of practicing teachers? This presentation provides a framework for designing professional development courses in IT to meet the needs of individual practioners. Key features of the course development model include: assessing the entry level of participants, based on ISTE standards and their levels of proficiency in using technology; determining the availability of technology and support for using technology in participants' schools; and the development of indidualized learning plans that are aligned with ISTE standards and based on principles of effective professional development. The intent of the presentation is to stimulate dialogue on designing and delivering effective graduate level coursework in IT to practicing teachers.

INTEGRATING TECHNOLOGY INTO TEACHER PREPARATION AND PRACTICE

Jim Kerr, Brock University, Canada; Howard Slepkov, District School Board of Niagara, Canada

This paper is a report on a pilot project undertaken by the authors. In the spring of 2000, 15 preservice teacher candidates from a Faculty of Education were placed with associate teachers in elementary classrooms in local schools for a four-week practice teaching block. In addition to the normal expectations of such a practice teaching experience, there was an additional expectation that there be an enhanced use of technology. Either the preservice student was identified as 'relatively computer literate' or their associate was deemed to possess effective computer skills. In some cases, both the student and associate were competent in the use of the technology. The expectation was that both groups of subjects would derive benefit in their teaching practices and their personal use of Information and Communication Skills as a result of this pairing and this project.

Kaleidoscope of Designing, Administering and Teaching Distance Education

Sheila Kieran-Greenbush, Teachers College, Columbia University, USA; Victor Aluise, Scholastic.com, USA; Pamela Furline, Hempstead High School, USA; Elsie Szecsy, Concorida New York, USA

This panel will discuss the practical issues of creating and implementing distance education courses for K-12, Higher Education and Professional Development. The members are professional who have designed, administered and taught distance education delivered using 2-way interactive television and web over the last 4 years.

Technological foundations: Integrating the use of technology in teaching and learning in an educational foundations course

Clare Kilbane, University of Massachusetts, USA; Marsha Gartland, University of Virginia, USA

New standards developed for the National Council for Accreditation of Teacher Education [NCATE] (NCATE, 2000) challenge schools of education to prepare all graduates to use technology. Schools receiving accreditation must ensure all graduates demonstrate a sound understanding of technology, can plan and design learning experiences and environments supported by technology, and are able to implement curriculum plans that include methods and strategies that use technology to maximize student learning. These graduates must also be able to apply technology to assess and evaluate students, use technology to enhance their own productivity, and understand the social, ethical, and human issues that surround the use of technology in educational settings. New methods for integrating technology across all areas of teacher preparation are needed. This paper presents one example of how technology was successfully integrated into an existing educational foundations course. Preservice teachers at the University of Virginia, acquired knowledge of educational technology and developed technological competencies while learning about their future profession in EDIS 201: Teaching as a Profession. Theoretical foundations for integrating technology in this entry-level foundations course are shared. Practical methods for doing so are also discussed. Student feedback collected during and after the course suggests that the strategies for integrating technology were appropriate and enjoyable. Technology blended with constructivist teaching methods made learning more engaging, effective, and efficient.

Multimedia Tools and Case-Method Pedagogy for Teaching and Learning

Clare Ryan Kilbane, University of Massachusetts, USA

Teacher educators face the challenge of preparing teachers to recognize and respond to educational problems as they arise in highly variable, often unpredictable contexts. Two recent innovations in teacher education offer promising possibilities for doing so: case-method pedagogy and multimedia tools for teaching and learning. The purpose of this research was to explore how these innovations interacted in CaseNET to help preservice teachers learn to address problems as they emerge in K-12 classrooms.

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Webfolios: Authentically Assessing Prospective Educational Leaders on the Web

Lori Kim, California State University, Los Angeles, USA

Technology was incorporated in portfolio assessment to create webfolios, portfolios on the World Wide Web. The webfolios project was implemented in the very first preparation class for the prospective educational leaders. The article first briefly describes the webfolio project, followed by the presentation of the results of the project evaluation, in terms of its strengths and weaknesses. The article also reports the result of the collaboration aspect of the webfolios through feedback. The article ends with conclusion and recommendations.

A Lecture Generator in the Web

Jorge Kinoshita, Sao Paulo University, Brazil

We created a tool to generate slides of a lecture (HTML pages) from a simple ASCII text file. Each line of the text file basically is a title of a new slide or a topics inside the slide. The tool can be accessed in http://www.pcs.usp.br/~jkinoshi/lecture as a CGI-script.

Critical Approaches to Technological Literacy and Language Education

Karla Saari Kitalong, University of Central Florida, USA; Richard J. (Dickie) Selfe, Michigan Technological University, USA

When we integrate technology into teaching and learning, our challenge is to imagine and enact technology-rich learning environments in which both teachers and students can succeed in ways that technicians and administrators can sustain. We suggest three approaches to designing such environments; each approach is useful at a different level of specificity. In the classroom, technology autobiographies help teachers learn about their students' technological backgrounds and capabilities. At the institutional level, a "multiculturalism" metaphor helps teachers and administrators imagine locally appropriate models of technology support. In the context of pre-service and in-service teacher education, a heuristic we've developed encourages critical reflection by teachers as they learn and implement new technologies.

A professional development plan for integrating technology into the classroom

Andrew Kitchenham, Malaspina University-College, USA

This paper examines a project at a Network of Innovative Schools (NIS) in BC, Canada. The researcher will present his model of professional development that assisted the teachers in completing action plans that involved the integration of technology. The main three tenets of the project will be outlined: (1) autonomy of the teacher; (2) the technology continuum; (3) motivators and inhibitors for success.

Developing and Teaching a Computer-Mediated Second Language Course in Academic Reading

Esther Klein-Wohl, Open University of Israel, Israel; Gila Haimovic, Open University of Israel, Israel

This paper will describe a new endeavour in the area of distance education: the design and teaching of an e-mail supported academic second language reading comprehension course. CMC allows for the adoption of a learner-centred approach so suited to the nature of reading; reading instruction and distance education are particularly well-suited. The paper describes an e-mail mediated reading course implemented at the Open University at an intermediate level of proficiency. The course spans 15 weeks and comprises three kinds of student participation: face to face meetings, e-mail sessions and written assignments. The teaching materials are pre-prepared and include a collection of reading passages; workbooks dealing with nine texts that include approximately 20 questions and relevant teaching points. The course consists of three 3-hour f2f meetings and nine asynchronous e-mail sessions. Students have a week to complete each e-mail assignment and they receive the tutor's feedback within 3-4 days. The course described above was designed to suit the needs of mature adult learners. Student feedback on the course is obtained through a questionnaire. They are especially enthusiastic about the close contact they have with the tutors. The tutors seem to enjoy the course as much as the students do.

An In-Service Methodology Course via the Internet: A Designer's Perspective on the Learning Potential of the Delivery System

Esther Klein-Wohl, The Open University of Israel, Israel

This presentation describes a model of an in-service Methodology course for teachers through the Internet which not only aims at teaching a content area but also represents a model of instruction. While focusing on the content of the course, the participants are exposed to a delivery system which includes features they can easily adapt to their own teaching environment; while expanding their personal horizons regarding the use and potential of the technology. Knowing how to transfer pedagogical skills and strategies from one context to another is essential to help teachers solve problems and reach students more effectively. We intend our training programme to serve as a model of teaching which the participants may transfer to their own teaching contexts. The design of the course is based on a Presentation, Practice and Production (PPP) model.

PREPARING TEACHERS TO COMPLEMENT MIDDLE-SCHOOL CURRICULA WITH WEB-BASED ENVIRONMENTAL HEALTH RESOURCES

W. R. (Bill) Klemm, Texas A&M University, USA

The College of Veterinary Medicine at Texas A&M University has teamed with the Center for Rural Public Health and the College of Education to develop science curriculum and teacher training for middle-schools in rural and under-served parts of Texas. Our approach is to use the World Wide Web to provide environmental health information at a middle-school level and to train teachers to complement their regular teaching with the information, learning activities, and experiments developed by our scientists. The curriculum receives on-going evaluation and revision. The program also includes in-class visits by scientists to the schools.

"WorldGate:" An Attempt to Close the Digital Divide

Richard Knecht, The University of Toledo, USA;

"WorldGate" offers the consumer a low-cost, simple to use means of connecting to the Internet, and sending and receiving email, without a PC or telephone line. All that "WorldGate" requires is a TV set, wireless keyboard and a set-top box connected to a cable TV system. This fall, fourth grade students from elementary schools in Connecticut, Illinois, Louisiana, Missouri and Ohio will be among the first to participate in the "WorldGate" Internet School To Home (WISHTV) Program. WISHTV is a public service initiative provided by "WorldGate," local cable operators and participating set-top manufacturers. The program provides participating elementary school children a full school year of free in-home Internet access. Home Internet access will enable them to do research on their homework, and gain access to school calendars, schedules and class information and extra curricular activities. The program expands existing school curriculum by linking students and parents directly to teachers. Students' Internet access to questionable Web sites will be restricted through current filtering technology.

Evolution of an online data acquisition system

Gerald Knezek, University of North Texas, USA; Rhonda Christensen, University of North Texas, USA

This interactive session will illustrate the evolution of online data collection systems implemented by the Preparing Tomorrow's Teachers to Use Technology (PT3) Millennium Project team (Capacity Building Grant # P342A990474) during the 1999-2000 school year. The presentation will include examples of the software and survey instruments, database structures, and feedback systems that were initially developed as well as those which are now in place. The session will conclude by having participants access and complete surveys on an experimental system that provides immediate educator feedback by graphing profiles of their responses against the database norm. The intended audience is computer literate educators at any educational system level who are exploring alternatives for online data acquisition.

Exploiting and Evaluating A Web-based Learning System: Six Days and Seven Nights in the Basement

John Knight, University of Wisconsin, USA; Bob Bermant, University of Wisconsin, USA

To evaluate a web based learning system as an adjunct to traditional "live" instruction, sixty students participated in a new interdisciplinary course that required sending email, posting to a discussion forum, investigating web-sites, constructing a home page, and completing several web-based "projects." Each week's activities were documented in individual logs. We will share our students' perception of this experience and our own assessment of its pedagogical value.

Using Intelligent Agent Tutors

Steve Knode, Information Resources Management College (IRMC), USA; Jon-David W. Knode, College of Notre Dame, USA

Intelligent agents are, in simplest terms, software programs built to perform certain specific tasks for the user. They are "autonomous" in the sense that they operate without specific user intervention. One form of intelligent agents, "chatterbots", is beginning to provide the capability to have intelligent tutors available to students at all times.

Internet Filtering vs. Content Management in Schools

Steve Korin, BASCOM Global Internet Services, USA

Prospective participants should be familiar with Internet-based educational products and hold a teaching or administrative position. Persons who maintain or administer educational networks would also be welcome.

Teacher Reflections on Learning New Technologies

Karen Kortecamp, The George Washington University, USA

An experimental course offered at The George Washington University (GWU) is specifically designed to assist teachers in meeting the technology standards and performance indicators developed by the International Society for Technology in Education (ISTE, 2000). Eleven teachers representing three school systems participated in the first offering of the course in Fall 2000. Teacher reflection through journal writing focused on how teachers perceived themselves as learners of technology and the ways they were able to transfer those perceptions and new understandings to their instruction of secondary students. Several common themes emerged relative to learning and using technology to enhance student learning.

3 Roads Diverged and we took each to enhance teacher use of technology

karen korth, DIAL Corporation, USA; Belinda Engelhart, Dial Corporation, USA; Hilarie davis, Dial Corporation, USA

The panel members will discuss and demonstrate through interactive videos and cd-rom some of the experiences along the journey implementing the technology integration projects (TIPs) and utilizing educational integration approaches in both the LITE (Linking Interactive Technologies and Educators) Institute and the WebMaster Institutes to achieve the desired outcomes of the ILC (Interactive Learning Campus). The three roads taken by DIAL to enhance teacher use of technology are: Technology Integration Projects (TIPs), LITE Institute and the WebMaster Institute program. The WebMaster program is a skill-based program while the TIPs projects and the Master Teacher Cadre meet on demand needs for curriculum and professional development and the LITE Institute encompasses the entire program for longevity and sustainability of technology use in the schools and communities.

Perceptions of Preservice Teachers' Technology Competency Skills in Arizona

Heng-Yu Ku, Arizona State University, USA; Lee Ann Hopper, Arizona State University, USA; Ann Igoe, Arizona State University, USA

This study investigated the perceptions of the education community in Arizona regarding technology competency skills for preservice teachers. The intended audiences are for all levels of preservice and inservice teachers. Participants included 67 preservice teachers, 67 inservice teachers, 45 school principals, and 21 human resource directors. Two sets of survey instruments were developed and used for this study. One survey containing 26 items of technology skills for preservice teachers was distributed to preservice teachers, inservice teachers, and principals. Another survey regarding hiring decisions was distributed to principals and human resource directors. The participants' ratings on the five-point scale of first survey were converted to their numerical equivalents (5 = very important to 1 = not important). Mean scores were calculated to test for significant multivariate effects on items among three groups. Frequency and percentage were used for the second survey. Significant differences of overall mean scores by group were obtained in this study. Preservice teachers placed more emphasis on overall technology skills than inservice teachers and principals did. The results showed that there were significant differences by group in nine of 26 items. The opinions from principals and human resource directors regarding hiring decisions were also explored.

Are We There Yet? A journey through distance learning

Jean Kueker, Our Lady of the Lake U., USA; Jerrie Jackson, Our Lady of the Lake U., USA; Scott Walker, Our Lady of the Lake U.,USA ,

Three years ago, the journey of utilizing a distance-learning format for offering coursework began with a low-tech instructional arrangement which we termed "two cans and a string". Technology has continued to be integrated in courses through software application such as PowerPoint, Internet sites and course management software such as Blackboard.com. We are now beginning to offer multiple point-to-point courses over ISDN lines using VCon videoequipment. This session will discuss key points to consider when making decisions about equipment, connectivity, infrastructure and money.

Scripting a lesson

Michel LABOUR, Université de Valenciennes, France; Laurent VERCLYTTE, Université de Valenciennes, France; Nicolas VIEVILLE, Université de Valenciennes, France; Sylvie LELEU-MERVIEL, Université de Valenciennes, France;

The audiovisual approach in pedagogics, so closely associated with a lock-step view of teaching in the seventies, has undergone a revolution in recent years. By way of examining how a body of pedagogic sequences, or lesson, can be " scripted " by a teacher, we look at the different phases of the lesson planning process. This more recent "audiovisual method" proposes an approach that can include both a narrowly linear, and a broader non-linear style of teaching. The method allows teachers to combine different types of traditional and more recent (viz. electronic) teaching tools in their lesson plans. To do this, the paper examines the pedagogic approaches available de facto to teachers, the different learning styles observed regarding learners, the different phases of creating a lesson script, and finally the development of personalized learning situations. The paper is aimed at teachers seeking to increase the variety and efficiency of their lessons in combining both face-to-face interactions with teaching tools in a coherent way. The approach proposes a structure to explore different ways of presenting learning/teaching resources in an explicit way that can lead to collaborative "lesson" planning and/or feedback about the instructional design of the lesson.

Designing Activities in Networked Classrooms at the Micro, Meso, and Macro Levels

Thérèse Laferrière, Laval University, Canada; Alain Breuleux, McGill University, Canada; Mireia Montané, Universal Forum of Cultures, Canada

University- and school-based teacher educators, pre-service teachers, and educational researchers/learning scientists are seeking to develop thoughtful and effective uses of information and communication technologies (ICT) in networked classrooms across settings in Canada and elsewhere. At the micro level, they design creative, engaging, and productive online activities for collaborative learning and teaching purposes, ones increasingly focusing on knowledge building. At the meso level, they facilitate new adopters' transition to networked classrooms; once technology is in place and working, the advancement of pedagogy tends to become the object of collaborative inquiry. At the macro level, the vision of interconnected learning communities is guiding the transformative process that is underway. Design principles that were found applicable across sites and levels, and which will guide participation in the Universal Forum of Cultures' Educational Project (Barcelona, 2004), are presented.

Characteristics of support initiatives to stimulate professional development on ICT

Elisabeth Laga, University of Leuven, Belgium; Jan Elen, University of Leuven, Belgium

Educational institutions have to support their staff in their professional development on ICT. The innovation and professional development literature suggest some, be it vague, principles to realise this support. In line with these principles a support strategy has been developed at the University of Leuven. In this contribution, an analysis is made of the different initiatives, in order to detect effective and powerful factors. An analysis scheme was developed. Powerful features of professional development initiatives that may guide decisions on elaborating educational support strategies and professional development initiatives are identified.

Puzzling Over the Missing Pieces - The Real Practice of Technology Integration

Judy Lambert, North Carolina State University, USA

This paper is a report on the findings of a pilot study conducted on novice technology-using teachers. Although emerging technologies have significantly impacted much of society, they have not yet and to any large degree, transformed the practice of many educators in the classroom. Findings indicate that several strategies may assist these teachers in learning to use technology. Provide them with a logically sequenced curriculum guide that identifies specific computer objectives and methods of including these in content areas. Encourage administrators to establish concrete guidelines to promote teachers' regular planning and practice of technology integration.

Preparation of Educators to Provide Effective Computer-Based Assistive Technology Accommodations for Students with Disabilities

Suzanne Lamorey, Arizona State University, USA; Ivana Bartarelo, Arizona State University, USA

As students with disabilities are mainstreamed into general education settings, teachers must be knowledgeable about appropriate accommodation formats and strategies as well as accessibility issues. Important areas in terms of accommodations currently include computer-based assistive technologies as well as Internet accessibility for students with disabilities. This presentation will describe the results of a qualitative study focused upon the experiences and needs of general educators in these areas. Implications for training will be discussed.

Website101:Creating Annotated Special Education Bibliotherapy with Children's & Young Adult Books

Philip Lanasa, Cameron University, USA; Betty Criscoe, Cameron University, USA; Terry Lovelace, Cameron University, USA

The purpose of this project is to share the steps involved in creating and designing a specialized web site for viewers who either work with children and young adults who have special needs or those who have special needs. The web site will allow the viewers to apply the principles of bibliotherapy. Bibliotherapy is defined as healing through books, reading books to help solve and better understand personal problems, and/or mutual sharing of literature in order to structure interaction between a facilitator and a participant. The web site, designed to be interactive, becomes the facilitator and the viewers become the active participants. For example, people may log on and write reflections about their feelings toward the book listed on the web site. Participation in bibliotherapeutic intervention allows participants to hyperlink with other viewers, and therefore, make connections that encourage active problem solving related to special needs.

Software Agents for Distance Education and Institutional Support

Thresa Lang, Veridian Information Solutions, USA

In this paper the author explores the use of software agent technology to provide options and solutions for the challenges facing educational institutions that have limited or fixed resources. One of the challenges examined is that of providing quality instruction to increasing numbers of students, including those with non-traditional scheduling requirements without straining current resources. Other challenges include optimizing the existing network infrastructure and supporting institutional business goals

The unique impact of internet instruction on future teachers: A qualitative study of delivery systems and their impact

Douglas Lare, East Stroudsburg University, USA

Recent teacher shortages and the growing popularity of teaching as a viable career change has led to a blossoming of many graduate teacher education programs. Distance education is especially attractive to these students since many have families and must maintain jobs. However, many teacher educators are still suspicious. This paper summarizes a qualitative study which looked at two required courses in the graduate teacher certification program at a teacher training university. Two groups of students participated in these courses in the traditional manner of traveling to the university and attending classes. Two other groups of students took the identical courses over the internet. All four courses were instructed by the same two instructors. This study followed these students not only while they took the courses, but also as they continued their studies and in some cases, when they started teaching in their own classrooms. The results suggest that while the instructional delivery models may have impact on course objectives, the greater impact may be upon a future teacher's attitude toward the effective use of technology in the classroom.

Practice on the Web: A Tool for Learning from Cases

Carlos Laufer, GaveaTech Research Center, Brazil; Marcelo Blois, GaveaTech Research Center, Brazil; Ricardo Choren, GaveaTech Research Center, Brazil

Cases and case methods of teaching represent a promising approach in education. This approach has always been best used to teach people about realistic decision-making situations. Case methodology is especially effective if students are required to identify facts and issues, to view events from different perspectives, to apply current professional knowledge and research, and to predict consequences of various courses of action. The purpose of this work is to present an application tool for the development of case-based web environments. This tool is a reusable, component-based application that can be specialized to produce custom applications.

Freeing the Monkeys: Making the Ed Tech Course More than Learning to Push Buttons

Daniel Laughlin, American University, USA; Sarah Irvine-Belson, American University, USA

Since 1995, the School of Education at American University has offered a course called Educational Uses of Technology. The aim of the class has been to teach the metaskills necessary to empower students to become self-directed learners capable of mastering new computer skills on their own. The course attempts to accomplish this through the use of tutorials and limited group projects. This study solicited feedback from former students who successfully completed the course. Most of the respondents reported that they had become more comfortable with learning new computer applications as a result of taking the course. The authors feel these results provide support for the teaching methods used.

An Overview of Information Technology on K-12 Education in Taiwan

Greg Lee, National Taiwan Normal University, Taiwan; Cheng-Chih Wu, National Taiwan Normal University, Taiwan

Under the support of the government's National Information Infrastructure project, ease of Internet access has increased dramatically at all levels of schools in Taiwan in recent years. In an effort to speed up preparation of tomorrow's teachers to use technology (PT3), the Ministry of Education of Taiwan has launched several multi-million U.S. dollar projects to facilitate and to promote the use of information technologies in the classrooms and in teaching across all subject areas. Those national efforts are directed at improving networking infrastructure, the computing environments, the digital educational resources, and on teacher training. In this paper, we will report the endeavors undertaken, the accomplishments, the current and on-going PT3 related projects in Taiwan and discuss the issues that have emerged.

On Integrating IT into Teaching of English in Taiwan Junior High School

Greg Lee, National Taiwan Normal University, Taiwan; Yu-Jen Lo, National Taiwan Normal University, Taiwan

The goal of this study is to investigate the support and training needed in integrating teaching of English as a foreign language with information technology (IT). Two junior high school English language teachers were given 20 hours of basic information technology training along with 12 group discussions on how to integrate IT into classrooms. Teaching experiments were then conducted in 8 class periods. The major founding are: (1) training of computer skills is more important than enhancement of computer working knowledge; (2) software that facilitate IT-integration is yet unavailable; and (3) full support from the school, both administrative and technical personnel are necessary for the long term implementation of IT integration into classrooms.

Benefits and Problems of Asynchronous Online Electronic Mail Forums

Kevin C. Lee, West Virginia Wesleyan College, USA

The use of structured listserv assignments is an effective means of generating quality on-line discussions regarding selected readings for text-based courses. Observed benefits of the listservs will be described by focusing on three representative cohorts of student communicators who parti-cipate in the forums. Building on the instructor's experience of using listservs successfully for several years, this paper explains the how and why of structured listserv discussions and provides suggestions based on course experiences.

Survivalist Guide to Online Course Development

Wes Leggett, The Metropolitan State College of Denver, USA; Debra Dirksen, The Metropolitan State College of Denver, USA; Peggy Anderson, The Metropolitan State College of Denver, USA

It's a cyber-space jungle out there! Take the virtual classroom challenge and learn the ropes for successful course development from three online "survivors." The objectives of this session include: 1) Briefly review the literature regarding online instruction; 2) Provide an evaluative framework for determining appropriate courses for online delivery; 3) Identify steps in analyzing course content with reference to online pedagogy; 4) Demonstrate technological options for course content; and 5) Address questions from participants that are specific to their course development needs. The cumulative experience of the three presenters will provide session participants with the knowledge and varied perspectives to begin the process of developing online courses. No prerequisite skills are needed to benefit from this session.

The Changing Role of the Teacher: Case Study

Amy S. C. Leh, California State University San Bernardino, USA

Modern technology is changing the role of the instructor from an information-giver to a facilitator. As facilitator, the teacher guides the learners through the learning process and encourages the students to be active in their learning. The experience of independent learning may encourage the students to continue the learning process on their own in other fields and in the future. This presentation reports how the author encouraged students to be resource providers and trained them to be self-learners and self-trainers in an educational multimedia course. Class observations and students' feedback revealed that the teaching methods and new role of the instructor had a positive impact on students' learning.

Computer Use in ESL: Case Studies and Action Research

Amy S. C. Leh, California State University San Bernardino, USA; Lori Ogata, Riverside Community College, USA

With the onset of the twenty first century, utilizing computer technology in school curriculum has become not only a reality but a necessity in preparing students for effective transition into today's society. In addition, with the multicultural composition of today's student population, computer technology can become a facilitative force in teaching students who originate from culturally diverse homes. The purpose of this article is to provide a brief history of how computer technology has been used in ESL classrooms. Then, a few case studies and some action research are presented as a glimpse into current ESL classroom environments where technology is being used to varying degrees.

P3T3: Purdue Program for Preparing Tomorrow's Teachers to use Technology

James Lehman, Purdue University, USA; David O'Brien, Purdue University, USA

This session describes P3T3: Purdue Program for Preparing Tomorrow's Teachers to use Technology, a PT3 project designed to: (1) prepare pre-service teachers to demonstrate fundamental technology competencies, and (2) prepare teacher education faculty to teach pre-service teachers in technology-rich environments, modeling approaches that future teachers should use themselves. The paper describes the project's three complementary components: (a) a comprehensive faculty development and mentoring program; (b) use of two-way communication technologies, notably IP-based video conferencing, for distant field experiences designed to expose students to diversity and technology use; and (c) development of a dynamic web-based digital portfolio system for pre-service teachers. The IP-based video conferencing system will be demonstrated. This session is appropriate for pre-service educators and other PT3 grantees.

In-Service Teacher Development for Fostering Problem-Based Integration of Technology

James Lehman, Purdue University, USA; Peggy Ertmer, Purdue University, USA; Kathleen Keck, Crawfordsville (IN) Community Schools, USA; Kathleen Steele, Crawfordsville (IN) Community Schools, USA

Tech-Know-Build: Indiana Students Building Knowledge with Technology is a Technology Innovation Challenge Grant project that focuses on problem-based learning approaches that integrate the use of technology. Problem-based or project-based learning is a model for learning characterized by: (1) use of an ill-structured problem or driving question that provides opportunities for student investigations and problem-solving; (2) student-conducted investigations or actions that typically result in the development of artifacts or products; and (3) collaboration among students, teacher, and community. Technology plays an integral role throughout this process as a tool for acquiring relevant information, gathering and manipulating data, and producing and presenting the culminating presentation in multimedia format. This session describes in-service professional development activities focused on facilitating teachers' understanding and development of problem-based learning methods. A key modeling activity involving in-service teachers, pre-service teachers, and grade 6-12 students is described and the evaluation of the activity is presented. This session should be of interest to teacher educators as well as K-12 teachers and staff developers.

The Distance Teacher: The Ultimate Distance Learner

Karen Lemone, WPI, USA

Distance learners have been increasingly under the microscope as teaching technologies have enhanced to include web-based courses and universities. Predictors of student success have been researched, tools created to enhance communication, thousands of courses put online, and assessments developed to show both success and comfort of students with web-based learning. Instructors share some of the same advantages and disadvantages as do students as well as some not shared by students. Little has been developed to predict instructor success. We analyze features commonly attributed to be assets and liabilities of distance learning for students and describe, from six years experience, their impact on instructors. We describe problems instructors do not have in common with students. We summarize results of a survey from students at the end of a distance learning class who were asked to describe features an instructor of distance learning classes should have.

PLUG IN OR OUT: The Quintessential Question for Education/Learning Enhanced Through Technology!

Donna Lenaghan, Barry University, USA; Angela Choate, Barry University, USA;

How do we know whether or not to Plug-in or out" is the most important question educators must answer before the first dollar is spent on technology. And if money was spent on technology without improving learning, the plug should be pulled. Insights and criteria for such a decision are provided within this paper's analysis of brain operations, technology enhanced learning opportunities, research study comparing learning styles with technology self-efficacy, and a review of assessment strategies. The two guiding questions for this paper are: What technology-based activities are associated with brain-based learning and how is the effectiveness of technology assisted learning measured. The authors assert that technology can be a powerful tool for teaching and learning and more and different ways to assess technology's effectiveness are needed.

Analysis of Large Web-Based Courses at the University of Central Florida

Kevin A. Lenhart, J. Stephen Lytle & Carol Cross, University of Central Florida, USA

Distance education, as once described by a colleague, is sitting in the back row of a three hundred-seat auditorium. It has traditionally been thought that to successfully teach a large class, you needed to herd students into an auditorium, and proceed to lecture them for several hours. This provides the students with very little opportunity to interact with fellow students or the instructor.

Museums Meeting Schools: Online and Right On the Mark

James S. Lenze, Indiana University of Pennsylvania, USA

Schools, individual teachers, and students are entering museums through the World Wide Web instead of the entrance off Main Street. Museum directors are faced with the challenge of designing and using Internet based technologies to enhance the bond between students, schools and museums. This article discusses some of the technologies that museums are using based on an analysis of the Detroit Institute of Arts Education Department's Internet site and like efforts around the world. Each discussion is followed by an example of a museum that is using a particular technology and information directing the reader to a web site with more information. Design considerations for museum based educational web sites are also briefly discussed.

Using Presidential Candidate Web Sites for K-12 Lessons

James S. Lenze, Indiana University of Pennsylvania, USA

The Bush and Gore web sites offer much in the way of resources for lessons in political science. This paper reviews the information available through these web sites. Then, these resources are tied directly to state standards to demonstrate how these resources can be used to meet benchmarks.

Energizing Teaching To Empower Students Through Emerging Technologies

Margaret Lynn Lester, Clarke College, USA; Jan Taylor, Clarke College, USA

This proposal presents strategies implemented through Clarke College PT3 grant. Exemplary faculty/student technology learning projects showcasing learning outcomes will be presented. Program activities serve as catalysts for processing "cultural change of mindset" into 21st century learning models. Results create a climate for college faculty, students, k-12 teachers and students to facilitate building collaborative models for exploring learning together through transparent use of information technologies. Our project creates a 21st. century "school" environment in real and/or virtual space where students and teachers explore, discover, and create new knowledge together as a community of learners.

Support for Models of Acceptance, Adoption, and Use of Distance Education Technologies

Joel Levine, Barry University, USA

The information age has led to increased use of technologies for teaching and learning. Companies, corporations, and organizations are offering courses, seminars and workshops via distance technologies. Universities and colleges need to make significant changes if they want to compete for an increasing number of students who prefer learning via distance technologies. A critical success factor becomes the acceptance, adoption, and use of distance technologies by faculty members at universities and colleges. Planning and implementing change in these institutions must consider the important stages or levels faculty must move through in order to successfully accept, adopt, and use technologies, especially distance technologies. Levels and/or stages are identified from various models, and specific support strategies are recommended to complement these developmental stages leading to acceptance, adoption, and use.

Surfing Safely with Social Navigation

Bruce Lewis, Freed-Hardeman University, USA

This proposal relates to the use of instructional technology in undergraduate and graduate teacher education. It fits the topics of: The Educational Computing Course; Graduate & Inservice Education; Instructional Design; Preservice Teacher Education; Technology Diffusion; and Telecommunications.

Developing a Foundation for Enhancing Modeling of Technology Integration

Ledong Li, Oakland University, USA; Anne E. Porter, Oakland University, USA; Dale Hopkins, Rochester Community Schools, USA; Deborah T. Clarke, School District of the City of Pontiac, USA; Marie Irons, School District of the City of Pontiac, USA

An overview of key issues involved in the development of a collaborative project between two K-12 school districts, one urban and one suburban, and a university to enhance the modeling of classroom technology integration by K-12 and university faculty members for the benefit of preservice teacher education students.

Learners' Perceived Differences in Learning and Application: Comparing Classroom and Distance Instruction

Doo Hun Lim, University of Tennessee, USA

In an effort to compare the perceived degree of learning and application between different groups of students in terms of gender, instructional delivery formats, length of study time, and learner motivation level, an HRD course of a university was studied. Data analysis was conducted to compare the learning and application difference and the reasons for high or low learning and application were identified and categorized. From the findings, issues in distance learner, instructor, and instructional design to enhance learning and application were discussed.

A Framework for Integrating Technologies in Teaching & Learning

Grace Lim, Temasek Polytechnic, Singapore

Convergence of IT & communication technologies brings about greater potentials & possibilities in using technologies as a powerful medium of delivery, instruction & communication. Changes in student demographics generate a strong demand for international higher education which can provide life-long, flexible learning programmes. Compelling change of skills needed at workplace drives education communities in all over the world to re-think about education requirements & processes. Combination of these factors set a scene of transformation in education causing a paradigm shift in teaching & learning, which poses new challenges to educators in acquiring skills & competencies not only in technology literacy but also in pedagogy. This paper aims at presenting a practical framework for integrating technologies in teaching and learning. The collective findings based on the author's experience and that of other institutions of higher education can serve as a general roadmap for an educational institution in adopting innovative educational practice supported by technologies.

Does Technology Really Make a Difference? - Perspectives from Teacher Education Students

Edmundo F. Litton, Loyola Marymount University, USA

This study analyzes how computers can be used more effectively in teaching in learning. The purpose of this study is to find out how the use of technology makes a difference in learning in a class designed for teacher education students. Data was gathered through a survey that asked students to reflect on their learning experiences immediately after a lesson that utilized computers. The study shows that technology makes a difference in teaching and learning. The students reported that technology made the lesson for meaningful, allowed them to be more creative, and they often learned a lot more than what was intended by the teacher. The use of computer technology in the class also gave the students an excellent way to experience true cooperative learning. The results can influence the design of future lessons that integrate technology in Teacher Education.

On-Line Delivery of Multimedia Courseware: Issues and Effects

Leping Liu, Towson University, USA

This paper introduced some methods of using the Web as a template to deliver multimedia courseware, including CBI (computer-based-instruction) applications created with multimedia authoring tools and tutorials accompanied with the applications. The author converted CBI applications created with ToolBook, HyperStudio, and Director into the Web version and then delivered them on the Web as an on-line courseware package. From the perspective of instruction, this project extended the concept of computer-based-instruction to a Web environment. From the perspective of technology integration, this project increased the uses of technology in school classrooms and, meanwhile, it reduced the equipment requirements to schools. From the perspective of information delivery, it used the Web as the template or organizer to deliver the courseware, instead of using certain particular software environment. Design details and feedback from schools will be presented.

Assessing Technology-Assisted Use of Information

Leping Liu, Towson University, USA; Cellestine Cheeks, Towson University, USA

This paper presented a two-year experience of assessing college students' use of information from different resources, including the methods, processes, instruments, results and some issues of the assessment. The assessment processes started from analyzing the goals of learning, defining the outcomes, then selecting or developing instruments, and the last, collecting data and analyzing results. A "qualitative-and-quantitative" (Q-Q) assessment package was developed and used, where we used portfolios to record the learning process and quantitative scores to measure the learning of specific skills. The Q-Q assessment procedures were employed into six classes during the past two years. Some interesting findings from the assessment results would be discussed in detail. This experience suggested that assessing the use of information and technology related outcome was a process rather than some one-time tests. The Q-Q procedures also provided a structure to develop an assessment model that should apply to other fields of information technology assessment.

Teaching with Geographic Information Technology

Amy K. Lobben, Central Michigan University, USA

This paper highlights curriculum designed to train pre-service and in-service teachers to teach with geography technology. Because geography, like many disciplines, has evolved into a field that implements technology into many areas of research, teacher educators must incorporate the teaching of geographic technology into their education curriculum. One particular area of geography, which has developed over the past decade is known as Geographic Information Science (GISci) and involves the gathering, manipulation, analysis, and display of spatial information. The burgeoning of this new science presents geography educators with several challenges: how do we teach pre- and in-service teachers to implement the new technologies in their classrooms, can in-service teachers use the new technologies to help create educational materials for the changing geography curriculum, can new geography technologies help present and future educators better understand the field of geography, and can we help educators to use the technologies to build geographic resources for their classrooms.

Integrating Technology in Classrooms with Learning Disabled Students: Teachers' Needs and Professional Development Implications

Jean Loiselle, Université du Québec à Trois-Rivières, Canada; Nicole Royer, Université du Québec à Trois-Rivières, Canada; Denis Bédard, Université de Sherbrooke, Canada; Jean Chouinard, CEMIS (special education), Canada

Technology can provide potential benefits for students with learning disabilities. However, a survey we conducted in Quebec schools shows that teachers generally do not make intensive use of computers with learning disabled students. The presentation relates to a 3-year collaborative research project focusing on the integration of technology in classrooms with learning disabled students in Quebec. This presentation will highlight the main uses of computers in the classroom and will describe teachers needs in regard with technology integration. We will discuss implications of these results for professional development in order to help teachers integrate technology in their classroom. A model for instructional activities engaging learning disabled students in long-term projects will also be presented.

Learning with Internet Resources: Task Structure and Group Collaboration

Yiping Lou, Louisiana State University, USA; S. Kim MacGregor, Louisiana State University, USA

The Internet, with its vast array of information, offers students opportunities for learning from rich, up-to-date and authentic resources and for developing information-seeking skills. On the other hand, complaints are often heard from both teachers and students alike that it can be frustrating to find useful and relevant information on the Web. The purpose of this project was to study how task structure and group collaboration may influence the way children learn with Internet resources. A group of 27 elementary school children and two classes of preservice teachers participated in this study during the summer 2000. The children were assigned to work on a WebQuest designed by the preservice teachers either individually or in pairs. Data were collected through an observation scheme and journals. The results showed differential patterns of behaviours and emotions when children learned individually and in small groups. In addition, the differences were often related to the different characteristics of the learners and the task structure. The study also indicated that incorporating observation studies in teacher technology training courses can be a valuable experience for preservice teachers.

Creative uses of digital technologies: developing literacy and capability

Avril Loveless, University of Brighton, UK; Terry Taylor, Artist, UK; Richard Millwood, Ultralab, UK

The panel addresses the progression in practice and understanding in the development of visual literacy and ICT capability using digital media in seven projects over a period of five years. These projects – The Glebe Project, Bristol Internet Project, Brighton Access Project, Art on the Net, Genes and Makeup, Plume School VI Form Project and the MMM:Media & Message Multimedia Project – were conducted as collaborations between artists, teachers, pupils and university researchers working in primary and secondary schools within the core and extended curriculum. The participants explored the ways in which visual literacy and ICT capability could be supported and extended in a range of relevant and meaningful contexts. The work is analysed from two perspectives – the artist focusing on children's learning and expression of visual literacy and the teacher educator focusing on the development of ICT capability. The session will use examples of pupils' visual work to present and discuss some of the findings and recommendations from the projects. These will highlight key issues including the nature of visual literacy; the contribution ICT; the development of ICT capability; conceptual frameworks of subject knowledge in art and ICT; links with contemporary culture; interactions between artists and teachers; models of resource management and evaluation of children's learning in art and with ICT.

Classroom Community in Post-Secondary Classes: An Examination of Traditional and Distance Learning Environments

Bob Lucking, Old Dominion University, USA; Fred Rovai, Regent University, USA; Michael Ireland, US Navy, USA

The purpose of this study was to determine how sense of classroom community develops in a higher education learning environment and to determine if there are differences based on type of learning environment (traditional or distance education), type of school (private or public), gender (male or female), type of course (education, leadership, or science), number of students in the class (small, medium, or large), and student academic standing (undergraduate or graduate). Three different types of distance education environments were examined: an asynchronous Blackboard-based integrated distributed learning environment, a synchronous two-way compressed video and audio teleconferencing environment, and a synchronous one-way satellite television with two-way audio teleconferencing environment. Principal components of the instrument designed to measure sense of community (Sense of Classroom Community Index) were as follows: (1) Spirit (lowest): feeling a sense of belonging to a group; (2) Trust: feeling that the group can be trusted and influenced; (3) Trade: feeling that the group is of mutual benefit to its members; and (4) Learning (highest): feeling that the group facilitates active construction of understanding.

Out of SITE and into Staff Development

Tim Lundy, Framingham Public Schools, USA; Liz Sheldon, Framingham Public Schools, USA; Mary Rastauskas, Framingham Public Schools, USA; Jim Woodell, School Change Network, USA

This presentation outlines a framework for transforming technology integration within a public school system from isolated success stories to a district-wide movement. This is accomplished in two phases: 1) A district staff development day based on the SITE conference model is used to expose educators to available resources and possibilities for curriculum/technology integration. 2) This day is followed by a yearlong focus on professional development and curriculum support utilizing online, interactive tools. Central to the entire process is encouraging educators to become leaders in their own development by taking advantage of online resources that encourage mentoring and collaboration.

The Internet science education environment (ROL)

Zdena Lustigova & Stanislav Zelenda, Charles University Prague, Czech Republic

Paper deals with the ROL (Remote and Open Laboratory) – a component of the open educational and informational electronic supportive environment for science education of a broad scale of target groups (from pupils and teachers to technicians). The ROL on the Internet contains different kinds of materials (experiments, models etc.) and tools for teaching and learning science via network. A brief description of the content and ways users can work with the ROL is given. Some examples starting from " sharing ROL environment via the Internet" to the Web delivery of online courses and learning environment are presented.

Middle School Education and CD ROM Technology

Gregory MacKinnon, Acadia University, Canada; Joseph Bellefontaine, Acadia University, Canada

While the internet has demonstrated great potential for technology enhanced instruction, CD ROM continues to be an appropriate pedagogical and pragmatic choice for instruction delivery. This paper briefly explores some of the innovative applications of this technology and presents a specific example of a CD ROM approach used in the delivery of a Middle School Teacher Education course.

Barriers to the Use of Computers in the Classroom: A Comparison of Teachers' and Principals' Perceptions

Angus J. MacNeil, University of Houston, USA; Doris Prater, University of Houston-Clear Lake, USA

Principals need to encourage the use of technology in learning. The barriers to the use of computers in the classroom as perceived by teachers and principals is important. This study found the rankings for teachers and principals on barriers were identical. The highest-ranking problems for both groups were lack of time and lack of computers. None of the barriers were seen as major problems. Results of a mixed design ANOVA indicated a significant main effect for barriers, no significant effects for either level of educator or interaction of level and barrier were found. Selected follow up post hoc comparisons using Tukey's HSD were used to identify significant differences among the barriers for each of the two groups. There were significant differences in the mean ratings for the "Lack of Time" and the "Lack of Administrative Support". Both groups rated the lack of time as significantly more of a problem than lack of administrative support.

Developing Web Pages to Supplement Courses in Higher Education

Cleborne Maddux, University of Nevada, Reno, USA; Marlowe H. Smaby, University of Nevada, Reno, USA

This presentation will focus on aids and cautions for higher education instructors who wish to develop web pages to supplement their traditional, on-campus courses. A sample of an extensive site developed by the presenter will be demonstrated.

A "Blended-Technology" Approach to Distance Education Course Delivery

Howard T. Major, Eastern Michigan University, USA

For several years Continuing Education and the Department of Education at Eastern Michigan University have used an Interactive Television (ITV) videoconferencing system to deliver a graduate course in Education. The course is "Educational Research Techniques" a graduate-level course required for students in several degree programs. Students are mostly teachers in K-12 systems located in or near three Michigan cities, Flint, Ypsilanti and Jackson. Initially, the ITV system (supplemented with printed materials) was the only distance learning technology deployed. However as the limitations of using a single technology became clear, a "blend" of delivery technologies were used. The additional technologies include online conferencing, occasional mailed videocassettes of course lectures, a PBS-produced telecourse, and printed coursepacks.

Implementations of Videoconferencing in in-service training

Jukka Mäki, The Ziridis Schools, Greece

This paper presents the possibilities of VC in staff development and experiences that the Ziridis School has had when teachers took part in interactive lessons instructed via ISDN-videoconference. The results of the experiences are explained and some suggestions for the use of ISDN-videoconferencing are made for in-service training and staff development. The paper is presented with videotaped-material of distance lessons and interviews of staff in Greece and remote teachers in Finland.

Videoconferencing in practicum of educational studies

Jukka Mäki, University of Oulu, Finland

This paper presents the use of ISDN-videoconferencing in practicum of teacher training at the University of Oulu in Finland. A special emphasis is given on music education explaining the problems and experiences of teaching music in VC-environment. Music lessons have more complicated difficulties than a normal VC-lesson, because for example a teacher cannot show the pupils from up close the instruments. But the ISDN-technology even helps the teacher in many ways. Experiences of a distance education project at Utsjoki School in Lapland are explained thoroughly and presented with videotaped-material of lessons.

Weaving a Collective Text: A Cooperative Experience

Cleci Maraschin, Carlos Ribeiro, Luciane Sayuri Sato, Débora Laurino Maçada, Mára Lúcia Fernandes Carneiro, Fábio Dal Molin, Rosecléa Duarte Medina, Janete Sander Costa & Vladimir Stolenberg Torres, Universidade Federal do Rio Grande do Sul, Brazil

This paper is a report on the experiences of a post-graduate multisciplinary team of students attending the Cognitive Ecology and the Technologies of Intelligence Course and their Lecturer, while working in a collective text construction and using a collaborative writing tool named The EquiText. It presents the analysis of the text construction as an end of semester extra-class asynchronous work, based on Varela's observer notion in the cognitive ecology field and in Maturana's concepts of organization and structure. At the same time the group was testing their own 'conivence' environment in this tool, which had recently been available for local use.

Collective Authoring in a Teachers Qualifying Course in Alphabetization via Web

Cleci Maraschin, Daniel Vaz Smith, Fabrício Raupp Tamusiunas, Janete Sander Costa & Simone Moschen Rickes, Universidade Federal do Rio Grande do Sul, Brazil

This paper describes a project in which a group of teachers and participants of a distance qualifying formation course, sponsored by the Brazilian Federal Government, discussed alphabetization concepts in the Seminar of Alphabetization. It aimed at giving support to the teachers in the construction of school learning projects. The main theme had to do with alphabetization and its subtopics ranged from technological alphabetization, to continuous education, teachers continuous qualifying education and the inclusion of teachers and pupils in the new communications net. Their written productions were displayed in different texts created in the domains of the EquiText, a collaborative writing tool via Web. The participants' collaborative text productions underwent interesting rewritings due to their own collective authoring experience. They could also share diverse reading possibilities of socio-constructionists authors who deal with alphabetization, such as Piaget, Vygostsky, Paulo Freire, Emília Ferreiro, Maturana and others.

Networks as Professional Development: The Case of the Andalucian Network of Trainers

Carlos Marcelo, Pilar Mingorance & Araceli Estebaranz, University of Sevilla, Spain

This paper informs on the creation and development of the Andalusian Network of Trainers in Spain. The Network serves like support structure to professionals of the formation that develop their activity in Andalusia. The Network helps the trainers in its own profesional development. It favors the innovation on themes thought and developed by the own trainers. The participants are professional of the vocational education field in working contexts little ruled and dispersed geographically.

Multimedia in the Classroom With PowerPoint and VBA

David Marcovitz, Loyola College in Maryland, USA

This paper describes the results of a pilot project to use PowerPoint and Visual Basic for Applications with a class of teachers taking Multimedia Design in the Classroom. Most participants in the class were enrolled in a masters program in Educational Technology and had completed Introduction to Educational Technology in which they learned basic multimedia functions of PowerPoint and HyperStudio. Few participants had more than beginner-level computer programming background but all were able to use and modify a limited number of Visual Basic for Applications tricks to create fully interactive multimedia projects.

The Unit of Practice: A Roadmap for Technology Integrated Learning

Ines Marquez Chisholm, Arizona State University West, USA; Carol Beckett, Arizona State University West, USA; Maria Cardelle-Elawar, Arizona State University West, USA

Teacher integration of technology in K-8 classroom teaching has remained limited despite increasing connectivity and increasing numbers of computers in classrooms. Few teachers use analytic and project-oriented software on a frequent basis and recent teacher education graduates report that they do not feel prepared to integrate technology in their curriculum. To address the issue of low technology integration in classroom teaching, ASU West. through its PT3 grant, is introducing student teachers and their cooperating teachers to the Unit of Practice (UOP) as a way of planning for technology integrated learning. The UOP, a product of Apple's ACOT project, builds on several learning theories, addresses local, state and national standards, and provides a framework for organizing thought and integrating technology into classroom instruction. It helps classroom teachers to break out of the textbook dependency mode and to guide students' learning through multiple sources of information. The presenters will share the nature of the UOP, how teacher-student teacher pairs develop their UOPs to reflect standards, and how the UOPs are evaluated. The presenters will provide examples of UOPs and the evaluation rubric. Handouts will be available for the participants.

Smart Classrooms Led by Technology Using Teacher Educators

Ines Marquez Chisholm, Arizona State University West, USA; Keith Wetzel, Arizona State University West, USA

The College of Education at a western upper division state university has two computer classrooms, called Smart Classrooms, that mirror the configuration found in many local schools where teachers have a limited number of computers. The presenters will share the results of a qualitative study in which the presenters explored the pedagogical beliefs of five teacher educators who used technology in their teaching. The researchers wished to know their reasons for booking the classroom and their cultural preferences in designing instructional activities. The researchers created a set of questions to guide interviews with these five subjects. The data consist of interview transcriptions and responses to written follow up questions. Using the constant comparative method, data analysis began as data were first collected and continued throughout the study. Each researcher independently read the transcripts and identified patterns and questions. The researchers found that the faculty chose to use a Smart Classroom because it matched their teaching methods. The faculty interviewed had developed a variety of meaningful technology uses for their students. And they addressed many elements of multicultural integration. The presenters will also share the implications of their study for faculty development and raise the questions for further study.

Meeting the Need for Technology Integration: Math, Science and Technology Integration for Preservice Teachers

Skip Marshall, University of Florida, USA; Rose Pringle, University of Florida, USA; Kara Dawson, University of Florida, USA; Alan Hochman, University of Florida, USA

Historically, teacher education programs offered methods courses offered in isolation, neglecting the integrated manner in which many elementary classes are taught. This presentation focuses on the importance of curriculum integration in pre-service teacher education programs. The presenters explore the Math, Science and Technology (MST) integration block developed by the School of Teaching and Learning at the University of Florida for its Proteach II teacher education program with a focus on the technology integration course. The MST program goal is to develop the skills required by teachers to effectively create and implement an integrated curriculum.

Technology and Social Change: Perceptions of Culturally Diverse University Students

Shane P. Martin, Loyola Marymount University, USA; Edmundo F. Litton, Loyola Marymount University, USA;

This paper is a report on the findings of a pilot study addressing the perceptions of culturally diverse university students and computer technology. A survey instrument was generated to assess differences in attitudes, background and usage of computer technology. Specifically, the study addressed three questions: How do female students and members of different ethnic groups view the importance of computer technology for themselves and for their families? What role do cultural traditions have in creating interest in using computer technology? How do female students and members of ethnic minority groups use computer technology? Results indicate the affects of gender bias in computer technology, and some differences between ethnic minority groups and European American students. Questions for further research on this topic are discussed.

Toward an Adaptive e-Framework for Teacher Education

Massimiliano Adamo, Italian National Research Council- IAC, Italy; Mario Giacomo Dutto, Italian Ministry of Education, Italy; Irene Gatti, Italian Ministry of Education, Italy; Maurizio Lancia, Italian National Research Council-CED, Italy; Gianfranco Mascari, Italian National Research Council- IAC, Italy

The Italian Ministry of Education in collaboration of the Italian National Research Council are engaged in joint activities concerning the modelling, design and prototype implementation of an adaptive e-framework supporting the interactions of the various actors of the national teacher training system.

An Application for Training and Improving Co-ordination between Team Members, Using Information Technologies.

Jose M. Maseda, Labein Technological Centre, Spain; Jose L. Izkara, Labein Technological Centre, Spain; Asier Mediavilla, Labein Technological Centre, Spain; Ana Romero, Labein Technological Centre, Spain

In the current world, where information technologies have an increasing influence in the individual training systems, as most of the daily situations are handled by teams, arises the necessity of training teams which collaborate in order to solve situations in complex time-pressure scenarios. This idea is expounded into a methodology based on the evolution of the training systems. Traditional trainings for individuals flow to Computer Based Trainings (CBT) and collaborative training systems using information technologies appear for team training. The integration of traditional trainings, CBTs, drills and collaborative trainings compensates and improves current team trainings. Training individuals and teams that must work in emergency situations is complex for several reasons; it may also be infrequent for similar reasons and also crucial information is usually lost with the existing training systems. In order to increase the effectiveness of systems which promote learning by individuals, teams and organisations involved in the emergency and raise the frequency and quality of training sessions, we present a training system which integrates Intelligent Agents, Virtual Reality and Shared Mental Models for learning from actions on equipment and management decisions to be performed in emergency scenarios. The system is being developed as part of the European project called ETOILE (Environment for Team Organisational and Individual Learning in Emergencies). It consists of an application based on the resolution of an underground fire emergency and another about an incident in a nuclear power plant. It is a European project called ETOILE. The system can be also applied to many other scenarios like laboratories, chemical plants, management, etc. where teams must collaborate, work together, act and take decisions.

Technology and Social Studies Teacher Education – Results from a National Survey

Cheryl Mason, University of Virginia, USA; Michael Berson, University of South Florida, USA; Walter Heinecke, University of Virginia, USA

The beliefs and practices of College and University Faculty Members (CUFA) of the National Council for the Social Studies Social technology integration into teacher education were investigated using a questionnaire. This presentation will present the survey results and highlight methods of integrating technology into social studies methods courses.

Lessons Learned: School based Reform and its Impact on the Restructuring of a Teacher Preparation Program

Jan Mastin, University of Missouri-St. Louis, USA; Joseph Polman, University of Missouri-St. Louis, USA; Kathleen Beyer, Educational Visions, USA

The reform in teacher technology integration at our university is based on a school reform project. Thirteen area classrooms were equipped with the latest technology. We were selected to train the teachers to use technology and inquiry-based, student-centered learning. Monthly meetings, training sessions and classroom visits were instituted. Our teachers were eager to learn and returned to their classrooms ready to try the new technology-rich, inquiry-based projects with their students. The result: student scores improved, students' projects became more professional, and the students became empowered by their success. We based our strategies on the success we had with our involvement in the aforementioned school reform and we relied heavily on the thirteen classrooms as observation sites for our preservice teachers. Our success during our first year far exceeded expectations. We are on our way to preparing our students to be the facilitators of technology-enriched, activity-based classrooms of the future..

Faculty Technology Coaches

Kathryn Matthew, Rebecca Callaway, Catherine Letendre & Kimberly Kimbell-Lopez, Louisiana Tech University, USA; Elizabeth Stephens, Southwest Texas State University, USA

The purpose of this research was to examine the benefits of one-on-one mentoring for technology coaches and teacher preparation faculty as they learned to use technology. Participants included 33 teacher preparation faculty and 14 technology coaches, teacher education majors. The technology coaches worked with the faculty members in their offices and classrooms as they learned to use technology for their personal benefit and to integrate technology into their teaching. Interviews and observations indicated that coaches as well as faculty members gained in their knowledge of technology.

Desktop Video Conferencing: The Optimum Solution for Synchronous Distance Learning

Ron McBride, Northwestern State University, USA; Frank Fuller, Northwestern State University, USA; Robert Gillan, Northwestern State University, USA

The technologies for teaching at a distance continue to proliferate. Though web-based delivery, using the computer and Internet, has attracted substantial interest recently, other technologies, like full motion video compression, continue to provide alternatives to the Internet. Factors such as quality of delivery, cost effectiveness and convenience of operation have shifted the emphasis away from high cost video compression systems. Nonetheless, web-based classed taught at a distance provide significant coverage but lack components such as full frame video that allow students see the teacher during synchronous delivery. The essence of "real-time" instruction is simulated with DVC, though at a fraction of the cost of video compression systems. Desktop video conferencing synthesizes the best features of all distance learning delivery systems, resulting in a technology that provides a variety of applications for the participating institutions. This paper explores desktop video conferencing as the "next generation" distance learning technology, comparing faculty and student preparation time, initial and maintenance cost, and effectiveness of instruction.

Umm...I Don't Think It's Working: Why our Class-to-Class E-mail Exchange Didn't Work (And What can be Done to Fix it)

Lauren McClanahan, The Ohio State University, USA; Linda Clady, Westerville City Schools, USA

Last spring, my teacher education students and I decided to partner with a local middle school via the Internet. Since my college students were in the process of learning how to be English teachers, and the middle school students needed help with their writing, the match seemed to be perfect and beneficial to both parties. However, the technology, rather than being an invisible vehicle for communication, got in the way. The middle school teacher and I, try as we might, had many difficulties with not only scheduling, but also utilizing the technology itself.

Culture Clash in the College Classroom: Changing the Work Teachers and Students Do

Averil E. McClelland, Kent State University, USA

This paper examines the experiences of beginning teacher education students in an inquiry-based, technology rich course that has been designed to change the work that both teachers and students do as they explore contemporary issues in the profession of teaching. Analysis of these experiences is framed by concepts from cross-cultural psychology, often used to understand experiences of individuals who abruptly find themselves living in a different culture. The premise is that classrooms characterized by changed teaching and learning design and activity are, in fact, "new cultures" to those who participate in them.

Web-based Delivery of a Generic Research Methods Module (for Social Sciences): The Graduate and Post-Graduate Experience.

Robert James McClelland, Liverpool John Moores University, UK

One educational development approach at Liverpool John Moores University (LJMU) from its Business School (LBS) is that of supported web-based learning systems to complement traditional teaching. This paper focuses on recent work at LBS concerning the development of a Research Methods module, that has grown since 1998 to serve a range of Social Science Masters programmes across the university. The programmes include the MBA, the in-house Masters in Learning and Teaching for Higher Education (undertaken by academic staff of LJMU) and several overseas Masters programmes. The module is web-based and provides teaching, learning and support environment for academic staff and students. It is flexible in that it is variably credit rated and can be studied in full-time, part-time and distance modes. The approach used in the delivery of the module has enabled us to explore module/programme support development possibilities on the web from academic, quality and commercial perspectives as well as the cybernetic and evolutionary nature of learning. It has also enabled us to explore student attitudes and perceptions to the technology, the learning strategies adopted by students, and relate it to student learning styles and their development as researchers. The emphases in studying in this system are appropriateness in terms of pedagogy, quality of content and presentation and technology fit. The development acts as an over-pinning in the LBS strategy of a web supported teaching and learning environment, coupled with an innovative support mechanism, for staff and students on Social Science Masters programmes at Liverpool John Moores University.

Lessons Learned

Ann H. McCoy & Helen C. Barrett, University of Alaska Anchorage, USA

Last year our School of Education received a PT3 Capacity Building grant. This year we received a PT3 Implementation Grant to continue our work with integration of technology into our teacher preparation program. In addition, last year we received a 5 year Title II Partnership for Teacher Enhancement grant to assist us redesign our teacher education program. The PT3 grants support this effort.

Ready or Not – Here They Come

Ann H. McCoy, University of Alaska Anchorage, USA

ISTE NETS for Students and the new NETS for Teachers raise expectations of what students and teachers should know and be able to do. Because of this, we sometimes assume that teacher candidates come with more technology experience than they actually do.

Multimedia Resource File: A Practical Project for Preservice Teachers

Leah P. McCoy, Wake Forest University, USA; Elizabeth M. Miller, Wake Forest University, USA; Nicholas J. Bender, Wake Forest University, USA

The Multimedia Resource File Project is used to allow students to practice and demonstrate integration of advanced technology and content skills in planning and organizing an instructional resource for high school teaching. The student will develop advanced skills in searching the web, evaluating and selecting resources, dealing with copyright issues, organizing resources, and producing a CD product.

Zones of comfort, proximal development and technology skills diffusion: A critical reflection on a curriculum-based approach to inservice teacher training

David McCurry, Monmouth University, USA

This paper explores the current practice of inservice teacher technology training through the lens of two theoretical constructs; Roger's Diffusion of Innovations theory as it relates to technology diffusion among select groups and Vygotsky's constructivist concept of Zones of Proximal Development as applied to practicing teacher's exposure to new tools in their working environment. The approach to training teachers in the context of their own workspace is directed at exploring situated experiences with new technological tools. The relationship between these tools and their patterns and habits of pedagogical practice are described through ethnographic and quantitative data collected during an inservice technology training for K-8 teachers.

Bootstrapping Online Organizational Knowledge: Technologies and Practices from a PT3 Initiative.

John E. McEneaney, Oakland University, USA; Anne E. Porter, Oakland University, USA, Bryan R. Baroni, Oakland University, USA, Wendy M. Subrin, Oakland University, USA, James Quinn, Oakland University, USA, Ledong Li, Oakland University, USA

Large-scale projects often depend in critical ways on points of leverage where modest effort has significant influence on outcomes. The purpose of this paper is to describe how a coordinated system of Web resources served as such a point of leverage in a federally-funded effort to promote technology in support of teaching and learning. We believe two other decisions were important in the success of our Web tools as a point of leverage. One decision was to avoid high-tech proprietary systems (i.e., "groupware") in favor of a loose collection of relatively "low tech" tools. The second was that we sought to build on, rather than replace, existing workplace practices and protocols. We believe these decisions also significantly enhance the generalizability of the model we have developed for preparing teachers to teach in an information age.

IDENTIFYING SCHOOL CONDITIONS AND TEACHER PRACTICES THAT HAVE PROVEN EFFECTIVE IN INCREASING MATHEMATICS AND READING ACHIEVEMENT FOR AFRICAN AMERICAN STUDENTS AND STUDENTS IN SCHOOLS WITH SUBSTANTIAL MINORITY STUDENT POPULATIONS.

Michael McFrazier, Prairie View A&M University, USA; Danita Bailey, Texas A&M University, USA

Reading, Writing and Arithmetic finding ways to make them stick! The focus of this research was to identify those conditions and teacher practices that have been proven effective in increasing the academic performance of African-American students and students in schools with substantial minority populations. The targeted population for this research was reading and math teachers from schools whose Texas Assessment of Academic Skills (TAAS) performance was reportedly Exemplary, Recognized or Acceptable. Research participants must have been teaching in classrooms with at least a 50% minority population. They also must have had at least 70% of their students passing the TAAS exam. Research results indicated that over 90% of the respondents Always exhibited the following strategies in their classrooms in Reading and Mathematics: Believing in their own self efficacy; Projecting a vision of excellence; Believing students can reach their potential; Encouraging students to ask questions; and Teaching students critical thinking strategies for solving math problems.

From Programs to Pedagogy: Professorial Change Through Technological Collaboration

Carol McGaughey, University of Houston, USA; Judy Radigan, University of Houston, USA; Nancy Searle, University of Houston, USA; Donna Smith, University of Houston, USA

The goal of the "Preparing Tomorrow's Teacher to Use Technology" grant awarded to the University of Houston College of education is to encourage the integration of technology into courses taught by education professors. This modeling of an appropriate use of technology by the university professors is intended to help pre-service teachers acquire proficiency in the use of technology for curricular purposes. To accomplish this goal, many changes had to be implemented, the most challenging of which was to assist professors to move toward pedagogical change through the fusing of technological resources and activities with their curricular objectives. Professors were paired with grant project members who assisted them to identify their personal needs concerning technology. Using an action research model, a collaborative community was developed between professors and the grant project members. The resulting increased interest and excitement of the professors was reflected in their communication with colleagues, their use of electronic communication with their students, and their growing integration of technology into their curriculum.

Students Perceptions of the Value of On-Line Instruction

Barbara McKenzie, State University of West Georgia, USA; Elizabeth Bennett, State University of West Georgia, USA; Nancy Mims, State University of West Georgia, USA; Tom Davidson, State University of West Georgia, USA

This paper explored college students' basic perceptions of WebCT on-line instruction, focusing on why students chose or did not choose to use this format, tools and activities preferred, and if this format should be continued. The findings revealed that students did not use on-line instruction due to lack of computer access. Students who chose to use WebCT did so to access course materials and for e-mail connectivity reasons. Tools and activities preferred were accessing class materials and posting to the bulletin board. The majority of the participants indicated that on-line courses should be continued.

The Way We Were - Reflections on the Impact of ICTs on Teacher Education in Ireland

Dearbhaill McKibben, Trinity College Dublin, Ireland; Sharon MacDonald, Trinity College Dublin, Ireland; Brendan Tangney, Trinity College Dublin, Ireland; Bryn Holmes, Trinity College Dublin, Ireland

The attitude of the teacher has been identified as a crucial factor in the successful integration of formation and Communication Technologies (ICTs) in education. This paper reflects on the learning experiences of a group of teachers during the first year of a Masters programme in ICTs in education. Using logged information from the class mailing list, video taped reflection, face-to-face interviews and a class questionnaire data was gathered about student learning experiences. It was found that there was a marked contrast between the student perception of learning at undergraduate level and that on the Masters course. Different learning and teaching strategies facilitated by the use of ICTs characterised this contrast.

Collaborative Action Communities for Preservice Technology Integration

Sara McNeil & Melissa Pierson, University of Houston, USA

With a successful field-based preservice program aimed at effective strategies for teaching diverse urban youth, the University of Houston is implementing an action research process to actively collaborate with area school districts to establish networked learning communities of university faculty, preservice teachers, and school-based educators to support the development of future teachers. The College has restructured its required 1 semester, 3-credit-hour technology course to a series of 3, 1-credit-hour technology sections tied directly to methods courses to allow students to develop appropriate content methods-based technology proficiencies based on

ISTE standards. To ensure that all members of our learning community are effectively prepared for appropriate inclusion of technology in content methods courses, faculty and students participate in a comprehensive support model of classroom instruction, workshops, and field-based experiences with the aid of a cadre of trained Technology Fellows.

Designing Constructivist Teaching and Learning Environments For Visual Learning

Sara McNeil, University of Houston, USA

This paper discusses the design of a graduate course in visual learning based on constructivist teaching principles. The conceptual framework is described, and guidelines and examples of each project are presented. Innovative strategies that contribute to a constructivist teaching and learning environment are discussed. Student and instructor comments are also shared.

Training Tutors Online: Three Challenges, Three Solutions, and Voices from the Other Side of the Whiteboard

Kelly Marie McVearry & Christa Ehmann, Smarthinking, USA

If Socrates and Plato were alive today, would they still meet in the streets of Athens to probe topics with questions, or would they meet online to do so? Consider another legendary tutor Annie Sullivan, who held Helen Keller's hand under a running faucet to teach the word "water". How would Sullivan promote this type of concrete understanding online? The stories of these legendary tutoring relationships endure because they model two of the most powerful principles of learning: from Socrates, we learn that good instruction teaches students to ask the right questions; from Sullivan, we learn that meaning is constructed through first hand experience. The crescendo of the distance education movement compels us to examine the application of these theories to new, online learning environments. To that end, educators must ask: do our most cherished teaching and tutoring principles transcend the vehicles in which those principles are delivered?

Using Technology in Early Childhood Environments to

Mikki Meadows, Eastern Illinois University, USA

Presentation will introduce unique methods of using technology in early childhood environments with a focus on strengthening cultural connections between family, child, and the community in order to foster appreciation of diversity. The presentation will include sharing information and theory, in addition to providing concrete examples of activities for children and families. Presentation will be based on James A. Banks' theory of curriculum transformation, Louise Derman-Sparks' anti-bias curriculum, and the Far West Laboratory Center's guide to culturally sensitive child care, with an eye toward Bredekamp and Copple's methods of developmentally appropriate practice. The presentation incorporates the use of technology as deemed valuable in regard to licensure, certification, and accreditation standards of early childhood professionals.

Using a survey to design and evaluate professional development activities

Timothy Melchert, Marquette University, USA; Joan Whipp, Marquette University, USA; Heidi Schweizer, Marquette University, USA; Maria Perez, Marquette University, USA; Michael Madson, Marquette University, USA

To implement our PT3 grant, we needed to answer three questions. First, we needed to identify the current level of computer skills in our faculty, both at the University as well as in two public schools that are participating in our grant. Second, we needed to know how the faculty were currently using computers in their teaching. And third, we needed to gain information regarding the faculty's attitudes toward integrating technology in education. This paper will demonstrate how a brief survey questionnaire can be used to help design computer support services and training workshops, help individual teachers and professors design professional development plans, and help administrators and program evaluators assess the effectiveness of these types of professional development activities. In addition, the paper will show how survey data of this type can be used to help identify how receptive a group of educators is to increasing the role of computers in the curriculum.

One Size Does Not Fit All: Designing Distance Education Support

Eunice Merideth, Drake University, USA; Peggy Steinbronn, Drake University, USA

The "One Size Fits All" label is a tantalizing one. It implies that whatever the garment, it is generous enough in intent and design to fit a large individual, yet it is structured so cleverly that it would be useful for the most petite. Like taste and fit in clothing, the need for online support requires different labels that recognize and address shared and unique needs. The purpose of this presentation is to outline a plan for online support that has been implemented at a medium-sized, liberal arts university. When creating a design for this type of support, one begins with all stakeholders' shared needs of communication, servers/computer, and software to make sure that the base of the support system is firmly in place, then moves outward to address crossover and unique needs of web administration, web faculty, and web students. Levels of support, like a well-fitting garment, can be categorized into small, medium, and large, depending on how much support is given and the effort incurred in producing and maintaining that support. Accordingly, small, medium, and large support strategies to address all identified needs will be discussed.

The WebCT Certified Trainer Program: Modeling Online Teaching and Learning with Industry Driven Standards

Sandy Mills, WebCT, USA

Written by professionals with extensive online teaching and learning backgrounds, the WebCT Certified Trainer program goes beyond typical technical training and was designed for those who are tasked with teaching others how to use WebCT and how to create instructionally sound courses. This discussion-based program focuses on the techniques, strategies and methods for integrating teaching and learning principles, learning styles, building online communities, and includes discussion on other topics such as intellectual property, copyright, academic honesty, and accessibility. This paper explores the research and educational philosophies behind the program, and highlights why over 90 institutions around the world have become involved and what they are saying about the program. Also, a list of online teaching and learning competencies that will be helpful to anyone putting together educational programs for teachers will be shared.

Managing On-Line Courses Around the World

Nancy Mims, St University of West GA, USA; Barbara McKenzie, St University of West GA, USA

Bringing new ideas and cultural richness to our universities in partnership with other institutions in other countries is gaining popularity. through the use of web-based or On Line Learning, it is, for many universities, the way of the future. Teaching across the continents appears to be a simple solution for bringing cultural richness to life. This presentation will assist college instructors in planning delivery of courses in foreign countries, especially Third World Nations. Discussion focuses on some possible barriers, concerns, tips and the equipment needed in order to experience web-based learning with a minimum hassle.

Putting the Instructor in Charge: Component Architecture and the Design of a Course Web Site

Punyashloke Mishra & Matthew J. Koehler, Michigan State University, USA

This paper describes the "component architecture" of the web and how teachers can use various existing components of the web – plugins, websites, applets, web services etc., to develop complex applications with limited investment of resources. Furthermore, the pieces of independent software units can be coordinated towards a final product that effectively hides the "duct tape" that holds the pieces together. This "mix and match" approach towards developing educational software saves money and time and allows information sharing across activities in an integrated fashion which in turn.

Aiming a better understanding in science courses through mathematical reasoning

Simon Mochon, Math Eduacation Department, CINVESTAV, Mexico

In this article we present a project which has the purpose of using mathematical based explanations to support the teaching of the sciences (chemistry, biology and physics) at the secondary level in Mexico. The article describes the structure of the worksheets developed and the pedagogical model followed within the classroom to ensure an efficient use of the activities. Spreadsheet models to be explored by the students accompany many of the worksheets. We will also show some of these spreadsheet models designed for this educational project.

Academic Staff Development Course for Coordinators of Distance Education: Russian Experience

Marina Moisseeva, Russian Academy of Education, Russia; Victor Krivoschokov, Southern Ural State University, Russia

The system of public education in Russia is in a process of reforming now. Most of the universities and colleges have recently opened the distance education faculties and departments, and developed their pilot distance courses organized on the basis of modern Internet technologies. But there is a contradiction between the urgent need in accelerated development of the Russian system of distance education and the lack of specialists to develop and manage it (i.e. coordinators of distance education). The report presents the Internet-based course for coordinators of distance education, developed by the Russian Academy of Education and South-Urals State University for academic stuff development programs. The report is intended for those scientists and practicians whose interests are focused on the problems of using Internet technologies and active methods of teaching for inservice training, or faculty and stuff development.

Asynchronous Online Group Decision Making: A qualitative analysis

Deana Molinari, Brigham Young University, USA;

A qualitative study of 1172 online messages suggests that online group processing is both similar and different from face-to-face problem solving. A comparison of findings between the least effective and most effective outcome product found that more communication, critical thinking, and relationship building occured in the most effective group. The mostly female sample did not use conflict in their processing and other differences suggest that gender may affect online group processing. The study at Brigham Young University College of Nursing used basic face-to-face research methodologies to explore the functional communications of forty-eight students conducting an action research family nursing project and completing group papers about their process. The three phase analysis of online groups took place as part of a nursing course lasting fifteen weeks and identified (1) functional communication constructs, concepts, and categories (2) differences between the least and most effective groups, and (3) differences between online and face-to-face group decision making.

Innovative Teacher Education using the Web-based Integrated Science Envrionment (WISE)

James Monaghan, California State University, San Bernardino, USA; James Slotta, University of California, Berkeley, USA

We present the design, testing, and implementation of a professional development model that uses three essential components: a successful Web-based curriculum environment (the Web-based Integrated Science Environment: WISE); a virtual community of teachers and scientists who discuss pedagogy, collaborate on curriculum design, and offer continuing support for in-service members; and virtual mentoring between new community members and veterans. The Web-based Integrated Science Environment (WISE) builds on the successes of a decade's research on the Computer as Learning Partner project. In this professional development project, we sought to combine solid pedagogy that was the result of extensive funding by the National Science Foundation, with large-scale professional development in a large teacher training institution.

Connecting Trainee Teachers and School Mentors with University Educators via MultiPoint Desktop Video Conferencing (MDVC): The Singapore Experience

Swee-Ngoh MOO, National Inst. of Education, NANYANG TECHNOLOGICAL University, SINGAPORE; Angela Foong-Lin WONG, National Inst. of Education, NANYANG TECHNOLOGICAL University, SINGAPORE; Leslie SHARPE, National Inst. of Education, NANYANG TECHNOLOCIAL University, SINGAPORE; Lachland CRAWFORD, National Institute of Education, NANYANG TECHNOLOCIAL University, SINGAPORE; Chun HU, National Inst. of Education, NANYANG TECHNOLOGICAL University, SINGAPORE

The focus of this paper is on the potential of MultiPoint Desktop Video Conferencing (MDVC) for adding value to the practicum component of the pre-service teacher education programme in Singapore. The spotlight is on the conferencing between trainee teachers and their university supervisors, and networking among school mentors and the universtiy reseachers via MDVC during the practicum. In essence, this means opening up to personnel involved in the practicum possibilities that have been unavailable to them till now. This paper presents an outline of the projects' development: the technological issues and problems involved, the organizing and structuring of the MDVC conferencing, and the nature of the discussions. It also inclues the preliminary findings of the MDVC research project and its current and future developments, and discusses the potential and implications these have for teacher preparation.

Findings from the Project for the Longitudinal Assessment of New Information Technologies (PLANIT): 2000-2001

Cesar Morales, Inst. of Latin American States for Education, Mexico; Charlotte Owens, University of Louisiana at Monroe, USA; Dale Mcgoun, University of Louisiana at Monroe, USA; Rhonda Christensen, University of North Texas, USA; Gerald Knezek, University of North Texas, USA

Since 1995, researchers in several countries have been gathering data about the impact of information technology on teachers and learners using a common set of instruments. A preconference symposium was held at SITE 2000 to summarize findings in the international sector through the year 1999. For SITE 2001, a panel presentation featuring new findings is offered. This panel features teacher attitudes toward information technology in the nations of Brunei, Mexico, Thailand, and the United States of America (USA).

Developing a University-Wide Digital Portfolio System for Teacher Education

Laurie Mullen, Ball State University, USA; Bill Bauer, Ball State University, USA; Web Newbold, Ball State University, USA

This paper describes the collaborative process we've utilized in conceptualizing a digital portfolio requirement for all teacher education majors. We entail the philosophical, logistical, and infrastructure considerations that have been part of the process along with the portfolio model adopted. Finally, we discuss the assessment timeline for portfolio evaluation.

Instructional Staff Development Project: A Pre-Post-Post Follow-up Evaluation

Rosemary Mullick, SUNY Inst. of Technology at Utica/Rome, USA; Ron Sarner, SUNY Inst. of Technology at Utica/Rome, USA

The Staff Development Project* was designed to facilitate integration of instructional technology in the classroom. The Project was first funded in 1999 and again in 2000. It involved a consortium of four local districts in a metropolitan area in Central New York. The overall effectiveness of each of the projects was determined using a Pre-Post Test Design. Responses to a General Pre-Test determined teachers' knowledge of and experience with technology and the extent to which they employed technology in the classroom. A General Post-Test determined any changes that occurred. The findings of indicate that the Instructional Staff Development Projects for both 1999 and 2000 were highly successful. Positive changes in ratings occurred between the Pre-and Post Tests. Responses on a Post Follow-up questionnaire indicated that not only did positive changes occur between the Pre- and Post-Tests, but the changes remained relatively stable one year later. Therefore, the Targeted Instructional Staff Development Project was successful and had a lasting effect on the participants.

Scoring Activities on Integrating Technology Into the Curriculum During Pre-Service Training Using Bloom/ACOT Scale

John Murphy, D'Youville College, USA; Jacqueline McFarland, Niagara University, USA

Pre-service Education students were observed as they integrated technology into elementary classroom activities. The authors created a special scoring tool by combining Bloom and ACOT (Apple Classroom of Tomorrow) scales to record cognitive and technology attributes. Data showed the relationship between Bloom and ACOT activities. Preliminary data pointed to a corresponding relationship between high scores on the Bloom scale and high scores on the ACOT scale. More work is needed to perfect the Bloom/ACOT model.

Problem-based learning using web-based discussions: A positive learning experience for undergraduate students.

Rene Murphy, Acadia University, Canada; Gary Ness, Acadia University, Canada; Joanne Pelletier, Acadia University, Canada

The purposes of this study were to incorporate computer technology to parts of an undergraduate exercise physiology course, to motivate students, to get them actively involved in the learning process and to enhance learning. Two classes of third year students were studied; the first was taught using problem-based learning (PBL) activities with on-line discussions on a course web page while the second was taught using traditional lectures. Student perceptions about the use of technology and PBL were collected using the Nominal Group Technique. Data related to student knowledge, comprehension, and application of course material, as well as retention over time (12 months) were collected. This teaching method resulted in similar grades on exam questions and final course marks with only one significant difference, that being a higher score (15%) in the PBL group's answer to a question of "application of knowledge" ($p=0.02$, PBL vs traditional). Lastly, this pilot project verified the viability of these teaching methods and demonstrated their acceptance by undergraduate students. Therefore, it could provide a framework for the use of these teaching strategies for other courses, continuing and distance education.

Web-Based Collaboration On Technology in Education: A successful constructivist course model for pre-service teachers

Sharon Murray, St. Thomas University, Canada

A Technology in Education course model that focuses on helping pre-service teachers think about how they learn and how they can improve their learning as well as how they can learn from one another will be discussed. The course tasks have a real educational purpose and are not usually done for the sake of completing an assignment. Students construct activities or representations of their understanding; represented particulary in their electronic course web pages, which reflect their experiences and thought developments as well as a finished product. The course design supports a constructivist model of instruction, which seeks to create an environment that has learners construct understandings rather than regurgitate the instructors view. It is my hope to share, demonstrate and showcase examples of course web pages of pre-service teachers as a way of engaging you in a discussion of this model of course design.

Using WebCT 3 to create web-based learning for multiple learning styles

Ann Musgrove, Florida Atlantic University, USA; Richard Knee, Florida Atlantic University, USA; Desmond Rodney, Florida Atlantic University, USA; Glenn Musgrove, Broward Community College, USA

Web-based learning (WBL) is rapidly becoming a staple at all levels of education. Statistics from a national study by the Department of Education in 1997-98 showed almost 44 percent of all higher education institutions offered distance-based courses, an increase of one-third since 1994-95. Estimates are that by the year 2002 there will be more than 2 million students in higher education participating in distance education. In this period of rapid change as education adapts to use the new tools of web-based learning, educators need to consider the foundational concepts of learning theories. Modern learning theories, based on constructivism, emphasize individual differences in learning styles. The most effective learning environments offer content that caters to these individual differences in learning styles. Focusing on how to use some of the information that learning theory offers can improve WBL just as it has helped with traditional educational environments. The focus of this paper is to show how WebCT3.0 can be used to make WBL appealing and effective for a variety of individual learning styles.

Investigating the Benefits of an Educational Technologist in Middle School environments: A Qualitative Study

Melissa Nail, R. Dwight Hare, Stephanie Davidson, Beth Ferguson & Michael Leman, Mississippi State University, USA

This paper is a report of a study conducted of a federally funded technology innovation grant, C*R*E*A*T*E for Mississippi. Qualitative techniques were used to examine the benefits of school based Educational Technologist in increasing teacher knowledge and integration of technology. Preliminary results indicate that teachers do benefit from the Educational Technologist. Teachers feel more confident in their use of technology, use more technological resources in planning and implementing their lessons, and are integrating technology into their lessons.

The Study of the impact of Learners, Learning Interactions on web-based tutorial program, to satisfaction on the Use of Web for Educational Purposes and Academic Achievement

Jaitip Na-songkhla, Chulalongkorn University, Thailand

Web-based Tutorial program was developed with HTML language to serve as a supplementary classroom activities for freshman in Foundations of Computer for Education class. The program was distributed online, consisted of two types of learning interactions: human-to-computer interaction and human-to-human interaction via computer network. Online materials, lecture notes, recommended reading, and review tests were identified as human-to-computer learning interaction; whereas, human-to-human interaction was set up in form of learning activities for students via web-board, chat forum, and e-mail.

Adapting Critical Thinking Models to a Technological Approach

Janice Nath, University of Houston, USA; Helen Farran, University of Houston, USA

Teachers must be prepared to teach higher-level thinking and incorporate technology so that students will have the proficiencies and skills needed to enter this new and creative era. The purpose of this paper is to present critical thinking models that have been researched and successfully used across the curriculum for all grade levels and are now being adapted to incorporate technology: concept attainment, Suchman inquiry, conflict resolution, and the memory model. Teacher educators and practitioners gain theory and insight on higher-level thinking models. Methods for construction and application of these models will be demonstrated including PowerPoint presentations, web-based presentations, directed Internet searches, and utilization of various graphics software.

WHERE IS THE ANY KEY SIR? EXPERIENCES OF AN AFRICAN TEACHER-TO-BE

Guillaume Nel, Technikon Free State, South Africa; Liezel Wilkinson, Technikon Free State, South Africa

This presentation focuses on efforts to assist first-year students from developing communities in computer classes at the Free State Technikon in South Africa. As an example, the story is told of Thabo, a student teacher from a rural area who was willing to live in a squatter camp just to be able to attend an institution of higher education. The compulsory computer literacy classes posed a major problem because he had never touched a computer in his live. On his first day the class mocked him when he indicated that he could not find the "any key"! The pace was just too fast and he also did not have a computer of his own. He ultimately failed the course - a major financial blow to a very poor student. The question is asked whether other approaches would not have given him the opportunity to adapt more easily. In surveys undertaken at the Technikon, it was found that many students from rural areas live in similar conditions as Thabo and experience similar problems in their first-year computer classes. A study of the nature of these students' problems led to the introduction of new approaches where innovative "user-friendly" methods are used.

System-wide Planning for Technology in Teacher Education: Lessons Learned at the University of Wisconsin System

Dana Nelson, University of Wisconsin System, USA

This paper reports both the processes and outcomes of the University of Wisconsin System's effort to facilitate technology integration throughout its thirteen teacher preparation programs. The context and rationale for the effort, the change strategies employed, and the results of institutional and system planning are explained. The paper also reflects on lessons learned from the planning effort. The planning effort has been conducted within a context of organizational change characterized by facilitation, engagement, and decentralization.

Virtual Worlds, Real Minds: an investigation about children, videogames and cognition

Antonio Simão Neto, Pontifícia Universidade Católica do Paraná, Brazil

The Virtual Worlds, Real Minds project aims to investigate and understand the cognitive processes that take place when young people play videogames and to provide educators with some insights based on this understanding. Preliminar findings show that traditional, Cartesian ways of thinking can be perceived, along with new, more emotional and interactive forms of viewing and making sense of external stimulae.

Forming a Cadre of Learners: Effective Educational Technology Integration in a Teacher Preparation Program

Ellen Newcombe, John Kinslow & Marlene Goss, West Chester University, USA

West Chester University's USE-Tech Partners (PT3) program has been a catalyst for increasing interest in and cooperation for preparing technology proficient teachers. Project activities during the capacity-building year included monthly participant meetings, development of integration strategies by faculty, consortia partnership development, completion of the university technology plan, and project evaluation activities. Nineteen participating faculty had released time during the Spring semester or Summer of 2000 to develop and test integration strategies in one or more of their courses. Faculty enhanced the learning of preservice teachers through: e-mail, the Internet and web-based learning applications (e.g., BlackBoard), content specific software, presentation software and other productivity tools, and video-conferencing.

How Can We Share Teaching Experiences in Different Countries through ICT? -Concepts, Models and Propositions for Instructional Design and Analysis -

Haruo NISHINOSONO, Bukkyo University, JAPAN

Information and Communication Technology (ICT) enables pre-service and in-service teachers to share their experiences with one another while in different places. In other professions such as architecture, medicine, engineering, etc, specific symbols and models are used to express ideas and inventions. In the educational profession, there are no common symbols or models for teachers to express their ideas or to share experiences. This paper proposes a procedure of instructional synthesis and analysis, concepts for teaching, graphic representation of models and logical expression of instructional propositions to enable teachers to share their experiences through ICT.

Art Responding Through Technology (http://www.vtartt.org)

Penny Nolte, VT ARTT Project, USA; Marty Leech, Missiquoi Valley Union High School, USA; Gracelia Monteagudo, Bread and Puppet, USA

ARTT is a network and collaborative based learning approach to visual arts education that would be impossible to replicate in 'real time' alone given geographic and monitory constraints on today's classrooms. Most art teachers in Vermont find themselves the only teacher in their field in a school or even a district, making networking, collaborating, and seeking support from their peers difficult. With the advent of ARTT, Vermont's teachers in the arts have a portal through which they've found access not only to each other, but to working artists and arts organizations where professional interaction and personal friendships have blossomed and grown. The use of assyncronous threaded discussions for iterative critique of student work in progress has provided teachers with a resource that is there when they need it, and can use it, and students with a test ground and feedback on artistic, written, and verbal expression. (http://www.vtartt.org/jellyfish.html)

Revising an educational computing course to meet the National Educational Technology Standards (NETS): A process of reflective teaching.

Aileen Nonis, University of Tennessee, USA; Blanche O'Bannon, University of Tennessee, USA

In our attempt to address National Educational Technology Standards (NETS) set forth by the International Society for Technology in Education, we have faced issues that impact the conditions of learning experienced by our students. As reflective practitioners, we have revisited the curriculum to make improvements based on our experiences and our students' experiences in the required educational computing course at our college of education. Our reflections have included conversations about the scope and sequence of the curriculum, pedagogical knowledge, instructional strategies, and procedures for assessment. This paper will highlight key points of our discussions, and describe interventions and their resulting consequences for our preservice teachers.

Bridging transformational geometry and matrix algebra with a spreadsheet-based tool kit

Anderson Norton, The University of Georgia, USA; Sergei Abramovich, State University of New York Potsdam, USA

This proposal stems from the authors' common interest of designing technology-enhanced activities within the context of matrix algebra, transformational geometry, and fractals for prospective high school teachers. It concerns the ways in which a spreadsheet can be used as a tool kit that enables one, through encoding and manipulating matrices, to create fractals with reliance upon "the chaos game." The authors argue that such use of a spreadsheet in the secondary classroom is conducive to linking properties of matrices and concepts of transformational geometry in a meaningful and representational manner.

When Attitudes Change, Do Changes in Practice Follow?

Priscilla Norton, George Mason University, USA; Nancy Farrell, George Mason University, USA

In order to meet the challenge of teacher education responsive to the integration of the newer electronic technologies, the Integrating Technology in Schools (ITS) Program leading to a Masters of Education in Curriculum and Instruction was developed. The ITS Program is structured around a cohort process that supports students finding common ground around a shared set of experiences, knowledge, readings, activities, and support systems. This paper presents a summary of data obtained during the 1999-2000 ITS Program and examines 1.) changes in participants' stages of concern, 2.) changes in participants' self-reported frequency of technology use, 3.) changes in participants' self-report concerning collegial interactions, 4.) changes in participants' summary of assigned technology use in their classrooms, and 5.) conversations with participants. Examining these changes enabled the authors to discuss the relationship between changes in attitude and classroom practice.

How Much Is Enough?: Comparing Certificate and Degree Teacher Education Options

Priscilla Norton, Geroge Mason University, USA; Georganna Schell, George Mason University, USA

Few would argue that teacher education is a central factor in realizing the potential of educational technology to influence teaching and learning. Understanding the impacts of a variety of teacher education options on teachers' concerns, self-reported uses, and self-reported collegial activities related to technology can play an important role in deciding what opportunities are most appropriate. This paper examines two graduate level options: a 12 graduate credit hour certificate program and a 36 graduate hour Master's of Education degree program. Using a three-part survey, 37 teachers who had completed the Master's of Education degree program and 153 teachers who had completed the Certificate Program were surveyed. Teachers in the Master's group were matched with teachers in the Certificate group using grade level/subject taught and years of experience. The resulting matched group of 37 Master's and 37 Certificate teachers were compared. Results of the comparison in three areas (Stages of Concern, instructional uses of technology, and collegial interactions concerning technology) are presented followed by a discussion of the relationship between program and outcomes.

USING MULTIMEDIA AND TECHNOLOGY TO TEACH MATHEMATICS AND SCIENCE: RESEARCH-BASED PROFESSIONAL DEVELOPMENT MATERIALS

Karen Norwood, North Carolina State University, USA

The ultimate goal of this project was to have a new crop of teacher candidates finish their undergraduate teacher education programs with a full understanding of the interconnections between mathematical scientific principles. It is the intent of this project to supply preservice teachers with the equipment and knowledge of how to use the latest equipment that makes real-life data collecting and computational explorations routine. This was accomplished by incorporating the use of multimedia and technology in the classroom in an effort to actively involve students in an integrated, reformed, technology-based, visual instructional model. Through the use of mathematical modeling and scientific inquiry, the tendency to teach each of the disciplines in isolation will be removed. The preservice teachers will be prepared for effective instruction in the scientific/information based twenty-first century.

Building the Capacity to Infuse Technology in K-6 Classrooms: A Training Model

Blanche O'Bannon, The University of Tennessee, USA; Rachel Vannatta, Bowling Green State University, USA

A recent effort that enhanced university/K-12 school partnerships is Project PICT (Preservice Infusion of Computer Technology). This project, piloted in 1999-2000, and funded by the U.S. Department of Education, used a team approach to promote the infusion of technology in the teacher education and K-6 curricula. This paper will describe the Technology Training Model design, implementation and results collected from participants regarding their perceptions of the model. In addition, a lesson library of technology rich lesson plans, developed by K-6 teachers and preservice teacher teams, and artifacts will be shared. Findings from this pilot study determined the design of the Technology Training Model adopted for the three year Implementation Project, now underway.

Netseminars: A Strategy for Team-Based Action Research

Gary Obermeyer, Learning Options, USA; David Gibson, Vermont Institute for Math, Science, & Technology, USA

Professional Development School (PDS) partnerships offer a powerful leverage point for the improvement of student learning in the K-12 sector and a unique opportunity to experiment with new forms of online learning for the adults who work in and with schools. In this paper we present lessons learned in the design and delivery of online courses to teacher educators, classroom teachers, support personnel, and student teachers associated with the Virtual Professional Development School Consortium. We describe the NetSeminar model that is evolving through this work, and consider strategies and implications for replication.

Multi-media Approaches to Teacher Continuing Professional Development: Dealing with Disruptive Pupils

Jim O'Brien, The University of Edinburgh, UK; Tony van der Kuyl, The University of Edinburgh, UK

Concerns about how teachers deal with disruptive pupils led to the Scottish Executive funding the development of a CDRom to be used for teacher professional development. The Project involved literature searches, field research and dialogue with teachers in schools to identify a range of scenarios and how they were best dealt with practically. The results and optimum approaches suggested on the CDRom are treated as problematic with users being presented with a range of interactive situations in video/audio and text. Teachers are encouraged to review and develop their own skills and school policy and are provided with exemplars and additional references for consideration.

Distance Learning: Effective Strategies for the Information Highway

Sara Olin Zimmerman, Appalachian State University, USA; Melanie Greene, Appalachian State University, USA; John Tashner, Appalachian State University, USA

This study was created to fill a void in the knowledge of instructor behaviors, effective instructional strategies, assessment measures and the overall effectiveness of learning in the distance education classroom from the student's perspective. Specifically, this study had graduate students evaluate three professors in three different courses during a fifteen-week semester while teaching in synchronous learning environments. Two of the instructors conducted classes at two sites simultaneously and the third conducted a three site class. At the end of the fifteen weeks, students in all classes were surveyed. All classes were comprised of graduate students who were practitioners in various fields of education. The most used strategies were lecture, group discussion, and cooperative learning. The most effective strategy was noted by students as cooperative learning, followed by group investigation, and presentation. On the open-ended questions, students concurred that a plethora of teaching strategies was employed to engage learners.

Continuous Zoom applied to texts

Francisco Oliveira, Universidade de Fortaleza, Brazil; José B. Silva, Universidade de Fortaleza, Brasil

The amount of text that we are required to read in the present days is amazing. One of the reasons for a poor performance of electronic text systems may result from the fact of users to avoid reading the whole text and make decisions mostly based on their headings (Fox, 1992). Aiming to minimize this problem, we have developed a computer-based tool for continuous zoom interfaces (graphic interface that allows a text to be continuously magnified of decreased). Prior to displaying the text, this tool performs a previous analysis of the text, taking into account its grammatical classification. Then, the text is displayed in its most condensed format and lowest zoom level, where only the most important words are shown. For that, the tool uses the artificial intelligence technique (pattern recognition). The text is then displayed in its most condensed format and lowest zoom level. As zoom increases, more elements of the text become visible. It should be highlighted that the tool deals with language "traps" and whenever the pattern recognizer fails to classify a certain word, it makes that word visible in its most reduced zoom format.

Electronic Portfolios: Developed by Preservice Educators to Show Teaching Skills and Philosophies to be Used by Future Employers

Roger L. Olsen & David H.Dimond, Brigham Young University, USA

This paper is a report on the work that has been done by two undergraduate cohorts in the David O. McKay School of Education. Approximately thirty students are formed into a cohort at the beginning of their junior year and remain together while they complete their methods courses and teaching practicum. All students in the cohort begin creation of their electronic portfolio as they come into the program. Electronic portfolios have been created and analyzed for the purpose of helping preservice teachers formulate and articulate their beliefs regarding the education of elementary students, and to collect evidence of planning, management, teaching strategies, and assessment that would be in harmony with those beliefs. This departure from traditional paper portfolios utilizes video clips of students' teaching, other visuals, written plans, and assessment to show their teaching abilities.

Engaging Learners with Technology: An Innovative Professional Development Model

Richard Oostenink, Van Andel Education Inst., USA; Matthew Burns, Van Andel Education Inst., USA; Margot Williams ,Van Andel Education Inst. ,USA

The goal of this learning experience is to share an instructional technology integration model designed to help educators develop and implement learning experiences that invite and engage students to construct knowledge and to make meaning of their world. Essential to ensuring the success of this professional development program is providing a cadre of foundational tools and strategies. Instructional technology, the digital medium, is one such tool that can provide students and teachers a powerful resource and support in the learning process.

The Identification of Opinion Leaders within the Elementary School

Susan O'Rourke, Carlow College, USA

This study focused on the identification of opinion leaders in the elementary school. The intent was to determine the extent to which opinion leaders exist in the elementary school. Three methods were utilized to identify opinion leaders within the school social network. They included self-designation, key-informant and sociometric techniques. Results of these methods were combined to identify teachers viewed as opinion leaders by their teacher peers. Fifteen of the 117 teachers included in this study were identified as opinion leaders. Three specific areas were addressed: 1) technology, 2) curriculum, and 3) school policy. Opinion leadership was compared across these areas to determine relationships. The findings reveal that teacher opinion leaders exist in the elementary schools included in this study. Two of the fifteen teacher opinion leaders were part of the school's formal structure (department heads, head teacher). Conversely, thirteen of the fifteen teacher opinion leaders did not carry formal designation as a leader in the school system. These teachers seem to constitute an informal leadership structure within the elementary school studied. This presentation will explore the implications of these findings on the diffusion of innovative instructional technologies into the classroom.

Preparing Teachers to Succeed in Online Professional Development Courses

Susan O'Rourke, Carlow College, USA

Future teachers will be able to take advantage of professional development courses offered in an on-line format. Specific skills are necessary to learn effectively in this new environment. How can we prepare future educators to be successful with this innovative delivery of instruction?

Coexistence of Technology and Healthy Active Lifestyles

Judith Oslin, Kent State University, USA; Connie Collier, Kent State University, USA

Intended audience will be teacher educators or curriculum specialistics with moderate technology expertise. A digital video case will be presented to illustrate the primary pedagogical strategy used to advance a healthy active lifestyle curriculum.

Examining pedagogical trends within a graphing calculator environment: An analysis of pre-service teacher perceptions

Elliott Ostler, University of Nebraska at Omaha, USA; Neal Grandgenett, University of Nebraska at Omaha, USA

This paper summarizes the findings of a research study designed to collect pre-service teacher perceptions on factors relating to the use of graphing calculators in the secondary math classroom. The study was designed as a way to help improve instruction in university mathematics methods courses. Data collected as part of the study addresses questions of how to overcome barriers of infusing graphing calculator technology in secondary math instruction, and how to create modeling and problem solving oriented activities that use graphing calculators, but still support a traditional textbook based curriculum. Results from the study suggest that greater empahsis on fostering creativity should considered in mathematics methods courses. The target audience for this research paper include pre-service teacher educators in mathematics and science.

Teacher and Developer: A Compromise for the Creation of CSCL Applications

César Osuna, Universidad Autonoma de Guadalajara, México; Yannis Dimitriadis, Universidad de Valladolid, Spain; Alejandra Martinez, Universidad de Valladolid, España; Rocio Anguita, Universidad de Valladolid, España

In this paper we present a methodology that reduces the level of complexity when analyzing, designing and evaluating technology-based collaborative learning applications. Its main characteristics are the agreement or compromise reached by teachers and developers in the creation of those applications and the interaction between both roles. The above-mentioned methodology is based on iterative and participative analysis, progressive design and collaborative evaluation. The analysis is performed by means of the presentation of a series of five templates that comprise and model the domain of a collaborative learning situation and Design is supported by a class model. The validation process is attained through usability-based techniques. The methodology is part of the DELFOS project (A Description of tele-Educational Layer Framework Oriented to Learning Situations).

Web-based Instruction: What should we know?

John R Ouyang, Kennesaw State University, USA; James E. Yao, Texas A&M University-Commerce, USA

Web-based instruction is the latest development of distance education, which has become an extremely important part of instructional technology. Web-based instruction has commonly adopted by universities and schools to deliver courses on line. Challenged by this advanced instructional technology, teachers will ask what we should know about it. The answer is that he or she should be knowledgeable of this advanced delivery method. He or she must be a life-long learner and be willing to face the challenge of being accountable for student's learning achievement. To obtain an effective web-based instruction, specific and clear instructional objectives are critical keys, strategic instructional time management and flexible collaborative learning environment lay down the foundation, and multiple means of evaluation guarantee the high quality of instruction and successful learning.

Multimedia in Chinese Elementary Schools

John Ronghua Ouyang, Kennesaw State University, USA; James E. Yao, Texas A&M University-Commerce, USA

Multimedia describes any system that unites two or more media into a single product or presentation. Along with the increasingly developed computer technology, it is believed that multimedia is the best single set of technologies to promote among teachers to improve the way they educate students. Facing the challenge of large-sized classes and lack of multimedia resources, Chinese teachers have made an impressive progress in using multimedia in their classrooms. They are taking the advantages of national centralized curriculum, design and develop multimedia courseware to accompany with the textbooks. Collaborating with media specialists, they have been directly involved in multimedia courseware development. Supported by administrative bodies, they participate in training, enrich their own technological skills, and utilize multimedia to improve teaching and learning. The schools, like Danyang Experimental Elementary School, Yangzhou International Elementary School and Nanjing's Beijing East Road Elementary School are setting up a good start, although there still exists a great unbalance in utilizing advanced computer technology among Chinese schools and teachers.

Scientific and Technology Learning: Enhancing the Attitudes Toward Technology for Middle School Girls

Charlotte Owens, The University of Louisiana at Monroe, USA; Dale Magoun, The University of Louisiana at Monroe, USA; Virginia Eaton, The University of Louisiana at Monroe, USA; Kim Taylor, The University of Louisiana at Monroe, USA

Middle school girls, selected from several rural and urban school districts in northeast Louisiana, participated in a three-week program at The University of Louisiana at Monroe (ULM). Pre and post-attitude surveys as measured by the Computer Attitude Questionnaire were compared to assess the effectiveness of the program. The analysis measured the effects of attitude changes in the following categories: interacting with the WWW, a word processor, a database application, and e-mail. Significant changes in attitudes in three of the four categories were observed. Positive attitudinal changes were observed in the areas of the WWW, word processing, and e-mail.

Enhancing Educators' Computer Learning with the Emerging Technology

Alex Pan, The College of New Jersey, USA

With the emerging technology highlighting hypermedia and the Internet, educators are finding ways to modify the traditional ways of teaching and learning. The need of infusing the Web in education is evident in two surveys of our college students and faculty members as well as a result of a national survey of teachers. To fully maximize the power of the Web to enhance instruction, this paper presents a working model detailing related issues and experiences in a few computer courses, based on a three-level Delta learning theory, containing: (a) technology used as originally intended; (b) technology applied in new ways; and (c) technology as a necessary component of any application. This paper also discusses the various ways in which technology can contribute to better instruction, inspiring students to learn through working cooperatively and collaboratively.

Teachers' Perception about the Text-to-Speech Technology

Alex Pan, The College of New Jersey, USA

This paper will first describe the potential applications of the text-to-speech (or synthetic speech) technology. The paper will further explore the inservice and preservice teachers' experiences with and perceptions about this technology. A study was conducted to investigate teachers' use of this technology, and their perceptions about this technology before and after they received some instruction of innovative ways of using it. The study also compare teacher's attitudes about the usefulness of such a technology with other non-school people.

Preparing Teachers for the School of the Infomation Society in Greece

Giorgos Papadopoulos, Hellenic Pedagogical Inst., Greece; Michalis Karamanis, Hellenic Pedagogical Inst., Greece; Barbara Ioannou, Hellenic Pedagogical Inst., Greece; Eleni Houssou, Hellenic Pedagogical Institute, Greece

Hellenic Pedagogical Institute is implementing a large-scale national teacher-training project. The project aims to expand teachers' understanding in Information and Communication Technologies (ICT) and to equip them with the necessary knowledge and skills in order to support their efforts in utilising ICT effectively to teach particular subjects. Central issue of the design of the project is its flexibility to accommodate the various professional needs, background knowledge and skills, learning styles and inclinations of the teachers. The training process is totally decentralised, transferring to the schools the responsibility for the selection of the training model and the training providers. Final target of the project is the establishment of a life-long training mechanism based on the operation of sustained learning communities around the country. In this paper the design principles as well as the implementation process of the project are presented.

IT Practice from Theory. The Need for a New Paradigm

Nigel Parton, University of Edinburgh, UK

IT is seen as having the power to transform teaching and learning. Extensive commitments have been made to its use throughout education. In some ways it has been successful but it has not always achieved its intended aims. It can be argued that this is because its introduction and implementation has not been based on an appropriate pedagogy. IT's power renders aspects of existing understandings obsolete. What is required before we can be truly successful is a new paradigm. Within the area of electronic communication and email a social constuctivist position can illuminate our current position and help show how best to use the technology to support teaching and learning in undergraduate degree programmes in future. This paper is intended to be of interest to individuals involved in initial teacher education.

The Effect of Multimedia Training on Teacher-Centered Vs. Student Centered Classroom Behaviors

Raymond Pastore, Bloomsburg University, USA

As we enter the 21st century, the questions remain: Are teachers creating active learning environments that enable student to become independent learners and creative problem solvers? One tool that helps teachers shift the control of learning from teacher to students is the use of multimedia in the classroom. Multimedia can motivate students to explore new learning environments through research, collaboration, and problem solving. Students can gather information from online resources and create interactive presentations that combine text, graphics, sound, and digital video. In order to integrate multimedia into classrooms, students and teachers must learn both the technical and application nature of multimedia programs. One of the problems with PowerPoint and other multimedia programs is that teachers have the tendency to use these programs to reinforce their presentations. The result is the reinforcement of teacher-centered behaviors. In this study, 15 teachers from one school district representing various levels from K to 12, enrolled in a one-credit graduate course titled "Instructional Applications of Multimedia Using PowerPoint." The question asked in this study was "Does the introduction of multimedia training to teachers and students help shift classroom learning from teacher-centered behaviors to student-centered behaviors?"

Virtual Facilitation: Developing and Managing Relationships in Virtual Teams

David J Pauleen, Victoria University of Wellington, New Zealand

The use of virtual teams in all areas of education is growing. They can form critical parts of distance education programs, collaborative research projects and joint-management schemes. Research shows that the development of personal relationships between team members is an important factor in effective working relationships in virtual teams. This paper reports part of a grounded action research study of seven virtual team facilitators in New Zealand. It will specifically look at how virtual team facilitators use electronic communication channels to build relationships with their virtual team members. The findings suggest that some electronic channels are more effective than others in building relationships and conclude that facilitators need to strategically use the channels available to them to effectively build relationships.

Digital Divide in Schools: We Can Make a Difference

Tamara Pearson, University of Florida, USA; Colleen Swain, University of Florida, USA;

Overcoming the issues surrounding the Digital Divide often appears to be insurmountable. However, in our recent examination of 28 research studies and reports we found the emphasis to frequently be on matters of access and not equity in the learning environment. The studies dealing primarily with access show that the gap between socioeconomic groups is declining. Yet, access to computers does not provide equitable learning environments. Findings from the literature we examined indicated three primary areas that influence the digital divide in the school system. These areas are frequency of use, the computer experience of students, and technology training for teachers. This session will address, in detail, each of these specific areas. The encouraging aspect of our review of the literature is that teacher educators can have a positive influence on these areas. We can make a difference in the digital divide in the school systems.

Working with Urban Schools Across the Digital Divide

Alec F. Peck, Kate Bielaczyc & Melanie Goldman, Boston College, USA

This presentation addresses some of the issues which one university encountered when it collaborated with 3 disadvantaged urban schools as part of a PT3 project. Using a case study format, we detail many of the obstacles which were faced by this partnership including hardware availability & maintenance, wiring in older buildings, threatened teacher strikes and work slowdowns, changes in delivery schedules, prioritization of schools within the district for various types of support, and levels of approval needed for changes to take place. What the university ultimately needed to supply and how this partnership became part of a larger outreach to the schools and community helps to describe the special challenges faced when working on technology partnership issues in social environments of this type.

The Enhanced Instructional Presentation (EIP) Model

Tim Pelton, Brigham Young University, USA; Leslee Francis Pelton, University of Victoria, Canada

In this document we describe the Enhanced Instructional Presentation (EIP) model for the development of educational hybrid linear/hypermedia presentations. Our proposed EIP model addresses the learners' needs for organized and synthesized content while providing for individual differences in background experience, learning orientation, and cognitive abilities. The EIP model is an instantiation of van Merrienboer's 4C/ID model (1997).

Effective Use of Technology in a Distance Education Program

Jane Pemberton, University of North Texas, USA; María Victoria Pérez Cereijo, University of North Texas, USA; Tandra Tyler-Wood, University of North Texas, USA; Mark Mortensen, University of North Texas, USA

The University of North Texas Educational Diagnostician Program has implemented effective uses of technology to help address the critical need for diagnosticians in the Dallas/Ft. Worth Metroplex and surrounding rural areas. Students in the Metroplex often deal with traffic back up, while students in rural areas may need to drive long distances. Technology can assist in meeting the needs of these two distinct student populations. The challenge for instructors in the program became how to use technology to support student learning without compromising the requirements of a certification program that includes a rigorous state exit examination and a high level of expertise on the job.

The Use of Two-Way Audio Video at the University of North Texas As a Tool for Practicum Supervision

Jane Pemberton, University of North Texas, USA; Tandra Tyler-Wood, University of North Texas, USA; María Victoria Pérez Cereijo, University of North Texas, USA; Joyce Rademacher, University of North Texas, USA; Mark Mortensen, University of North Texas, USA

One of the challenges of course delivery at a distance is determining an effective method to conduct practicum supervision. In the past, educators have used a variety of strategies to observe practicum students completing their field work. On-site supervision often required extensive travel for faculty or hiring adjuncts to conduct supervision. The University of North Texas Educational Diagnostician Program is involved in a research study using EnVision, desktop conferencing software developed by Sorenson, Inc., to supervise graduate students enrolled in an advanced practicum. This paper assesses the effectiveness of the EnVison System as a tool for monitoring practicum students in the Educational Diagnostician Program.

Implementing Web-Based Portfolio Assessment in a Graduate Instructional Technology Program

Melissa E. Pierson & Michael Rapp, University of Houston, USA

Web-based portfolios are a solution to presenting learning in our Masters program because they allow students to play a key role in directing their own learning, to demonstrate creative design, and to conveniently access work on any platform. Students store learning artifacts on a department server, and confidentiality is guaranteed through a Web-based form that automatically enables password protection. New students take a required course to learn about technical procedures related to maintaining the portfolio, as well as strategies for selecting portfolio items and for composing personal reflections on their work. Students review and reflect on their own learning during each course so that they will have a clear timeline of their own learning. As students' understandings mature, they create connections among discrete learning artifacts, designing various interfaces to customize the presentation for multiple audiences. During their final semester, students review the entire portfolio to select items that demonstrate achievement of program objectives and write reflections to accompany each item. Students will compose a summative "epilogue" as one part of their comprehensive exam. Despite some anticipated challenges, initial informal feedback from students is positive, so we remain committed to further developing our portfolio assessment process.

A School-University Partnership Model for Developing Student Technology Leaders

Melissa E. Pierson, Sara McNeil & Bernard Robin, University of Houston, USA; Kathy Booth, Spring Independent School District, Texas, USA

Multimedia Masters is unique a school-university partnership of student "consultants," teacher "clients" and university "experts." The year-long project begins with a development day to collaboratively set goals for the year, and four remaining sessions, two on the university campus and two at the district, assist students with meeting these goals. Each session focuses on developing technical, pedagogical, mentoring, and reflective skills. At the end of the project, students present their finished multimedia projects to parents and school administrators. Year 1 achievements include students learning to communicate more effectively, think critically, and reflect upon themselves as learners, in addition to increased technical skills. Teacher clients expressed increased interest in using technology both personally and within their curriculum. Challenges during Year 1 and areas to improve for Year 2 involve student time commitments, more effective teaching of the teacher clients, improved communication with the district technology team, and more effective structuring of session activities.

Cognitive Design of Instructional Databases

Michael S. Pilant, Texas A&M University, USA; Robert J. Hall, Texas A&M University, USA; R. Arlen Strader, Texas A&M University, USA;

One of the fundamental problems in distance delivery of educational content is to determine the amount of learning that is taking place. Merely delivering content is not enough - some form of assessment (at a distance) is necessary. Traditional methods for assessing students' understanding of course content (e.g. multiple choice problems short answer problems) can be enhanced and supplemented through the use of computers and information technology. Timing and tracking information collected in real time, coupled with information from interactive, specially designed Java applets and scripts, can be used to supplement traditional assessment methods by capturing information about students' decision-making processes. This paper describes how to develop databases and assessment methods based on cognitive models of information processing, to better interpret performance data and more effectively deliver instruction at a distance.

The Relationship between Leadership, Self-efficacy, Computer Experience, Attitudes, and Teachers' Implementation of Computers in the Classroom

David Piper, Mount Union Area School District, USA; Wenfan Yan, Indiana University of Pennsylvania, USA

A study of 160 teachers from eleven school districts revealed that certain factors may influence their practices of using computers in the classroom. Three computer uses were identified by elementary and secondary teachers as ways computers might be used in the classroom. The variables, experience and knowledge, perception of leadership, self-efficacy, and attitudes toward computers were tested to determine if they had an influence and a relationship to teachers' use of computers. Aspects of all four variables demonstrated significant positive influence on all three-computer uses. Significant relationships were found between the computer uses and self-efficacy, experience and knowledge, professional development, perception of leadership, and gender. Self-efficacy was found to have a significant relationship with clerical/management and academic use of computers, while experience and knowledge, professional development, and perception of leadership demonstrated a significant relationship with advanced computer use. Hierarchical regression models demonstrated that in lower computer uses such as clerical/management use, self-efficacy was the variable of significance. As the computer uses moved to advanced use, the variables of experience and knowledge, professional development, and leadership demonstrated significance. This demonstrates that as teachers use of computers in the classroom changes the significance of experience, knowledge, professional development, leadership, and self-efficacy also changes.

A GFearless Approach to Technology Integration in the Elementary Classroom

Joyce Pittman, The University of Cincinnati, USA; Sheila Seitz, The University of Cincinnati, USA

Taking on this challenge, a professor and graduate student at a major urban university with over 40,000 students and 600 preservice teachers reorganized a traditional instructional technology course. The prevailing purpose of the course was not to have students become "technology proficient" in every application, but that preservice teachers in the class develop a "fearless approach" to learning new technology. Students observed the differences in learning with technology within both types of pedagogy. Students utilized the learning plan model called "ASSURE" to examine effective planning for integration of technology.

Empowering teachers through cognitive literacy skills development: Implications for restructuring teacher education programs through technology infusion

Joyce Pittman, University of Cincinnati, USA

Technology has opened Pandora's Box in many respects. Perhaps one of the greatest challenges is building college students' advanced literacy and technical skills, especially preservice teachers. This aspect of technology in education is raising unprecedented levels of new concerns for educators. It has presented educators and policymakers with problematic decision-making about how to attract, sustain, and prepare students for careers and living in an increasingly technological education society (Prager, 1993). The Comprehensive Educational Restructuring and Technology Infusion Initiative Pt3 Project is addressing the problem (CERTI2 2000). Educators need direction for retooling to restructure instructional approaches to help entering students construct new knowledge and skills. This PT3 project is developing new directions for a teacher education program by infusing an online and CD-ROM model for assessing and developing new technology skills (Lieberman & Linn, 1991).

A New Approach - Situation Learning (SL)

Maja Pivec, Graz University of Technology, Austria; Hermann Maurer, Graz University of Technology, Austria

The presented solution offers a new approach to knowledge module presentation that is different from the majority of presently used approaches. The interactive component of the SL approach increases students' involvement and motivation for learning. Learners can experiment and investigate within the 'virtual world' of the SL knowledge module. Such experimenting and interacting with different knowledge presentations makes it possible to construct own specific knowledge thus making the factual knowledge more permanent.

InTime: A PT3 Catalyst Grant

Masha Plakhotnik, University of Northern Iowa, USA

The purpose of InTime (Integrating New Technologies Into the Methods of Education) is to provide the necessary resources for methods faculty to revise their courses, model technology integration, and require preservice teachers to integrate technology, along with components of quality education, in their lessons and units. This project is developing online video case studies to be utilized in methods courses that include videos of best practices showing scenarios from PreK-12 classrooms where teachers are integrating technology in a robust educational environment. The participants will have a chance o view and critique one of the online case studies of best practice in technology integration and quality education via video streaming. The issues addressed in this session will be interesting for deans, administrators, faculty, and decision –makers of all expertise levels.

INTIME (Integrating New Technologies into the Methods of Education): A PT3 Catalyst Grant

Masha Plakhotnik, University of Northern Iowa, USA

Reports from the National Council for Accreditation of Teacher Education (NCATE) and the Office of Technology Assessment (OTA) have called attention to existing deficiencies in teacher preparation programs in preparing preservice teachers to use technology effectively in the PreK-12 classrooms. Technology and the New Professional Teacher (NCATE, 1997) reports that preservice teachers should be required to apply technology in their courses and should see faculty model technology use in the classroom. In order for undergraduate students to learn to use technology when they teach, it is vital that university teacher education faculty change the way they prepare teachers to use technology.

InTime (Integrating New Technologies Into the Methods of Education): A PT3 Catalyst Grant.

Masha Plakhotnik, University of Northern Iowa, USA

The objective of this session is to consider how to utilize online video case studies of PreK-12 teachers using technology in a robust educational environment in preparing tomorrow's teachers to use technology.

Changing with the Times - The Evolution of a Faculty and Staff Web Development Program

Elizabeth Poff, St. Philip's College, USA

Educational institutions have a responsibility to provide faculty and staff adequate training in web development so that faculty, staff and the institutions they represent can communicate their ideas, information, course content and activities over the Internet. The key to successful implementation is to deliver the training in such a way as to make faculty and staff want to participate in the training, as well as to make the training relevant, and to encourage continual development once the training has been given. St. Philip's College has structured its curriculum to facilitate the adult learner in such a way as to remain flexible enough to meet the emerging needs of each individual interested in pursuing web development. Discover how the web development program at St. Philip's College has changed with the times, and has evolved to remain relevant and valuable to those it serves.

Putting the Pieces Together: Systemic Change for Technology Integration in Teacher Education

Joseph L. Polman, University of Missouri-St. Louis, USA; Jan Mastin, University of Missouri-St. Louis, USA; Katherine Beyer, Educational Visions, USA; Virginia Navarro, University of Missouri-St. Louis, USA

Today's schools must prepare students to use computer-related technologies well in a range of tasks. For K12 schools to prepare their students, colleges and universities must prepare teachers to integrate technologies well for learning. Thus, reform in teacher preparation must become a high priority. Research has shown that lasting reform must be systemic—in other words, the parts of an educational system must synergistically support one another. In efforts to reform teacher education at an urban public university, we have tried to ensure that policy, curriculum, field experiences, and faculty teaching practices all support the meaningful integration of technology. Our efforts to sustain systemic change along these lines have been greatly enhanced by a "technology and learning center" and a Preparing Tomorrow's Teachers to Use Technology grant. We show through a case study and vignette how these pieces fit together for reform towards the integration of technology in teacher preparation.

TEACHING WITH TECHNOLOGY: STAFF DEVELOPMENT THROUGH A TURNKEY TRAINER MODEL

Carole Polney, West Babylon Schools, USA; Patricia Squiciarini, West Babylon Schools, USA; Richard Walter, West Babylon Schools, USA

Using a PowerPoint presentation, the Associate Superintendent, a fifth grade teacher and a high school English teacher will demonstrate the key ideas and themes of the staff development Turnkey Trainer Model and its applications and benefits within the school district. We will discuss the "administrative" role of the model (budget, implementation of the turnkey trainers—choosing the "Teacher Technologists") and will present the trainers in action. We will explain how the staff development sessions are conducted; how encouraging reluctant staff builds trust and willingness to try and learn; how continuous support and growth enable cooperation among faculty, as well as between buildings. All presenters will discuss obstacles, challenges and strengths of implementing technology into a school district. The discussion will be supported with handouts of successful staff development workshops. A question and answer period will follow the presentation.

Improving the Use of Media in the Classroom

Sal Marinello, West Babylon Schools, USA; Carole Polney, West Babylon Schools, USA

Emerging technologies continue to change and improve the landscapes of our classrooms. Computers, Internet, and video have played a large role in changing how students learn. One way to integrate the use of emerging technologies is to enhance older and proven methods of instruction. Schools have created video libraries to augment and improve student retention for years. Now, using a combination of computer software, high speed network access and large screen classroom monitors, teachers can quickly access and control a large cadre of video media, without the past burden of hardware set up and scheduling. ETR, Educational Technology Resources, Inc., provides a software product to assist teachers in using media in the classroom with ease—the product MediaMaster. Whether traditional media or digital media, MediaMaster allows teacher to rapidly deliver video content with ease and confidence.

Rethinking Teaching and Learning in the Age of the Virtual-Classroom

Pithamber R. Polsani, University of Arizona, USA

The objective of this paper is to address the question of the changing conception of knowledge at present and the need for institutions of higher learning and educators to reconceptualize the notion of knowledge and learning in order to keep in line with the changes in the society. Furthermore, I will argue that it is necessary to develop teaching methodology that can function effectively in the new technologically-grounded paradigm that is evolving in the realm of the social and the economical on a global scale today. This paper is based on my experience in developing, designing and delivering a web-based Spanish Civilization course at the University of Arizona, Tucson.

Developing Techno-Ssavvy English Language Arts Teachers: From Blank Screens to Full Directories

Carol Pope, NC State University, USA; Judy Lambert, NC State University, USA; Julie Weber, Wake County Schools & NC State University, USA; Amelia McLeod, NC State University, USA

This session will explain and demonsrate the ongoing process of infusing technology into an English language arts teacher preparation program, along with the research results of a longitudinal study of a cohort of undergraduate students' development as users and implementers of technology in their teaching an learning. The session will include a "model" of infusion as well as examples of the teachers' and students' work in technology.

A Technology Consultant Model Implemented In A Project-Based Pre-Service Teacher Education Program

Anne Porter, Maria Cseh, Ledong Li, John McEneaney & James Quinn, Oakland University, USA

A recent national survey on the preparation of new teachers to use information technology (Moursund, 1999) reports that most college and university faculty do not model the use of information technology skills and most student teachers do not routinely use technology during field experiences. Topp's (1996) also revealed that recent graduates of teacher education programs felt that their preparation for using technology was inadequate because their programs did not include modeling of technology uses in methods and general education classes. Almost certainly related to the problem of limited faculty modeling of information technology in the university setting is the fact that faculty who adhere to a traditional professorial role may intentionally avoid using technology, fearing that it will reveal their lack of expertise and undermine their instructional authority. Moreover, the fear of appearing technologically inept is magnified by the familiarity and experience students frequently have using technology in other settings. Ironically, the very technology skills we hope to develop in students may undermine efforts to introduce new teaching technologies to classrooms by intimidating teachers. The traditional professorial model simply will not work under these circumstances and that, in part, seems to be the reason there is such widespread interest in alternative approaches to teaching with technology (Duffy, & Jonassen, 1992). The professor as a facilitator of learning is one particularly powerful example that has been used with technology-supported case analysis (Cognition and Technology Group, 1990; Risko, 1995) and problem-based learning (Savery, & Duffy, 1995; Barab, Hay, & Duffy, 1998).

Supporting and Evaluating Distance Learning Students' Use of an Electronic Discussion Board

Richard Pountney, Sheffield Hallam University, UK; Alice Oxholm, Sheffield Hallam University, UK

This paper deals with the introduction of an electronic discussion board into a paper-based distance learning phase of a post-graduate diploma in Teaching English to Speakers of Other languages (TESOL). It outlines the thinking behind the implementation of learner support through on-line discussion. The students' messages were analysed and a questionnaire used to examine and reflect on their contributions. Findings indicate that positive attitudes do not automatically result in high level of use and that the factors influencing this are varied. It goes on to describe a second, ongoing phase of implementation that is based on the lessons learned.

The Carrot or the Stick: The Development of Faculty Technology Competencies

Susan M. Powers & Kenneth Janz, Indiana State University, USA

The School of Education at Indiana State University put forth a requirement that all faculty who requested new desktop computers must meet a set of established faculty technology competencies. The goals were to use a velvet glove in order to ensure that faculty can perform the same technology competencies as students, ensure new technologies are used to their fullest, identify those persons who needed training and assistance, and build departmental awareness of potential technology mentors. The competencies are a work in progress that have been ratified by SOE governing bodies, but are still working toward true implementation.

The Uses of Computers For Instruction in the Classroom: A Comparison of Teachers' and Principals' Perceptions

Doris Prater, University of Houston-Clear Lake, USA; Angus J. MacNeil, University of Houston, USA

This study surveyed teachers and administrators in 50 schools in a large school district in South East Texas. The purpose of this study was to compare teachers and principals in their perceived uses of technology for instructional purposes in the classroom. The teachers and principals were asked to rate the extent to which technology is used in their classrooms for the following purposes: a) drill and practice b) problem solving c) world wide web searches d) compositions e) newsletters or desktop publishing. They were also asked to indicate the frequency a typical student uses the computer in their classrooms. The computer was used significantly more often for the lower level skill of drill and practice than for worldwide web and desktop publishing. The principals perceived that students were using the computers more frequently for the higher-level skill of worldwide web use than the teachers reported.

Empowerment of personnel to survive in an IT-enabled organisation and an e-world

Boeta Pretorius, University of Potchefstroom, South Africa

One of the most important success factors of the e-enabled university is IT-skilled faculty and staff. IT alone won't do the job. It needs to be placed in the hands of knowledgeable, skilled and creative people with a clear focus on their job. This applies to both faculty and staff, and not only to IT staff. Personnel need to have general as well as specialised skills, appropriate to their specific roles in the enterprise. Without these skills, technology is often blamed for failures, and the enormous investment in IT will be wasted. Without a paradigm shift in the appreciation and role of technology, it will simply become part of the problem of rising costs, instead of becoming part of the solution.

Designing Accessible Web Sites for People with Disabilities

Robert V. Price, Texas Tech University, USA

In order to make the Worldwide Web accessible to individuals with disabilities and also more accessible for everyone, web developers can follow 14 guidelines provided by the W3C group. This paper summarizes these guidelines and provides suggestions for compliance. Levels of compliance, benefits of compliance, examples of accessible web sites, and an accessible web site template are described.

Extending the learning environment: Potentials and possibilities in web mediated courses

Rose Pringle, University of Florida, USA

Asynchronous learning network utilizes different tools for computer mediated communication. It employs the integration of these tools as a means of slowing down the dynamic face-to-face interactions, characteristic of the traditional classrooms (Nulden & Hardless, 1999), while creating opportunities for the incorporation of a wide range of learning styles. This presentation will include a description of the internet application known as Connecting Communities of Learning (CCL), one program that employed the asynchronous learning tool. I will also share my experiences with the program from the perspective of a learner in a graduate course and as an instructor of two sections of an undergraduate teaching and learning course. Embracing the notions of interaction and co-participation the CCL as a teaching and learning tool offers potentials for changes in education and how we conceptualize learning communities. However, issues such as access, learner-responsiveness to the changes, institutional support and the emerging role of the instructors will need to be addressed.

New Teachers And New Technologies

Zoran Putnik, University of Novi Sad, Faculty of Science, Yugoslavia

A key moment in emancipating the teacher from the physical limitations of the classroom and encouraging a sense of collaboration, cooperation and collegiality would be introduction of principles and responsibilities of electronic collaboration. Teachers have to be introduced to Internet, electronic mail, news-groups, list-servers, bulletin boards and other means. By those, they can act jointly and communicate with colleagues near and far. They should be acquainted to online resources and the means of connecting and using them as well as contributing to them. In this paper, I will try to outline a learning model that will succeed in such education of a teacher.

Effective Online Learning at Western Governor's University

Ian J. Quitadamo & Abbie Brown, Washington State University, USA

Internet-based, distance learning solutions may prove effective in facilitating advanced study coursework for remotely located, place-bound students. However, the conditions for promoting online learning success have not been entirely defined. We present as an example the teaching challenges and benefits of an online graduate-level Instructional Design course for in-service teachers taught through Western Governors University and Washington State University. This paper addresses some of the teaching challenges for this online instructional experience, focusing specifically on how teaching styles were used to build online learning community, to effectively promote productive and satisfying learning interactions, and develop student problem-solving and critical thinking abilities. Also discussed are those instructional design strategies that were repeatedly employed in multiple course sections to increase online student engagement, critical thinking, and enhance student learning. This paper should prove of interest to anyone currently developing or delivering online instruction.

Technology in Early Childhood: A Model for Teacher Training

Patricia E. Ragan, Arthur Lacey & Theodor Korithoski, University of Wisconsin-Green Bay, USA

Changing perspectives for the use of technology in early childhood education lack explicit standards, based on a sound theoretical and empirical foundation, to generate changes in teacher practice and student learning. Funded by the university system and working in partnership with PK-16 area school districts and community-based childcare centers, this project developed technology standards for young children and the teachers who work with them and used those standards to develop competencies that define what young children and their teachers need to know and be able to do. These competencies were then integrated into pre-service teacher coursework and piloted in a workshop series offered at a local childcare center. The data collected from this pilot is now being used to develop a workshop series for early childhood professionals in the region to be applied collaboratively in early childhood settings. Anticipated outcomes include changes in teacher beliefs about and skills in technology, technology-enriched early childhood classrooms, more equitable access to technology for all young children, greater continuity between the preschool and elementary years, and enhanced student achievement.

Teacher Preparation and Online Learning: Is It Working?

Patricia E. Ragan, Arthur Lacey & Theodor Korithoski, University of Wisconsin-Green Bay, USA

The collaborative exploration, development and implementation of the use of web technology in the UW-Green Bay Professional Program in Education for early childhood students is discussed. This paper begins with a discussion of the origins of this innovative response to the process of teacher preparation, beginning with the award of a 3-year FIPSE Grant to support the vision and ending with the incorporation of distance learning to deliver course content and class contact hours. An overview of the technological issues, problems and glitches is shared, from institutional resistance to software incompatibility to instructional design, as well as the solutions that were used to address them. A summary of what is working, what is not, and why is presented and recommendations for what needs to be done next are made.

First Things First: Addressing Teacher Concerns Toward Technology

Glenda C. Rakes, The University of Louisiana at Monroe, US; Holly B. Casey, The University of Louisiana at Monroe, US

Teacher technology training frequently produces less than desirable effects in part because training is often viewed as the presentation and/or demonstration of new skills rather than as a behavior change process. As a result, the effect of technology on classroom instruction frequently fails to live up to its potential. This presentation will present the results of a study which investigated the concerns toward the use of instructional technology of 659 purposively selected PK-12 teachers using the Stages of Concern Questionnaire. Results indicate a high Stage 2 for the group profile which indicates an intense personal concern about instructional technology and its consequences for the respondents on a personal level. Though these concerns reflect uneasiness regarding technology, they do not necessarily indicate resistance to technology. The second highest concern was Stage 5, reflecting a desire to learn from what other teachers know and are doing. The low stage of concern for the aggregate data was Stage 4 which indicates the respondents have minimal to no concerns about the relationship of students to the use of the innovation. The presentation will be of interest to teacher education faculty and PK-12 faculty who provide technology training and support for PK-12 teachers.

Articulating Technology Needs To Administrators And Policy Makers

Thomas Rakes, The University of Louisiana at Monroe, USA; Glenda Rakes, The University of Louisiana at Monroe, USA;

There is a continuing disconnect among those who recognize the value and growing needs associated with technology-related innovation and campus administrators and policy makers who are in charge of overall budgeting and resource allocation. How does one communicate effectively within the context of the administrative framework of a college or university? When making funding requests to those who may be less familiar with specific aspects of information technology issues, one should 1) make data-based requests, 2) speak from a global perspective, and 3) consider administrators' priorities.

Technological Tools and Mathematical Guided Discovery

Olga M. Ramirez, University of Texas - Pan American, USA; John E. Bernard, University of Texas - Pan American, USA

Teaching by discovery is probably as old as formal education itself given that its origins can be traced back as far as 430 - 320 B.C. to Socrates and Plato. Nonetheless, teaching by discovery using technological tools such as graphing calculators, spreadsheets, or computer software is a relatively new adventure! The position here, furthermore, is that the process of discovery, guided or otherwise, is just as important as what is to be discovered because learning by discovery promotes learning to discover. The mathematical activity that will be modeled emphasizes the use of technology and promotes active participation in naturally occurring exploratory stages. During the latter phases of the activity, notions of relations (e.g., independent variable, dependent variable, function) begin to become apparent. Consequently, the discovery process, guided by a sequence of instructional moves, elicits specific responses that lead to the intended mathematical discoveries. The authors hope to provide a convincing demonstration that the use of technological tools enhances the teaching/learning process and facilitates discovery.

Interactive Training Video and Software (For Faculty & Staff Development)

Imtiaz Rasool, British Education & Training Systems (BETS), UK & Pakistan; Nadia Imtiaz, Misali Public School,Pakistan

A Training video supported with a software is developed to train Faculty and staff, for effective use of new technologies and to improve the standard of delivery and instruction tools.

Revolution at Hand: Handheld Computers in the Science Classroom

Beverly Ray, University of Alabama, USA; Anna McFadden, University of Alabama; Susan Patterson, University of Alabama, USA; Vicki Jenks, Westlawn Academy for Math, Science, and Technology, USA; Martha Hocutt, Westlawn Academy for Math, Science, and Technology, USA

This session will cover major features of various hand held devices, including their use as grade books, information gathering and collection devices, and as communication devices. An overview of available educational software will be given along with a brief demonstration of how to locate, download, and install software on a handheld device. Leave the session with ideas, activities, and examples for using hand-held devices in the science classroom.

Electronic Portfolios: Technology Integration and the Preservice Teacher

Beverly Ray, University of Alabama, USA; Vivian Wright, University of Alabama, USA; Stallworth Joyce, University of Alabama, USA; Elizabeth Wilson, University of Alabama, USA

With the implementation of national standards addressing technology, teacher preparation programs are faced with the issues of preparing teachers to effectively use and to seamlessly integrate technology across content areas. A team teaching approach at a southeastern university required its secondary methods students to produce electronic portfolios during spring 2000. The teaching team consisted of secondary education language arts and social studies faculty, instructional technology faculty, and graduate students from both disciplines. This effort of modeling technological best practices resulted from numerous team meetings, intensive planning, and consistent project evaluation. The secondary education methods courses at the University of Alabama have traditionally incorporated technology on a limited basis. However, as the result of a team teaching approach and in answer to technology integration needs, the preservice teachers were required to attend technology seminars as part of regular classroom and methods work. Students were evaluated on their electronic portfolios that consisted of websites, digitally edited teaching episodes, databases, concept maps, and more. Through pretest and posttest surveys, the students were assessed on their perceptions of an electronic portfolio's value and their ideas of how technology can enhance teaching and learning in future classrooms. This session will present a discussion of the results from these assessments, procedural details, and the challenges and successes experienced by the teaching team and the students. Examples of student produced portfolios will be presented along with ideas for developing a similar project in a variety of educational settings.

A comparison of preservice, inservice, and non-teacher education majors on technology confidence, ability, and use

Sue P. Reehm, Eastern Kentucky University, USA; Shirley Long, Eastern Kentucky University, USA; JoAnna Dickey, Eastern Kentucky University, USA

This paper describes the findings from a study based on a newly enacted state technology standard for new and experienced teachers. Teacher education students rated their confidence level, ability, and usage on technology areas. A control group of non-education majors was used to determine whether the technology competencies were acquired within the teacher education program or general university requirements. The results of the study were also examined to determine whether there is a progression from juniors to seniors to graduate students, and whether there are specific criteria of the new standard that students have not met.

Open Source and the Diffusion of Teacher Education Software

Herbert Remidez, University of Missouri - Columbia, USA; James Laffey, University of Missouri - Columbia, USA; Dale Musser, University of Missouri - Columbia, USA

Three recent reports, one from the U.S. government and two from European Union related groups, indicate that the open-source software development model is gaining worldwide acceptance. This model provides a means for teacher educators to create software that is sustainable, continuously improving, and sharable. As a result, it can reduce duplicated efforts among PT3 grant recipients and reduce the risk that a project's work efforts will go unutilized when a grant's funding ends. The paper gives a brief overview of what the open-source model is, explains how it can be used to benefit the different stakeholders in a grant funded project, and discusses how it can support the diffusion of technology innovations. The paper concludes with the recommendation that the U.S. Department of Education should encourage the use of the open-source model in all department-funded projects that have a software development component.

Teachers' Perceptions of Technology In-Service:A Case Study

Carl Reynolds, University of Wyoming, USA; Bruce Morgan, University of Wyoming, USA

A series of case study-type interviews were conducted with selected K-12 teachers on their perceptions of technology integration in-service activities in which they had participated. Teachers were selected to represent rural and urban, small to large schools, and a variety of disciplines. The primary goals were to determine the depth and breadth of in-service activities teachers experienced such as variety of computer applications, utility applications versus instructional applications, Internet usage, degree of expertise, and degree of successful implementation developed from the experiences. Teachers reported positive results of in-service in terms of awareness of the technologies available. Often, recent in-service activities were focused on administrative/utility functions rather than instructional applications. One major concern mentioned was that during the in-service activities, teaching strategies and 'hands-on' time were seldom included. Many teachers expressed frustration with the limited time allocated to the topics/skills being taught in the in-service activities.

Taking Language Arts Instruction to the Applied Level Through Integration of Graphic Arts Technology

Christine Reynolds, Rock River School, USA; Carl Reynolds, University of Wyoming, USA

In order to meet a documented need for more advanced ELA (English Language Arts) electives, the secondary ELA teacher integrated graphic arts technology in a new course, Literary Desktop Publishing, to meet advanced students' needs. Students acquired graphic arts communication skills that are currently used in local businesses, and met district ELA standards and benchmarks as well. The course was taught to motivate students to think for themselves, to solve problems, and to read, interpret and apply complex operations in computer applications.

Troubleshooting Windows

Sharon Reynolds, Des Moines Public Schools, United States

This is written to help teachers understand steps which they can take to keep their equipment running longer and better. It will walk them through steps to see if they can troubleshoot their problem on their own or need to send for more help.

Looking Out, Looking In: Technology's Impact on Teaching and Learning

Carole S. Rhodes, Adelphi University, USA

The use of technological advances has been an easy accommodation for some educators. For others, this is not the case. This paper presents the findings of three year research project which explored the integration of technology in graduate teacher education classes and the impact of that on the K-12 classrooms in which these graduate students teach. Some of the issues to be explored are: Does the integration of technology in graduate teacher education classes impact on students practice in K-12 classrooms? How is technology most effectively integrated in teacer education university classes? How is technology being integrated in the K-12 classroom? In what ways can teacher education programs facilitate the integration of technology in K-12 classrooms?

An introductory internet skills program for teacher education: or from practice to theory: a case study

Cameron Richards & Mita Bhattacharya, Nanyang Technological University, Singapore

This case study presentation will report on how the presenters successfully responded to the 'just-in-time' challenge of putting together an inservicing 'introductory technological skills' course for a 'difficult' group of teachers. The particular course which will be the focus of the presentation provided the specific opportunity for the two presenters to bring together their convergent but differing international experiences in teacher education to try and distil the key principles and practical requirements for developing an effective introductory internet skills program. Although many of the students undertaking this course began with little knowledge of computers let alone the internet, they all achieved in a short time (2 hours X 14 weeks) a basic and convergent competency in a range of generic internet skills: internet communications, online information literacy using browsers and search engines, developing animated powerpoint presentations and webpage learnaing resources, and other associated skills like FTPing and scanning graphics. Indeed, some of the initially less confident and even reluctant teacher-learners quickly became adept at using what for them was a completely new medium.

Silk Purses out of Pigs' Ears: The Conversion of Reluctant or Intimidated Students (Especially Teachers) into Keen Users of The Internet in Education

Cameron Richards & Mita Bhattacharya, Nanyang Technological University, Singapore

If 'the internet in education' is framed and conducted strategically with at least a little insight rather than in an ad hoc way, then learners will be more likely to not only forgive you but even thank you for guiding them through the inevitable stage of temporary frustration to the initial steps of self-empowerment. The paper outlines an integrated approach which would not only encourage but actually serve to 'convert' reluctant learners into actual keen users: (a) as a theorization of the presenters' own experiences with teacher education courses; (b) in terms of simple activities involving, say, information literacy and web design linked together to produce an initiatory 'aha' effect of seeing underlying or generic connections between a variety of internet skills, processes and potential educational applications; and (c) with an appreciation of how even 'difficult' students can be most impressive if allowed initiative with their own learning. The paper will further discuss three practical stages in the process of 'internet in education' conversion which also constitute key principles of an integrated theoretical framework.

Integrating Videos Into A Business Calculus Class

Bob Richardson, Appalachian State University, USA; Brian Felkel, Appalachian State University, USA

The idea involves producing videos that are made available to the students through the Internet. This affords the opportunity of unlimited access. The videos must show the students how to use the technology (for example Excel and/or Maple) within the course. The students can view the videos as often as they wish and then practice the concepts on their own. The advantages to course content and time management are obvious. In our presentation we will connect to our web site and show organization of the site. We will also create a video and show how to play it and "hint" it for streaming.

Sequence Independent Structure in Distance Learning

Richard Riedl, Appalachian State University, USA; Theresa Barrett, Appalachian State University, USA; Janice Rowe, Appalachian State University, USA; Rick Smith, Appalachian State University, USA; William Vinson, Appalachian State University, USA

Teacher schedules and commitments make it difficult for them to pursue long term learning environments that help them develop the skills and understandings necessary to exploit the use of technology in their own classes. Therefore, there is a need to understand the role various technologies and formats play in distance learning environments for training and supporting teachers in the field. To explore this issue a 3-D virtual world environment was developed in which to deliver a graduate course on the integration of computer technology into instruction. A study of student participation in this world and their progress toward the stated learning goals was conducted to better understand the potentials of such an environment for the delivery of distance education for teachers and graduate students in education. The context of this study and the initial findings will be presented.

The Implementation and Integration of Web-Based Portfolios into the Proteach Program at the University of Florida

Gail Ring, University of Florida, USA

This paper describes the development and implementation of the electronic portfolio program in the College of Education at the University of Florida. Beginning in the fall of 2000 all students entering the Proteach Program were required to develop electronic portfolios. Prior to this initiative an elaborate infrastructure was designed to support both the students and faculty involved with this innovation. Each student's electronic portfolio is viewed as a dynamic, interactive document that is developed over the student's entire college experience and may continue to develop indefinitely. It will contain illustrations of how the student has met Florida's Accomplished Practices, the student's professional goals and achievements, biographical information, and a personal teaching philosophy. Methods of developing electronic (online) portfolios are shared, ways of integrating these portfolios into practice are discussed, and an illustration of sample contents is reviewed.

Faculty Development - A Comparison of Two Models

Gail Ring, University of Florida, USA; Melissa McCallister, University of Florida, USA; Naglaa Ali, University of Florida, USA;

Faculty development in the college of education has changed and evolved over the last several years. In the beginning, faculty received technical help from the technical support staff, but had little support at the curriculum integration level. In the fall of 1999 the College of Education embarked on a technology training program. This program was offered to all faculty and after completing 16 hours of training the participating faculty members received a laptop computer. This training program was offered through the central academic computing center, a university-wide agency. This program was deemed a great success and the faculty left happily with their new computers. But, what really happened? We found that the faculty did not learn as much as we thought and they thought. A second program was developed. Similarities and differences between the two programs are discussed. Hopefully the experiences and development in this program will help others in the area of faculty development to better train and educate their faculty in technology and enable faculty to embrace technology in new ways.

Instructional Technology: Practical Application Alignment with Theory in Student Teaching Field Placements

Carole Robinson, University of Montana, USA

This case study explores what student teachers learn about practical classroom instructional technology applications within their elementary field placement and any underlying influences on student teachers implementing instructional technologies in the elementary are described along with their cooperating teachers' accounts of factors in the school that either promote or inhibit professional technological growth. Student teacher/cooperating teacher participants were placed into buddy system configurations. These pairings served to investigate a) What effects do instructional technology using educators have on non-instructional technology using educators? And, b) What effects do non-instructional technology using educators have on instructional technology using educators? When looking for ways schools of education can successfully merge instructional technology theory with classroom practice, three themes emerged: a) collaboration and rapport; b) self-directed learning; c) equipment: time and availability. This case study explores what student teachers learn about practical classroom instructional technology applications within their elementary field placement and any underlying influences on student teachers implementing instructional technologies in the elementary are described along with their cooperating teachers' accounts of factors in the school that either promote or inhibit professional technological growth.

A Rubric for Assessing the Interactive Qualities of Distance Learning Courses: Results from Faculty and Student Feedback

M. D. Roblyer, University of West Georgia, USA; Leticia Ekhaml, University of West Georgia, USA

Results of studies of distance learning courses indicate that interactive qualities seem to be a major factor in determining course quality as reflected in student performance, grades, and course satisfaction. That is, the more interactive the course, the more effective it is. However, the field reflects considerable disagreement on what these interactive qualities are and how they should be assessed. This paper offers a rubric to help instructors begin to identify and self-assess these qualities in ways that assist them in improving their distance courses. Included in this paper are: an explanation of rubrics and their uses; a review of literature related to interactive qualities that led to identifying elements for the rubric; a discussion of methods used to gather feedback and revise the interactive qualities rubric draft; and a copy of the revised rubric itself.

Visualize This: PT3 Project InSight Develops Three Resources to Promote Visual Communications

M. D. Roblyer, University of West Georgia, USA; William R. Wiencke, University of West Georgia, USA

As part of its activities funded by the U. S. DOE as a PT3 Implementation Grant, Project InSight, led by a consortium at the University of West Georgia, has three objectives to promote more visual communication of ideas and skill training among preservice students and faculty. These objectives include: (1) expanding a video-based school-to-university network link among six partner school districts and the university; (2) developing a series of video demos illustrating effective instructional uses of adaptive/assistive technologies; and (3) developing virtual reality and 3D environment examples to illustrate diagnostic applications and instructional uses of these emerging technologies in meeting special needs of students with disabilities. This presentation will describe the Year 2000-2001 activities and progress on accomplishing these objectives, and demonstrate the products developed to date for each.

Easy methods and media for creating electronic CDROM portfolios

Desmond Rodney, Florida Atlantic University, USA; Richard Knee, Florida Atlantic University, USA; Ann Musgrove, Florida Atlantic University, USA

This paper seeks to outline a practical solution to creating electronic portfolios using the CDROM, which has traditionally been expensive and inaccessible in educational environments (Barrett: 1994). The process of creating CDROM portfolios was also complex and difficult to learn and to teach. The methods outlined here are in effect easy to learn and to teach. Importantly too, the methods make portability, replication and updating CDROM portfolios easier for students and educators alike. In an educational context CD-R media is preferable because of their low cost. It however means that there needs to be a CDROM creation process that is error free, or at least where errors are kept at a minimum. The process we will outline will eliminate, or at least offset many of the technical problems associated with creating CDROM portfolios. Creating a CD image or ISO 9660 reduces error considerably. Also this approach allows for faster creation of a CDROM portfolio since burning the image to disk is faster than organizing, assembling and burning the files through the CDR software. To make a cd image we use a demo version of CDEveryWhere. Allows you to read the same CD-ROM whether you are on a PC, Mac, or other major computer platform. Almost all computers with CD-ROM drives can read files from an ISO 9660 file.

Implementing a Web-based Middle School Science Curriculum: An Evaluatiuon Report

Stephen Rodriguez & JoAnn McDonald, Texas A&M University - Corpus Christi, USA

The Internet and its associated World Wide Web (WWW) have been marked by phenomenal growth and use in seemingly every aspect of life. The WWW has emerged as an area ripe for development of products that can support educational efforts at all levels. As a case in point, Active Ink Incorporated—a Texas-based firm specializing in development of web-based learning materials—has developed the eeZone Project. This project is a Science/Technology/Society (STS) on-line, web-based interdisciplinary curriculum. The intended audience is middle-school students.

Access for all: Developing an online course about online courses

Loye Romereim-Holmes, South Dakota State University, USA; Denise Peterson, South Dakota State University, USA

This paper discusses the development and delivery of a course that focuses on online instructional design that provides accessible resources for diverse learners.

PREPARING PRE-SERVICE TEACHERS TO USE TECHNOLOGY

Stephen Rose, University of Wisconsin Oshkosh, USA; Henry Winterfeldt, University of Wisconsin Oshkosh, USA

This paper describes how the UW-Oshkosh Teacher Education Program prepares pre-service teachers to integrate technology into instruction. Specifically, how the social studies methods and instructional technology courses are: using a framework for authentic instruction and assessment to help students develop and refine their pedagogical knowledge; using interdisciplinary teams to help students reflect on content, teaching methodologies, and appropriate use of technology; and having students develop and demonstrate technology based teaching materials.

Building a Professional Cyberspace Community

Suzanne Rose, Robert Morris College, USA; Linda Runyon, Robert Morris College, USA

This paper is a report of a newly-initiated project designed to connect preservice teachers, cooperating teachers, student teachers, and higher education faculty through the use of a world-wide-web site. Goals of the project were to enhance the teacher preparation program and curriculum, to provide professional development for P-12 faculty and mentoring support for novice P-12 faculty, to provide professional development opportunities for higher education faculty, to provide educational resources for those web-users outside of the cyberspace community that was developed in the project, and to form the basis for continual teacher education program input and assessment.

Preparing Teachers To Use Assistive Technology In Inclusive Settings

Dina Rosen, Montclair University, USA; Arlene Bloom, New Jersey City University, USA

With the passage of special legislation for the education of children with disabilities, educators are required to provide services to children with disabilities and consider the appropriateness of new technologies as a tool or intervention. This article considers what teacher educators can do to familiarize their preservice teachers with options in assistive technology and prepare them to work with assistive technology. Preservice teachers need minimum competencies in technology and assistive technology. Teacher educators by providing three-prong instruction may play an important role in awakening in each prospective teacher the desire and ability to be the conduit for using assistive technology to develop the potential of each student with special needs.

Compressed Video Technology, Innovative Teaching and Realistic Experiences: Recommendations for CVT Usage

Gary Rosenthal, Nicholls State University, USA; Barlow Soper, Louisiana Tech University, USA; Lamar Wilkinson, Louisiana Tech University, USA; James Barr, Nicholls State University, USA

Compressed video teaching with the VTEL TC2000©, teleteaching system, is a promising new technology that offers the opportunity to effectively teach a large number of students at both local and remote sites. With compressed video technology, the televised image and sounds of an on-campus course (lecture, discussion, and audio-visual teaching aids) are sent to compressed video classrooms at other locations, while the images and sounds of remote students simultaneously return to the on-campus classroom. Image and sound quality with this technology are excellent but (as with any new technology) effective pedagogy requires understanding the medium, prediction of pitfalls, and modifications in teaching techniques. The presentation will offer insights into effective compressed video teaching based upon the first-hand experiences of teachers who have presented compressed video.

Dancing with Technology to Teach Technology

Tweed Ross, Kansas State University, USA

Those who believe modern electronic technologies are fundamentally changing the learning of young people are faced with an intractable conundrum. To teach the new technologies to the uninitiated they are relegated to the old practices used in education for some considerable time: lecture, textbook, guided demonstrations, and lab exercises. In short while they believe in discovery learning and constructivist theories they end up using didactic process and behaviorist means. Is there a better way?

Technology in Arizona: A Summary of the Report to the Arizona Board of Regents

Paul Rowland, Jennifer LeCrone, Gary Tucker, Elizabeth M. Willis & Penelope Wong, Northern Arizona University, USA

The significance of technology in today's society is self-evident. What is less clear is how to ensure that today's children, the workforce of the future, will have the technological literacy and skills to successfully function and support our highly technological society. Public education is charged with the mission of providing the foundation in not only the basic workplace and personal skills of reading, writing, numeracy, language, and communication, but also, "a high level of competence with computers, telecommunications...and the ability to quickly adapt to new technologies and new ways of working" (National Governor's Association, 1999). In considering the charge to prepare a future technological workforce the school's role is to demonstrate technology as an object that is to be used and manipulated. On the other hand, the school's role as society's institution of cultural perpetuation emphasizes the use of technology as a tool for learning. These two roles are not necessarily mutually exclusive but they are distinct and schools must have an idea of which role they play—where, when, and how. It is this situation which shaped the Technology in Arizona study—an overview of the state of technology in Arizona's schools at all levels.

Use of Telecollaboration to Develop Authentic Learning Experiences

Regina Royer, Salisbury State University, USA

Participation in a telecollaborative project with K-12 students can provide authentic learning experiences for teacher candidates that connect theory with practice. This paper discusses how teacher candidates in a preservice teacher education class moderated a K-12 global telecollaborative writing project. As a result of the candidates' participation as moderators, the candidates gained an understanding of how to integrate technology into the classroom to acheive curricular objectives and became motivated to use technology in their own teaching.

How We Integrated Technology Throughout Our Education Program

Reuben Rubio, Albion College, USA; Dana Sedersten, Albion College, USA

In this paper, we would like to describe the technology integration efforts of the past four years, with the hope of providing a vision to programs that are both similar and dissimilar to us. Of particular interest is our successful integration into methods courses, and the way that we used our diverse strengths and worked as a team to accomplish all of this.

Cyber Space Communities for Pre Service Teachers

Linda Runyon, Robert Morris College, USA; Suzanne Rose, Robert Morris College, USA

Technology impacts our professional lives in many ways. Instead of a disconnected voice over the PA system, classrooms are now invaded by the sounds of "You've got mail." Teachers record attendance and grades "on line." We teach our students how to conduct Internet research. We send students on "virtual field trips" and plan simulations. Instead of asking for home addresses, we ask for e-mail addresses. We have begun, albeit slowly in many cases, to integrate technology into our classrooms and profession. As a profession, we are learning to use technology to build a sense of community among our members. At Robert Morris College, we plan to concentrate on the ways in which a virtual community can be build using technology, specifically e-mail and electronic bulletin boards, might be used as a way to keep student teachers connected to one another in addition to providing information on current issues as they complete their field work

Development of English Department of Computer Information Systems as a Way of Worldwide Educational Integration

Anatoly Sachenko, Ternopil Academy of National Economy, Ukraine; Hrygory Hladiy, Ternopil Academy of National Economy, Ukraine; Igor Vasiltsov, Ternopil Academy of National Economy, Ukraine; Andrij Vivchar, Ternopil Academy of National Economy, Ukraine

The Institute of Computer Information Technologies of Ternopil Academy of National Economy has started with some universities from West Europe together to develop new Business Information Systems curriculum. The main result of collaboration, which can be obtain, lies in the developing new Faculty, "English Department of Computer Information Systems" consisting of ICIT where all subjects will taught in English. There is a number of potential results, which possible to obtain, including assisting to reform system of Higher education in Ukraine; increasing the co-operation of workers of higher school with universities of different World regions etc. The results of the proposal faculty development may be used by higher schools of Ukraine (and other countries, which are going to integrate in the World community) as a basis for curricula development for Business Information Systems as well as for other similar specialities and branches.

A Multimedia Design for Leadership Training: From Process to Product

Hanadi Saleh & Roberta K. Weber, Florida Atlantic University, USA

Training future educational leaders utilizing a variety of multimedia produced modules provides an excellent opportunity for introducing the benefits of well-designed courseware and the possibilities of exploring interactive computer-based instruction. This paper discusses the development of a software program that will be used at the graduate level by current and prospective leaders in the educational environment. This unit of instruction consists of content delivered in an educational organization course dealing with administrative theory developed with the Authorware program.

Introducing Tutor Professor to Online Distance Education: By Online course

Verónica Salinas Urbina & Rosa María Garza, Virtual University, ITESM. México

This paper discusses the development of tutoring guidelines for tutor-professors in the Virtual University of Monterrey Institute of Technology (ITESM). The purpose in discussing these guidelines is that they may be relevant to teaching in any online environment. We also developed an online course for tutor professors considering these guidelines.

Multimodal distance learning: A personal cooperative video on-line asynchronous experience.

Dorothy Sammons, Idaho State University, USA; Albert Strickland, Idaho State University, USA; Charles Zimmerly, Idaho State University,

In order to serve its 40,000 square mile area, ISU's College of Education seeks innovative means of delivering graduate courses to a large population of in-service teachers and administrators. This paper describes one distance learning class that utilized compressed video and supplemental web-based material to reach students at six different cities and towns. The primary means of delivery was a weekly 3-hour broadcast from Pocatello to the other six sites. During the weekly broadcast, the instructor and students delivered presentations which incorporated computer, videotape, and Elmo technologies. Outside of class, students utilized on-line components of WebCT to access additional information and to communicate. A survey of the 81 students was conducted to determine which technology components were the most frequently used and the most effective in meeting class objectives. Weston (et al.,1999) identify nine important constructs that must be considered when delivering on-line instruction, including: impact on learning, student computer literacy, student computer access, infrastructure, interactivity, navigation, evaluation, accuracy and recency, and loading speed. The survey also queried students as to whether these considerations were met in the course design and delivery.

Futuristic Strategies for Designing and Implementing World Wide Web

Presentations

Rubye Sanders, Lander University, USA

This presentation is designed for people who intend to create and implement pages for the World Wide Web. The techniques and methods presented can be applied not only to create an informative, engaging presentation but also to maintain such a presentation. Emphasis will be placed on four key players involved in the design process: presenters, information stewards, designers, and Web site users. Techniques and methods that lead participants step by step from conception of a project through successful design will be presented.

THE OBSERVATORY OF THE ICT IN HIGH SCHOOL CENTRES

Albert Sangrà & Andreu Bellot, Universitat Oberta de Catalunya, Spain

The observatory of ICT in non-university schools is a project implemented by Jaume Bofill Foundation and the Edu Lab of the Universitat Oberta de Catalunya, whose purpose is to analyse the use of information and communication technologies (ICT) in the non university education.

Hypertext flexibility in a web learning environment to promote extensive reading activities in school learning

Luísa Santos, Secondary School Alexandre Herculano, Portugal; Paulo Dias, University of Minho, Portugal

Poetry has been a challenge for English as a Second Language (ESL) teachers and students. The former evaded the issue by simply not using poetry in their classes and the latter were quite content in not having to deal with texts that they considered "difficult". The aim of this in progress study is to understand the importance of the hypertext flexibility in the design of web based learning environment to the literary text and mainly the use of poetry in the second language learning process in every level of teaching as a possibility to be taken into account in the domain of extensive reading activities.

A Pilot Study of the Web-based Environmental Simulation

Tago Sarapuu & Margus Pedaste, University of Tartu, Estonia

Nine groups of students (total 36) from three different schools participated in a three-week pilot study and passed five virtual communities of the web-based simulation "Hiking Across Estonia". The members of hiking teams had to solve 35 different educa-tional tasks. The analyses of students' answers in the pre- and post-tests and also in the semi-structured group interviews proved the program to be applicable for developing stu-dents' environmental problem solving and decision-making abilities. Students demon-strated the improvement of their skills in analyzing texts, drawings and graphs of the sub-tasks. Moreover, the participation in the virtual hike promoted students' involvement in cooperative learning and it also increased their interest in environmental problems.

Faculty Development as an Agent of Technology Change: Implementing a Shared Vision

Charles Savitt, Virginia Commonwealth University, USA

This paper will describe first year efforts in reference to a PT3 Implementation grant. The grant promotes an alliance between two very diverse institutions of higher education. One university is a historically white public institution while the other is a small historically black private institution. Both institutions are implementing a series of initiatives to transform their respective teacher preparation programs. Using shared resources, these initiatives include an extensive program of faculty development in instructional technology for both arts and sciences and teacher education faculty. Significant changes to both institutions technology infrastructure provide faculty, preservice teachers, and classroom teachers with significant technology support, including individual assistance and a lending library of software and portable technologies. Using these support services, university faculty are modeling the use of instructional technology in their courses and increasing the use of technology into course assignments.

Web Library

Norma Scagnoli, University of Illinois at Urbana Champaign, USA; Pedro Willging, University of Illinois at Urbana Champaign, USA

This paper presents an effective use of the World Wide Web by schools. This is a multidisciplinary proposal intended to integrate disciplines from the school curriculum in a common project. A description of the steps to develop this virtual school library for its use as a tool in the everyday process of teaching and learning is provided. School teachers have tested this Web-library and their comments greatly contributed to the paper.

A Collaborative Course Portfolio

Catherine Schifter, Temple University, USA

Core courses are those which are deemed to be essential to a major, whether in Teacher Education, History or English. Typically there are several sections of core courses, not all taught by the same persons. How do we engage faculty in the process of ensuring equality across faculty and sections of core courses? Indeed, how do we ensure equality across sections of core courses? This paper presents a model to ensure coherence and continuity across sections of a core course on the infusion of technology in education through a case study of one technology course at one large urban university.

Domains of Adaptation in Technologically Mediated Classrooms: An Ethnographic Report

Lorraine Schmertzing, Valdosta State University, USA; Richard Schmertzing, Valdosta State University, USA

An inductive analysis of the adaptation of graduate education students to an interactive televised (ITV) classroom generated four primary domains within which much of their adaptation occurred. These emically-derived categories – student relations, technological aspects, instructor's role, and content/class participation – provided a framework within which to assess the complex social and cultural aspects that influence student adaptation and consequent learning in ITV classes. The paper draws on analysis of hundreds of hours of observations, interviews and informal conversations with students, teachers and staff.

Student Expectations of Distance Educators: Instructor Roles in an Interactive Televised Classroom

Richard Schmertzing, Valdosta State University, USA; Lorraine Schmertzing, Valdosta State University, USA

An ethnography of graduate education students in interactive video-based classrooms provided the data for the exploration of student perceptions of the instructor's role in the technologically mediated learning environment that is set forth in this paper. Data suggest students assigned new responsibilities to the instructor and expected the instructor to bridge the distance gap between the classrooms, clarify new rules for classroom behavior, and maintain a focus on course content despite of the instructor's added technology related duties.

Simultaneous Renewal in Teacher Education: Strategies for Success

Denise A. Schmidt, Ann E. Thompson & Clyciane Michelini, Iowa State University, USA

To adequately prepare preservice teachers to use technology in their own classrooms, teacher education programs must develop comprehensive models for technology integration that include meaningful uses of technology to improve and renew the teacher education curriculum. In addition, model K-12 sites must be fostered where preservice teachers can practice using technology to create active learning environments for students. Integrating technology effectively into teacher education courses and working collaboratively to create rich technology field experiences are both tremendous challenges for teacher education programs. Given the needs and challenges that both K-12 schools and teacher education programs face with respect to effective use of technology, it appears that both entities would benefit from collaborative work to address these needs. John Goodlad's theory of simultaneous renewal for colleges of education and K-12 schools provides a useful framework for this type of collaboration. This paper describes several strategies that faculty at Iowa State University have used to successfully integrate technology throughout the teacher education program and in K-12 classrooms.

Internet use in teacher education: what are the foundations in determining learner outcomes

Donna Schnorr, California State University, San Bernardino, USA; Angela Burnell, California State University, San Bernardino, USA; Sylvester Robertson, California State University, San Bernardino, USA

This descriptive case study is the continuation of research done at the time of design and implementation studies using this interactive web module design as an instructional tool in a teacher education course. The implications of this study range from how to integrate instructional technology within a teacher education course to the development of an instrument to assess module components aligned with learning theories. This presentation will describe the outcomes and observations found.

Student Teacher Educational Technology Use

Allen Seed, Northern Kentucky University, USA

This paper deals with the use of instructional technology by student teachers. According to the results of three years of surveys, student teachers at our university are reporting limited use of instructional technology during this experience. Data from the surveys illustrate the restricted use of instructional technology, which technologies are being utilized, and some of the causes for concern.

Perceived Versus Real Self: Applying Rogerian Theory to Technology Resistant Students

Eric Seemann, Louisiana Tech University, USA; Lamar Wilkinson, Louisiana Tech University, USA; Walter Buboltz, Louisiana Tech University, USA; Sonia Beaty, Louisiana Tech University, USA

This paper proposes ways of helping technology resistant (TR) students in terms of Carl Rogers' theories. In this view, students are motivated by the single, unitary motive of actualizing—maintaining or enhancing their lives to their fullest potential. Resistance to technology is defined in terms of incongruence among the Real Self, the Ideal Self, and the technological task to be learned. Suggestions using Rogerian principles are given to assist educators in working with technology resistant students.

Applying Social Learning Theory to the Teaching of Technology Skills: An Interactive Approach

Eric Seemann, Louisiana Tech University, USA; Walt Buboltz, Louisiana Tech University, USA; Lamar Wilkinson, Louisiana Tech University, USA; Sonia Beaty, Louisiana Tech Univrersity, USA

Advanced technology has a relatively short life span before it substantially changes; this is especially true of computers and information technology. Acquiring skills that are well developed and flexible will allow students to adapt to the rapid changes and innovations in technologically advanced environments. As the demands of teaching have changed over time educators have examined a variety of approaches in order to make the process of computer and technology education as efficient as possible. Albert Bandura's Social Learning Theory offers both concepts and techniques which can aid the professional educator in optimizing classroom instruction in technology and computer skills. Bandura's descriptions of the learning process and mechanisms by which they operate are especially well suited to the teaching of computer and technology skills. Techniques and theory from this approach are applicable to almost any level of education from grade school to college.

Assistive Learning Within a Special Needs Environment

Randy Seevers, University of Houston - Clear Lake, USA; Sylvia Martin, University of Houston - Clear Lake, USA; Caroline M. Crawford, University of Houston - Clear Lake, USA

The potential value and importance of assistive and adaptive technologies within the learning environment of special needs students must be emphasized. Students with exceptionalities can be aided through the thoughtful and successful integration of instructionally appropriate technological tools. The potential significance of instructional technologies within a special needs environment is imperative towards the success of the student learners.

MINDS - The Learning Environment of the Future, Today

Karl Seiler, The MINDS Institute and DataServ, Inc.. , USA

Come Join Us for a Lesson in Interactive Learning - Addressing the needs of those seeking knowledge is a timeless call for educators, administrators and all of those involved with the knowledge experience. Exploring resources via multimedia is the way that your learners want to learn. The MINDS Institute, a Learning Portal to Rich Worlds of Information, offers multimedia resources, video conference database, professional development, interactive events calendar, web board/collaboration tools and so much more. We bring you the content and resources that invites you to fully participate in next generation learning.

The Imfundo Project: ICT in teacher education in developing countries

Michelle Selinger, Cisco Systems, UK

Currently 130 million children across the world do not go to school. In many developing counties those that do attend school often leave functionally illiterate. Many teachers on sub-Sahara Africa are dying of HIV/AIDS, and in the worst cases more teachers are dying than are being trained and recruited. UK Prime Minister, Tony Blair launched the Imfundo project in April 2000 and gave the team six months to find ways to support the international quest for universal primary education by 2015 using educational technology. The decision was taken to focus on teacher education as the most effective way to improve both access to education and the quality of that education. This paper describes the project's findings to date and describes one of the pilot projects.

Online Resources for ESL/EFL Teachers and Students: An Approach to Organization and Structure

Peter Serdiukov, University of Utah, USA

This paper discusses the structure and organization of ESL websites and online educational resources. The design, implementation and initial evaluation of the online teaching/learning resource system that is provided through the Distance Education ESL Endorsement Program's (DEEEP) website is presented here.

Telementoring Beginning Teacher Researchers

Lynn Shafer, George Mason University, USA

This study looks at the daily processes that might impact developing an effective online mentoring relationship with beginning teacher researchers. Specific online facilitation techniques and approaches will be discussed. Its intended audience are those interested in facilitating online teacher professional development activities.

Using Information Technology Applications to Support Distance Learner Services

Dennis B. Sharpe, Memorial University of Newfoundland, Canada

This paper presents a brief summary of a comprehensive report that documents the results of a needs assessment of a sample of university distance education students engaged in degree courses during the 1999-2000 academic year. The intent was to examine the current use of available student services and to determine, based on the expressed needs of distance learners, the kinds of multimedia, interactive support services that should be developed to enhance student success and retention in an increasingly competitive market

Distance Education: An Ultimate Subject for Teachers and Students

Osama Shata, Athabasca University, Canada; Mahmoud Abaza, Athabasca University, Canada

Distance education, as a learning technique, has been in use for several decades. The word 'distance' is used to indicate that the teacher and the student are geographically separated. New technology, such as video conferencing, teleconferencing and the Internet, have virtually united the teacher and the students. As a result, the word "distance" may be replaced by other words such as "virtual", "flexible", or "computer mediated." Recent advances in computer technology have made the Internet the main delivering media for teaching courses at distance. In this paper, we use the term "distance education" to refer to the situation where computer-mediated technology is used as the main delivering media of courses of study, and where the teacher and the student are physically in two different locations. Many research papers discuss the reform of high school education and deal with issues such as the new technology and computer mediated curriculums without discussing the role that distance education may play in this reform. Other papers discuss how to improve teachers' knowledge of certain subject areas and only address distance education as a way to make teachers' professional development more flexible in terms of time and space. This paper takes a different approach in claiming and justifying that taking a course at distance should be part of the high school curriculum, and that students need to experience a form of distance education even if they plan to continue their study at traditional institutions. Moreover, this paper also claims and justifies that distance education is a key factor in teachers' good teaching at traditional schools.

Project Sun: A Collaborative Teacher Preparation Technology Project

Blanche Sheinkopf, Florida Solar Energy Center, USA; Linda Krupp, Brevard Community College, USA

Brevard Community College (BCC), in partnership with the Florida Solar Energy Center (FSEC), the School District of Brevard County, the Astronauts Memorial Foundation (AMF), and the University of Central Florida (UCF), has submitted a proposal to the National Science Foundation, Advanced Technological Education Program called Project Sun to provide pre-service (BCC teacher education students) and in-service (Brevard County certified) teachers an exciting array of curriculum opportunities and technical experiences to enhance their scientific and technical instructional skills. Project Sun is a comprehensive plan that addresses an ATE project in the Technical Experiences program track with objectives that will provide 1) technical experiences for pre-service (PS) and in-service (IS) teachers, 2) a thematic approach to science instruction, 3) a method of scientific investigation, scientific practice, and thought, 4) exposure to working scientists and educators, 5) recruitment and articulation activities between all institutions involved, and 6) business partnership connections.

Meeting the Accountability Challenge—Electronically

Tracey Shelley, EdVISION Corporation/Fort Osage Schools, Independence,MO, USA

The teachers who graduate from our nation's teacher education programs will face an increasing professional challenge of accountability in their classrooms. Public schools are hearing an escalating call to arms to raise the standards of the performance of our students. Raising the standards for our students translates directly into raising the bar for our teachers. High stakes tests for college admissions of high school students are not the only major benchmark of student success nowadays. Middle and even elementary school teachers are preparing their students for high stakes benchmark exams. Under the microscope of political and public scrutiny, teachers are being held directly accountable for their students' performance in ways that did not previously exist. Pre-service teachers need the immediate attention and support of the mentors who are preparing them to enter this high stakes arena. How do technology and accountability intersect teacher education?

The impact of instructional technology on student achievement

Lorraine Sherry & Shelley H. Billig, RMC Research Corporation, USA

For the evaluation of The WEB Project, a Technology Innovation Challenge Grant (TICG), RMC Research Corporation developed a conceptual framework to measure the impact of instructional technology on student achievement, based on an extension of Sternberg's (1998) Developing Expertise Model. Structural equation modeling, using student surveys, teacher observations of student learning processes, and teacher-scored student products, revealed paths that correlated motivation -> metacognition -> learning processes -> student achievement. This model may be replicable for evaluators who must report impact on student achievement for TICG or PT3 grants using assessments other than standardized test scores.

System Development and Fundamental Design of Interactive Mathematical CAI System

Masanori Shibata, Tokai University, Japan

Computer provide opportunities for its users including both teachers and students to make knowledge, to gain access to knowledge, and to share knowledge with one another that are not possible before. Our projects consider system environments and minimum requirements for interactive Math CAI systems that must support to assist building students' preparation for the college-level mathematics, and set three basics for Math CAI system such as to keep track of study process, have the exact interpretation for math symbols, and construct the dynamic curriculum organization.

Course Design Overview of a Web-Based M.S. Program

Ching-Chun Shih & Connie McLaughlin, Iowa State University, USA

This poster presentation will provide an overview of the course design of the Master of Science in Agronomy Distance Education Program at Iowa State University. The presentation will share experiences of the course design and formative evaluations of the courses provided by the program. In the fall of 1998, the Masters of Science in Agronomy Distance Education Program at Iowa State University (ISU) started providing interactive multimedia courses in which most course materials and resources were accessed and delivered through the WWW and CD-ROM. Most of the students enrolled in this program were professionals working in industry and government. Several interactive multimedia activities were developed in the courses. Those activities included Study Questions, In Detail, Try This, Check This Out, and FYI. Various formative evaluation activities related to the course design have been conducted and actions have been taken to improve the courses and program. Lesson maps, glossaries, and calculation examples have been added to the courses. Additional multimedia presentations have been developed. Links to previous and subsequent lessons have aided with navigation. A search function for topics and words within each course has also been tested.

Web Sites Usability Evaluation Guidelines for Teachers: A Case of CikguNet On-line Environment

Norshuhada Shiratuddin, Universiti Utara Malaysia, Malaysia; Shahizan Hassan, Universiti Utara Malaysia, Malaysia

Web usability is one of the important factors that determine the success of a web site of any type, especially web learning environment sites. Teachers, who have the intention of developing on-line teaching materials, must take into consideration the issue of usability not only during the development process but also when the web site is being implemented. This paper describes a usability-testing model, which is then applied to evaluate CikguNet web site. CikguNet (at http://www.cikgu.net.my), is one of the well-known web sites for teachers in Malaysia maintained by a governmental agent MIMOS and is designed as an environment to assist teachers in producing quality teaching and learning materials especially materials that are technology based, for teachers to exchange their educational ideas or materials and serve as a resource centre for academics and teachers. CikguNet proves to exhibit a high usability level with only few usability problems. The usability-testing model proposed in this paper is intended as a guideline for teachers to adopt.

Models of Instructional Technology Leadership In U.S. Schools

Mary B. Shoffner, Georgia State University, USA

: Recent studies indicate that half of all teachers who have access to technology in their schools do not make use of it in their instruction. The time has come for states and school districts to examine the potential of instructional technology leadership in the schools to address teacher training and support needs. In considering what type of roles instructional technology leaders might play in the schools, it is prudent to examine what models are already in place. An exploratory national survey was conducted to determine the presence of licensed IT professionals in school-based settings. Results were gathered through multiple channels: via the Internet, e-mail, and telephone interview. Results and implications of the study are presented.

Use of Nvivo for Classifying Synchronous Dialogue Resulting from Web-based Professional Development

Paul Shotsberger, University of North Carolina at Wilmington, USA

A SITE 99 paper by the author (Shotsberger, 1999) extended the work of (Blanton, Moorman & Trathen, 1998) to generate a framework for analyzing synchronous dialogue generated from a Web-based professional development program. The current study attempts to further refine the framework through the use of qualitative analysis software called Nvivo (Scolari Software, 1999). The Nvivo program was used to analyze chat transcripts from two different years of a Web-based inservice program for mathematics teachers. The 1997 transcripts from the previous study were re-analyzed using the Nvivo program. Then transcripts from 1998 were analyzed using Nvivo to attempt to validate the new classifications suggested by the re-analysis.

The Handheld Web: Using Mobile Wireless Technologies to Enhance Teacher Professional Development

Paul Shotsberger, University of North Carolina at Wilmington, USA

The project described in this paper represents an effort to more thoroughly infuse technology into the undergraduate curriculum for prospective mathematics teachers, while strengthening the relationships that already exist between the author's university and its partnership public schools. A key component of the project involves the use of Jornada 690 Pocket PC devices and supporting equipment/access, including a cell phone. This technology adds a new dimension to just-in-time training and support by allowing preservice and inservice mathematics teachers to be literally anywhere and receive information, collaboration and support using Web resources. This initiative represents a unique field application of mobile technology that has the potential to benefit not only universities and their students, but regional schools, teachers and their students as well.

Revolution of the Pedagogical Use of ICT by Influencing the Whole School Community

Marja Kylämä & Pasi Silander, University of Helsinki, Finland

The only way to make changes in the pedagogical practices of teacher's work is to influence the whole school community in collaborative way. Also the background organizations like the whole commune should actively give the frame of reference and financial resources to make it possible to all students to participate in the information society. Based on these findings ICT Learning Centre of Helsinki University has been developing the practices for in-service training that includes methods like collaborative learning, research based learning, computer assisted team work and distance learning on the net. It is easier to make a change in a school community when there is a team of teachers to adapt new pedagogical skills to use. In this article we present the authentic case: Information Strategy for the Educational Use – Done by Collaborative Work.

Challenges to Currency in the Educational Computing Course

Sisk Kathy, North Georgia College & State University, USA

This short paper is an initial report on the challenges facing the instructor of the educational computing course as colleges and universities strive to prepare technology-capable teachers who in turn can produce technology-capable students. These challenges include the changes in entry-level computing skills for preservice teachers, along with the many new innovations in hardware, software, and course delivery tools. These dramatic changes pose wonderful opportunities and demanding challenges for the instructor of the educational computing course and for teacher education programs.

Mining for Problem-solving Styles in a Virtual World

Brian M. Slator, North Dakota State University, USA; Donald P. Schwert, North Dakota State University, USA; Bernhardt Saini-Eidukat, North Dakota State University, USA

The Geology Explorer provides a multi-modal virtual environment that implements an educational game for teaching principles of geology. The game is a networked, multi-player, simulation-based, educational environment that illustrates our role-based pedagogical approach. This takes the form of a synthetic, virtual world (Planet Oit) where students are given an authentic experience and the means and equipment to explore a planet as a geologist would. Each student's experience includes elements of exploration of a spatially-oriented, virtual, world; practical, field oriented, expedition planning and decision making; and scientific problem solving (i.e. a "hands on" approach to the scientific method). Students assume a role and learn about real science by exploring in a goal-directed way and by competing with themselves and with other players. In this paper, data are reported from a 1999 study, in which students enrolled in a freshman-level Physical Geology course explored the planet for credit. These data were collected in two forms: 1) a survey of student perceptions, positive and negative; and 2) a data mining analysis of student histories which reveals apparent categories of student problem-solving style. Planet Oit can be visited at http://oit.cs.ndsu.nodak.edu/

Movies in English for Specific Purposes: From Entertainment to Excellence

Tatiana Slobodina, Northern International University, Magadan, Russia

Being instrumental within the global business community, English, in the format of English for Specific Purposes, has taken a firm position in the university curricula outside the English-speaking world. However, the technology-based learning materials used in teaching Business English are limited to numerous audio, several video courses, and a few computer programs. This reflects the tendency in teaching English as a Second Language in general, depicted by P.Delclocque (1997): "Linguists... have made full use of audio, little use of video, and have been very slow to adapt to the computer revolution." Thus, only a small portion of the immense potential of video has been employed in language learning. The work presented on the poster aims in increasing the use of video in TESL/TESP and is an example of incorporating video materials in Business English university-level courses.

GETTING REAL IN TESP: OPERATIONAL TECHNOLOGY AT BUSINESS ENGLISH CLASSES

Tatiana Slobodina, Northern International University, Magadan, Russia

In the age of information, a university graduate has to be competent not only in his major field. The world business community, traditionally communicating in English as lingua franca and well advanced in using modern technologies to manipulate information, requires both language proficiency and technology skills as mandatory for a business executive from outside the English-speaking world. Using the English-based operational software at Business English classes is the efficient way to develop the students' command of the language as well as that of technology, thus raising the quality of higher education. The paper presents the basic ideas for integrating operational technology in the Business English course and discusses the necessary competencies of an ESP (English for Specific Purposes) practitioner.

Integrating Mathematics, Science, and Technology Goals: An Interdisciplinary Approach

Scott Slough, University of Houston - Downtown, USA; Gregory Chamblee, Georgia Southern University, USA; Jon Aull, Georgia Southern University, USA

The infusion of technology in today's mathematics and science classrooms is a top priority of many school districts. This presentation will discuss how mathematics, science, and technology education national standards documents and state standards provide rich opportunities for interdisciplinary planning, teaching, and learning. The explicit and implicit relationships between the mathematics, science, and technology education disciplines and the enhancement in learning via the World Wide Web are examined in an eighth-grade weather unit. Other areas for interdisciplinary explorations also are discussed.

Edu-Effectiveness and Distance Education: How to Measure Success in the Online Classroom

Judith Smith, Ph.D., CertiLearn, Inc., USA

How we determine the quality of online education in the classroom is of primary concern for all institutions and organizations providing continuing education via new technologies. Why? Recent statistics from the National Center for Educational Statistics reveals that enrollment in distance learning courses roughly doubled in two years from 754,000 to 1.6 million. With heightened enrollments come heightened expectations from adult learners that the quality of their online instruction will be (at minimum) equivalent to that which they can obtain in traditional learning environments. Despite the lack of national standards (at present) for delivering online educational courses, there are effective (and peer-reviewed) strategies that online faculty can use to measure and ensure an effective online classroom experience for the learner. This session will explain (and demonstrate) those strategies, and provide models for other faculty to use in their online classroom experiences.

Managing the Dark Side of Online Courses — While Enlightening Your Online Students

Judith Smith, Ph.D., Vice President, Instructional Development, CertiLearn, Inc., USA

For every online distance education program launched, there have been five online distance education programs that have either failed outright, or have been deemed unprofitable, because they were launched without benefit prior research. This is what we term the "dark side" of online education — for every success, there are numerous failures that provide strategic (and important) learning lessons for us all, as we move towards a more technlogically enhanced world of education.

Remote-Control Computing

Mark Smith, Purdue University, USA

If you have ever taught a class where your students use software that they run at home or in a lab remote from you, or have ever had the need to access your office computer files from home, then remote-control computing is for you. Remote-control computing software allows you to connect to remote computers from your computer, and control those systems as if you were right there in front of them. You can take over the remote system and provide problem solving assistance, upload and download files, or even change system parameters and re-boot.

Preparing Tomorrow's Teachers to Use Technology: Developments and Strategies of Ten Grantees

T. Colette Smith, Arizona State University, USA

There is a substantial demand to integrate technology into teacher education programs. Future teachers are not prepared to effectively integrate technology into the classroom. Emphasis is placed on the concept that effective programs are needed in order to produce technology-adept teachers. This paper describes project activities from 10 Preparing Tomorrow's Teachers to Use Technology (PT3) grantees. Information was gathered from the PT3 web site, grantee web sites, and project members via electronic mail. Developments focus on revamping teacher education programs. Strategies include facilitating teacher and methods faculty workshops, and building interactive web sites and video based web instruction.

Planning Makes "Perfect?" - A Comprehensive Look at Successful Implementation of Technology and Teaching at a Major University

Glenn Snelbecker, Ph.D., Temple University, USA; Graciela Slesaransky-Poe, Ph.D., Temple University, USA; David Fitt, Ph.D., Temple University, USA; Susan Miller, Ph.D., Temple University, USA; Gail Gallo, M.Ed. , Temple University, USA

Temple University has demonstrated success at infusing technology and at implementing innovative approaches to teacher education. This presentation is comprised in five segments that address successful strategies and programs at different university levels: university, college, department, course, and community/school district collaboration. Each segment will address specific topics such as Preservice Teacher Education, technology diffusion, faculty development, and diversity. One of the primary goals of this presentation is to connect strategic planning at the university and college levels with successful implementation of innovative programming at the program, course, and community/school district levels. Presenters include faculty, professional staff, and graduate students.

Learning to Integrate New Knowledge and Skills (LINKS): First Year Results of a Systemic Infusion of Technology into a Field-Based Teacher Education Program

Sharla Snider, Texas Woman's University, USA; Vera Gershner, Texas Woman's University, USA

This ongoing research study examines the changes in technology proficiencies of future teachers as they progress through the three-semester teacher preparation program implemented at Texas Woman's University. The systemic integration of technology into this foundation teacher education program is called Learning and Integrating New Knowledge and Skills (LINKS). This report addresses evaluation of the first semester of implementation under the three year grant for Preparing Tomorrow's Teachers to Use Technology (PT3). Three population groups were studied: all future teachers enrolled in beginning coursework as Cohort 1, a volunteer sample of university instructors teaching coursework supporting teacher education, and classroom Mentor teachers from two of the rural school districts. The evaluation is grounded in the Concerns Based Adoption Model (CBAM) which monitors changes as an innovation is implemented. In addition to the CBAM measures, the increasing technology proficiencies are assessed as they change over time. Additional qualitative data were collected to assess program support over the semester and to design management matrices appropriate to implementation of LINKS with each population. Data collection methodology included anonymous electronic collection of quantitative data, individual interviews of university instructors, evaluations of each training session, and review of each support activity provided by LINKS personnel. Implementation recommendations and educational significance are discussed.

Infusing Technology into Leadership Development

Helen Sobehart, Duquesne University, USA; Janet Armstrong, Central Instructional Support Center, USA; Lawrence Tomei, Duquesne University, USA

As we prepare teachers for technological competence necessary in this new century, we must assure that those who administer the educational systems in which teachers work also have the technological competence to support the work of the educators. This paper discusses how technological competence has been infused into the context of the curriculum of a doctoral program which prepares superintendents and other leaders based on AASA and Pennsylvania standards. The curriculum consists of eight domain areas, plus research skills. Technological competencies have been infused into the leadership curriculum. This paper describes those competencies, with descriptive examples of technological infusion.

Organizational Learning: The Venue for Institutional Change with Online Technologies

Barbara Solberg, WebCT, USA

As educational institutions envelop technologies to include online course components from the distributed model to complete anywhere/anytime online programs, faculty and student mental models of teaching/learning must change. The change can be slow as the face-to-face model of teaching/learning evolves into with the new model. How can institutional professional developments programs provide the new teaching model for faculty with no experience using online technologies? Faculty need to know both how these new technologies work and how they might implement these technologies to facilitate learning. How does the institution ensure that its professional development programs are not individually targeted but rather grow individual learning into organizational learning? Daniel Kim, of the Senge Learning Organization, has provided a model for linking individual change to organization change. This paper will present the rationale and the model to effectively link individual learning to organizational learning. In addition, two case studies will be provided during the face to face presentation.

Communication Technologies: Post-industrial Infrastructure

Tatiana Solovieva, West Virginia University, USA

This session addresses the complex relationship between the post industrial society and communication technologies. This interaction results in the acquisition and the codification of theoretical knowledge and information that influences the key aspects in the social and technological development, namely: social, political, economic changes. A model was developed to represent the balanced coexistence of technical and human infrastructures in our information era. As a result of the interactive presentation of this model, the conference participants will gain a new perspective on their position within the multi-level human-technology infrastructure.

Development of an ePortfolio builder for teacher education

Steve Soulier, Utah State University, USA; Mimi Recker, Utah State University, USA

The paper describes and discusses designing and developing a system to help pre-service teachers document and track how they meet technology standards throughout their teacher preparation program. We describe a prototype ePortfolio building system called ePort that supports the online assessment and tracking of pre-service teachers' ability to meet technology standards throughout their teacher education program.

Online Portfolios for Educational Technology Graduate Students: An Ongoing Capstone Project

Jennifer Sparrow, Florida Gulf Coast University, USA

Students in the Curriculum and Instruction Master's Degree Program at Florida Gulf Coast University are required to create and maintain an online portfolio as an alternative to traditional comprehensive examinations. The program is delivered in an online format, and students are located around the world. The development of the online portfolios allows student to showcase their technology and curriculum knowledge. Additionally, professors have instant access to student portfolios to assess learning and growth. Portfolio assessment is an attractive alternative to exams by offering an authentic assessment of student knowledge in the quickly changing world of educational technology.

EdTech Online: A 16 Month Online Master's Degree

Jennifer Sparrow, University of Central Florida, USA; Bill Engel, Florida Gulf Coast University, USA

Florida Gulf Coast University is offering a Master's Degree in Curriculum and Instruction with a concentration in Educational Technology. The degree is delivered online with optional drop-in tech-in sessions available throughout the program. This program is designed to meet the needs of K-12 educators and individuals interested in teaching at the community college level. Courses prepare students to incorporate technology in their classrooms, become school-based technology specialists, or community college instructors.

Literacy Junction: Exploring Narrative Theory and Books for Youth in a Cyberworld

Hiller A. Spires, Pru Cuper & Cris Crissman, North Carolina State University, USA

This paper describes the development of Literacy Junction, which is an interactive web site for teachers and students in grades 5-8. Using an interdisciplinary approach to learning, Literacy Junction offers two distinct features: technology-enhanced experiences with outstanding young adult literature and cybercharacters who serve as both academic models and technology guides. A pilot study was conducted in which 8 students created their own cybercharacters after interacting with the site's cybercharacters as well as text-based literary characters. Through qualitative analysis of students' character drawings and oral and written discourse, several themes emerged depicting the role of cybercharacters in conjunction with students' aesthetic responses to narrative texts. Based on these preliminary findings we anticipate that future studies will contribute to narrative transactional theory as it is recontextualized from print-based to web-based learning environments.

High Touch Mentoring for High Tech Integration

Debra Sprague, George Mason University, USA; C. Steve White, George Mason University, USA

The Graduate School of Education (GSE) at George Mason University (GMU) is committed to developing new teachers who not only have the skills they need to develop and teach lessons with technology, but who also have the knowledge needed to distinguish between effective and ineffective uses of technology. In order to help the faculty achieve this goal, a concerted effort was needed to ensure that faculty's use of technology included a variety of advanced learning applications. We submitted a proposal and were awarded a Preparing Tomorrow's Teachers to Use Technology (PT3) Implementation Grant. This project involves pairing GSE faculty with K-12 teachers already proficient in technology for one-to-one mentoring. The K-12 teachers are helping the faculty redesign the teacher education curriculum to include technology, providing models for effective technology use, and demonstrating instructional software programs. The one-to-one support is being supplemented with Webcasts and "best practices" videos on integrating technology.

Summer Technology Institutes: Overcoming Barriers to Technology Integration in Higher Education

Denise Staudt, University of the Incarnate Word, USA

In recent years there has been a growing recognition that teacher preparation programs must prepare their preservice teachers to teach in tomorrow's classrooms. The vision of faculty involved in teacher preparation at the University of the Incarnate Word is to produce quality teachers who are well-versed in innovative instruction, skilled in technology and prepared to serve the multicultural and diverse student populations of South Texas. The future teachers should learn with modern technologies integrated into the postsecondary curriculum by faculty who are modeling technology-proficient instruction, particularly in courses where they acquire subject area expertise. In order to adequately train future teachers to use technology, the teacher educators realized that they needed to be retooled and retrained. Three Summer Technology Institutes were conducted to help faculty develop their technology skills to aid in the improvement of their classroom teaching.

Using Technology Camps as Catalysts for Increased Technology Integration

Mary Stephen, St. Louis University, USA; Gayle Evans, St. Louis Public Schools, USA

A major challenge in engaging faculty members and K-12 teachers in in-service technology activities is the many demands and constraints on their time during the school year. A summer technology camp offers one approach for addressing this challenge by providing time for participants to interact and focus on technology in a relaxed atmosphere. This paper describes a technology camp that brought faculty members, K-12 teachers, and teacher candidates together for three days of technology related activities. A sampling of participants has been surveyed now that they are back in the classroom to determine the ways and amount they have used information and skills obtained in the camp. Practical suggestions based on the evaluations and the implementation of the camp will be described at the session to assist other educators interested in creating a similar camp.

Faculty Teaching Faculty: A Matter of Trust

Elizabeth Stephens, Southwest Texas State University, USA; Kathryn Matthew, Louisiana Tech University, USA

The primary aim of the Viewing and Doing Technology (VDT) Project was to situate field-based secondary preservice teachers in a learning environment in which university faculty demonstrated skillful teaching with technology and offered students rich opportunities for visualizing and infusing technology in teaching. This project involved 10 secondary teacher preparation faculty who developed and conducted professional development workshops for each other. Workshops included developing online course materials, creating

WebQuests, peer editing with word processing software, developing video cases, creating multimedia course materials, and photo editing. Graduate assistants, two computer science majors, provided technology support. Data collection included email messages, faculty created web pages, observations, and interviews. Results of the data analysis indicated the faculty developed a connected community of learners who worked together to learn new ways to use technology and incorporated what they learned into their teaching.

Reflections of K-12 Teachers on Graduate Education via Distance Learning

Bill Stinson & Mark Stanbrough, Emporia State University, USA

This presentation will describe a recently NCA approved online delivery of a graduate teacher education that has been developed to accommodate the needs and interests of K-12 teachers in the field. The surveyed needs and technological capabilities of these teachers will be discussed along with the reflections of their experiences with receiving professional information in a distance learning delivery system. Also, the structure and functioning of these courses will be highlighted along with how they are used to foster ideas among K-12 teachers for using this approach in their own classroom settings.

Preparing Pre-service Teachers for integrating technology into science instruction:a PT3 project

David Stokes, Westminster College, USA; Sonia Woodbury, University of Utah, USA; Carolyn Jenkins, Westminster College, USA

This paper reports on a Preparing Tomorrow's Teachers to use Technology Capacity Grant Project designed to provide preservice teachers greater exposure to the instructional uses of technology. Goals for the project include: curriculum revision for college science methods courses to integrate more use of technology, integrating similar technology into both college and public school instruction, providing technology training and pedagogical mentoring for college teacher education faculty and participating public school teachers, and enhanced experiences for pre-service teachers in teaching with technology in the classroom. The opportunity to participate in a coordinated experience with using technology between their methods course and their field placement allowed pre-service teachers to focus on the issues of teaching with technology rather than on just becoming familiar with the technology. Pre-service teachers found the experience of first learning with and then teaching with the same technologies to be an important influence on their thinking about integrating technology into the curriculum. While levels of previous experience with technology varied, initial enthusiasm for teaching with technology united instructors at the college and intermediate school as they began this project. However, what was intended to be a democratic partnership with all members of the consortium participating equally in curriculum design and development, and in mentoring pre-service teachers, evolved into something less.

The use of Instructional Technology to enhance teaching outcomes on site and at a distance

Dr Armand St-Pierre, Royal Military College, Canada

Teachers using IT in their school and classroom will like to learn more about the use of the Web in the teaching process on site and at distance. Constant changes in technology are a major threat to the survival of traditional education systems. Instructional technology (IT) has to become a major component to the educational system to help teachers effectively and efficiently integrate new media in their teaching. Several factors such as a greater demand for technological learner graduates, the teaching of knowledge for distant learners and a more effective delivery of the curriculum influence the use of IT in academic institutions. The author of this article will present a practical framework to help faculty and academic staff to incorporate IT into the teaching process.

Use of FrontPage 2000 to develop and manage a teacher's educational web site

Armand St-Pierre, Royal military college, Canada

FrontPage 2000 is a very popular tool that will be used by teachers to develop their own teaching web sites to enhance learning outcomes in the classroom. In this session, I will describe and show briefly the necessary steps to build a simple Web site to support the teaching process.

Assessing Student Statistical Problem-Solving Skills using Interactive Java Applets

Arlen Strader, Texas A&M University, USA; Robert Hall, Texas A&M University,USA ;Michael Pilant,Texas A&M University,USA

Problem-solving instruction is a growing field within education. However, for distance education and other Web-mediated courses the traditional methods of assessment, namely multiple choice and short answer, are not sufficient. Although these formats can record final answers they cannot assess detailed aspects of the problem-solving process without becoming intrusive. A better assessment strategy is to use simulations and other highly interactive systems. Such tools can discreetly track student performance data without interfering with the problem-solving process. This paper will explore the use of interactive environments as an assessment technique of the problem-solving processes within Web-mediated courses and will focus on an example developed by the authors for use in an applied statistics course.

The LPII Simulation: A Lesson-planning Tool for Preservice Teachers

Harold Strang, University of Virginia, USA; Ronald Clark, University of Virginia, USA

This paper describes the key features of a Visual Basic simulation that is designed to help preservice teachers to gain insights in planning effective lessons for both motivated and unmotivated students. The tool's four-step descision-making sequence will be demonstrated and the post-participation debriefing phase will be discussed. Finally, initial field testing results and projected future applications will be presented.

The Formative Evaluation of a Computer-Managed Instruction Module: Metric Instruction for Pre-Service Elementary Teachers

A.W. Strickland, Idaho State University, USA; John Springer, Idaho State University, USA; Martin Horejsi, Idaho State University, USA; Jane Strickland, Idaho State University, USA

A Computer-Managed Metric Instruction Program (CMIP) providing instructional units on basic metric concepts has been developed. A blending of Gagnè, et al. (1992) and the developmental theories of Bruner (1966) provides the pedagogical basis for the instructional design. The instructional design model used to create each metric lesson utilizes a system of "branches" allowing a student who has difficulty with a specific lesson to be routed to a review section or attend to remedial exercises. This research concentrated on the design and development of the metric area module as the first module of the entire metric system course, and to act as a prototype for the remainder of the modules. Each unit has a companion review module for those students who obtained a score that met the pre-test criterion for that particular unit. The pre-test data for the metric area module consisted of 15 questions, 3 each on the following square unit segments: Kilometer, meter, decimeter, centimeter, and millimeter. Test results indicate that the use of concrete materials adds a learning dimension to those students who need a transition between the "hands-on" learning modality and the more abstract learning module presented in the computer software.

The Impact of Electronic Portfolios on Early Experience Preservice Elementary Teachers in Integrating Technology into their Instructional Process

Jane Strickland, Idaho State University, USA; Chris Williams, Idaho State University, USA; Michael Jenks, Idaho State University, USA; Charles Zimmerly, Idaho State University, USA

The State of Idaho has mandated evidence of technology integration within the instructional practices of certificated personnel. The Idaho State University College of Education created a portfolio assessment process for certificated personnel in the schools as well as preservice students within its teacher education program. The resultant Instructional Technology course (EDUC3111) is constructed around the portfolio process. Evidence comprising the portfolio include tool software integration, educational software evaluation, and foundational standards regarding adaptations for special needs, basic computer/technical concepts and operation, equitable, ethical and legal use of technology, and the application of technology into instructional planning and delivery. During academic year 1999-2000, there were 291 preservice elementary teachers enrolled in the fall semester and 124 enrolled in the spring semester. Each student submitted an electronic portfolio for assessment by the ITPA (Idaho Technology Portfolio Assessment) assessors. The students, during the fall semester, had a 97.6% success rate, and those in the second (spring) semester, 95.2%. At present, the process of developing learning activity plans that include technology integration (EDUC311), coupled with the requirement for a minimum of two integration lessons taught during the corequisite early field experience (EDUC309), has resulted in a heightened awareness and use of technology in instruction.

Faculty Mini-Grants: A Key Piece of our PT3 Puzzle

Neal Strudler & Risa Weiss, University of Nevada, Las Vegas, USA

The mini-grant concept, used at many universities, was identified as a "best practice" in a study of teacher education programs deemed exemplary in their integration of technology (Strudler & Wetzel, 1999). It is designed to address the obstacle identified by faculty as the biggest impediment to technology integration—time for professional development. Planned in collaboration with UNLV's Teaching and Learning Center, our mini-grant program provides faculty time outside of their normal work schedule to gain new skills and plan and develop technology-enhanced learning activities for their classes. Ten mini-grants were awarded last summer as part of our PT3 Capacity-building grant. Now, our Implementation grant includes 36 mini-grants per year for three years—24 within the College of Education and 12 to faculty in other colleges across campus. Overall, we feel that the mini-grants offer a wonderful "next step" as a follow-up to the faculty workshops that we've offered. This paper will document the process and outcomes of our mini-grant program to date. For more information and examples of faculty projects please see: http://www.unlv.edu/projects/THREAD/.

Stage Struck - Exploring Technology for the Performing Arts

Bronwyn Stuckey, University of Wollongong, Australia; John Hedberg, University of Wollongong, Australia

The session will involve demonstration and hands-on activity with the Stage Struck CD-ROM and web site. An accompanying poster session and paper have been presented for this conference. The paper allows teachers to see the theoretical background to the CD-ROM and the web site. The poster session will allow teachers to further explore both media products and to order or purchase copies of the software.

Professional Development On-line - Doing IT Pedagogically

Bronwyn Stuckey, Faculty of Education University of Wollongong,Australia; John Hedberg, Faculty of Education University of Wollongong,Australia; Lori Lockyer, Faculty of Education University of Wollongong,Australia

This paper describes the first phase of a research study to examine the role played by Internet-based teacher professional development in the implementation of an innovation. The innovation in this study is the software application (StageStruck) for the performing arts. The professional development web site has been developed to support inservice teachers in best practice use of the software. The cases investigate the effect of this the on-line professional development strategy and teacher implementation of the software with elementary and secondary inservice teachers. In this first phase the web site portal (http://www.stagestruck.uow.edu.au) has been established to build and support a community of practice in the performing arts areas of learning. The web site development has been an iterative process based on an understanding of best practice in professional development, a review of the literature and exploration of cases available in and about on-line communities, and the contributions and ongoing evaluation of our community members (teachers and students). The current phase of the research begins the data collection of data on the efficacy of the on-line professional development strategy employed.

An instrument to assess Malaysian teachers' IT preparedness

Wong Su Luan, Faculty of Educational Studies, Universiti Putra Malaysia, Malaysia; Kamariah Abu Bakar, Faculty of Educational Studies, Universiti Putra Malaysia, Malaysia; Rohani Ahmad Tarmizi, Faculty of Educational Studies, Universiti Putra Malaysia, Malaysia; Ramlah Hamzah, Faculty of Educational Studies, Universiti Putra Malaysia, Malaysia

The Malaysian Ministry of Education plans to turn approximately 10,000 primary and secondary schools into Smart Schools by the year 2010. This means that in the next decade, all teachers must be fully prepared to teach in all the Smart Schools nation-wide. The pressure on teachers to be IT prepared has, therefore, become urgent. For this reason, there is a growing educational interest in the assessment of teachers' IT preparedness. In this paper, we examine the need to develop an instrument that is able to assess teachers' IT preparedness. IT preparedness in this study is measured in three domains: the teachers' actual IT skills, their knowledge about IT and their attitudes toward IT. We also describe what the instrument attempts to measure, how it is administered and present results of phases one and two of the study.

Collaborative university-public school partnerships: Development of an online network for School of Education faculty and public schools

William Sugar, East Carolina University, USA; Helen Parke, East Carolina University, USA; Jon Pedersen, University of Oklahoma

This presentation details the development of a collaborative network that supports a university-school partnership. The intention of this proposed network is to help School of Education faculty develop and maintain collaborative relationships with their public school counterparts. During this presentation, the initial design phase and subsequent design phase will be discussed. Illustrative descriptions of this final network, as well as an analysis of features available in existing online teacher networks will take place. Issues related to developing effective university-school partnerships will take place in the context of this proposed collaborative network. School of Education faculty and public school teachers are encouraged to attend this presentation. Their immediate feedback and insight will be incorporated in the continual evaluation of this network.

The Design of Instructional Technology to Help Students Connect Phenomena to Scientific Principles

Jerry Suits, McNeese State University, USA

This paper describes how instructional technology can be designed to help students make meaningful connections between phenomena and scientific principles. Conversely, traditional instruction in the sciences separates the study of phenomena—in the laboratory—from the study of the underlying scientific principles—in the lecture room. Three types of technology can help students bridge their way across this large curricular gap: (1) Microcomputer-based laboratory (MBL) experiments give them the opportunity to predict, observe, and explore the effects of experimental parameters (e.g., temperature, pressure, pH, etc.) upon the outcome of an experiment (i.e., the dependent variable). (2) Computer-simulated experiments (CSE) allow them to extend the MBL learning opportunities to include a wider range of phenomena (e.g., rapid chemical reactions or larger scale models of industrial processes). (3) Multimedia learning modules (MLM) can be used to help students practice their problem-solving skills within a real world context that serve as applications of scientific principles. Students need help in building procedural/conceptual bridges that connect a phenomenon (e.g., an acid-base chemical reaction) to its pictorial/iconic representation (e.g., a graph of pH on the y-axis versus volume of base added on the x-axis) and its symbolic representation (e.g., mathematical equations needed to calculate pH). Technology can help students build these bridges by providing the scaffolded instructional resources that they need to design experiments and discover the underlying scientific principles. Initially, they receive full support (e.g., help, cues, and feedback) from these resources as they engage in the decision-making processes; however, support is gradually faded as they make progress through the instructional sequence.

From Email to Virtual Reality: An Online Master's of Education in Educational Technology that Models Interaction

Laura Sujo de Montes, Northern Arizona University, USA; Michael J. Blocher, Northern Arizona University, USA

This paper addresses how Northern Arizona University (NAU), an institution that serves mostly rural students in Arizona, created and implemented a totally online Master's of Education in Educational Technology degree that is based on the constructivist theory, promotes and fosters interaction among students, between student and instructor, and between student and content. A discussion of the fourth type of interaction, interaction with the technology interface, is also addressed. Finally, the authors talk about how Active Worlds, a three-dimensional, virtual reality environment that allows interaction, is built into the master's program.

Educational Technology at the University of Florida

Colleen Swain, University of Florida, USA; Sebastian Foti, University of Florida, USA; Kara Dawson, University of Florida, USA

A metamorphosis has been occurring in the teacher education program at the University of Florida in recent years. The PROTEACH program, as our teacher education program is known, has a national reputation for innovation and collaboration. Technology has been a major component in the evolution of PROTEACH and in this institutional session we will discuss and demonstrate many of the ways that technology is integrated in the preparation of teachers. In addition, the integration of technology in our PROTEACH program has simultaneously contributed to other changes and innovations in our College that we will also discuss and demonstrate in our session. Students and faculty will be on hand during this institutional session to discuss and demonstrate the various components mentioned above. The session is designed to facilitate dialogue among professionals interested in the integration of technology in teacher education.

Move To The Top Of The Class: A Comprehensive Technology Staff Development Program

connie swiderski, Education Service Center, Region 11, USA

Teachers have increasing demands on their time and energy and need a staff development program that offers flexibly and a "just-in-time" approach that provides the skills they need when they need to acquire them. In order to offer this level of staff development, the Move To The Top of the Class, a series of classes will combine 45-minute mini classes delivered during the teacher's conference period in conjunction with on-line courses. The program provides for district teachers not only ways to build the knowledge and skills needed to be proficient in the use of technology, to use technology in curriculum planning, and designing student learning activities that integrate technology, to engage students in "student centered" learning experiences, and to communicate and collaborate to promote the use of technology to improve teaching and learning but delivers this training in smart ways to allow the participant flexibility to fit course work among other demands of their time. This is offered as on-campus classes with a consultant for each campus, and on-line versions of the on-campus classes and an on-line instructor for each class. The hope is to offer non-threatening training and support for all participants.

SMOOTHING THE TRANSITION FROM TO THE INSTRUCTIONAL TECHNOLOGY AGE: A CHANGE MODEL BASED ON PROFESSIONAL DEVELOPMENT AND INNOVATION DIFFUSIONSMOOTHING THE TRANSITION FROM TO THE INSTRUCTIONAL TECHNOLOGY AGE: A CHANGE MODEL BASED ON PROFESSIONAL DEVELOPME

Michael Szabo, University of Alberta, Canada

We are in the beginning stages of another one of the world's major social revolutions which has been spawned by technology; the information communications technology revolution. A subset of this is the instructional technology revolution. History shows that once a revolution is established, things go rather smoothly. During the revolution, however, there is chaos, dislocation and tremendous social and economic upheaval. This paper hypothesizes that educators can take certain actions to minimize the shock and turmoil we face in the coming IT revolution. The actions are based on a study of the history of successful and unsuccessful innovations and their diffusion into our everyday world. From ten lessons to be derived from innovation diffusion, we can draw inferences for educational actions. These lessons have been developed into a system for renewal through change and professional development. The system, known as TIES, emphasizes professional development, ownership of change through empowerment, multipliers to meet the demand of massive training, support in a timely and understandable fashion, high credibility, embedded expertise, and leverage of renewal. This paper will describe TIES, its 3 year application in an educational setting, and lessons learned.

The Information Revolution and The Future Role of Educators

Michael Szabo, University of Alberta, Canada

We are embroiled in one of the world's major revolution; the Information Communications Technology (ICT) revolution and its subset, the Instructional Technology revolution (IT). IT is slowly changing the way instructors and education institutions carry out their day to day activities. The purpose of this paper is to identify trends in the ICT and IT revolutions and implications for educators. Because predicting the future beyond lunch is frustrating and unrealistic, an alternative considers different plausible scenarios (Schwartz, 1996).

Work-in-progress project aiming at assessing the Faculty Attitudes Toward Information Technology of Universidade Paulista (UNIP) Post Graduation Course in Brazil

Sandra Mônica Szwarc, Universidade Paulista, Brazil

This small paper is a report of the work-in-progress project aiming at assessing the Faculty Attitudes Toward Information Technology of Universidade Paulista – Post Graduation Course in Brazil leading to taylor-made training suggestion at identified areas in order to promote inquiry-based learning and effectively integrate the use of technology into existing curriculum thus increasing teacher - student learning and achievements. Assessment will follow Project for the Longitudinal Assessment of New Information Technologies in Education coordinated by Professors Gerald Knezek and Rhonda Christensen of University of Texas- TECET translated into Portuguese.

Innovative Program Design & Instructional Methods for Online Teacher Education

Roy Tamashiro, Webster University, USA; Julie Reitinger, Webster University, USA; Virginia Lewis, Webster University, USA

Can faculty views about internet-based online courses and degree programs change from skepticism to acceptance, and from opposition to cooperation in less than two years? This paper reviews the development and institutionalization of two 100% online teacher education degree programs at Webster University (St. Louis, MO, USA). The number of course offerings grew from one pilot online course in Spring 1999 to 14 in Spring 2001. This success is attributed to program developers' efforts to understand the institutional climate, select suitable program directions, and design online instructional methods congruent with those program priorities. The applicability of Webster University's solutions to online program development efforts at other colleges and universities are discussed.

LIFE AND DEATH OF THE LYMPHOCYTES A DIDACTIC-PEDAGOGIC GAME FOR TEACHING IMMUNOGENETICS

Gerlinde Teixeira, Universidade Federal Fluminense, Brasil

All individuals are potentially capable of generating Immunoglobulins to all antigenic stimuli. Immunoglobulin aminoacid sequencing has revealed a curious and unique fact among proteins, a high diversity amino-terminal region denominated the variable region, responsible for antigen recognition associated to a relatively constant carboxi-terminal region responsible for biological functions. Bearing in mind that the presence or absence of immunoglobulins during maturation will determine the fate of the lymphocyte we elaborated the game which we here propose. Genetic rearrangement, lymphocyte differentiation and repertoire selection, are the topics present in the game, which follows some rules of Role Playing Games, where each player participates as an actor. This was the topic of our course where medical students had most difficulty learning before we elaborated the game. Their first reaction in doing this activity is of disbelief, they are reluctant in starting and present childish reactions, but as they start going through the steps of the game they started asking the questions I expected during classes. We have used the game, with great success; in continued education programs for high school teachers where Molecular Biology, Genetics and Immunology are the central themes. This type of activity renders the learning process a more pleasant one.

Online Teaching Tools: Early Results from an International Survey of Online Instructors

Lucio Teles, Simon Fraser University, Canada; Irina Tzoneva, Simon Fraser University, Canada

As online learning becomes increasingly common and an integral part of our educational system, it is important to investigate how instructors and students teach and learn in the online classroom. This paper presents preliminary results from a research in progress which studies the use of instructional tools by online instructors. We are collecting data on the most used tools, the tasks they accomplish, and on the impact of their use as reported by instructors. The research focus is on instructor tasks which are facilitated by online tools, whether the use of these tools increases or decreases instructors' workload, according to their own perceptions, and how online instructors value the use of tools for online teaching.

A Collaborative Approach to Integrating Technology and Information Literacy in Preservice Teacher Education

Lolly Templeton, Westfield State College, USA; Signia Warner, Westfield State College, USA; Richard Frank, Westfield State College, USA

The current focus on technology and Information Literacy (IL) represents an important shift in preservice teacher education from basic skills, which are necessary but not sufficient for students today, toward evaluation, analysis, synthesis, and production to produce students who can demonstrate understanding as well as knowledge and skill (Lieberman & Miller, 2000). The National Council for Accreditation of Teacher Education (NCATE) recommends infusing "information literacy requirements into undergraduate and graduate programs in teacher education." NCATE standards specify that candidates preparing to work in schools must be "able to appropriately and effectively integrate technology and information literacy in instruction to support student learning" and "understand the importance of using research in teaching . . ."(NCATE 2000 Standards). The Intent of this study is to observe the complexity of preservice Information Literacy (IL) processes as they occur in one teacher education program and to describe how one education resource librarian and one professor of education collaborated to provide IL instruction to preservice educators that went beyond the traditional bibliographic instruction lecture format, using active learning methods to encourage lifelong information literacy skills.

Creation of a new paradigm for the roll of educators through in service training that facilitates innovation and improves the process of imperfectly seeking emerging technology in tandem with the evolving market place.

Gopakumaran Thampi, SPCE, Mumbai, India; Shankar Mantha, VJTI, Mumbai, India

Change is the name of game in the hyper - competitive international market place - radical, unrelenting and ever accelerating change. It is not an event. On the contrary, it is a journey that has no end. In this whirlwind of change, only such educational institutions of higher learning that are prepared to make the leap beyond the traditional hierarchies would thrive and survive. Educators should understand the deeper forces that operate on the Teaching Learning process and the market place. The paper attempts to find this synergy through a case study. A technique like ABC analysis in the realm of inventory control is to be discussed in the paper at large. Most importantly the paper address the pedagogy involved in the Teaching-Learning process of computer programming languages such as Object Oriented Programming in C++, JAVA and other Internet technologies and methodology to innovate to understand and follow the technology, with out a time lag, so that state of art technology can be offered to trainees and students.

A graduate track in learning technologies

M.O. Thirunarayanan, Florida International University,

A graduate level specialty track in learning technologies was approved in 1998 in the College of Education at Florida International University. It is offered as a track under the Master of Science in Urban Education degree program. The first group of students enrolled in the program during the Spring 1999 semester. This paper provides an overview of the program, including comments made by students who will have graduated by the time this paper is published.

A Web-based Precision Teaching Approach to Undergraduate Physics

Adrian Thomas, Louisiana Tech University, USA; Lamar Wilkinson, Louisiana Tech University, USA; Jack Marr, Georgia Tech, USA; Edward Thomas, Georgia Tech, USA; Walter Buboltz, Louisiana Tech University, USA

The current research was aimed at improving performance in an undergraduate electromagnetism course at a reputable engineering university with a history of high attrition. In particular, a team of physicists, psychologists, and computer scientists engaged in a five year project to develop an improved instructional approach. Based on an extensive task analysis, the underlying reason for poor performance in the course was found to be lack of fluency on lower-level skills involved in solving physics problems (i.e. basic math skills, basic units knowledge, etc.). Subsequently, an extensive series of web-based materials were developed based on the principles of precision teaching (Lindsley, 1972). The current research reviews the precision teaching approach in general. Then, in turn, the paper discusses the year-long process of the development of the materials, discusses how the web-based materials should be presented, and presents results for several independent implementations of the materials at our university. Finally, the advantages of using the web-based materials over a traditional paper and pencil approach are discussed. In total, the current project shows that not only was web-based precision teaching very effective in the current research, but that such an approach may be much more cost effective and teacher friendly than traditional approaches to instruction.

Integrating Technology into the K-6 Classroom

Gary Thompson, Valley City State University, USA; Dale Hoskisson, Valley City State University, USA; Dave Bass, Valley City State University, USA; Larry Grooters, Valley City State University, USA

To respond to this need to produce technology proficient teachers, the VCSU Elementary Education Department has formed a partnership with six other educational entities to strengthen and improve learning with technology and to ensure that there is a continuity between the VCSU Elementary Education technology requirements and K-6 needs. To help achieve this continuity, the VCSU Elementary Education Department applied for and received an implementation grant from the U.S. Department of Education (PT3 Grant). One of the main goals of the grant is to provide opportunities for VCSU Elementary Education faculty, preservice teachers and inservice teachers from the consortium to work together to integrate technology into their courses and to create a learning community among themselves for the purpose of using technology to improve learning and develop complex reasoning and problem solving skills.

Pre-service Teacher Responses to the Restructuring of the Traditional Educational Computing Course

Mary Thompson, University of Houston, USA; Saru Cheriyan, University of Houston, USA; Angelle Adams, University of Houston, USA; Evelyn Beyer, University of Houston, USA; Leslie Starcke, University of Houston, USA; Melissa Pierson, University of Houston, USA;

The primary focus of this paper is the perceptions of currently enrolled students regarding a new course format. Data has been gathered from students currently participating in CUIN 3111, Technology in the Classroom, through a qualitative ethnographic interview process and through the medium of a web-based newsgroup application. Through this data we will understand the perceptions of our pre-service teacher students regarding their experience of the new computer course and will then be able to incorporate any changes necessitated by these observations into designs for future classes in the upcoming Spring semester.

From "Inches" to "Miles": Web-Enhanced Instruction Using WebCT (Version 3.1)

Ingrid Thompson-Sellers, Georgia Perimeter College, USA

This workshop will introduce the participant to the WebCT software program, which can be used as an additional instructional delivery tool to complement in-class meetings, as well as to develop distance learning classes. The emphasis is on getting a general concept of how to include this program as a part of your teaching tools as well as the possibility of creating an on-line version of your face-to-face classes.

Making Sense of Number:a Resource for Pre-service and In-Service Education

David Thomson, University of Edinburgh, Scotland; Tony van der Kuyl, University of Edinburgh, Scotland

This paper reports on the development of a multi-media/web/cd package which provides users with opportunities to consider issues in the teaching and learning of numeracy in the early years of elementary school. By viewing exemplifications of classroom activities and listening to commentaries from teachers, children, school managers and parents, users are invited to reflect on and critically evaluate their own practices and contexts. The package also provides a basis for the establishment of an on-line learning community where ideas and resources can be shared and issues discussed.

Technology Empowers a Diverse Population of Students: Results From a Technology Professional Development School

Carrie Thornthwaite, Lipscomb University, USA

This study documents the experiences of a school-university partnership initiated in January, 1998, between Lipscomb University and Glencliff High School, both of Nashville, TN. The partnership was established with a focus on the preservice training of university students and the professional development of inservice personnel, with a particular focus on technology. The partnership strove to follow guidelines for professional development schools (PDS) as established in research. Unique characteristics of this PDS developed as a result of the facts that Lipscomb is a small, private university with limited diversity and Glencliff is an inner-city school with tremendous diversity. Annual studies have been conducted using qualitative research methodologies. Although the research indicates success in several areas, the valuing of diversity and community has evolved as the outstanding hallmark of this partnership.

Successful Multidisciplinary, Thematic Curriculum Activities: Development, Implementation, and Impact

Neal Topp, University of Nebraska at Omaha, USA; Cecil Doshier, Morrill Schools, USA; Carolyn Schlager, Scottsbluff Schools, USA

This paper will focus on multidisciplined, integrated, thematic curriculum units as developed and taught by teachers from three Nebraska school districts who are involved in a U.S. Department of Education Challenge grant. The teachers from these three schools designed the units using an on-line form and database developed by the grant project's staff. The project teachers received staff development training on several aspects of effective teaching/learning, such as multi-intelligences, brain research, multi-disciplinary strategies, efficient assessment, and the importance of connecting learning to community and real world situations. The paper will explain the process of curriculum development, the on-line availability of the units, the training for teachers, the local school support to make the units successful, lessons learned, and the impact of this type of activity on student learning, teacher growth and attitudes, school climate, and community connection to student learning and the school in general. In addition, the benefits to undergraduate and graduate education in a college of education will be discussed.

A model to design technology for teacher training program

Dogan Tozoglu, Folrida State University, USA; Ilhan Varank, Folrida State University, USA

Teacher training is one of the most important factors that determines teachers' use of educational computing in classroom. On Average five to seven-years of training is necessary for a teacher to become a confident user of educational technology (Hardy, 98). However, most teachers do not have enough computer skills (Dupagne, 92) and feel they have not taken adequate training to integrate computer in their classroom. The purpose of this paper is to describe a teacher technology-training model for a private high school in Turkey that incorporates the notion of instructional design and systems thinking. The training model is structured around the generic ADDIE model, which is Analyze, Design, Development, Implementation and Evaluation. However, the model provided in this paper is situation-specific and has additional elements to satisfy the need for in-service technology teacher training.

Using Communities Of Practice Strategy To Enhance Mentoring

Chih-Hsiung Tu, The George Washington University, USA; Marina McIsaac, Arizona State University, USA

The current model for mentoring doctoral students is based on

apprenticeship; but this process may result in the insufficient development, application and spread of knowledge. Other mentoring models have been proposed, but none have addressed online professional development. Communities of practice (CoP) have the potential to be conducive to mastery of new knowledge. Several successful reform projects have supported this concept. This paper describes a CoP model that combines on-line and face-to-face (FTF) elements designed to enhance mentoring and professional development strategies. The goal is to evolve a sustainable CoP for the graduate education of professionals, learning the intricacies of their profession, implement practices, and apply new content knowledge. This study demonstrates how a CoP model supports doctoral students' learning. It concludes with a discussion of the attributes of CoPs and guidelines for construction of effective mentoring models for learning reforms.

A Study of Faculty Perceptions to the Integration of Systems Thinking in the Teacher Preparation Program at Northern Arizona University

Gary Tucker, Northern Arizona University, USA; Laura Sujo de Montes, Northern Arizona University, USA; Becky Willis, Northern Arizona University, USA; Michael Blocher, Northern Arizona University, USA

This paper is a report on a study done at the Center for Excellence in Education at Northern Arizona University. In 1984, the Center was created on a concept of moving away from the typical hierarchical structure of a college of education toward a matrix. The matrix was designed to help create a community of people in a diverse organization and move away from the "turf" concept of departmentalization. A concept that was to be verbalized by Peter Senge (1990) in his book on learning organizations. By the fall of 2000, the Center has deteriorated back to a hierarchical, departmentalized college of education. Senge (1990) identifies 7 organizational learning disabilities that are typical in organizations that are not learning organizations. This study was a survey of the faculty of the Center to help gain a better understanding of where we are in terms of suffering from these 7 learning disabilities.

The Learning Lab: Teaching and Learning In An Online Information Technology Environment

Jaap Tuinman, Open Learning Agency, Canada; Enid McCauley, Open Learning Agency, Canada; David Porter, Open Learning Agency, Canada; Peter Donkers, Open Learning Agency, Canada

This paper will discuss the Learnware funded program for teachers - The Learning Lab. The Learning Lab is an online professional development program for teachers who want to upgrade their information technology skills and learn more about integrating technology into teaching and learning. The program is based on self-directed learning. It includes prior learning assessment and development of personalized learning plans as core components of the program. A wide range of learning paths, modules, learning objects, and resources are provided to meet the needs of teachers whose skill levels range from emergent technology learners to education technology leaders. The Learning Lab provides opportunities for teachers to work at their own pace, in the curriculum area of their choice, and to apply their research and their learning into the classroom. Offered as both a non-credit and credit program, The Learning Lab provides an easily accessible, media-resource rich, mediated model for teacher professional development programs that meets international standards and strives to address key issues in ITC training.

THE FACULTY RETREAT—A TOOL FOR TECHNOLOGY ENHANCEMENT AND TEAM BUILDING

Cordelia R. Twomey & Gertrude Abramson, Nova Southeastern University, USA

Explore innovative methods to advance your program's technology initiative and staff development for all faculty—full-time and adjunct, on-campus and on-line.

TECHNOLOGY STAFF DEVELOPMENT AT AN URBAN PUBLIC UNIVERSITY

Cordelia R. Twomey & Gertrude Abramson, Nova Southeastern University, USA

The Instruction and Technology Initiative at New Jersey City University, an Hispanic Serving Institution, was designed to increase the capacity of faculty to foster instructional innovation via educational technology, both within the University and to reach teachers on the local and the statewide level. The Initiative is designed to fuse technology education with the specific learning needs of students through one-to-one and small group faculty training, and that full-time personnel staff the Center, serving as in-house consultants to the faculty.

Implementing Technology into PreService Teacher Education Courses: PT3 First Year Accomplishments

Tandra Tyler-Wood, University of North Texas, USA; Dana Arrowood, University of North Texas, USA; Rhonda Christensen, University of North Texas, USA; Jeff Allen, University of North Texas, USA; Michele Maldonado, University of North Texas, USA

The University of North Texas received a Capacity Building Grant from the U.S. Department of Education's Preparing Tomorrow's Teachers Fund. One of the goals of the grant was, "To enhance technological knowledge and skills of future teachers to that they can infuse technology into learner-centered classrooms." This session presents the results of four initiatives funded by the grant.

The Education Technology Revolution Challenge

Timothy Tyndall, Camp Internet, USA

The American education system is in the midst of a challenging revolution as it steps from the 20 th century chalk and blackboard environment to the 21 st century multi-media electronic networking environment. This transformation has created new teacher professional development needs, and presents new innovative content delivery opportunities. To successfully make this transformation from the blackboard to the electronic classroom, the national education community must now challenge technology to deliver on its promise of redefining American education practices.

Learner Self-efficacy, Attitude, and Utilization Patterns of an Electronic Textbook

David Unfred & Steve Crooks, Texas Tech University, USA

The use of electronic textbooks is increasing. The spectacular growth of the electronic learning space that is accessible through the computer, CD-ROM, DVD, Internet and World Wide Web has impacted a traditional form of mediated instruction, the expository printed textbook. With the digitization of information has come an evolutionary societal change where electronic publishing increasingly supplements (and some would argue eventually supplants) the printed text. A pilot study of learner self-efficacy, attitudes, and access and utilization patterns are addressed using graduate students in instructional technology. This pilot study was initiated to discover areas that could impact an expanded study on factors influencing the use of electronic textbooks.

Faculty Training - Lessons in a "Flash"

Michael Uttendorfer, New York Inst. of Technology, USA

This interactive session will provide hands-ons on experience with creating interactive instructional materials using Macromedia's Flash which can be used as "standalone" files or "published" to the web. Examples of several of the presenter's online web-based lessons created for faculty development workshops will be demonstrated. Participants will then have an opportunity to create their own interactive lesson with materials provided by the instructor. Models, templates and media libraries will be used to facilitate the creation process. Session attendees will receive a CD-ROM containing samples and template files. This session requires no special HTML or web experience. Participants may have little or no experience with Macromedia Flash.

An In-Service Program for Ecuadorian Teachers. The Innovation of Elementary Education in the Santa Elena Peninsula Project

Martin Valcke, University of Ghent, Belgium; Katherine Chiluiza, Escuela Superior Politecnica del Litoral, Ecuador;

The Ecuadorian educational setting promotes teaching strategies that are still built upon traditional educational models. The potential of new learning models and information technologies is neglected and little interest is shown in including ICT as a catalyst to foster innovation of education in general. This paper is about an Innovation Educational Program for elementary education in the Santa Elena Peninsula in Ecuador. The project seeks to develop creativity, critical-thinking and problem solving in primary school children with the support of ICT. A major part of the project is focused on teacher training. The study monitors and follows teachers and pupils during a 6-year period. In this paper part preliminary results of the teacher-focused studies are presented. This sub-project focused on the analysis of video materials and surveys that research the current dominant teaching - learning strategies adopted and promoted by teachers in the Peninsula Project.

Designing & evaluating a powerful online environment to support teachers to integrate ICT into the curriculum.

Tony van der Kuyl: University of Edinburgh, Scotland; Margaret Kirkwood: University of Strathclyde; Rob Grant: Northern College, Aberdeen Campus; Nigel Parton: University of Edinburgh, Scotland

Traditional ICT courses for teachers cover the basic skills of operating hardware devices or the key features of software applications, and may provide some examples of appropriate classroom use. Such courses rarely have lasting impact. The knowledge and skills gained on the course are soon forgotten as other priorities take precedence in teachers' working lives.

Designing web based Constructivist Learning Environments

Emiel van Puffelen, Stoas, The Netherlands

A group of 18 university teachers designing and constructing a Constructivist Learning Environment (CLE) was interviewed and monitored in order to find and test optimal design of web based CLEs. The information functions of the CLE were supported by web based technology and the social / collaborative functions were designed using "face to face" interaction. The learning environment was designed for use by a group of 180 first year students with no experience in using CLEs. The results show that supporting the information functions of a CLE with web based technology can be very useful for case oriented education. It also supplied good support for efficient instructional design by a group of teachers. In addition it resulted in a shift of teachers behavior towards facilitating active learning.

Pilot Results of a Teacher Education Technology Infusion Model

Rachel Vannatta, Bowling Green State University, USA; Blanche O'Bannon, University of Tennesee-Knoxville, USA

Funded through a PT3 Capacity Building Grant, Bowling Green State University piloted a technology infusion model in its elementary education program. Project PICT (Preservice Infusion of Computer Technology) was initiated during the 1999-2000 academic year and sought to prepare technology-using preservice teachers by: 1) increasing faculty/teacher technology access through laptops and electronic classrooms; 2) implementing an extensive technology training program for education faculty, arts & sciences faculty, and area K-6 teachers who work with teacher candidates; 3) initiating a curriculum restructuring process to align with NETS-teachers; and, 4) beginning the infusion of technology in the elementary program. Results of this pilot will be presented.

Justification of Technology Teacher Training From Human Performance Perspective

Ilhan Varank, Florida State Un., USA; Dogan Tozoglu, Florida State Un., USA

Technology teacher training is one of the most preferred methods in schools and other educational institutions to close the gap between teachers' expected level and current level of technology use in the classroom. The purpose of this paper is to investigate, based on Mager and Pipe's (1997) performance analysis model, if technology teacher training is the only solution to improve teachers' performance in using technology in the classroom. First, a literature review on technology teacher training will be provided and then the performance analysis model will be used to evaluate the necessity of the training.

Electronic Tutorship Support in an Educational Intranet

María J. Verdú, University of Valladolid, Spain; Juan P. de Castro, University of Valladolid, Spain; Rafael Mompó, University of Valladolid, Spain; Ricardo López, University of Salamanca, Spain; Joaquin Garcia, University of Salamanca, Spain;

Information and Communication Technologies have changed the way we work, the way we live and the way we learn. One of the things that should be updated regarding the new educational context is the tutorship support, that is specially important in a learning environment. In this communication a definition of the educational system of the Information Society for primary and secondary education is proposed, what is called Educational Intranet. Next, it focus on how should the tutorship support be offered by such Educational Intranet. So, this document describes and proposes an original tutorship support system to be incorporated to an educational intranet for primary and secondary education. The tutorship support can be performed face-to-face, that is to say, in real time using a video-conference system (Synchronous Tutorship Support) or it can be carried out by means of a text-based messages or queries electronic mailbox (Asynchronous Tutorship Support).

It's a Small University After All - Reducing Distances Between Colleges via Web CT

Karen Verkler, University of Central Florida, USA

This paper describes a Web CT-based project by which a collaborative relationship was effected between foreign language education majors in the College of Education and foreign language majors in the College of Arts and Sciences at a large metropolitan university.

Thousand-level Spanish and French students responded weekly in the target language to instructors' queries posted on Web CT class accounts. Foreign language education majors, as a form of formative assessment, provided constructive feedback to these students by means of comments posted to them on WebCT. At the end of the semester, student reactions to this project were obtained via surveys. The author will provide a brief description of the project and will share the results during the presentation.

Using Information and Communication Technologies to develop a learner-centered approach with pre-service elementary school teachers : An exploratory research.

Jacques Viens, University of Montreal, Canada; Geneviève Légaré, Concordia University, Canada

This paper presents the preliminary results of our exploratory research concerning students' perceptions about their role as future elementary school teachers and the educational practice they integrate in the development of an integrative scenario. We have noticed that when a socio-constructivistic teaching/learning approach is used, many students still have problems assuming more freedom over their own learning experience. Indeed, they tend to fall back on their old ways of learning and they plan their lesson accordingly. We will present instructional strategies that are likely to facilitate the shift from a teacher-centred approach to a more genuine learner approach. We will shortly describe a Web site providing scaffolding tools to help students and teachers through the whole process of scenario production. In order to stimulate metacognitive processes and collective knowledge construction about the new roles of teachers, we use telediscussions in an electronic forum.

CRACTIC : towards a model for the implementation of socio-constructivists principles in multiple classrooms collaborative projects using the Web

Jacques Viens, Université de Montréal, Canada; Alain Breuleux, Mc Gill University, Canada; Pierre Bordeleau, Université de Montréal, Canada; Allen Istvanffy, Mc Gill University, Canada; Sonia Rioux, Université de Montréal, Canada

CRACTIC stands for "Research Community on Collaborative Learning with Information and Communication Technologies". It is a collaborative research involving university professors, teachers and domain experts in the development and implementation of collaborative learning activities based on socio-constructivist principles. Our pedagogical model builds on having students from different schools along the St-Lawrence River to exchange questions and answers about the impact that the River have on their respective economical, social and geographical environment. Each school answering questions raised by another school and doing so, contributing to the construction of collective knowledge expressed in a community Web site. Six classrooms, matched in pairs, participate to our community. Each classroom developed a Web site presenting itself and the work done locally. We will present the theoretical foundations, the emerging model, the implementation conditions, the process of appropriation of the model by teachers and students and the outcomes of our three cycles of experimentation.

Active Server Page Programming Tutorial

Joaquin Vila, Illinois State University, USA; Barbara Beccue, Illinois State University, USA; David Doss, Illinois State University, USA

This paper describes a web-based Active Server Page (ASP) Tutorial that provides an interactive online guide for ASP programming. The application was created using a variety of technologies including ASP and Macromedia Flash to implement the interactive segments of the tutorial. All the sample codes written in ASP can be demonstrated online. Flash movies are used to provide online, side-by-side ASP code interpretation. This site is intended to provide an easy-to-follow, step-by-step tutorial for inexperienced ASP programmers. The ASP Tutorial introduces ASP syntax and the basics of ASP programming. Using an interactive style, this tutorial provides fully commented easy to follow examples, programming techniques, and quizzes. Both linear and random navigation are provided on every page so the user can easily find topics of interest.

Technology Chalkboard: Building a Collaborative Model to Integrate Technology in the Classroom

Jeanne Vilberg, Clarion University of Pennsylvania, USA; Darla Ausel, Clarion University of Pennsylvania, USA

Integrating technology into the classroom is an evolutionary (if not revolutionary) process for most educational institutions. In rural Western Pennsylvania three State System of Higher Education universities (Clarion, Edinboro, Indiana) formed a consortium to address the need to increase faculty understanding of the advantages of using technologies in teaching, their competencies in specific technological applications, and their level of comfort in using them. The universities created learning and technology centers to provide technology-rich learning environments for university faculty and K-12 teachers. A $1.7 million Preparing Tomorrow's Teachers to Use Technology (PT3) implementation grant provided funding for new methodologies for infusing technology in the classroom. A "technology chalkboard" model was developed by Clarion University to provide diverse classroom learning opportunities. Technology modules incorporated foundation training on specific software or technologies, application training on how the technology is applied in the classroom and integration training on how the technology enhances student-centered learning. To augment the classroom experience, participants were enrolled in "Technology Chalkboard", a specially created online course using Blackboard's CourseInfo software. Due to the success of the "technology chalkboard" model, the consortium is transforming the nine modules into supplemental online course components or as online courses for in-service teachers.

Guiding Collaboration to Enhance Procedural Learning

Aurora Vizcaino, Escuela Superior de Informatica, Spain; Jesus Favela, CICESE, Mexico ; Manuel Prieto, Escuela Superior de Informatica, Spain

Learning is a process which involves many activities such as: memorisation, establishing relations between ideas or concepts, reflection, observation, etc. The activities involved in the learning-teaching processes depend on the topic that a student is trying to learn. For instance, when a person studies history he/she should use processes of relation, understanding, and memorisation. On the other hand, if a student is learning to program, memorisation becomes less important. On some occasions, students do not know how to study neither what kind of activities they must perform as part of their learning process, so they usually try to memorise contents and procedures without reflecting when and why it is convenient to use those knowledge. On the other hand, procedural learning is generally more difficult than declarative learning. We have observed that the disciplines with most failures at our university, are procedural disciplines, such as: mathematics, statistics, or programming where students must use activities such as: observation, reflection, or comparison.

WANTED: A MIRACLE WORKER - a Consideration of Some Issues Arising From the Leadership of Entrepreneurial Activity in Information and Communications Technology in an Academic Setting

Lynne Walker, University of the West of England, UK

This paper seeks to explore notions of leadership in relation to the role of the Project Director of a nation-wide in-service ICT training and development for teachers provided by a University Faculty of Education. In examining leadership and the management of change the paper seeks to focus upon the dilemmas inherent in managers leading entrepreneurial activity in an academic environment. The paper also attempts to highlight some lessons learned, key issues requiring resolution and future papers to be written.

A Faculty Development Plan For The Successful Integration Of Technology Into Teacher Preparation Courses

Joseph Walsh, University of Montevallo, USA; Lauren McCay, University of Montevallo, USA; Jack Riley, University of Montevallo, USA

With unprecedented emphasis being placed on preparing pre- and inservice teachers to integrate technology into their classrooms, schools of education are facing increasing pressure to provide students with experiences and faculty who can adequately prepare them for this task. This session will provide details on how one college of education in a small liberal arts university is meeting this challenge. Using the National Educational Technology Standards for Teachers(NETS-T) as a basis, education faculty worked together to implement a faculty development program that culminated in the measurable integration and utilization of technology in the program's professional studies classes. The outcome of this semester-long collaboration was that the methods faculty involved were better prepared to (a) utilize technology as a tool for instruction, (b) train their students/preservice teachers to utilize technology in the classroom, and (c) serve as technology mentors to other methods faculty. Through this project, participating faculty were able to document a planned and systematic method of transparently integrating technology into teacher education courses that may prove beneficial to similar schools of education.

How on-line collaborative Study improve human cognition: A perspective on the evolution of modern education

James T.J. Wang, National Taipei University of Technology, Taiwan; David C.Y. Lin, National Taipei University of Technology, Taiwan; Richard Wang, Chinese Culture University

This paper is a research to investigate the growth of Internet which will give rise to new adventure of teaching and learning strategies in the decade to come. A series of more recent education approaches that come into play will be examined by addressing their advantages versus shortcomings to identifying why they have come to contribute the collaborative study method and how they are taking shape in the new education trend. The principle of "Collaborative Study" and how it fits appropriately and closely into the modern network media revolution will be demonstrated and explained. Virtual Learning and developing highly effective human cognition techniques through investigative problem solving, thinking and creativity are the major components that will assist the success of Collaborative Study and in fact new ideas in education. This research also brings teaching and learning to a higher level by exploring collaborative study and modeling it as the future education template to be deployed countrywide in Taiwan.

Teachers' Roles in Classrooms with and without Computers

Yu-mei Wang, University of Guam, USA

Literature indicates that teaching with computers requires a shift from the traditional teaching practice. For technology to transform teaching and learning, there is a need to redefine the teachers' role and change existing teaching practice. Technology-rich classrooms tend to be more student-centered rather than teacher-centered. This study was designed to investigate whether preservice teachers are shifting their perceptions of the teachers' role when teaching in the classroom with computers. The research questions are (1) What are the preservice teachers' perceptions of the teachers' role in the classroom without computers? (2) What are the preservice teachers' perception of the teachers' role in the classroom with computers? (3) Do the preservice teachers' perceptions of the teachers' role in classrooms with computers differ from their perceptions of the teachers' role in the classroom without computers? The preservice teachers' perception of the teachers' role is to be measured as teacher-centeredness versus student-centeredness.

Computer Assisted Mathematics Learning Environment- A Study on the Computer, Math and Human Interaction

Yu-mei Wang, University of Guam, USA; Carl Swanson, Jr., University of Guam, USA; Steve Lam, Guam Community College, USA

Integrating CAI into the math curriculum is a challeging process. Computers change the way teachers teach and the way students learn. The learning process is affected by a combination of factors; for example, learners' attitudes toward math and computers, learners' computer skills, learners' confidence level in learning math and computers, learners' learning styles, the quality and the suitability of the computer learning system, and the way the instructor conducts the course and interacts with the student. This study is designed to explore factors affecting the Guam Community College students' math learning experiences via CAI interactive learning system. The primary instrument for this study was a modified survey questionnaire. In order to gain a fuller insight into the students learning process, the data for this study were also drawn from other sources: (1) student interview; (2) faculty interview; (3) classroom observation; (4) documentation such as student drop-out rate and grades.

Emerging Careers in Instructional Technology

Shirley Waterhouse, Embry-Riddle Aeronautical University, USA

The implementation of instructional technologies is creating a number of new careers in education. Three are instructional technology director, instructional technologist, and instructional technology technician. Also, numerous positions are required when institutions develop instructional technology modules in-house. This paper provides a brief overview of the major instructional technology positions, as well as a description of a faculty technology liaison and the details of an instructional technology director job description.

Overview of Web-Based Pedagogical Strategies

Shirley Waterhouse, Embry-Riddle Aeronautical University, USA

Preparing teachers to utilize Web-based instruction requires a focus on Web-based pedagogy, not just Web-based technology. Teachers must understand that technology should be utilized as the enabling factor, not the primary factor if Web-based instruction is to be effective in enhancing teaching and learning. The Web provides an array of teaching strategies that can be added to those commonly utilized in traditional instruction; and today's teachers must understand both. Recommended Web-based pedagogical strategies are addressed in this paper as well as how they relate to Gagne's Nine Events of Instruction as well as the American Association of Higher Education's Seven Principles for Good Practices in education.

Internet based learning environments in higher education: Experiences from the HALÜBO-Project

Peter J. Weber, University of Hamburg, Germany; Hornberg Sabine, Ruhr-University of Bochum, Germany

The European process of integration is steadily moving forward, since 1993 and the coming into force of the Maastricht contract also with a greater effect on the national general education systems. This development is by no means a topic for future teachers and others in higher education, even though it will clearly affect their professional and personal future. Another worldwide rapidly developing movement takes place within the new media, especially in the area of internet based teaching and learning. In our paper we will present a joint Project of the University of Hamburg, Lüneburg and Bochum (HALÜBO)(GER), which was realized by adapting traditional working techniques as well as new tools, like the internet.

Special Educators' Technology Literacy: Identifying the Void.

Roberta K. Weber, Florida Atlantic University, USA; Perry L. Schoon, Florida Atlantic University, USA; Jim Forgan, Florida Atlantic University, USA

This study was initiated to investigate the technological knowledge and skill level of special education teachers and their use of technologies in special education classrooms. The study was conducted in two Florida school districts and included a sample of 210 teachers with a response rate of 69%. The results of this research will discuss the correlation between teacher skill level and the use or non-use of computers and other technologies for instruction. Additionally, the analysis of data shows the interest level of these special educators towards learning more about technologies that could be utilized in their classroom.

Real Concerns on Distance Education When Distances are Real

Leo Wells, Camel Research Associates, USA

The study from which this report was derived explored concerns of school change facilitators (superintendents, principals, and technology coordinators) as they implemented new curricular requirements for instructional technology. This present report focused on one strand of concerns: distance education. Six informants expressed hesitation over the impending interactive video labs which were to be installed in their school districts, primarily over bad experiences from previous efforts in distance learning. Each informant expressed hope that the new systems would be useful. There appears to be the need for balance as the positive aspects of distance systems (service, teaching) are implemented against the negative aspects of distance systems (teaching changes, impersonalness).

Technology and Problem-Based Learning: Connecting Students, Teachers, and Student Teachers

Nancy Wentworth, Brigham Young University, USA; Eula Monroe, Brigham Young University, USA

The investigation reported in this paper strives to bring technology and problem-based learning into the student teaching experience through an integrated, collaborative mathematics task. The project presented is based in data collection and analysis. It supports the National Educational Technology Standards (International Society for Technology in Education [ISTE], 2000) and the latest standards for school mathematics (National Council of Teachers of Mathematics [NCTM], 2000). Students from several schools collected and analyzed data for a task on an 2000 Summer Olympic project. Technology was vital to data collection, data sharing among schools, and data analysis. This project served as a stimulus and prototype for projects for the 2002 Winter Olympics.

State-wide Collaboration among Three PT3 Grant Recipients

Nancy Wentworth, Brigham Young University, USA; Rodney Earle, Brigham Young University, USA; Steven Soulier, Utah State University, USA; Tim Smith, Utah State University, USA; David Stokes, Westminster College, USA; Wanda Carrasquillo-Gomes, Westminster College, USA

The PT3 Utah consortium includes Brigham Young University, Utah State University, and Westminster College. It provides members with unique advantages: opportunity to be informed of each other's projects to the subsequent benefit of all; to share resources of local expertise and material assets; to strengthen inter-college activities through joint publications and presentations; and to help each other out when moments of challenge arise. The leaders hope to impact teacher preparation and technology use in schools across the state of Utah. This panel discussion will focus on areas of common interest, and how the collaboration has strengthened their work.

The Implementation of Change in Technology Rich K-8 Classrooms

Keith Wetzel, Arizona State University West, USA; Ron Zambo, Arizona State University West, USA; Ray Buss, Arizona State University West, USA; Helen Padgett, Manager PT3 Project, Arizona State University West, USA

This qualitative study reports on Arizona Classrooms of Tomorrow Today(AZCOTT), a component of a Preparing Tomorrow's Teachers to Use Technology project. In conjunction with five partner school districts, Arizona State University West developed five technology-rich K-8 classrooms that serve as models for preservice students and university instructors. This study reports on the changes occurring as the AZCOTT teachers learn to teach in technology rich classrooms. Changes were described in teacher practices, student attitudes, and classroom management. Generally, the researchers found that technology has become an integral part of each classroom. Factors contributing to implementing change in these classrooms are discussed. The researchers also discuss the progress made toward using these classrooms as models for preservice students.

Increasing the Use of Computers in Early Childhood Teacher Education: Psychological Factors and Developmental Appropriateness

Karl F. Wheatley, Cleveland State University, USA

This paper examines the case of one urban early childhood teacher educator's increasing use of computers in early childhood (PK-3) curriculum courses, over a period of one year. The paper describes the both the obstacles to such increased computer use and the factors related to this increasing integration of computers. The case is analyzed from the perspective of the early childhood concept of developmental appropriateness, and with respect to the motivation and learning required of the teacher educator.

Learning to Learn in Online Courses

Joan Whipp, Marquette University, USA; Heidi Schweizer, Marquette University, USA

This presentation will display results of a study conducted of online learners at a large midwestern university during the summer of 2000. The study posed these questions: What unique challenges do students find in the online learning environment (compared to face to face)? What specific strategies do students use to cope with these challenges and achieve academic success in this environment? Primary data sources included: anonymously written surveys of 94 students (in seven sections with 13-15 students each) who successfully completed an online instructional technology course designed for practicing teachers and verbatim transcripts of face to face interviews conducted with 14 students in one section of the course after they completed the course. Besides technical issues, the greatest challenges cited by these students in their online course in order of frequency were: procrastination and time management issues, the slow pace and asynchronous nature of discussions, feelings of isolation, work overload, and writing anxiety. Strategies to address these challenges most often cited included strategies for: time management and pacing, previewing and planning offline reading and notetaking, alternative planning used in anticipation of technical problems and server delays, and summarizing. Students also described a number of motivational strategies that focused largely on their beliefs about themselves as competent online learners. Finally, these students spoke of networking, help-seeking, and personalizing strategies.

Helping Higher Education Faculty Model Use and Integration of Technology for Future Teachers

Joan Whipp, Marquette University, USA; Heidi Schweizer, Marquette University, USA; Nereus Dooley, Marquette University, USA

Those who attend this session will: 1) Gain information about how a midwestern university's PT3 (Preparing Tomorrow's Teachers in Technology) project is helping higher education faculty in English, History, Mathematics, Biology, Chemistry, Physics, Spanish, French, Communications, and Education use a variety of technological tools to create constructivist learning environments through "just in time" tutorials, small group support, mini-grants, online training modules, workshops and a newly developed faculty website and online conferencing center 2) See a demonstration of web-based faculty training modules that are currently being used to increase faculty members' use of technology that supports active student-centered learning environments 3) Share successes, challenges and concerns with others who are engaged in similar higher education faculty development projects.

Collaboration and Integration: Technology in a Pre-Service Elementary Education Foundations Course

C. Stephen White, George Mason University, USA; Debra Sprague, George Mason University, USA

Changes in State regulations and National Standards have resulted in Colleges of Education redesigning their teacher preparation programs. During this redesign, many programs are eliminating their "technology course" in favor of integrating technology throughout all teacher preparation courses. This redesign has often resulted in concerns that many education faculty are ill-equipped to provide teacher candidates with the technology skills and knowledge needed to insure the effective integration of technology into K-12 curriculum. This paper focuses on one teacher preparation program's efforts to address this concern. Faculty members in the Elementary and Instructional Technology Programs paired up and team-taught an Introductory to Elementary Curriculum course, providing students with the needed foundational knowledge and technology skills.

Critical Kiwi Chronicles: Technology and Teacher Education in New Zealand

Cameron White, University of Houston, USA

This paper provides a critical analysis of the integration of technology in pre-service teacher education in New Zealand. New Zealand has made great strides in reforming curriculum both at the pre-college and teacher education levels. As a result, the country has decided that technology has a vital role to play in the teaching and learning process. As a result teacher education institutions have made great strides in course development, online offerings, and internet resources for prospective teachers. The issue is the continued professional development of teachers and actual application of technology in the schools.

Electronic/Distance Preservice Teacher Education – an example

Leon Wickham, Massey University, New Zealand

This paper and presentation will review how Massey University College of Education went about meeting the challenge of delivering preservice teacher education to those who, for a number of reasons, could not attend an on campus programme. Programme delivery will be outlined demonstrating the linkages between traditional extramural delivery and the use of WebCT for web based delivery. The results of surveys and studies of the students involved in the programme in the first four years of course delivery will be presented within the discussion. Over the past ten years there has been a growing demand from the New Zealand Ministry of Education, the schools and the client base of teacher education to have preservice teacher education programmes delivered extramurally. Massey University has met this challenge. The advent of the Internet and the merger of Palmerston North College of Education and Massey University has enabled extramural delivery of the Bachelor of Education (Teaching) Primary degree. Massey University bought its expertise in extramural delivery of degree programmes and the College of Education its expertise in teacher education.

Effectiveness of an Exemption Exam for an Introductory Educational Technology Course

William Wiencke, State University of West Georgia, College of Education, USA

The need for teachers who are proficient in the use of technology in the classroom has increased dramatically over the past few years. Professional and regulatory organizations with direct and indirect influence on teacher education programs have issued reports, recommendations, standards, and accreditation criteria all aimed at increasing the technology competencies of beginning teachers. The College of Education at the State University of West Georgia established an introductory technology course for all teacher education majors to meet this demand. This survey course provides students with a background in various instructional technologies as well as classroom integration strategies. At the time the course was created, many of the faculty involved believed that many students entering the program would be sufficiently competent in technology to enable them to exempt the course. Those exempting the course would be able to take an additional class in their content area. This presentation will provide an overview on how the exemption exam was created and implemented, as well as a measure of its effectiveness in identifying technology competent students. Additionally, the results of the exam will be viewed in relation to the students beginning the course perceived level of technology expertise.

TEACHERS ON-LINE IN AFRICA: THE ISSUE OF ACCESS

Annette Wilkinson, Vista University, South Africa; Liezel Wilkinson, Technikon Free State, South Africa

South Africa is on the threshold of drastic changes in the field of education. The ideal is to move away from the stereotyped teaching methods and passive learning to a learner-centered approach. This is linked to efforts to address inequalities in education and to overcome historical disadvantages. Examples of new initiatives are the introduction of the outcomes-based model, Curriculum 2005; the Technology Enhanced Learning Investigation, TELI; and on higher education level, a paradigm shift away from the fragmented education system of the past towards an integrated system that will eliminate inequalities and introduce quality assurance measures. One of the major stumbling-blocks, however, is the relatively under-qualified teacher corps and the massive undertaking of the retraining of ten thousands of teachers - many of them in remote areas, far from the larger training centers. A lack of basic infrastructures such as electricity, telephone and adequate transport facilities further complicate the situation. The nature and extent of these problems were clearly revealed in several national surveys. The critical issue addressed in this paper, concerns the availability of the necessary infrastructure for the delivery of effective learning opportunities and whether the introduction of computer technology in schools can in any way promote the process of change.

LINKING UP BY SOLAR ENERGY: THE STORY OF THE GELUKWAARTS FARM SCHOOL

Fred Wilkinson, Free State Dept. of Education, South Africa; Annette Wilkinson, Vista University, South Africa

The existence of farm schools is a very unique characteristic of the South African school system. In the Free State, a predominantly rural province in the Republic of South Africa, some 1600 out of 2525 schools are farm schools. Unfortunately, the remoteness of the schools, as well as the absence of basic facilities like dwellings, electricity and water supply within walking distance, only attracted teachers with low qualifications, and in many cases a low quality education is offered. Despite recent developments, many of the farm schools still lack essential facilities. Gelukwaarts Farm School took the bold step to emerge from the typical farm school set-up by utilizing modern information communication technology driven by solar power. The solar energy generated is utilized for TV reception and getting computers connected to the worldwide web. New communication and education channels have opened, and teachers and learners are no longer confined to the radio and out-of-date newspapers. The presentation will focus on how the school succeeded to emerge from a half-forgotten farm school in the bundus to a school with informed teachers, learners and parents. These are all due to the presence of lots of sunshine in the country!

Impact of Technology on Student Socialization in the Classroom

Lamar Wilkinson, Louisiana Tech University, USA; Walter Buboltz, Louisiana Tech University, USA; Adrian Thomas, Louisiana Tech University, USA; Eric Seemann, Louisiana Tech University, USA

The use of technology and computer mediated communication is changing the lives of students in the classroom. Research is beginning to emerge examining the effects that technology is having on the social behavior and adjustment of students. Computers and technology are influencing the interactions between teachers and students, as well as other interactions in a student's life. Research is sparse at this time as to the effects of this new form of communicating, however, it appears that it can have many positive as well as negative impacts on students development and adjustment. The use of technology appears to down play the importance of social contact and may lead many students to not develop the necessary social skills to function in the world. This article exams the impact that technology may have on student development and adjustment in the technology rich classroom. It is hoped that educators will be cognizant of the potential social and developmental pitfalls that can occur when blindly implementing technology into the educational process.

ADOPT-A-SCHOOL

Liezel Wilkinson, Technikon Free State, South Africa; Guillaume Nel, Technikon Free State, South Africa

With the aim to play an active role in the community and in support of the national education department's Tirisano Project 2000-2004, the Technikon Free State (TFS) in Bloemfontein launched its Adopt-a-School program in September 2000. The program, in which the school will be assisted in various ways, is a collaborative adoption between the TFS and a disadvantaged secondary school in the Free State province (Lereko Senior Secondary School). The vision of Tirisano is of a South Africa in which all inhabitants have access to lifelong education and training opportunities. The development of the professional quality of the country's teaching force is stated as one of the major strategic priorities of the five-year plan. In the first phase of the program, the emphasis is on the professional and personal growth of Lereko's teachers, with computer literacy as one of the main objectives. The TFS equipped a computer laboratory with Internet facilities at the school, and the training of teachers have just started. The discussion of the progress of the project presents a preview of what can be achieved when the more advantaged reaches out to the less advantaged in this country with its unhappy past.

Tomorrow's Teachers and Tomorrow's Technology—The T4 Project

Linda Wilson, Langston University / Tulsa, USA

Educators in northeastern Oklahoma have collaborated on a special three-year project entitled "Tomorrow's Teachers and Tomorrow's Technology (T4) Project". The focus of the project will be to deliver a three-year comprehensive professional preparation program for prospective teachers from the northeastern region of Oklahoma for the purpose of empowering these future educators with the technological skills necessary for effectively teaching in twenty-first century schools. The purpose of this paper is to document the goals and objectives of the T4 Project, the elements involved in Phase I, and detail the benefits of this project to Langston University / Tulsa elementary education majors.

Cognitive Learning Theory Meets Technology: Incorporating Research on Attention into E-Design

Joan Wines & Leanne Neilson, California Lutheran University, USA

During the implementation of a two-year faculty development grant, California Lutheran University (CLU) has explored technology's potential for improving teaching and learning. In incorporating various technologies into the design and redesign of 27 undergraduate courses, we have found that certain cognitive and physiological processes are tremendously relevant to learning outcomes. Strategic uses of new technologies that capitalize on the dynamics of these processes can, we believe, optimize a student's ability to focus and sustain attention, improve comprehension, and facilitate the transfer of content into long-term memory. To develop new design strategies that incorporate relevant cognitive theory, we have set up the generic methodology we follow in this paper: 1) examining a specific cognitive phenomenon (Attention, in this case), 2) identifying its relations to learning, and 3) imagining how its principles might be best incorporated into the architecture of an e-designed instructional project.

Got Hack? Strategies to reduce online cheating

Joe Winslow, Coastal Carolina University, USA

For more than two decades, computer-based testing (CBT) has been used to administer objective assessments to students at all education levels. Vendors of CBT systems tout myriad logistical advantages over traditional test administration-including automatic grading, conditional feedback, performance tracking, and adaptive remediation. But the proprietary nature of the software generally precludes most faculty from developing their own customized assessments; instructors purchase datasets containing canned content authored by independent software developers. The origin of the Internet as an open-source medium has recently undermined the dependence of educators on these proprietary assessment systems. Standardized technologies like HTML, XML and Javascript have been integrated into inexpensive, intuitive authoring tools easily mastered by luddites. As a result, web-based testing (WBT) systems are increasingly common components of Internet-delivered courseware. The adoption of WBT necessarily predicates the assumption that the testing system developed is secure from "hacking," loosely defined here as file theft or vandalism. The purpose of this paper is to report findings from an empirical study investigating the degree to which three popular WBT development systems are susceptible to student hacking and to derive specific strategies therefrom to reduce online cheating.

Tech, Language Arts, and Teacher Prep: Stacking the Odds of Classroom Use

Rod Winters, Winona State University, USA

This session will look at two technology projects undertaken with preservice elementary language arts teachers. The introductory level projects were successful in changing dispositions toward technology infusion in future classrooms. In the first project, students from distant universities utilized web-based technology to collaboratively produce, organize and respond to original reviews of children's books. In the second project, students utilized e-mail to create and sustain a literary conversation with an intermediate grade student as both participants read and respond to a shared children's novel. A discussion will invite participant insight into how we might best proceed to prepare future teachers to utilize technology in K-12 classrooms

Collaborative Technology Exploration: Bridges Between University and K-12 Education

Carol Wolfe, Saginaw Valley State University, USA; Jeffery Ashley, Saginaw Valley State University, USA; Elliott Nancy, Ubly Public Schools, USA; Ericka Taylor, Saginaw Public Schools, USA; Janice Wolff, Saginaw Valley State University, USA

Saginaw Valley State University teacher education and content faculty are engaged in a research and development initiative through the United States Department of Education Title II Grant (Teacher Quality Enhancement). One strand, identified for study and implementation by the Title II Grant, is technology. Content Development Teams (CDT's), comprised of participants from the following areas; university content faculty, two per team; university teacher education faculty, one per team; and K-12 master teachers, two per team, are expected to use technology in some manner as a pedagogical tool. Content and teacher education professors and master teachers are engaged in learning about and implementing various technological methods. Syllabi are being redesigned to be placed on a web site created especially for each course. Course web sites will include an interactive component, search engines and other online resources important to the course. CDT members will also be trained to use Blackboard technology and will integrate it into redesigned courses. Our group is curious about the effectiveness of technology as a pedagogical tool in university content and teacher education classrooms and elementary and secondary classrooms. In this process, we intend to re-examine our ideas about student participation, instructor roles, and expectations with technology use.

Mission Possible: Project-Based Learning Preparing Graduate Students for Technology

Harrison Hao Yang, State University of New York at Oswego, USA

This paper addresses how the project-based learning was designed and then implemented in a graduate applied technology course at State University of New York at Oswego. The focus of the course was to engage students to produce projects that were authentic, meaningful, and intended for future teaching and professional use. This paper outlines the course content, provides an overview of the processes involved in developing the project-based learning activities, and reports the responses of students in the course on effectiveness of learning process and perception of technology integration on completed projects. Discussion for using project-based learning and examples of students' projects (educational web review, WebQuest, and web-based portfolio) are included.

Does Distance Education Resolve The Current Problems of Education?

Ya-Ting Carolyn Yang, School of Education, Purdue University, USA; Timothy J. Newby, School of Education, Purdue University, USA

Distance education has come of age. Its foundations have become firmer, its applications have grown in number and variety, and its influence has become more visible and more substantive. Yet, one question is still frequently raised: "Does distance education resolve the current problems of education?" This paper aims at giving some answers to this question by investigating the benefits and challenges of distance education. What follows is a thorough discussion of the question. Finally, suggestions are made for further research in the field of distance education to improve the current educational system.

Digital Video: What Should Teachers Know?

James E. Yao, Texas A&M University-Commerce, USA; John R. Ouyang, Kennesaw State University, USA

Texas State Board for Educator Certification has published new technology application standards for teachers who want to be certified, including teachers of technology. The standards require that teachers should know how to create digital video products for a variety of purposes and audiences and use them in multimedia applications. Other states may follow soon. This paper discusses the difference between traditional video and today's digital video, including streaming video; examine the current technology in digital video; provides a step-by-step guide on how to create digital video; provides teachers with practical suggestions of how to create digital video economically and effectively.

Can we address learning styles of students in traditional and web-based courses: Perceptions of faculty members and preservice teachers

Yasemin Gulbahar Yigit, Middle East Technical University, Turkey; Soner Yildirim, Middle East Technical University, Turkey

The present study explored faculty members' and preservice teachers' perceptions on addressing learning styles in different instructional environments, namely in traditional classroom and web-based instruction. This study used data from faculty members and preservice teachers at a state university in Turkey. This study reports both faculty members' and preservice teachers' perceptions on considering individual differences while designing a course for both traditional setting and web-based instruction.

COMPUTERS ARE READY BUT HOW ABOUT TEACHERS: AN ASSESSMENT OF TURKISH BASIC EDUCATION TEACHERS' INSERVICE TRAINING NEEDS

Soner Yildirim, Middle East Technical University, Turkey; Settar Kocak, Middle East Technical University, Turkey; Sadettin Kirazci, Middle East Technical University, Turkey

Recently, the Turkish government has started a new project for Basic Education Schools (partially financed by the World Bank) in order to take a major step for Turkey to leap to an information society. The purpose of this study is to investigate 592 basic education schools teachers' competency on computers and training needs. Analysis of data indicated that teachers do not feel competent on and ready for computer. Finally, this study offers recommendations for effective inservice training programs and technology integration strategies for the teachers.

Lights, Camera, Action: Videoconferencing in Kindergarten

Nancy Yost, Indiana University of PA, USA

This paper explains a kindergarten project that uses multiple technologies, culminating in daily videoconferencing with another kindergarten. This project took place at a university laboratory school as a demonstration of appropriate use of technology, including videoconferencing, for preservice teachers. As the students prepared for the daily videoconferences, they were engaged in dramatic play activities, Internet activities, and a field trip to a television station. The project proved to be an exciting experience for the children, extending their understanding of technology and the world.

The Computer Endorsement Program: Examining Expectations as a Catalyst for Change

Linda Young, Indiana University South Bend, USA

This paper examines attitudes and perceptions associated with the instructional technology programs offered by the School of Education at Indiana University South Bend (IUSB). The IUSB School of Education is constantly evaluating and adjusting programs to meet the changing needs of the schools we serve. I chose to examine the instructional technology programs offered by the School of Education. The School of Education currently offers a computer endorsement, which may be added to a primary area of certification. It is expected that teachers holding this endorsement will be sufficiently competent to incorporate computers into instruction in a variety of contexts. It was therefore my intent to conduct a survey of school corporations in the IUSB service area to determine the level to which our students are meeting school expectations. An appropriate instrument was developed to investigate prevailing attitudes and expectations, and the survey was conducted. While technological skill expectations were quite similar, disparity was found to exist in two other areas. The results of this survey will be used as a catalyst for change in the School of Education's instructional technology programs.

Technology Integration in K-12 Classrooms: Evaluating teachers' dispositions, knowledge, and abilities

Ron Zambo, Arizona State University West, USA; Ray Buss, Arizona State University West, USA; Keith Wetzel, Arizona State University West, USA

As part of the evaluation of PT3 sponsored technology integration workshops conducted at Arizona State University West, a Likert-type questionnaire was developed to collect information about teachers' beliefs and skill levels related to technology integration. This presentation will include a description of the questionnaire that is being used to collect pre-test and post-test data from preservice and inservice teachers. The instrument contains several subscales targeting teachers' perceptions of their confidence and skill level for using technology, knowledge of technology standards and the Unit of Practice (UOP), and beliefs about the best use and effects of technology integration. The focus of the presentation will then shift to the results obtained from its first administration. Quantitative results and conclusions about the effects of the technology training are presented.

CHANGING INTERPERSONAL RELATIONSHIP BETWEEN TEACHERS AND STUDENTS USING TUTION

Vladan Zdravkovic, University of Gävle, Sweden

In this work we are proposed relocation of teacher's time during process of education. We have analyzed mutual student teacher relationship and proposed relocation of teacher's time as well as combination between tuition and classical teaching. The most common problem in relationship is insufficient experience or knowledge of teachers but as well learners (changing of learning paradigm form secondary school to higher education, or change in level from graduate studies till postgraduate studies). We have proposed different practical approaches and techniques for solving problems in teacher – learner relationship. Results have been obtained in both introspective form and testing form - student's evaluation of courses and marks.

Solving educational problems during learning computer visualization applications and raising students' creativity

Vladan Zdravkovic, University of Gävle, Sweden; Boris Vian
VR LAB – AFPC, Netherlands

Learning visual based application has been one of the biggest problems for most of students. Both in art and technical education. One of the reasons is that education in computer visualization, especially in area of 3D modeling, 3D animation, computer-generated special effects and programming for multimedia and VR applications are not same as education for standard computer application. But any way teachers have been trying to implement standard educational techniques. The solution is in changing learning paradigm and tries in more flexible and differential approach. In this work we are presented combination of project based learning and teaching have been implemented in different proportion and sequence.

Numeracy CD - Whole Number Concepts & Operations Numeracy II - Understanding, Using & Applying Fractions

Audrey Zelenski, Saskatchewan Inst. of Applied Science and Technology, Canada

Numeracy & Numeracy II are interactive multimedia CDs that enable learners to improve their numeracy skills. In the Numeracy CD, the learner accompanies George on a journey through the jungle to help save a village from grave peril. To complete his journey, George must understand whole number concepts and learn the operations of addition, subtraction, multiplication, and division. In Numeracy II, the learner accompanies a young Aboriginal woman on a journey of discovery through the North where she experiences the beauty of the country, learns about native plants and animals, and discovers ways to overcome obstacles she faces along the way. In the same way that she learns the ways of nature, she comes to understand fractions, learns how to work with them and applies her knowledge to solve problems involving fractions. The CDs provides a stimulating and motivational learning environment for learners who may not have been successful with traditional methods of learning math. The learners increase their self-esteem by developing math skills that have eluded them in the past. The multimedia approach will accommodate the diverse needs of learners in school and in alternate settings, such as home, communities, and the workplace.

Making the Case for Science Teacher Learning: An Analysis of Argument and Evidence in Electronic Portfolios

Carla Zembal-Saul, Penn State Universoty, USA; Tom Dana, Penn State University, USA; Leigh Ann Haefner, Penn State University, USA

This interpretive case study explores the nature of prospective elementary teachers' evidence-based philosophy statements for science teaching and learning, as portrayed in web-based science teaching portfolios. Evidence-based philosophy statements are explicit articulations of beliefs related to learning and teaching science. The 32 participants authored the portfolios in a web-based environment, allowing them to connect claims in their philosophies with evidence from their work as teachers. In addition to the electronic portfolios, exit interview transcripts were inductively analyzed. Based on the data, the claims in the prospective elementary teachers' philosophies became more science-specific and learner-sensitive over time. Supporting evidence was increasingly drawn from classroom-based experiences, requiring connections among theory and practice. In addition, there was evidence that the technology facilitated substantive reflection by (a) providing a simple means of making explicit connections between evidence and claims; (b) allowing prospective teachers to express themselves creatively without diminishing an emphasis on substance; and (c) providing a means of saving multiple versions (track changes over time).

Learning to Teach with Technology — From Integration to Actualization

Carla Zembal-Saul, The Pennsylvania State University, USA; Belinda Gimbert, The Pennsylvania State University, USA

The purpose of this proposed session is to highlight technology integration within a unique PDS setting. Emphasis will be placed on teaching interns (prospective elementary teachers in their final year of preparation) who were introduced through their university coursework to applications of technology designed to support student learning. Opportunities to explore technology use in the classroom were afforded through a year-long, school-based internship experience.

An On-Line Math Problem Solving Program that Stimulates Mathematical Thinking

Joanne Yaping Zhang, Hollywood Elementary, USA; Leping Liu, Towson University, USA.

This paper presents a case study in which the authors developed a Web-based instruction (WBI) unit — an on-line interactive math problem-solving program, and explored the means of using this WBI program to stimulate young children's mathematical thinking and develop their skills of and interests in solving mathematics problems. 100 word problems were developed and divided into the four basic operations, and further sorted into 11 semantic structures at three difficulty levels. The KWHL (I know, I want to find, how to find, I've learned) format was used to teach children how to organize and analyze the data. The program is designed in a non-linear approach, navigating by categories and difficulty levels. Learners/teachers can select appropriate problems for their learning/teaching purposes. Ten children used this program to enhance their mathematics problem solving skills. Their performances were observed and the program was helpful in leading them through the mathematical thinking processes.

Innovative Software-based Strategies for Reading/Listening Comprehension: Information Technology is Reforming Foreign Language Acquisition

Senquan Zhang, University of Ottawa, Canada

Mastering the IT media, both hardware and software, is one of the challenges of language teacher training. The session introduces an interactive IT software tool for comprehension of foreign language text in electronic format, at the example of Chinese web text. Among the software programs available for writing/reading of Chinese texts in electronic format, the KEY software (www.cjkware.com) stands out for its unique design as a multimedia reading comprehension tool. In the hands of the modern language teacher who makes full use of today's information technology, this software enables even beginners to independently develop a reading and listening comprehension of Chinese texts.

Teaching Mathematics with Technology

Yuehua Zhang, Washburn University, USA; Michael Patzer, USD 501, USA

This paper intends to report on a variety of innovative ways to utilize technology in teaching basic math skills and to motivate students in mastering the basic skills. Teachers will be able to turn so-called boring practice routines into interactive enjoyable learning experience for students to learn the basic concepts necessary for further exploration in the depth of mathematics, therefore to pay a solid foundation. Our experience also showed us that using technology in teaching does not mean simply putting students in front of the computer. The instructional materials have to be carefully designed which will provide opportunities for authentic learning, hence to achieve the outcomes that are expected.

The Role of Internet in the Technology Training of Teachers

Yuehua Zhang, Washburn University, USA; Tom Sextro, USD 336, USA

Educators continue to experiment with different technology training of teachers for more effective models, turning to the internet and instructional software tools in order to create an educational environment that supports the knowledge and skill-building approaches to learning. This paper intends to share the successful technology training experience of inservice teachers and educators of preservice teachers using video instruction and Internet as delivery tools. We intend to share our resources for those who are interested in self training and those who are in charge of technology training in their staff development program

A Pilot Project: Integrating Multimedia Portfolio Development Into The Preservice Teacher Education Program at Randolph-Macon College

Zizi Zhang, Randolph-Macon College, USA

Randolph-Macon College offers teacher education as a minor program. To fulfill the requirements for teacher education, and to comply with the state regulations, instructional technology has not been taught as a course. Instead, it is integrated into the Foundation course, Educational Psychology, and Senior Seminar. Although this method has been relatively successful, preservice teachers request more opportunities be provided for applying technology skills for teaching and professional use. Creating multimedia portfolio appears to meet the needs. In this pilot project, four volunteer preservice teachers use and will learn various instructional technology skills for the development of their portfolios.

Putting Assessment in Perspective: Successful Implementation in Educational Technology and Curriculum Integration

Robert Zheng, Marian College, USA; Kris M. Giese, Chegwin Elem School, USA

This paper focuses on how to use assessment tool to effectively integrate educational technology into curriculum. The author examines the current practices in educational technology and curriculum integration and points out that successful integration of educational technology and curriculum depends on a sound system of quality assessment. An assessment model is proposed with an focus on the various stages of designing, developing and implementing the model that will enhance the integration of educational technology and curriculum in schools. Examples and case studies are discussed to illustrate how to use this model for K-12 educational technology integration. Limitations and suggestions will be included for further study.

From Theory To Practice - Practical Use of Classroom Technology

Woody Ziegler, Doane College, USA; Rob Ziegler, Madison Public Schools, USA; Sue Burch, Grand Island Public Schools, USA

The educators of today face multiple learning models: Bernice McCarthy's 4MAT Learning, Bloom's Taxonomy, Multiple Intelligences, and the SCANs Document are a few. Educators frequently hear how technology can and should enhance the learning of individuals. However transfer to the classroom and learning environment comes about slowly. This workshop seeks to review the practical of each model and present how technology coordinates with each model. By using a concrete model, the Technology Pyramid, becomes the tool to demonstrate the connectivity of each abstract model and clarifies the performance level of the learner as the teachers use technology in their instruction. Theory is not enough! The educator needs "access to" and "know how" to use planning tools in creating/coordinating integrated learning units and activities meeting local and national learning standards and technology standards. The planning tool presented in this workshop helps educators maximize their time by guiding students as they produce technology based learning presentations. The planning tool facilitates monitoring of student performance by the student, the teacher and the parent Rubrics facilitate the assessment of technology-integrated units and the performance of the students. Rubrics are the final piece of the workshop, setting the standards and opportunities.

Promises and Pitfalls of a PT3 Grant

David Zimmerman, James Madison University, USA

This presentation will outline the challenges encountered by the project director of a PT3 grant in bringing together educators from higher education and the public schools to work on digital video units, obtaining release statements from parents whose children will appear in the units, encouraging educators to view assessment as a positive aspect of instructional design, administrative requirements (I call them speed bumps rather than road blocks) and production problems associated with the use of technology in the elementary classroom.

AUTHOR INDEX

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CONCEPTS & PROCEDURES

Section Editors:

Deborah Y. Bauder, *Rome City School District*
Rosemary Mullick, *SUNY Institute of Technology at Utica/Rome*
Ronald Sarner, *SUNY Institute of Technology at Utica/Rome*

This year's papers Concepts and Procedures section are considerably more diverse than in previous years both in terms of topical coverage and the greater international flavor of the submissions. Geographically, almost all continents (with the exception of Africa and Antarctica) are represented with submissions from close to a dozen countries in addition to the United States.

The first grouping, dealing with areas of pre-service and in-service teacher training, attracted fewer submissions than in prior years. In *Disitech: Advanced Training on Technologies and Didactic for Italian Teachers*, Mario Bochicchio and his colleagues from the University of Leece, Italy note that the "...teacher's role must be reinvented; its primary goal is not to be well programmed schoolbook explainers, but to supply students the ability to manage the primary keys..." Jan Mastin, Joseph Polman, and Kathleen Beyer from the University of Missouri-St. Louis report on the impact of school-based reforms on their teacher preparation program. Tweed Ross from Kansas State University describes the evolution of instructional technology in the College of Education from PowerPoint enhanced lectures to learning support. Barbara Chamberlain from the University of Virginia has a selection on the use of training teachers to use Photoshop and Sharon Reynolds from the Des Moines Public Schools provides insight on training teachers to troubleshoot Windows. Finally Juli Dixon and Judith Johnson from the University of Central Florida describe a course designed to train teachers in the "art of problem posing" in a high tech environment.

The second cluster of papers deal with issues of performance assessment with respect to teaching performance and learning. Cindy Anderson, Elizabeth Smith, and Joan Briscoe of National-Louis University together with Kevin Anderson from the Kenosha Unified School District report on the development of teaching portfolios. Alejandra Fernandez and Ana Beatriz Martinez from Universidad Central de Venezuela and Renee Cambiano from the University of Arkansas take portfolio development one step further examining the differences between an online portfolio and a traditional portfolio. Helen Barrett from the University of Alaska-Anchorage reports on the use of Adobe Acrobat for portfolio development.

Several of the submissions deal with knowledge representation and learning theory. Charles Dickens from Tennessee State University presents a paper that considers several facets of knowledge representation including constructivist theory, visual thinking, and the mathematical notion of hyperspace. Thorsten Hampel from the University of Paderborn in Germany describes a project in which students use document management systems to represent the current state of their knowledge Eric Seemann, Walt Buboltz, Lamar Wilkinson, and Sonia Beaty - all from Louisiana Tech University have a presentation on the application of social learning theory to the teaching of technology skills, and the same group of authors also have a paper on the application of Rogerian Theory.

The next selection of papers deal with issues attendant to Distance Learning and Course Management Systems (CMS). The first paper by Brenda Gerth from the University of Victoria in Canada is a primer on the incorporation of digital audio in web-based instruction. Another approach to the CMS is presented by Punyashloke Mishra and Matthew Koehler from Michigan State University who describe the use of modular components in the development of web-enhanced coursework. Esther Klein-Wohl and Gila Haimovic from the Open University of Israel describe teaching in a second language employing CMS technology. Armand St.Pierre from the Royal Military College in Canada has a selection that examines the Web-based Instructional Model (WBIM) to enhance distance education. Mark Smith from Purdue University North Central has a paper that evaluates various software packages to enable an instructor at a distance to take control of a student's computer. Finally, James T.J. Wang and David C.Y. Lin, both from National Taipei University of Technology in Taiwan, examine the intersection of virtual learning and human cognition.

The last group of selections deal with ethical, social, and legal issues. Lamar Wilkinson, Walter Buboltz, Adrian Thomas, and Eric Seemann, all of Louisiana Tech University examine the impact of technology on the socialization of students. Anatoly Sachenko and Hrygory Hladiy from Ternopil Academy of National Economy in Ukraine explain how they use the Internet as a means of enhancing a world view of their students. In the same vein, Carol Cobb from Bellarmine University describes her institution's measures to produce "culturally responsive, inclusive, and reflective" teachers.

The greater breadth of issues in the section this year as well as the increased geographic diversity speak well to the maturation of the discipline beyond the earlier emphasis on technical issues.

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Using School District Standards to Develop Thematic Lessons for Electronic Portfolios

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Abstract: The National Council for the Accreditation of Teacher Education (NCATE) suggests that teacher education institutions require portfolios as a method for demonstrating that their preservice teachers have mastered NCATE standards including those technology standards recognized by the International Society for Technology in Education (ISTE). At the same time, school districts are requiring their teachers to demonstrate how their K-12 students have mastered the academic standards of that school district. This paper presents an electronic portfolio template that blends these standards, providing the opportunity to demonstrate how one artifact, in this case, a thematic lesson, acts as a performance indicator of mastery for each of these standards.

The National Council for Accreditation of Teacher Education (NCATE), in cooperation with the International Society for Technology in Education (ISTE), has developed a list of minimum competencies for beginning level teachers in technology (NCATE, 2000). This list is known as the National Educational Technology Standards for Teachers (ISTE, 2000). These competencies were developed from a list representing minimum competencies that ISTE has determined as being necessary for today's public school children to know. This list will help teachers prepare their students to be ready for tomorrow's jobs where projections indicate that five of the ten fastest growing job areas will be computer related (College Planning Network 1996). To remain accredited through NCATE, teacher education institutions must demonstrate that they are addressing this area, that is, they must be training preservice teachers in the use of technology (NCATE, 1997), so that, in turn, their public school students will be able to meet their minimum technology standards.

At the same time that NCATE is emphasizing the infusion of technology in teacher education, NCATE is suggesting teacher education institutions demonstrate that their graduates have mastered these technology competencies through performance-based artifacts found in preservice teacher portfolios. The portfolios developed by preservice teachers can then be used as part of the teacher education accreditation process by NCATE. These portfolios provide evidence ensuring that preservice teachers have mastery of NCATE performance standards including the National Educational Technology Standards for Teachers (NETS) developed by ISTE. These portfolios can be either print-based or digital, saved on paper or saved on disk.

Preservice teacher work samples or artifacts within these portfolios are chosen by the preservice teacher to serve as a representation of the preservice teacher's mastery of the NCATE performance standards.

As teacher education institutions are addressing these NCATE requirements, they are exploring the professional literature in their search for programmatic changes that will result in effective technology-using teachers. In particular, a study by the International Society for Technology in Education (ISTE, 1999) explored several methods that teacher education institutions use to train their preservice teachers in the use of technology. This research concluded that technology infusion into the education courses of preservice teachers was more successful than separate technology training classes. One of the frequent requirements of these education courses is a lesson or unit plan. As teacher education institutions are attempting to respond to NCATE directives, many teacher education programs are requiring that their students develop these thematic units or lessons, frequently suggesting that the preservice teacher include a technology-infused lesson. These thematic lessons then are added to either the print-based or the electronic portfolio as a demonstration of the preservice teacher's mastery of the NCATE performance standards including NETS technology standards.

While preservice education is emphasizing technology integration and performance standards, inservice education is also emphasizing technology integration and student performance standards (NCREL, 2000). Increasingly, public school teachers are being asked to integrate technology into their classroom instruction (U.S. Dept. of Education, 1994). At the same time, these teachers are being asked to demonstrate the mastery level of their own K-12 students on state and national academic performance standards (NCREL, 2000). Reflecting these standards, many school districts have developed benchmarks for mastery and are asking their teachers to assess their students according to these benchmarks. The inservice teachers are then required to demonstrate through the use of performance-based assessments that their students have mastered these benchmarks. It follows that these K-12 standards or benchmarks and their assessments should be reflected in the artifacts that are included in the preservice teacher education portfolios. Indeed, NCATE is recommending that teacher education institutions begin to require the inclusion of K-12 student assessment samples with portfolio artifacts to function as a measure of the success of the students being taught by the preservice teacher (NCATE, 1999).

As part of the NCATE accreditation process, preservice teachers are asked to use these portfolios to demonstrate their expertise in teaching and learning through performance-based evidence in the form of artifacts. A logical blending in this portfolio is to develop artifacts that not only reflect these NCATE standards but also the academic standards of the school district where the field experience associated with the artifact takes place. Two preservice teachers from National-Louis University, using an electronic portfolio template developed to demonstrate mastery of the NCATE standards, as well as the ISTE standards, produced thematic lessons that combine these national standards with the local standards of the two districts where they did their field experiences. The software used for the template is an HTML template developed by the teacher education faculty member responsible for the technology integration of preservice teachers. The template includes links from the NCATE standards, the ISTE standards, and the district standards to the appropriate artifact, in this case a thematic lesson. The first page of the template presents a concept map that has branches labeled according to each of these standards. These branches act as a linking image map, allowing entrance into the portfolio by each of the different lists of standards. One branch enters the template through the NCATE standards while another enters the template through the ISTE standards. A third branch enters the template through a simple listing of artifacts while a fourth branch enters through one of four practicums that occur each term of the MAT program. Finally, the template can be entered through the appropriate K-12 school district standards. Figure 1 shows the illustration of the entrance page with the concept map for one of the two preservice teachers.

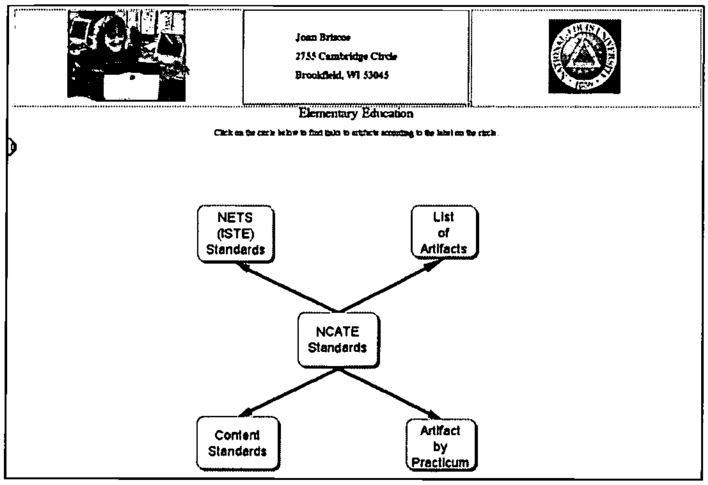

Figure 1: Entry to template

Each of the entrance points or buttons leads to a listing of the standards that are in turn linked to the artifact that functions as the performance indicator reflecting that standard. Figure 2 illustrates the link page of district standards from one sample portfolio while Figure 3 illustrates the link page from the ISTE standards to the artifact.

Mathematics

Grade 2

Standard:

1. Uses appropriate methods while performing the process of computation

Benchmarks:

Memorizes addition and subtraction fact families through 20

Counts and compares coins and bills using a combination of coins and dollar bills

Adds and subtracts with money and makes change (e.g., using manipulatives or calculators)

Applies addition and subtraction fact families to extended facts

Understands that it is useful to estimate quantities (e.g., rounding)

Standard:

2. Understands and applies concepts of number sense

Benchmarks:

Understands basic whole number relationships (e.g., 305 < 427, 589 > 5 hundreds)

Counts and orders whole numbers to at least 999

Makes reasonable estimates

Identifies or represents fractional parts of a group or a shape

Standard:

3. Understands and applies concepts of measurement

Benchmarks:

Understands equivalent periods of time including relationships among hours, days, months, and years o

Identifies the names, equivalents, and combinations of coins (e.g., pennies, nickels, dimes, quarters, half-dollars, dollars)

Figure 2: District standards links page

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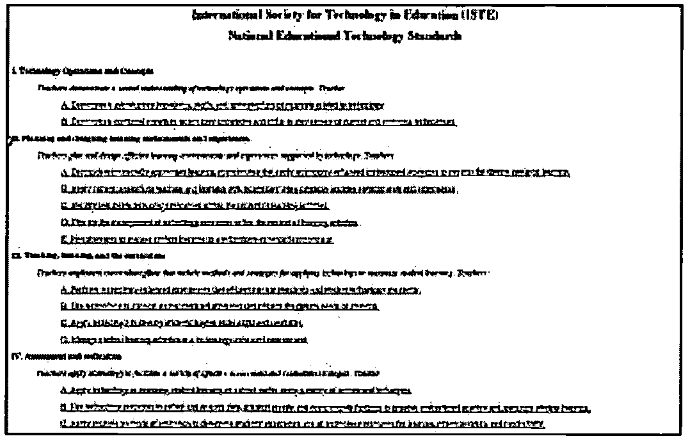

Figure 3: ISTE standard link page

The electronic portfolio template provides a place for the preservice teacher to represent himself or herself in resume format. On the same page, the template provides a listing of NCATE performance standards that act as links to pages describing that appropriate NCATE standard. Figure 4 illustrates this page.

Each of the pages that are linked to the page in Figure 4 describe the appropriate NCATE standard. They also contain links to the artifacts selected by the preservice teacher to represent their mastery of this standard. Figure 5 is an illustration of one of these pages.

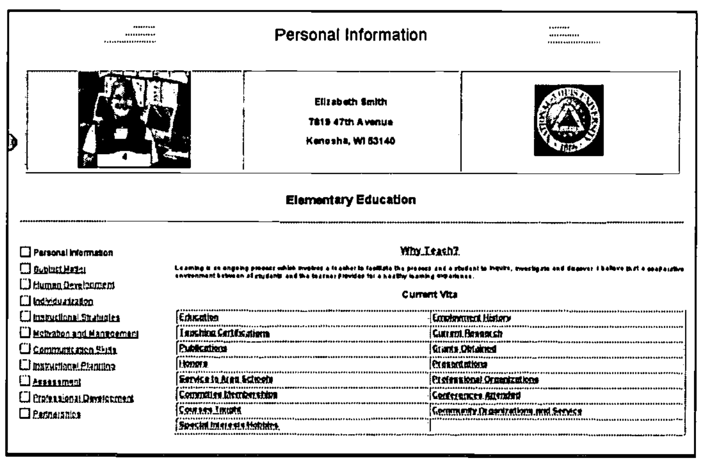

Figure 4: NCATE links and resume links page

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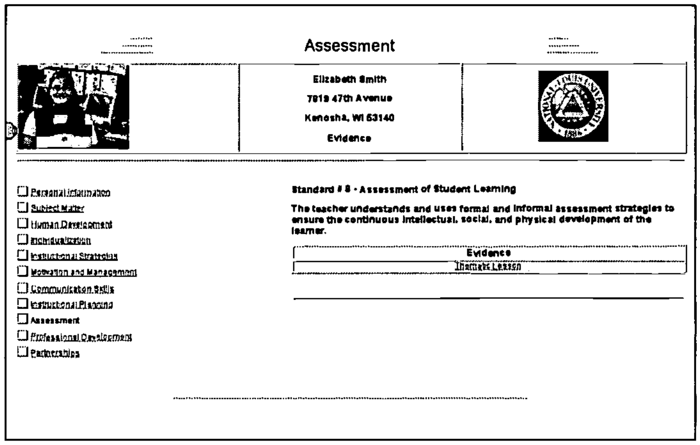

Figure 5: NCATE standard page and link to artifact

The template page that displays the artifact selected by the student is a framed page. This framed page has five frames. One frame includes the appropriate district standards that are covered in the thematic lesson. Another frame lists the appropriate NCATE and ISTE standards. A third frame includes the artifact itself, in this case, the thematic lesson. A fourth frame displays the reflection paper written by the student about the artifact. Finally, a fifth frame includes the teacher education instructor's comments concerning the artifact or the thematic lesson. Figure 6 is an illustration of a framed page that includes these items.

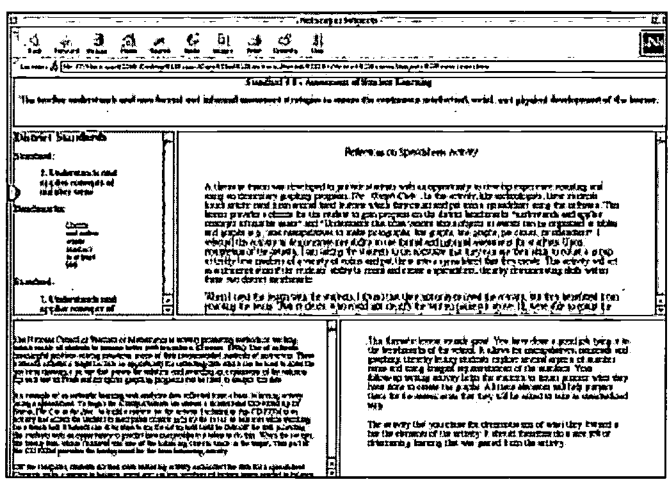

Figure 6: Framed page with the artifact

The use of standards as a measurement of preservice teacher success is recognized by many institutions that have an impact on teacher education programs and teacher education candidates. The International Society for Technology in Education has developed a list of standards composed of technology skills that are expected to be met by beginning level teachers, NETS. The National Council for the Accreditation of Teacher Education recognizes this list of standards, but has their own list of standards, as a measure of competency for the beginning teacher. A suggested measure of this competency has been the production by the teacher candidate of a portfolio, in some cases, an electronic portfolio, that contains artifacts reflecting mastery of each of these standards.

At the same time, states and districts have developed lists of academic standards for their public school students. All these lists of standards can be reflected in the artifacts contained in a preservice teacher's

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portfolio. Using links from these standards in an electronic portfolio, preservice teachers can select artifacts that demonstrate their mastery of these teacher education standards and their students' mastery of K-12 district standards. Thus, their artifact, in this case, a thematic lesson, reflects mastery of NCATE standards, NETS standards, and school district standards.

References:

College Planning Network. (1996, October 16). *Back to school: A guide for adults returning to college*. Seattle, WA: Author. Retrieved October 29, 1999 from the World Wide Web: http://www.collegeplan.org/bcksch/bkschool.htm.

International Society for Technology in Education (2000). *National educational technology standards for teachers.* Eugene, OR: International Society for Technology in Education.

International Society for Technology in Education (1999). *Will new teachers be prepared to teach in a digital age?* Santa Monica, CA: Milkin Family Foundation.

Task Force on Technology and Teacher Education. (1997). *Technology and the new professional teacher: Preparing for the 21st century classroom (1997)*. Washington, DC: National Council for Accreditation of Teacher Education. Retrieved November 14, 2000 from the World Wide Web: http://www.ncate.org/projects/tech/TECH.HTM.

McNabb, Mary L. (2000). *Perspectives about education.* Oak Brook, IL: North Central Regional Educational Laboratory.

National Council for the Accreditation of Teacher Education (2000). *NCATE program standards.* Washington, DC: National Council for Accreditation of Teacher Education.

National Council for the Accreditation of Teacher Education (1999). Performance-based accreditation for the new millenium. *Quality Teaching 9*(1). pp. 5-6.

U.S. Department of Education. (1994). *Revising the 1996 national educational technology plan*. Washington, DC: US Department of Education.

Using Adobe Acrobat for Electronic Portfolio Development

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Abstract: Adobe's Portable Document Format is the ideal container for electronic portfolio reflections connected to digital artifacts. This paper describes the software environment, and then describes the process for converting digital artifacts from many applications into the Portable Document Format, and maintaining a cross-platform, web-accesible, hyperlinked digital portfolio.

Introduction

There are many tools and strategies that can be used for Electronic Portfolio Development. In the SITE 2000 Conference Proceedings, I outlined a five-stage, five-level model of electronic portfolio development, using off-the-shelf software. In addition to the stages of portfolio development, there appear to be at least five levels of electronic portfolio development, each with its own levels of expectation and suggested software strategies at each stage depending on technology skills of the student or teacher portfolio developer (Barrett, 2000). There are several commercial templates for creating electronic portfolios using PowerPoint and Hyperstudio, books and resources for creating digital portfolios in HTML, and a variety of proprietary software packages. However, there are few resources available on how to publish an electronic portfolios using Adobe Acrobat. This paper outlines strategies for using this software to create an electronic portfolio.

Adobe Acrobat and the Portable Document Format: the Universal Container

Acrobat has been branded as *ePaper* by Adobe, with the following description on their website:

> Adobe® Portable Document Format (PDF) is the open de facto standard for electronic document distribution worldwide. Adobe PDF is a universal file format that preserves all of the fonts, formatting, colors, and graphics of any source document, regardless of the application and platform used to create it. PDF files are compact and can be shared, viewed, navigated, and printed exactly as intended by anyone with a free Adobe Acrobat® Reader™. You can convert any document to Adobe PDF, even scanned paper, using Adobe Acrobat 4.0 software.
>
> Adobe PDF is the ideal format for electronic document distribution because it transcends the problems commonly encountered in electronic file sharing. Anyone, anywhere can open a PDF file. All you need is the free Acrobat Reader. PDF files always display exactly as created, regardless of fonts, software, and operating systems. PDF files always print correctly on any printing device.
>
> Adobe PDF also offers the following benefits:
> - PDF files can be published and distributed anywhere: in print, attached to e-mail, on corporate servers, posted on Web sites, or on CD-ROM.
> - The free Acrobat Reader is easy to download from our Web site and can be freely distributed by anyone. More than 110 million copies have been downloaded or preloaded onto PCs.
> - Compact PDF files are smaller than their source files and download a page at a time for fast display on the Web.
> - Using Acrobat 4.0 software, bookmarks, cross-document links, Web links, live forms, security options, sound, and video can be added to PDF files for enhanced online viewing. (Adobe, 2000)

Adobe Acrobat is based on the PostScript, a device independent page description language, introduced by Adobe in 1985 to control printing documents to laser printers. The Portable Document Format (PDF), introduced in 1993, is an advanced version of the PostScript file format, which saves each page is an individual item, incorporating fonts within the document while creating a file that is usually smaller than the originating document. The underlying concept of creating a PDF document is printing to a file (Andersson et, al., 1997).

Creating a PDF file makes it portable across all computer platforms, using the free Reader that can be downloaded from the Adobe web site. Adobe grants permission to publish the Reader Installer on a CD-ROM without written permission from Adobe. There is even a version of the Acrobat Reader that can be pre-installed on a CD-ROM, although most computers are being shipped today with the Acrobat Reader pre-installed on the hard drive. PDF files are WWW compatible, with the PDFViewer plug-in for most web browsers. The latest version of Acrobat can even download web pages with fully functional web links.

Electronic Portfolios published in Acrobat

An electronic portfolio includes technologies that allow the portfolio developer to collect and organize artifacts in many media types (audio, video, graphics, and text). A standards-based electronic portfolio uses hypertext links to organize the material, connecting artifacts to appropriate goals or standards. Often, the terms "electronic portfolio" and "digital portfolio" are used interchangeably. However, I make a distinction: an electronic portfolio contains artifacts that may be in analog (e.g., videotape) or computer-readable form. In a digital portfolio, all artifacts have been transformed into computer-readable form. (Barrett, 2000)

In my opinion, Adobe Acrobat is the most versatile and appropriate tool to publish an electronic portfolios because this software most closely emulates the 3-ring binder most often used in paper-based portfolios. In my opinion, PDF files are the ideal universal container for digital portfolios. In fact, here is how John Warnock, Co-founder and CEO of Adobe Systems, Inc. defined the Adobe Acrobat Portable Document Format:

> PDF is an extensible form of paper, a hypermedia that is device independent, platform independent, color consistent and it is the best universal transmission media for creative and intellectual assets.

What else is a portfolio but a container for our creative and intellectual efforts? If Adobe Acrobat is chosen as the development software, here are the skills I have found to be important:

1. Convert files from any application to PDF using PDFWriter or Acrobat Distiller
2. Scan/capture and edit graphic images
3. Digitize and edit sound files
4. Digitize and edit video files (VCR -> computer)
5. Organize portfolio artifacts with Acrobat Exchange, creating links & buttons
6. Organize multimedia files and pre-mastering a CD-ROM
7. Write CD-Recordable disc using appropriate CD mastering software OR
8. Post PDF files to a web server

Structure of my Electronic Portfolio

Here is the process I use to create and then update my electronic portfolio every year. I maintain two separate PDF files: The **Portfolio.PDF** file is organized by the major sections as outlined in my table of contents:

- INTRODUCTION
  - Table of Contents
  - Introduction to the Reader
  - Workload Agreement
  - Annual Activity Report
  - Self-Review and Standards Achievement
  - Vita
- TEACHING SUMMARY
  - Curriculum Development
  - Course Syllabi
- RESEARCH & CREATIVE ACTIVITY SUMMARY
  - Publications
  - Grants
  - Conference Presentations
- SERVICE SUMMARY
  - University Service
  - Community & Professional Service
  - Summary of Professional Development
  - Supporting Correspondence

The **Artifacts.PDF** file contains copies of each artifact I might want to include, organized chronologically with all of the artifacts together for each year. The order of each year's files follows:

- Annual Activity Report
- Syllabi for the year for all courses taught
- Course Content Guides for all new courses developed or revised
- Grants written/received during the year – full text
- Publications for the year – full text

How I Create and Update my Electronic Portfolio using Adobe Acrobat

1. **Organizing files and folders** - My hard disk drive is really my working portfolio. Once a year, I "mine" my hard drive for those "gems" that I want to include in my artifacts file.

   1.1. During the year, collect appropriate artifacts in a folder called, "new items" or in a folder named for the year. I keep a "Working Folder" to store all of the artifacts for inclusion in the portfolio that have been converted into Acrobat format. Sometimes I add contemporaneous reflections to the artifacts using the Notes tools in Acrobat.

   1.2. Set up a new folder for the working files for the new year. Save all of the new summary files in the new current year folder if you want to maintain source documents for prior years (the prior year folders can be tossed later, if hard disk space is an issue). Once a PDF file is inserted into the main Portfolio.PDF or Artifacts.PDF document, I store them into a folder that I call "PDF files" inside the current year's folder.

2. **Contents of portfolio pages**

   2.1. At the end of the summer, I write up my Annual Activity Report (AAR). Each component of the report becomes the foundation for updating the separate sections of the portfolio. The formatting of each section matches each section of my Vita.

   2.2. From my Annual Activity Report (AAR), copy the publications, conference presentations, and any other appropriate information into my Vita. Print the Vita to PDF.
   2.3. Update major section summary pages (Teaching, Research, Service)

2.4. From my Annual Activity Report (AAR), copy the contents of each section to the Summaries of each type of activity (i.e., classes taught, different types of service, publications, conference presentations, etc.) after adding a heading for the current year. This results in a summary of the different aspects of my work for all years. I recommend organizing these summaries in chronological order, adding the current year's record at the end. That way, if links have been made to artifacts, those links would remain in the same place when the new information is added at the end.

2.5. Convert these summary pages to PDF (all of these items are drawn from the AAR):
- ❑ Summary of Courses Taught
- ❑ Overview of Curriculum Development
- ❑ Summary of Research & Creative Activity
- ❑ Summary of Publications
- ❑ Summary of Grants Received including paragraph Abstracts
- ❑ Conference Presentations
- ❑ University Service
- ❑ Professional Service and Affiliations
- ❑ Community Service Summary (including School District In-Services)
- ❑ Paid Consulting
- ❑ Summary of Professional Development
- ❑ Supporting Correspondence (see description #3.6)

3. Organizing the PDF files

3.1. Take last year's PDF portfolio, save with another name. Create a new folder to hold the new portfolio and place this new file into that folder.

3.2. I maintain my artifacts in a separate PDF file. Make a copy of that file, but keep the same name if you want the old links to that file to work. Move that new file to the new portfolio folder.

3.3. Replace the appropriate pages in the portfolio, updating them with the new versions. This will leave the links intact. Don't Delete Pages and Insert Pages; the links will disappear. The only pages to insert should be those where the page counts exceed the previous year when the additional information is added.

3.4. Review the artifacts that might be included in the portfolio file (in my case, the current year's syllabi), and copy those pages to the end of the Artifacts file. From prior experience, the cross-document links from the Portfolio PDF file to individual pages in the Artifacts PDF file will be correct only if pages are not inserted in the middle, but rather at the end of the document. I insert a divider page before the beginning of the new year's files.

3.5. While the Artifacts file may be filed in chronological order, the Bookmarks can be organized by artifact type, so that each major heading can have sub-headings that link to individual documents.

3.6. An important component at the end of my portfolio is a collection of correspondence that I have received during the year that support my portfolio. Many of these items are e-mails and have been converted to PDF at the time they were received, and are stored in the folder described in Step 1. I create a summary list of these pieces, convert that document to PDF, and insert into the portfolio. This is the only page that I delete and insert, and then need to update the links and the bookmarks. I also make links to each individual piece of correspondence.

4. Adding Reflections (Reflections turn *artifacts* into *evidence* of achievement)

4.1. When creating the PDF version of an artifact, sometimes I add a reflection to the file, using Acrobat's Annotations Tools.

4.2. Update the Introduction to the portfolio, convert to PDF, and replace the older version in the Portfolio file. If necessary, link from the Table of Contents and re-link Bookmark.

4.3. Write up my summary reflection for the year, convert to PDF and insert into the Portfolio file. If necessary, link from the Table of Contents and re-link Bookmark.

4.4. Review the document that contains the Standards I have chosen, and update the reflections from the prior year. I keep my ATE reflections in a FileMaker Pro database. Convert to PDF and replace the older version in the Portfolio file. If necessary, link from the Table of Contents and re-link Bookmark.

5. Fine-tuning the finished files before publication

5.1. Check all Bookmarks or make new ones.

5.2. Check all links or make new ones.

5.3. If file size is not an issue, create all Thumbnails.

5.4. If you want the PDF files to open with the Navigation Pane showing, select File Menu -> Document Info -> Open and select the appropriate Initial View.

5.5. Before finalizing the PDF files, do a "Save As…" using the same name to compress the file. If saved too many times, the file becomes very large.

5.6. If the files are to be posted in a public space, such as a web server, I save the files with Normal Security, to prevent printing, copying, adding notes, making any changes or form fields. I also assign a password required to change those security provisions. Be sure to remember the password, or keep another version without the security provisions.

6. Adding Multimedia

6.1. I review the portfolio for standards or reflections that could benefit from a multimedia reflection. I also review the video clips that I have collected over the year. I create short video clips to illustrate a component of my portfolio (try to keep each clip less than 30 seconds).

6.2. Save the files in Quicktime cross-platform format or AVI format. Store in a "Movies" folder inside the current portfolio folder. Once stored in a place that will not change, create links from the Portfolio document to the appropriate video file.

6.3. If appropriate, I will create a tour of the portfolio using CameraMan or another Screen Recording software package, narrating the overview for a novice viewer, and saved in QuickTime or AVI format.

7. Publishing the Portfolio

7.1. Using a CD-mastering program, I set up a temporary 650 megabyte partition and copy the all appropriate files and folders in the current portfolio folder to that partition. Organize the windows the way they should appear when the CD is loaded in the CD drive (Macintosh only). Write the CD.

7.2. Post the appropriate files to a web server. I post only the Portfolio.PDF file, not the Artifacts.PDF file to a web server. I also use the Normal Security so that the document cannot be printed, pages or text/graphics copied, etc. I do not include the video clips with the online PDF files, since the links to video do not work over the Intemet.

References:

Adobe Corporation (2000) "Adobe PDF" Retrieved from the World Wide Web: December 4, 2000 at: http://www.adobe.com/products/acrobat/adobepdf.html

Adobe Creative Team (2000). *Adobe Acrobat 4.0 Classroom in a Book.* Adobe Press

Alspach, Ted; Alspach, Jennifer. (1999) *PDF with Acrobat 4: Visual Quickstart Guide*. Peachpit Press

Anderson, Mattias; Eisley, William; Howard, Amie; Romano, Frank; Witkowski, Mark; (1997) *PDF Printing and Publishing*. Micro Publishing Press

Barrett, Helen C. (2000) "Electronic Teaching Portfolios: Multimedia Skills + Portfolio Development = Powerful Professional Development" Published in the *Proceedings of the Annual Conference of the Society for Information Technology & Teacher Education.*

Padova, Ted (1999) *Acrobat® PDF Bible*. IDG Books Worldwide

Discetech: Advanced Training on Technologies and Didactic for Italian Teachers

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Abstract: The Discetech project was conceived in 1996 at *Politecnico di Milano* (Italy) to integrate technological training and educational practice.
In Discetech, in fact, we train teachers on the use of computer applications (CD's, Internet, software, videoconference, ...), then we prepare it to design teaching experiences to be performed in their own classrooms. Each experience is observed and measured, from the didactic point of view, by adopting a number of parameters (about the training process, the educational aspects, the knowledge acquisition and the contents selection).
In the final phase of each year the results are evaluated, compared and shared among all participants in order to gain the largest possible amount of knowledge about the adopted teaching modalities and the achieved results.
Discetech is an experimental project rather than a simple upgrading course; it is conceived to observe and to better understand different aspects of the Italian School.

Introduction.

The Discetech project was started in 1996 at *Politecnico di Milano*; in the first year it was performed in the high schools of Como, then, in 1997 it was extended to the high schools of Lecce (in the South East of Italy) in collaboration with the local University. This paper is about the Lecce branch of the project.

Discetech is an experimental project rather than a simple upgrading course. It is conceived to analyze different aspects of the Italian School:

- the first aspect is about the extraordinary spread of new technologies among the students in the last years: it is interesting to observe that, in most cases, the use of computers, Internet, CD/DVD-ROMs etc. is not pushed from School but from other factors (essentially computer games and the relatively low cost of the hardware).
- the second aspect is about the "embarrassment" of many teachers with respect to technological issues ("how to find something on Internet?", "how to read a CD-ROM?", "how to insert an image in a composition written on the PC?", etc.): teachers need to be credible towards students without transforming itself in computer scientist. Teachers need to use (and to demythicize) technologies by using it, not to learn internal details about it.
- the third aspect is about the current learning process, primarily (almost exclusively) based on schoolbooks: teachers don't know how to evaluate/use new media in their teaching practice.
- finally, we consider that today students may have several information sources, like CD's or Web sites, so they can be *more informed* (in some case) and/or *more updated (in most cases)* than their teachers, nevertheless students need a method to organize this information and to transform it in knowledge.

For these reasons Discetech is above all directed to teachers, and not to students: the coordinated training on technological applications and didactic experimentation is the key point of the project (Henderson & Bradey, 1999) (Suen & Szabo, 1999).

This paper is about the experience acquired in last three years of the Discetech project in Lecce.

The project.

Concisely, in Discetech we train teachers on technologies and computer applications (CD-ROMs, DVDs, Internet, e-mail, software, videoconference ...), then we prepare it to plan a teaching experiment to be performed in their own classrooms. The technological training and the preparation of the experiments is carried out in the first semester of each year, while the experiments (the duration is on the order of 3 months) are performed in the second semester.
During each experiment, the whole class, and each student in it, are observed from the teacher(s), and a number of parameters are evaluated and registered, mainly about the training process, the educational aspects, the knowledge acquisition and the contents selection.
In the final phase of each year the results are evaluated and shared among all participants in order to gain the largest possible amount of knowledge about the adopted teaching modalities. A suitable didactic background is essential in this phase to compare the results coming from the various experiments and to extract from it a more global and reusable knowledge.

In more details, at its fourth year, the project is structured into 3 levels and each level is organized into 3 phases. Each phase is structured into modules with both theory and practice.

- The Base level is oriented to teachers approaching for the first time to Computer and multimedia technology (Sims 1999).
- The Advanced level is oriented to teachers coming from the base level or with previous experiences about multimedia technologies. The goal of this level is to learn an advanced use of Internet resources for both searching the Web and participating to virtual communities (Bennet 1999) (Harasim 1995) (Slavin1995) (Hiltz 1994)
- The Experimental level is oriented to teachers coming from the previous levels. Here teachers learn how to evaluate existing CD-ROMs and Web Sites, how to conceive new hypermedia applications and how to develop it (Frohlich 1999) (Hackbarth 1996) (Garzotto et al. 1993).

Each level is structured in 3 phases with different contents according to the level, but with a common goal.

- In the first phase, technical tutors provide to teachers the needed know-how for that level.
- In the second phase, didactic tutors provide to teachers the knowledge needed to develop teaching experiments in which "normal" teaching aids and new technologies are jointly used to achieve specific didactic goals.
- In the third phase the teachers, in its own classrooms, performs the teaching experiment. A given number of parameters are measured during this phase in order to evaluate the results and to compare it with the results of their colleagues.

Base Level: Modules Structure.

The base level has the goal to quickly supply the teachers with the initial computer practice and the base principles to understand a multimedia application. This level is structured into the following modules:

- Module A: Introduction to the PC, the Windows Operating System, Word 2000;
- Module M: CD-ROM and multimedia application; introduction to the Hypermedia Design Model (HDM)(Garzotto et al. 1993); evaluation parameters for multimedia applications;
- Module M1: advanced topics on the evaluation of the hypermedia applications; presentation of the main criteria to select a CD-ROM as teaching-learning aid (a media library with more than 300 titles is used). In this module are presented the best didactic projects of the past years;
- Module I: Introduction to the Internet, search engines, e-mail;
- Module W1: Didactic evaluation: parameters and tools
- Module W2: planning of the teaching experiments (individual meetings with didactic tutors);
- Module W3: results presentation and analysis.

Advanced level.

In the advanced level, teachers achieve to the ability to correctly use the Internet in their usual teaching-learning activities. This level is structured into the following modules:

- Module I1: Introduction, objectives and examples;
- Module I2: Internet Browsers: configuration and basic operations;
- Module I3: Internet communication: e-mail, newsgroups, chat, mailing list;
- Module I1: exploration and evaluation of about 100 Web sites selected for the purpose; in this module each teacher select one or more Web site to be used in its teaching experiment;
- Module C1: virtual communities; building a community with WebBoard;
- Module C2: collaboration tools and video-conferencing tools; MS Netmeeting
- Module P1: issues and technical planning of a teaching experiment based on the above-described tools;
- Module W1: Didactic evaluation: parameters and tools
- Module W2: didactic planning of the teaching experiments (individual meetings with didactic tutors);
- Module W3: presentation and evaluation of the results.

Experimental Level.

At this level the teachers are involved in the creation of an hypermedia application. The level is structured into the following modules:

- Module H1: the HDM methodology to evaluate Hypermedia Applications; (Garzotto et al. 1993)
- Module H2: the HDM methodology to model Hypermedia Applications;
- Module T1: tools for media authoring (Adobe Premiere, Adobe Photoshop, ...);
- Module T2: hypermedia authoring environments (Macromedia Director, Flash, DreamWeaver, ...);
- Module D1: design and development of a specific hypermedia application;
- Module E1: Evaluation of the efforts to develop the above application. Evaluations of the results.

In the last 3 years Discetech involved, in Lecce, about 100 teachers and 1700 students, participating to 75 different teaching experiments.

Didactic Project.

A synthetic example of teaching experiment is reported in the following. The project was developed for an history class in the first year of a professional high school, using a CD Rom about the Ancient Rome.
Two kinds of goals (generic and specific) are defined:

the generic goals, structured into 4 categories:

1. training:
   - to enhance the student's interest for the History;
   - to enhance the class-group understanding;
2. instrumental:
   - to correctly use the computer;
   - to acquire the ability to interact with different information sources;
3. knowledge:
   - to understand texts of medium difficulty and to elaborate it;
   - to establish links between arguments and to compare them;
4. content:
   - to grasp the fundamental concepts of the subject;
   - to grasp the links with other subject in a multi-disciplinary environment;

the specific goals:

- to correctly explain the arguments
- to appropriately use of the vocabulary
- to correctly evaluate the CD contents.
- to place the historical events in the correct time/space dimension
- to understand the political, social and economic situation in the ancient Rome.

The expected results are:

- To analyze and to list the main concepts
- To find the hot keys and to understand the links between arguments
- To verbally explain the acquired information
- To find/understand the implicit and explicit means in the non-verbal (multimedia) information;
- To enhance the motivation of students with low proficiency problems.

evaluation parameters.

The evaluation of the teaching experiments is based on the observation of different groups of parameters: two of this groups are reported in Tab. 1. Teachers fill the tables by observing each student, and the whole class in almost two different times: before and after the experiment. The normal scholastic tests performed during the experiment are also recorded and analyzed.
Tab. 1, as well as the other tables of parameters, has been designed specifically for the Discetech project from the didactic equipe of Lecce.

Parameters	Technical Abilities						Orientation Abilities				
Description	He/she is able to access to PC	He/she is able to open a program	He/she is able to save data	He/she is able to copy files	He/she is able to print data	He/she is able to use the navigation tools	He/she is able to use technical terms	He/she is able to understand the main arguments	He/she is able to correctly use links to study in depth	He/she is able to correctly use the Internet navigation	He/she is able to access the information easly
Student's Name											

Table 1. Technical and Orientation Ability

Final Considerations.

During the last 3 years we observed that the teachers, initially embarrassed in using the computer, and skeptical about the effective use of multimedia and Web applications into their lessons, changed radically their opinion when experimented the combined use of traditional and innovative media in their projects.
They generally become more able to select new CDs and new Web sites related to specific fields of interest.
The teachers well understood and interpreted their new role, becoming more and more a guide for the students, in a cooperative learning experience, and working with other teachers on similar projects.
Furthermore, teachers became more interested in this new way of teaching, as a consequence of the increased preparation and participation of the students.

In general, during the running phase of the projects, teachers observed the following points:

- The motivation and the interest of students with a good profit were enhanced and the project was a stimulus to consolidate their self-esteem.

- The motivation and the interest of students with lower scholar profit were more oriented to the instruments than to the contents, but also this result is remarkable.
- All the students well understood the structure of adopted CDs or Web sites
- The final result of each student was generally better than before the experiment.
- In general, all students participated to the experiment and cooperated with their colleagues independently from any previously established friendship relation. The project stimulated an effective exchange of information and experiences.

To sum up, in our opinion teacher's role must be reinvented; its primary goal is not to be a *well programmed schoolbook explainers*, but to supply to students the ability to manage the primary keys, the conceptual supporting structure and the principal concepts of a given subject, independently from the technical nature of the media (TV, CDs, Internet, Books, Computers, ...) used to teach.

References.

Bennet J.F.(1999). Incorporating the Internet in the Class Room, *ED-MEDIA 1999 – World Conference on Educational Multimedia, Hypermedia & Telecommunications.*

Frohlich R. (1999). Strategies for Selecting Technology for Education: Choosing the Right Tool for the Job, *ED-MEDIA 1999 – World Conference on Educational Multimedia, Hypermedia & Telecommunications.*

Hackbarth S. (1996), *The Educational Technology Handbook: A Comprehensive Guide: Process and Products for Learning*, Educational Technology Publications.

Harasim L., Hiltz S. R., Teles L. & Turoff M., (1995), *Learning Networks: A Field Guide to Teaching and Learning Online*, MIT Press, Cambridge MA.

Henderson L. & Bradey S. (1999). Getting Computer Information Used in Teaching and Learning: A Model of Technology Diffusion in K-10 Schools, *ED-MEDIA 1999 – World Conference on Educational Multimedia, Hypermedia & Telecommunications.*

Hiltz S. R., (1994), *The Virtual Classroom - Learning without limits via computer networks*, Ablex Publishing, Norwood, NY.

Sims R. (1999). Interactivity and Narrative: Strategies for effective Learning, *ED-MEDIA 1999 – World Conference on Educational Multimedia, Hypermedia & Telecommunications.*

Slavin R. E., (1995), *Cooperative Learning: Theory, Research and Practice*, John Hopkins University.

Suen C.& Szabo M.(1999). A Study of the Impact of a School District Computer Technology Program on Adoption of Educational Technology, *ED-MEDIA 1999 – World Conference on Educational Multimedia, Hypermedia & Telecommunications.*

F. Garzotto, P. Paolini, & D. Schwabe,(1993), HDM - A Model Based Approach to Hypermedia Application Design, *ACM Transactions on Information Systems*, 11 (1), 1-26.

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Online Portfolios vs. Traditional Portfolios

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Abstract: Portfolio is a methodology for teaching and evaluation. A certain time and requirement must be followed when developing a portfolios must. It implies different activities such as: homework, presentations, research, projects, interviews, comments and others. This methodology demands students to compromise the process of learning, being the ultimate goal to fulfillment the program objectives. For this study, two groups were compared using online portfolios and traditional portfolios. The populations were composed of 58 college students from two different universities. Data were collected from September 1999 to January 2000.

Introduction

Education today is touched by diverse paradigms some of them are: the high develop of new technologies for communication and information, the cognitive science and its impact in teaching and learning and the continuing education. Based on this framework one of the most important issues to discuss is the learning evaluation. Today it is accepted that evaluation plays an important role for the process of learning to give meaningful feedback to the learner, to improve the learning process, and to teach practice and educational options (Gonzalez & Flores, 1998).

Education today is searching for new meaning for the teaching and evaluation process. It is looking for alternative ways to teach and evaluate. Today evaluation is more than asking students to select answers; it is asking students to generate questions and answers to situations related to the real life (Sacristan, 1988). Also, it is important to explore the meaning of knowledge and make it meaningful to the learner (Ausubel, Novak, Hannesian, 1983). Evaluation has to relate not only to the academic tasks, but also to the many possible answers the learner can create, based on creative and divergent characteristics (Lazear, 1991).

Alternative evaluation will require radical changes into the process of teaching and learning. In fact the evaluation process needs to be open, flexible, and diverse to related students performance with real life situations. Evaluation has to be a continuous process, with permanent feedback. Finally, alternative evaluation has to consider mistakes as a method of learning.

Portfolios are a method that can be used as an alternative way to evaluate the process of learning. They offers many possibilities to enrich the teacher's work and student's possibilities to learn, but also its practice emphasizes the action and decision students have on their own learning. Portfolios can be used as a collaborative work that will help develop cognitive processes (Castelli, 1999).

Portfolios offer the learner opportunities to make decisions on their learning, and the opportunity to think about the process of learning. Using the portfolio method, allows students to be aware of their own learning and help them to develop cognitive process (Brien, 1994).

Portfolios are a method for teaching and learning. Portfolios can be a collection of many works, experiences, or assignments. Portfolios are a method of evaluation, referring to an authentic evaluation that puts students in relevant, and meaningful tasks (Perez Gomez, 1991) related to the real life.

Using portfolios, the learner will build their own progress to the expertise. Students are autonomous and responsible for their own learning. Its allow students to conform real criteria about the quality of their performance. Finally, portfolios permits learners visualize their own production and compare them with others to determine progress and weaknesses in the learning process. Portfolios can be used as formative or summative ways to evaluate learning.

New technologies of communication and information are affecting education. On this mediated environment portfolios can be developed online. It is possible to evaluate the process of learning based on electronic portfolios. Its represents dimensions, abilities, examples and answer to brainstorming. Portfolios have been used to make a search on the Internet, do assignments, and give feedback throughout e-mail. In the process of building portfolios online it is requires students to create lectures, use portfolios with other learners, and build a CD-ROM version.

Research Questions

1. Relating to the process of developing and conducting portfolios in the process of teaching and learning, how do students who develop traditional and online portfolios differ?
2. Relating to the evaluation of the portfolio as a tool for learning, how do students who develop traditional and online portfolios differ?
3. Relating to the portfolio as an evaluation methodology, how do students who develop traditional and online portfolios differ?

Methodology

A survey was developed by the researcher, and was used to gather the data. The survey was developed to measure three variables: (1) developing and conducting a class, (2) methodology and (3) evaluation. The survey consisted of 12 questions to be answered on a scale of A= totally agree, B= partial agreement, and C = disagree. Items 1, 2, 3 and 4 pertained to criterion 1, items 5,6,7,8,9 and 10 pertained to criterion 2, and items 11 and 12 pertained to criterion 3. The Survey took approximately 20 minutes to complete.

The research was designed to acquire information on portfolios that are used in instruction. The data was collected from twenty-nine participants that created a traditional portfolio and twenty-nine participants that created an online portfolio.

T-tests were conducted in order to determine if there was a significant difference between the students developing traditional and online portfolios. Descriptive statistics were also utilized.

Findings

The sample consisted of 29 students developing a traditional portfolio and 29 students developing an online portfolio. Upon analysis, the t-test indicated that there was a significant difference between the two groups. ($t = 2.31$ $p = .03$).

The t-test indicated that there was a significant difference between the students who developed traditional portfolios and the students who developed online portfolios concerning how a portfolio was developed in class ($t = 3.12$ $p = .02$). A t-test indicated that there was no significant difference between the students who developed traditional portfolios and the students who developed online portfolios the methodology of developing the portfolios ($t = .73$ $p = .47$). A t-test indicated that there was no significant difference between the students who developed traditional portfolios and the students who developed online portfolios the methodology of developing the ($t = .46$ $p = .69$).

One hundred percent ($n = 29$) of the students that developed traditional portfolios and 100% ($n = 29$) of the students that developed online portfolios, agreed that the professor was clear and precise with homework concerning the portfolios. One hundred percent ($n = 29$) of the students that developed traditional portfolios and 100% ($n = 29$) of the students that developed online portfolios, agreed that the answers were according to the topic.

Ninety-six percent ($n = 28$) percent of the students that developed traditional portfolios and 100 % ($n = 29$) of the students that developed online portfolios agreed that the portfolios consisted of more effort and dedication in the class. One hundred percent ($n = 29$) of the students that developed traditional portfolios and 100% ($n = 29$) of the students that developed online portfolios indicated that the portfolio demands pertained to the class.

Ninety-seven percent ($n = 28$) percent of the students that developed traditional portfolios and 100 % ($n = 29$) of the students that developed online portfolios indicated that creativity and the portfolio were related. One hundred percent ($n = 29$) of the students that developed traditional portfolios and 100% ($n = 29$) of the students that developed online portfolios indicated the portfolios promoted cooperative learning.

One hundred percent ($n = 29$) percent of the students that developed traditional portfolios and 100 % ($n = 29$) of the students that developed online portfolios indicated that the demands were according to the students' backgrounds. Ninety-three percent ($n = 27$) of the students that developed traditional portfolios and 93% ($n = 27$) of the students that developed online portfolios indicated that the portfolios required extra time.

One hundred percent (n = 29) percent of the students that developed traditional portfolios and 97 % (n = 28) of the students that developed online portfolios indicated that the assignments and activities were interesting and useful. One hundred percent (n = 29) of the students that developed traditional portfolios and 97% (n = 28) of the students that developed online portfolios indicated that the portfolios were relevant.

Ninety-three percent (n = 27) percent of the students that developed traditional portfolios and 100 % (n = 29) of the students that developed online portfolios agreed with the professors' evaluation of the portfolio. Forty-one percent (n = 12) of the students that developed traditional portfolios and 24% (n = 7) of the students that developed online portfolios indicated that they knew how to develop portfolios.

Conclusion

Knowing how students are using portfolios can be beneficial in several ways. First of all, knowing this information allows educators to incorporate it into curriculum in both traditional and online situations. This will in turn provide an opportunity to enrich the learning environment. Imagining the future, there will be more access to online learning. Educators can take this information to incorporate it into new courses and distance learning or Web-based environment.

Portfolios can be used to visualize students' performance and to certify students progress. It can be utilized as a methodology for teaching and learning, a methodology for evaluation, and finally as a methodology to develop educational values. In higher education professors can use portfolio in a wide range that enrich the instructional process and to evaluate the performance. However the most important part is that the students have the opportunity to control their own process of learning and to value it and to compare their own criteria with professor's criteria.

References

Ausubel, D; Novak, J; Hannesian, H. (1983. Psicología educativa. Un punto de vista cognoscitivo. Edit. Trillas.

Brien, R. (1992). Science cognitive & formation. Presses de l''Universite du Québec, Canada.

Castelli, E. (1999). El enfoque cooperativo y el uso del portafolios. Revista de pedagogía. No. 59. Universidad Central de Venezuela.

González, C.; Flores, F.M.(1998. El trabajo docente. Enfoques innovadores para el diseño de cursos. Ed. Trillas.

Lazear, (1991). Seven ways of teaching. The artistry of teaching with multiple intelligences. IRI. Skilight Publishing Inc. Palatine Illinois.

Pérez Gómez, A. (1991). Cultura escolar y aprendizaje relevante. Revista Extramuros. Junio 47-62. Universidad Central de Venezuela.

Table 1. The Professor is Clear and Precise with Homework

Response	Traditional	Online
Partially Agree	58.63%	79.32%
Totally Agree	41.37%	20.68%
Disagree	-------	-------

Note. Online n=29; Traditional n=29

Table 2. Answers are According to Topic

Response	Traditional	Online
Partially Agree	41.38%	86.21%
Totally Agree	58.62%	13.79%
Disagree	-------	-------

Note. Online n=29; Traditional n=29

Table 3. The portfolios consisited of more effort and dedicaion to the class

Response	Traditional	Online
Partially Agree	48.28%	58.62%
Totally Agree	48.28%	41.38%
Disagree	3.44%	-------

Note. Online n=29; Traditional n=29

Table 4. Portfolios demands pertained to the class

Response	Traditional	Online
Partially Agree	62.07%	82.78%
Totally Agree	37.93%	17.22%
Disagree	-------	-------

Note. Online n=29; Traditional n=29

Table 5. Creativity and the portfolio were realted

Response	Traditional	Online
Partially Agree	68.96%	79.31%
Totally Agree	27.58%	20.69%
Disagree	3.46%	-------

Note. Online n=29; Traditional n=29

Table 6. The portfolios promate cooperative learning

Response	Traditional	Online
Partially Agree	68.96%	93.01%
Totally Agree	31.04%	6.99%
Disagree	-------	-------

Note. Online n=29; Traditional n=29

Table 7. The demands ofthe portfolio were according to the students' backgrounds

Response	Traditional	Online
Partially Agree	72.41%	82.75%
Totally Agree	27.59%	17.25%
Disagree	-------	-------

Note. Online n=29; Traditional n=29

Table 8. The portfolios required extra time

Response	Traditional	Online
Partially Agree	24.14%	55.18%
Totally Agree	68.97%	37.93%
Disagree	-------	6.89%

Note. Online n=29; Traditional n=29

Table 9. Assignments and activities were interesting and useful

Response	Traditional	Online
Partially Agree	79.31%	68.96%
Totally Agree	20.69%	27.58%
Disagree	-------	3.46%

Note. Online n=29; Traditional n=29

Table 10. Relevance of portfolio

Response	Traditional	Online
Partially Agree	82.75%	65.52%
Totally Agree	17.25%	31.03%
Disagree	-------	3.45%

Note. Online n=29; Traditional n=29

Table 11. Students' opinion on their evaluation

Response	Traditional	Online
Partially Agree	62.06%	96.56%
Totally Agree	31.04%	3.44%
Disagree	6.90%	------

Note. Online n=29; Traditional n=29

Table 2. Answers are According to Topic

Response	Traditional	Online
Yes	41.38%	24.14%
No	58.62%	75.86%

Note. Online n=29; Traditional n=29

Instructional Strategies for Adobe Photoshop: Developing Teacher Training That Works

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Abstract: Adobe Photoshop is a powerful image-editing program with extended capabilities. Unfortunately, the power and versatility of the program can result in teacher training that is too broad, difficult to apply immediately to classroom resource development, and overwhelming to those new to image editing. Instructional conditions often place additional constraints on Photoshop instruction, such as lack of adequate lab facilities and short training periods. Skill-based training in Photoshop should be relevant, easy to learn and implement, well documented with tutorials for further exploration, and should build confidence and develop problem-solving capabilities.

Adobe Photoshop is a comprehensive graphics program - the industry standard in manipulating photographs and bitmap graphics. Technologists often fall in love with it because it is fun to use and teach and offers creative outlets rich in visual possibility.

The technical community is so enamored of Photoshop that instruction in its use often assumes an evangelical flavor: Instructors may emphasize the full range of its features, stressing that 'anyone doing a website must learn Photoshop.' Because Photoshop is so comprehensive, teachers could easily devote more time mastering this graphics tool than developing educational content.

Photoshop can be valuable to teachers and is a valid component of teacher education: however, teachers need instruction designed for K-12 use and applications. Teachers need Photoshop training that is applicable to their uses. While other instructional methods such as project-based learning may be an effective way to develop teachers' skill in Photoshop, hour-long workshops seem to be the norm. Educational technology specialists can employ this format effectively, provided they focus their workshop on the appropriate instructional objectives for teachers.

Teachers are now required to master a broad range of software. Photoshop instruction should draw correlations among the range of graphics programs that teachers may encounter, and specify how Photoshop is particularly geared to a specific task. Instruction should develop skill in the program while also developing skill in directing self-learning in the program.

Consider this possible scenario:

> Mary is a 6th grade teacher who uses WebQuests regularly in her Life Science classroom. Though the WebQuests are effective and generally liked by her students, she wishes she could have more control over her images. She tries to make her web pages visually interesting, using clip art whenever possible. She knows her pages are slow to load because of the images, and wishes she could resize them to the correct size. She also thinks she could do a lot with a graphics program; such as separating some bones out of the human skeleton image for the "No Bones About It" lesson where her students make predictions on bone use based on structure.
>
> Mary was enthusiastic about attending the Photoshop training Saturday morning. Photoshop was a great program. The trainer clearly loved the tool and showed a lot of what it could do. She loved how the trainer restored the old photo to

remove the fold line across the middle, and was impressed by the fancy borders he could make around the animal photos.

The best part of the workshop occurred when the instructor demonstrated how easy it was to use the selection tools. She took detailed notes as the trainer used the magic wand tool to select one sunflower from a field of flowers, and then pasted the flower into a graphic for a web page. She couldn't wait to get to her computer at school to tackle the bones image.

Mary's schedule was as busy as it usually was. During the first three-day weekend after the workshop (about 4 weeks later), she fished out her notes and opened Photoshop and her bones image. Wait a minute... Her notes weren't as clear as she thought they were. At the top she had scribbled something about 'check the resolution', but now that didn't make any sense to her. She was able to use the magic wand tool and select parts of the background around the bone in the photo. The background had a lot of different colors in it, so it was tricky. She was very careful, and spent about 45 minutes selecting exactly the background around the bone. She selected another part of the picture and -- oh no -- she just double clicked. She lost the selection she spent 45 minutes getting! "Forget it," she thought, and decided to crop the image close, leaving the background in the photo. She saved it as a JPEG (she remembered the trainer said jpeg was a good format for the web) and used Front Page to put it in her WebQuest. "That doesn't seem right", she muttered, the image was huge! "It was so much smaller on the screen," she thought to herself, "What am I doing wrong?" She opened the second bone image she wanted to work with. A friend had given her this photo she took at the museum. Mary opened it, made some changes and tried to save... Photoshop wouldn't save it as a JPEG... Why not? She had just done it successfully minutes earlier... "Why doesn't it work now?"

Over dinner, Mary was grumbling about her experience, saying she wasted her time even trying to learn the program. Her daughter, visiting for the weekend, tried to console her, "Mom, don't feel bad, I had to get a degree in graphic design before I started to really understand the program. Maybe you should leave Photoshop to the artists."

The instructor in this scenario was right in believing Photoshop could serve teacher's needs. The instructor was enthusiastic about the program, and was able to get the students excited. Several instructional strategies could have been implemented in the workshop that would have changed Mary's experience. These include:

Instruction Should be Relevant

All instruction in Photoshop should be placed within an educational context. Will teachers be restoring old photos? Will teachers need to add a third eye to the photo of a fashion model? Instruction should demonstrate real applications related to the classroom curriculum such as Mary's bones example.

Teachers frequently prepare images for the web; so any Photoshop instruction should include a demonstration of saving in web formats. When altering existing photos, most teachers need to highlight a certain area, add simple graphics such as an arrow or box, or include text in an image. Teachers also frequently handle several images in the same manner, such as preparing individual images from each student. When structuring a planning session, begin with a list of tasks teachers will need to perform using Photoshop, and teach software skill relating to those tasks.

For example, Photoshop's "Effects" feature applies drop shadows effortlessly to any layer, though drop shadows rarely enhance the educational power of a single image. Rather than emphasize this glamorous feature, emphasize the power of navigational graphics in the design of a web page. When developing buttons for navigation, users are more likely to differentiate navigational text buttons from traditional text if the buttons look like traditional, three-dimensional buttons. Using common WebQuest headings, create text over colored square blocks. Use the "Effects" feature to bevel these square blocks, creating simulated buttons. In this manner, you have helped the teacher strengthen interface design skills, as well as demonstrate a simple component of the program. Additionally, the next time the teacher is making WebQuest buttons; they will remember this lesson, recalling a relevant, easy to apply Photoshop skill. In an extension of this skill, the teacher can explore the "Effects" options, learning that drop shadow is an option, should they choose to use it.

Additional relevant skills include:

- *GIF v. JPEG: When to Use Which for Web Images*

  Include a discussion of saving as any file type, as well as a conceptual overview of why we use different file types.
- *1001 Words: Adding Text to an Illustration*

  Text can be used many ways in Photoshop, including labeling parts of a specimen, 'signing' students' names to work. Text is also a good way to demonstrate layers and how they work in Photoshop.
- *Getting What You Want: Selection Tools in Use*

  Frequently teachers wish to remove the subject of their photo from the background, most will find using a combination of Quick Mask mode, the magic wand, and other selection tools helpful. Remember to use a real example that could be used in an educational setting.
- *Size Does Matter*

  The most common mistake in web pages is resizing images in the web page, resulting in images that print too large, overprinting text on the page. When developing pages, specialists should resize images to the desired size in Photoshop, requiring a rudimentary understanding of pixels, resolution, file size and the "Image Size" dialog box. As an example, prepare snapshots of student work for a standard web size, approximately 250 pixels wide by 300 pixels tall. Remember to use a real example that could be used in an educational setting.
- *32 GIFs per Second: Batch Processing Your Class Images*

  The Actions palette allows for batch processing of several steps, including opening a file, resizing, and saving as a GIF or JPEG.

Instruction Should be Easy to Learn and Implement

In-service instruction is often delivered in short doses. Instructors can specify small parts of using Photoshop; such as "JPEG or GIF: when to use which" or "Five Ways to Select Items in Your Photos." Instructors should remember that Photoshop is just a small part of each teacher's collection of software skills. A teacher doesn't have to understand how professional graphic artists use CMYK mode, or how alpha channels work to crop a simple image.

Successful strategies for keeping training digestible include the one-third, two-thirds rule: use one-third of your allotted time for demonstration, and two-thirds for hands-on practice. Consider this format:

- Provide a conceptual overview for what will happen, including a view of the 'finished' product.
- Clarify that you will demonstrate twice, once while they watch and once while they follow along.
- Provide extension activities in writing, so that quick learners will be able to move forward exploring the tools ("Once you have mastered the 'bevel' mode of the Effects feature, experiment with your text by applying a drop shadow, or embossing").
- Provide sample images so that everyone is working with the same file on which you have worked.
- Teach no more than one conceptual idea (such as resolution or layers) per hour session.

Workshops Should be Well-documented, with Tutorials for Further Exploration

Teachers' schedules rarely allow for immediate practice of learned software skills: Mary's notes would have been well supplemented by an online tutorial, reviewing the sunflower example the trainer demonstrated. Mary could have downloaded the same flower the instructor used, developing her selection skills on an 'easier' image before tackling her own work. Unfortunately, preparing effective tutorials can be time consuming, so the wise trainer establishes a library of tutorials for multiple uses. Don't hesitate to use other's tutorials if you demonstrate them in training using those files. Effective tutorials:

- Replicate given training exercises. Learners may not remember that you were discussing selection techniques, but they may remember you were doing something useful with the bones photo.
- Provide sample files. At the beginning of the tutorial, include a beginning image for download.
- Include specific instructions, cross-platform commands (PC and Macintosh) and extensive images visually conveying the steps included.
- Encourage additional exploration and extension activities for the tools. These activities don't need to be explained step by step, but learners can be encouraged to explore in certain places within the menu.
- Provide additional resources. Remind learners of the resources available to them, the book, web, perhaps even your email for personal inquiries.
- Print well. Especially if you post your tutorials to the web, print the final product from a series of printers, making sure any colored text, images or headings print correctly. Learners will want to print the tutorial and follow it while working in Photoshop.
- Use the proper terminology. You may call the selection the 'marching ants', but a confused learner will come up empty handed when searching for this term in online help. Whenever possible, provide the terminology Photoshop uses in addition to your own lingo. This is especially important with tool names.
- Can be completed within an hour. Really, how much patience do you have with tutorials? Remember that the brain can only absorb what the seat will endure.

Instruction Should Emphasize Problem Solving

No instructor could prepare Mary for every problem she may possibly have in trying to save her image as a JPEG. How could Mary have investigated why the photo wouldn't save? How does online help work? What is the most efficient way to use the book? What other resources are available? Some of the most effective training begins with an exploration of the menu, emphasizing that savvy Photoshop users don't always know exactly where to go in the menus, but feel confident exploring until they find what they need.

Part of this problem solving is established in using the proper terminology, as addressed in developing tutorials. Learners need to be able to speak the language before effectively using help or search tools. Additionally, training can include an example of using the online help, the index, or the Adobe web site.

The most accessible problem-solving tool for most learners is are other learners. As much as possible, facilitate relationships between your learners. If possible, group learners of comparable skill together, and allow time for learners to get to know each other (over coffee and doughnuts after a session, if needed). Encourage learners to help each other in small groups. If training sessions are continued over a length of time, consider asking teachers to share a simple trick or tip in the program with others. In addition to building their own confidence, it helps teachers identify a resource for additional help. Finally, at the close of your training, consider asking teachers to sign an "I can help" list, giving their name, email, and phone, as well as one area they feel confident in. This can work will in many areas of technology training, not just in Photoshop.

Instruction Should Build Confidence

Few people, even graphics professionals, will master all the capabilities of Adobe Photoshop. The instructor in the scenario could have used hands-on lab time to reinforce Mary's newly gained knowledge. If lab time is not possible, several other techniques including self-paced tutorials, graduated training methods and question-answer time can be utilized. Effective trainers are able to demonstrate simple procedures, motivate learners to try the task at hand, and encourage learners that everyone learns by messing up a few times.

Build confidence for learners by drawing parallels between Photoshop and other programs, such as the save as, open, and even the marquee selection tool. If there is an image program at the school that most of your learners are familiar with, point out the similarities among all image tools such as file size, selection, and adjusting brightness and contrast.

Also, prepare your learners for frequent mistakes. Encourage saving multiple versions of documents and saving frequently, so that catastrophic errors won't cause a complete loss of data. Consider demonstrating the History Palette as a multiple undo mechanism. Demonstrate how to save documents with the layers intact as Photoshop .psd documents, before flattening into other formats like pict and .gif.

While Adobe Photoshop is considered a professional tool, it can greatly benefit teachers who prepare websites or develop other classroom materials. In conveying its power and enjoyment to use, demonstrate its effectiveness in the classroom. Finally, remember that your learners may also serve as trainers for others, so be sure to model effective instructional techniques.

TEACHING AND TECHNOLOGY: A NATURAL INTEGRATION

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Abstract: In keeping with Bellarmine's School of Education theme, ***Teachers as Reflective Learners***, the Middle/Secondary MAT Program's aim is to produce forward-thinking professional educators who are culturally responsive, inclusive and reflective in their teaching. The Program provides high quality educational experiences which enable pre-service teachers to gain conceptual proficiencies for creating a secure and nurturing learning environment that appeals to a wide variety of students; and that supports both a sense of collective purpose and individual construction of complex responses. This is achieved through the use of technology instruction and management tools; creative activities used throughout the curriculum for teaching and learning, and for assessing and evaluating student progress; and through use of on-line discussion group assignments. Our constructivist approach stresses teaching for *meaning-making* rather than memorization or practice of rote skills; thusly, calling for students to construct their knowledge as active inquirers into the subjects they are studying.

The Program

The original proposal I submitted and that was approved by the State in the Spring of 1999 was an accelerated five module (semester) secondary program. But because of the now critical shortage of both middle and secondary teachers in the Jefferson County School District, we combined our middle/secondary offerings and collapsed the program into four modules whereby student teaching would occur during Module IV: The Professional Semester. I then added a Primis Custom Built Case Study Book with content specific cases for each Module to promote discussion pedagogy.

The Middle/Secondary MAT Program provides high quality educational experiences which enable pre-service teachers to gain conceptual proficiencies for creating a secure and nurturing learning environment that appeals to a wide variety of students; and that supports both a sense of collective purpose and individual construction of complex responses. The following curriculum strands are intentionally integrated throughout each Module and delivered through constructivist teaching practices:

- **Diversity** – instruction and activities that intentional reflect a culturally responsive and relevant curriculum while providing the means for pre-service teachers to create bridges between home, school and community experiences, incorporate learning activities and assessments that address various learning styles.

  <u>Sample Activities</u>:
  - Make Philosophy of Education paper inclusive of a multicultural perspective and meeting the needs of special needs students. (Builds on Philosophy paper assigned in Module I).

- Develop Cultural Autobiography that includes implications for effective teaching.

- **Special Needs** – collaboration between regular and special needs pre-service teachers that results in the careful and systemic interfacing of the regular education program and classroom; this includes skills and techniques in multilevel instruction.

  Sample Activity:
  - Unit Plan in content area, age level appropriate, using inclusive multi-tasking instruction consistent with Kentucky's Core Curriculum.

- **Technology** – used as an instruction and management tool; creates activities used throughout the curriculum for teaching and learning, and for assessing and evaluating student progress; use of on-line discussion groups and assignments.

  Sample Activities:
  - Developmental Theory Research Project (topical ideas expanded from Module I include Piaget Assessment; Learning Styles; Motivation.)
  - Summary Presentation of research project utilizing effective multimedia/technology, such as Power Point, Digit Cameras, Interactive Presentations, etc. (See Figure 1: Integrated Technology Schema).

In 1990 The Kentucky Department of Education, as a result of KERA (Kentucky Education Reform Act), created eight Kentucky New Teacher Standards for Preparation and Certification (KNTS). More than the demonstration of teaching competencies, these Standards imply a current and sufficient academic content that promotes consistent quality performance of authentic teaching tasks. Thusly, they describe what first year teachers should know and be able to do in authentic teaching situations i.e. the academic content, teaching behaviors, etc. that are necessary to connect prior knowledge to new knowledge.

- Standard I: Designs and Plans Instruction
- Standard II: Creates and Maintains Learning Climates
- Standard III: Implements and Manages Instruction
- Standard IV: Assesses and Communicates Learning
- Standard V: Reflects and Evaluates Teaching and Learning
- Standard VI: Collaborates with Colleagues/Parents/Others
- Standard VII: Engages in Professional Development
- Standard VIII: Knowledge of Content

In 1999 KDE added a ninth:

Standard IX: Demonstrates Implementation of Technology - The teacher uses technology to support instruction; access and manipulate data; enhance professional growth and productivity; communicate and collaborate with colleagues, parents and the community; and conduct research.

This Standard became our primary delivery mechanism for the other eight standards.

An Integrated Technology Schema

MODULE I: Foundations of Middle & Secondary Education

Learning Activities	Product	Kentucky New Teacher Standards	Learned Society Comps. Technology Education
Communication Tool: Synchronous discussion using E-groups, Tapped In or Judi Harris web site; Send documents to professor by Email	**Case Studies:** Classroom Management Behavior Management Diversity Special Needs	KNTS = I, V, VI, VII, VIII, IX	Special Needs = CC:1S1; CC:1K1; CC:1K2; CC:4S4; CC:7K1
Research Tool: Intellectual Property Law Study (web site); Web site evaluation (BUILT); Search Engine Assignment	Philosophy Paper (APA Style) **Continuous Assessment Reflection I:** Reflective Journal		
Headers, Footers, Page Numbering, Tables, Hypertext links, references, endnotes, spell check, grammar check; accessibility options			
Productivity Tool: Taxonomy of Domains; Multiple Intelligence Inventory (chart results) and implications for instruction; Visit Entech-Assistive and Assertive Devices; construct rubrics Spreadsheet/Use tables in MS Word; Personal Learning Plan document	Lesson Plan Individual Development Plan		
Productivity Tool: Name Poem (Moving text, Thesaurus, Formatting by setting Tabs, include picture; class yearbook)	**Continuous Assessment Reflection II:** Admission to Teacher Education Portfolio		
Start Personal Web Page-Digital camera, Word processing, Graphical Organizers, and Scanning (include Picture and biographical data; add philosophy link)			

Presentation Tool: PowerPoint - Creating a presentation, incorporating audio, pictures, and/or video; style checker; save as an HTML file—add to web page; Presenters University Web site	**Oral Presentations:** Micro-teaching Curriculum Report		
MODULE II: Principles of Learning			
Learning Activities	Product	Kentucky New Teacher Standards	Learned Society Comps. Technology Education
Communication Tool: Synchronous discussion using E-groups, Tapped In or Judi Harris web site; Send documents to professor by Email; Collaboration/Instructional uses of Email	**Case Studies:** Learning Styles; Special Needs i.e. Inclusion; Diversity; Parent, School and Community Relations	KNTS = I, II, III, IV, V, VI, VII, VIII, IX	Special Needs = CC:1S1; CC:1K1; CC: 1K2; CC:1K4; CC:1K5; CC:2K1; CC2K7; CC:4S2; CC: 4S4; CC:3K1-3K4; CC:7K1
Research Tool: Use *Multiple Intelligences in the Classroom 2nd Ed.*	Philosophy Paper Developmental Theory		
Right Brain-Left Brain personal analysis (Brain.exe) and web-based study			
Productivity Tool: Continue lesson plan development began in Module I; Internet, Databases (off and online); Graphical organizers; Digitize video frames Digitize audio	Extended Lesson Plan		
Presentation Tool: Use b and w to blank a screen while presenting; Inspiration software; Drawing and painting software; Use pen for emphasis in presentation	Power Point Presentations; Digitize video frames Oral Reports: Cultural Autobiography Mini-lessons		
MODULE III: Middle & Secondary Pedagogy			

Learning Activities	Product	Kentucky New Teacher Standards	Learned Society Comps. Technology Education
Communication Tool: Synchronous discussion using E-groups, Tapped In or Judi Harris web site; Send documents to professor by Email; use Email for collaboration & instruction	**Case Studies:** Planning & Instruction; Pedagogy; Evaluation; Teacher Expectations	KNTS = I, II, III, IV, V, VI, VII, VIII, IX	Special Needs = CC:1K4; CC:2K1; CC2K7; CC:4S2; CC:4S4; CC:3K1-3K3; CC:7K1
Research Tool: Assessment & Evaluation Examine units on web; construct rubrics	Multicultural Unit		
Research Tool: Assessment & Evaluation Examine plans on web; construct rubrics	Curriculum Plan w/Syllabus		
Presentation Tool: Video/Audio; Use Herrell & Fowler *Camcorder in the Classroom* – Digitize a video clip for portfolio; Gather materials (data files, audio, video, stills) to include in your portfolio	**Continuous Assessment Reflection III:** Admission to Student Teaching Portfolio		
MODULE IV: Professional Semester			
Learning Activities	Product	Kentucky New Teacher Standards	
Communication Tool: Participate in an electronic discussion of concerns about student teaching; Correspond with students and teachers using Email; Use technology when communicating with parent when possible; Appropriately incorporate technology into teaching	**Student Teaching/ Social Context Cases**	KNTS = I, II, III, IV, V, VI, VII, VIII, IX	

Presentation Tool: Use Herrell & Fowler *Camcorder in the Classroom* – Digitize a video clip for portfolio; Gather materials (data files, audio, video, stills) to include in portfolio	**Continuous Assessment Reflection IV:** Exit Portfolio		
Research Tool: Use internet to research best practices and methodologies in reading;	**Reading in the Content Portfolio**		
Productive Tool: Power Point presentation on reading strategies and best practices found on internet			

Figure 1

Our focus in developing this program has been the curriculum outcome, not the technology. It is through our instructional methods that Standard IX can be met while addressing district, state and national learner expectations. Our first Cohort will student teach Spring 2001. We will continue to monitor and evaluation their progress, gathering data for continuous program improvement.

Acknowledgements

Words can not appropriately express my degree of gratitude to my colleagues, who once the framework was in place, spend many hours collaborating with me putting the pieces together. Not only did they assist in the sequencing of this program but took the lead in their area of expertise: Professor Ivan Baugh, Ed.S. (technology), Professor Jan Goings, M.P.S. (special needs and diversity), and Professor Carrie Burton, M.S. (classroom management and learning theories)

An N-dimensional Model for Digital Resources

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Abstract: This short paper proposes an n-dimensional communications model for digital resources such as presentations and hypermedia projects. The model combines multidimensionality, use of visual tools, and constructivist views of knowledge.

- COMMUNICATION: an exchange of knowledge between individuals
- DIALOGUE: communications within a heterarchy.
- HETERARCHY: a spontaneous lateral network of autonomous individuals; a system of authority based on the evolving performance of individuals; e.g., a cybernetic circus.
- NETWORK: an ephemeral, freely evolving, unpredictable dynamical four-dimensional pattern.
- CIRCUS: a cybernetic state of free interactions; a community of autonomous performers, continuously reformed by the independent choice of each; a feedback loop; a recursive mechanism.
- EXPERIENCE: an exchange of knowledge between individuals.
- MEANING: the free interaction of values.
- KNOWLEDGE: the invention of the world in all the complexity and multiplicity of its phenomena.

(Woods 1991)

The definitions above are from experimental architect, Lebbeus Woods from the book *Lebbeus Woods: Terra Nova*. They seem to fit quite well with the developing state of the contemporary constructivist learning theory and seem especially applicable for teachers in the electronic and information rich environment we are creating in schools today.

The purpose of this short paper is to propose a conceptual model for teachers and students to use in thinking about and presenting information in the digitally enhanced learning environment. As the title suggests, the model itself is "n-dimensional," i.e., having dimensions above or beyond the limited one-, two-, and three-dimensional conceptions of Euclidean space referred to as hyperspace.

What is the value of such a reconceptualization of existing models of communication prevalent in educational practice? To begin with, by adding more directions of movement we increase the volume of ideas that can be contained. Consider a line of length a. Move the line in a perpendicular direct through distance a and a square of area a^2 is produced. Move the square a distance and you have a cube of volume a^3. Imagine if you could move the cube likewise in another perpendicular direction, i.e., through a fourth dimension, and the hypervolume becomes a^4. As the hypercube adds dimensions, its volume increases to the power of the dimension, e. g., a 20 dimensional hypercube of side a has a volume of a^{20} (Pickover 1999).

Knowledge representation in the traditional classroom is overwhelmingly linear in nature, having only one degree of freedom. The text on this page is a linear representational form. Such meaning as can be communicated must be embodied in this one-dimensional, beginning to end progression. Thinking mathematically, as we add degrees of freedom to move, in this case additional directions of representational depth, we increase the volume of the communications space exponentially.

Constructing meaning and communicating that meaning through representational forms is one basis by which knowledge can be defined. Digital media, which allow flexible encoding of multiple representational forms, have become a dominant mode for information manipulation, storage, and retrieval for today's society. The Internet is already such a multidimensional entity. The tools for access and creation of information to reside in whole or in part in that dynamic hyperspace are readily available and already widely used in classrooms.

There is a need, however, for a formal yet flexible model for this communication to prepare teachers and their students both to become adept at interpreting and building information constructs that have multidimensional features. Moving in that direction, Hyerle's work with developing and using visual tools

(1996, 2000) moves knowledge construction into at least a two dimensional space with tools such as brainstorming webs, graphic organizers, and thinking-process maps. A recent addition to the Graphic Organizer web site is an article on "layering" which suggests creating linked layers of information (Freeman no date) adding another dimension to the visual tool schemata.

Notions about the nature of knowledge and information representation continue to change over time. Recently, cognitive psychology has taken a renewed interest in mental imagery and that information represented in both a verbal and an imaginal coding system produces stronger memory traces (Brunning, Schraw, & Ronning 1999). In the information and technology rich environment of the new century, teachers and students will need to modify their personal epistemologies to construct knowledge with and from more robust modes of representation.

In teacher education, we emphasize the teacher's role as a facilitator of learning and the constructivist view of learners as knowledge creators, not simply information recipients. Integration of the multimedia and online technology with classroom practices requires the utilization of the technologies by both teachers and students. In my two graduate courses in technology for teachers, I have my students create presentations and Web based activities for their own students' use as well as participate in the student role, taking part in the creation of a group thematic project. The n-dimensional model is used as they develop their products and to create the rubrics for assessing them.

References

A + U. (1991). *Lebbeus Woods: Terra nova, 1988-1991.* Tokyo, Japan: A + U Publishing Co., Ltd.

Bruning, R., Schraw, G., & Ronning, R. (1999). *Cognitive psychology and instruction, 3rd edition.* Upper Saddle River, NJ: Merrill.

Freeman, G. (no date). Layering. [Online]. Available:
http://graphic.org/layerng.html [2000, November 29].

Hyerle, D. (1996). *Visual tools for constructing knowledge.* Alexandria, VA: Association for Supervision and Curriculum Development.

--- (2000). *A field guide to using visual tools.* Alexandria, VA: Association for Supervision and Curriculum Development.

Pickover, C. (1999). *Surfing through hyperspace: Understanding higher universes in six easy lessons.* NY: Oxford University Press.

Cyber Spaces and Learning Places: The Role of Technology in Inquiry

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Abstract: This paper describes a course designed for K-8 science and mathematics teachers to learn how to teach using an inquiry approach within a technology-rich environment. The World Wide Web and calculator-based data collection devices are the primary sources of inquiry-based technology we will share. We will describe the World Wide Web as a resource for assisting teachers to learn the art of problem posing, to increase their repertoire of problem solving strategies, and to enrich their sources for data collection. The calculator-based data collection devices are useful tools for generating real data from natural phenomena. Elementary and middle level teachers are often unfamiliar with the use of these tools much less their effectiveness as tools for inquiry.

Introduction

Throughout the country, there are many efforts to enhance effective science and mathematics teaching and learning in K-8 classrooms. Authentic and meaningful inquiry in mathematics and science depends on teachers, who themselves, have investigated their own questions. These experiences provide contexts for teachers to think critically, explore phenomena, and solve relevant problems. In order to do this they must have experiences in planning and conducting investigations in relevant settings, gathering and collecting information to construct reasonable explanations and solutions, and engaging in discourse about their ideas, explorations, and conclusions. The purpose of this paper is to describe the use of technological tools to initiate the posing and investigating of questions necessary for authentic inquiry-based learning of science and mathematics. Specific examples will be shared about how technology can be used, within the context of a graduate course for K-8 mathematics and science teachers, to provide teachers with experiences in an inquiry approach to learning. Without these kinds of experiences, it is unlikely that the teachers will orchestrate this approach in the learning environments they provide for their students.

Calculator-based data collection devices and the World Wide Web are the primary sources of inquiry-based technology used in this graduate inquiry course. Calculator-based data collection devices are useful tools for generating real data from natural phenomena. Elementary and middle level teachers are often unfamiliar with the use of these tools much less their effectiveness as tools for inquiry. The World Wide Web provides a plethora of data from which teachers and their students can pose problems and design investigations. Both types of technology are used to increase K-8 teachers' repertoires of strategies for implementing an inquiry approach by enriching their sources for data collection and analysis.

Our research in using technology to assist teachers to experience and learn more about the inquiry approach is helping us uncover the relationship between finding patterns and posing problems in the process of designing authentic investigations and reaching logical conclusions. Using technology that is available to these teachers, but has not previously been used in these ways, has opened new avenues for assisting teachers to become more effective in the teaching of science and mathematics in their own classrooms.

Background

A response to the calls for reform in mathematics, science and technology education resulted in the initiation of an innovative project at the University of Central Florida. The Lockheed Martin/University of Central Florida Academy for Mathematics and Science is an education/industry/community partnership aimed at improving mathematics, science, and technology education in Florida. Funding was initially provided by the National Science Foundation. Currently an endowment from Lockheed Martin Electronics, Inc., and a partnership between the University of Central Florida and five local school districts fund the program. The purpose of the Academy is to cultivate and support a qualified teacher workforce, which is a key to a nation's educational welfare. The Academy supports and promotes quality education (K-8) in mathematics, science, and technology, with an ultimate goal to increase the number of students prepared for high school mathematics and science coursework leading to careers in mathematics, science and/or technology

The Lockheed Martin/UCF Academy is a Master's degree program for K-8 teachers who have had a minimum of three years of teaching experience. Upon completion of the program of study, the teachers receive a Masters of Education (with emphasis in science, mathematics and technology). The cohort groups of approximately 25 K-8 teachers are admitted to the Academy each spring, and complete their study in 24 months. The project began in 1992, there are now 305 Scholar graduates, and there are currently 38 teachers enrolled in the Academy. Both long-term and short-term quantitative and qualitative studies are sketching a picture of the significant impacts of this project in the diverse and complex public education environment of Florida.

The common threads woven throughout the program include emphases on teacher leadership, inquiry, and content updates in mathematics, science, and technology. Overlaying these threads is the ongoing inquiry into practice action research project conducted by each program participant. Teacher research has a powerful potential for educational reform because it allows teachers to view their teaching as research (Russell and Munby, 1992; Schon, 1983, 1987; Van Manen, 1977), it encourages teachers to accept and implement others' research (Judd, in Grinder, 1981) and promotes a deeper understanding of practice and thus results in improvement (Carr and Kemmis, 1986; Elliott, 1976-77; Noffke, 1992). The Academy Scholars' inquiries assist them to learn from what fails as well as from what works and to realize their own control over their professional lives as they examine the effects of schooling on themselves and their students. As they produce knowledge they reconstruct their professional lives and re-vision their worlds of expertise and voice.

General Description of Course and Population

The course that is the focus of this paper is called "Inquiry in Mathematics and Science". While inquiry is suggested in national and state standards as a way to develop knowledge and understanding, in reality it is seldom observed in practice in classrooms. Teachers must be actively learning as they teach. Teachers must confront the dilemmas and create contexts so that teachers have the tools for self-renewal to make informed decisions about their actions in classrooms, and to be able to systematically address the preparation of students for the 21st century.

This course is designed to foster and enhance teacher development for K-8 teachers in mathematics, science, and technology. It is embedded within a Master's degree program specifically aimed at school/teacher reform. Our goal is to bring about fundamental transformations of teaching practice within classrooms rather than the traditional staff development 'innovations' that "... have become . . .modest additions to existing practices or have slipped away leaving few traces of their presence" (Cuban, 1992, p.228). Furthermore if we hope to develop students who are critical and creative thinkers and problem-solvers who know how to get things done and are committed to making a better world, teacher development must be aimed at helping them to develop confidence in their own knowledge and judgement while recognizing the benefits that are to be gained from collaborating with others. Educational change implies that we must change the conditions and experiences of teachers in teacher development efforts. This includes giving teachers opportunities to develop their own expertise in planning and enacting the curriculum through critical inquiry and collaboration.

The Master's level course follows two courses - Curriculum Reform in Mathematics and Science and Technology in Education. The Lockheed Martin Academy Scholars who participated in the course are K-8 teachers who are in the first year of the two-year program. They teach in schools that are representative of the diversity of the Central Florida area. The course if team-taught by a mathematics educator and a science educator, the authors' of this paper.

Theoretical Framework for Course

This course emphasizes the constructive nature of learning where theory emerges from practice and the social nature of learning. The research on Complex Instruction demonstrates a positive and critical link between verbal interaction and learning. Groups can trigger multiple ways of interacting, thinking, and finding solutions. Working in groups, the inquiry focuses on the teachers' questions about the complex and problematic world of classroom teaching, as well as experiencing the inquiry approach to learning about mathematics, science, and technology. Our goal is not only to enhance the teaching and learning of mathematics and science but to assist teachers to experience the use of technology to generate real data, to find patterns, and uncover relationships.

The theoretical underpinnings of this course are informed by Dewey's and Piaget's emphases on 'learning by doing', and the active, inquiring kind of education through which students construct meaning in successive phases and develop scientific habits of mind. Our work is also informed by the work of Donald Schon (1987) on reflective practice, and Carr and Kemmis' (1983) work focusing on the action component of the process of teacher development through self-initiated classroom inquiry. Additionally, we rely on Vygotsky's (1978) idea that the most effective learning is that which is in the learner's 'zone of proximal development' or the space between what the learner can manage alone and what he or she can achieve with help.

This course is built upon the cyclic inquiry model. This model provides a framework for teachers to understand the cyclic nature of inquiry, and the importance of the student's role in learning. The inquiry approach is not a specific method, but rather a way of thinking about learning.

Our goal is to design a course to provide experiences and understandings that promote effective, relevant, and content-rich science and mathematics education in the schools. Therefore, emphasis was placed on the processes of inquiry as well as on inquiry into the attitudes and practices that promote student-centered curricula oriented to the construction of knowledge rather than the memorizing of facts. The inquiry cycle was also utilized to inquire about individual classroom practice through action research.

Technology supports the processes of wondering, exploring, and discovering which are central to the inquiry process. The desire and drive to answer questions and to solve problems are characteristic of students who are successfully prepared to enter the workforce of the future. Although learning is a dynamic process, students and teachers are often not afforded opportunities to experience learning in this way. As a result, the vast majority of students and teachers often view mathematics and science as static--a great wealth of facts known only by a few.

Technology affords learning opportunities that situate students in a context where authentic inquiry, investigation, and data collection can take place to provide students and teachers with a more accurate view of the inquiry process. Providing teachers with these authentic experiences has been shown to result in changes in learning environments in their classrooms.

Role of Technology in Inquiry

In designing the curriculum for the course, it was important to keep in mind that the answers to the questions we posed were not the teaching objectives, the teaching objective was to internalize the inquiry process. What teachers did with the questions that were posed was more important than the results of their investigations. To this end, teachers were provided with several opportunities to be engaged in authentic, technology-based, inquiry experiences.

Calculator-based Data Collection Devices

One investigation was to determine the effect of the container on the rate at which boiling water cooled. Students had access to calculator –based data collection devices with probes to measure temperature and graphing calculators to display the data. Students collected several different containers including Styrofoam cups, glass cups, metal pots, and waxed paper cups (which melted and leaked!). Other students compared glass containers of different shapes and sizes. The students placed probes in the containers and poured boiling water into each. The graphs produced from each set of data were compared. The students did not need to interpret all parts of the graphs; they just needed to be sure that they were comparing graphs with the same scale. The technology allowed for the students to collect data with relative ease and to organize the data for comparison. This made the investigations more accessible to students with varying mathematical abilities.

The calculator –based data collection devices were also used to determine the effectiveness of different types of antacids on acid. The students selected several brands of antacids and dropped them into mixtures of water and lemon juice. The students were able to use pH probes to collect data on the speed with which the antacid neutralized the acid using a commercially available calculator program and then compare the graphs displayed on the graphing calculators.

Students used heart rate probes to investigate the effects of exercise on heart rate and motion detectors to look at the height to which different balls bounce. In both cases, the design of the experiment was the focus of the activity. What types of exercise were investigated? Who did the exercising? Did the students compare different people doing the same exercise or the same person exercising in different ways? Were balls with different material make-up compared or were balls of different sizes and/or weight but similar material make-up compared? Once the experiments were designed the students used the calculator-based data collection devices to collect the data and the calculator to display the data. Depending on the type of data that were collected, some students compared graphs and others compared values entered in tables on the graphing calculators.

The calculator-based data collection devices and the graphing calculators were made available to the students, the ways the students chose to use them and the data that were collected were part of the investigation and were left to the discretion of the students.

The World Wide Web

The World Wide Web contains a tremendous amount of data. The Web is a valuable resource for topics to investigate. The students surf the Web looking for questions to pose. This is not the same as searching the Web for specific information. The students pose questions based on the data they happen upon. The topics of questions that have been posed from Web-based investigations have been as diverse as the number of visits to the Ty Beanie Baby site to the density of people viewed from the live camera on the University of Southern California (USC) campus to weather patterns on the NOAA Web site.

For example, the recorded number of visits to the Ty Beanie Baby site changes extremely quickly. One student noticed that in one 15-minute interval, 1500 more visits were recorded. The types of questions posed after visiting this site included: Is there a consistent rate of change in the number of visits over time? What happens when several people visit the site simultaneously? Do more people visit the site on weekends or holidays? Does the company use this data as an indicator of consumers' interest in new releases of Beanie Babies? The investigations of these questions were accessible to the students in the graduate inquiry class as well as to the students' students in grades K-8. The graduate students were able to compare the types of questions that were posed in the graduate course to the types of questions that were posed in K-8 classrooms. This provided a means for students to take the inquiry approach directly back to their schools.

The Web can also be the source of information from which a question may be posed and then other technology can be used to explore the question. For instance, the Nabisco site had a food guide pyramid giving suggested servings for the food groups. Students checked to see if a pyramid would be the most appropriate visual for displaying this information. They sketched and partitioned various polygons using dynamic drawing software. They used the software to determine the area of each of the sections and compared them to the proportions of the serving sizes on the partitioned pyramid. The dynamic nature of the software allowed students to explore several options for visuals of this food guide.

Wendy's Restaurant Web site had a list of its international restaurant locations. Students investigated where on the globe they would be the furthest from a country with a Wendy's restaurant. Other students inquired whether the location would be in an ocean or on land and continued to investigate the question applying different constraints. This topic provided a nice connection to geography.

The live camera on the USC campus provided the basis for several different investigations. A new picture is taken of the same location on the USC campus every minute. Some students looked for trends in movement of people over time while other students looked at ways of measuring and describing the density of people seen in the live shots. While still other students looked at the groupings of the people and if the types of groupings were related to the time of day the picture was taken.

The dynamic nature of the Web makes it difficult to conduct the same investigation using the same data over time. Snapshots of rich sites can be taken so that the contents of the sites will continue to be available for future investigations. However, once the students become comfortable looking at Web sites as possible inquiry sites, they are able to find other sites to use with elementary or middle level students.

Conclusion

There are several important aspects of this course that are being shown to make a significant difference in teacher learning. First, the teachers are not learning just about using calculators and the Web, but rather they are 'learning by doing' and at the same time are being asked to implement their learning in their own classrooms. By embedding new learning into teaching practice and reflecting and dialoging about that learning collaboratively in a community of learners environment, these teachers are having the kinds of professional development experiences that are recommended by current research, and that is being shown to be effective by our own research. These are teachers that are teaching full time and the focus of the class is to translate their learning into their own classrooms, to reflect on what they learn on their experiences in our classroom, and to continue to make ongoing changes and improvements on what they do. In addition, these inquiry experiences are overlaid with their own action research projects based on inquiries into their own teaching practices. The technology-rich environment, which is an integral part of this graduate inquiry course, provides a setting in which teachers can participate in authentic inquiry, incorporate similar inquiry-based experiences in their teaching, and conduct their own research into the effectiveness of their teaching practices.

References

Carr, W. & Kemmis, S. (1986). *Becoming critical: Education, knowledge and action research.* Philadelphia, PA: Falmer.

Cuban, L. (1992). What happens to reforms that last? The case of the junior high school. *American Educational Research Journal*, 29 228.

Elliott, J. (1976-77). Developing hypotheses about classrooms from teachers' practical constructs: An account of the teaching project. *Interchange*, 7(2), 2-22.

Grinder, R. (1981). The "new" science of education: Educational psychology in search of a mission. In F. Farley & N. Gordon (Eds), *Psychology and education: The state of the union.* Berkeley, CA: McCutchan.

Noffke, S.E. (1992). The work and workplace of teachers in action research. *Teaching and Teacher Education,* 8(1), 15-29.

Russell, T., & Munby, H. (Eds.). (1992). *Teachers and teaching: From classroom to reflection.* London: Falmer.

Schon, D. (1983). *The reflective practitioner.* New York, NY: Basic Books.

Schon, D. (1987). *Educating the reflective practitioner.* San Francisco, CA: Jossey-Bass.

Van Manen, M. (1977). Linking ways of knowing with ways of being practical. *Curriculum Inquiry,* 6, 205-228.

Vygotsky, L.S. (1978) *Mind in society.* Cambridge, MA: Harvard University Press.

Audio on the Web:
Enhance On-line Instruction with Digital Audio

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Abstract: People only retain 20% of what they see and 30% of what they hear. But they remember 50% of what they see and hear, and as much as 80% of what they see, hear and do simultaneously (Computer Technology Research, 1993). Internet-based audio and video tools are now used by educators to support instructional, research and administrative activities. Incorporating Web-based multimedia elements such as video, animation and audio into the delivery of on-line course materials can enrich learning by facilitating and encouraging active student participation in the learning process. However, if not designed properly, the addition of audio and other multimedia elements will detract rather than enhance Web-based instruction.

The focus of this paper details the design techniques and strategies educators can employ to record digital audio and add audio clips to their instructional Web pages to enhance their on-line course materials.

Introduction

Adding audio and other multimedia elements such as animation and video to on-line course materials enriches the learning environment and ameliorates knowledge retention by involving students in the learning process. Adding interactive elements to on-line course materials can improve student motivation, promote active rather than passive student participation and increase learner control. Advocates of new multimedia and web-based technologies argue possible benefits of such technologies include increased intrinsic motivation, and the opportunity for students to learn in their own "style" and at their own "pace" (Weber et al. 1999). Effective design techniques and strategies should be employed to ensure digital audio elements enhance the delivery of on-line course materials. The foremost consideration of supplementing on-line course materials with digital audio is to fulfill the criteria of *adding value* to the content of the page. If the audio clip does not augment the content by some means, the audio file is burdening the Web page with additional bandwidth and should be excluded. Digital audio is successfully used to provide sample phonetic, language and music clips; explain examination questions and answers; provide instructions for assignments and supplementary messages to explain Web page content; and archive lecture notes.

Methods of Distributing Digital Audio

Audio files are distributed on the Internet by file downloading or by streaming audio. *File downloading* requires that the complete audio file is downloaded to the user's hard disk before playback can commence. Significant time delays void of user interaction are characteristic of the download method resulting in a potentially higher incidence of aborted user requests. *Streaming audio* differs from downloading in that small packets of the audio file are delivered over the connection with playback commencing as just enough information is received by the browser to keep the download slightly ahead of playback, rather than after the complete file is downloaded.

Audio Server Distribution

Two types of servers distribute audio files on the Internet, a standard HTTP Web server or a special purpose media server. The HTTP protocol enables audio and video content to be streamed from a World Wide Web server. Although a standard HTTP Web server is not as robust or efficient as using a streaming media server, it provides an adequate method for delivering small, short audio clips to a limited number of concurrent users. The preferred method of delivering audio content is to distribute audio files from a dedicated streaming media server. RealNetworks developed streaming media (audio and video) technology, introducing RealAudio in 1994 to address the inherent problems and inflexibility of distributing audio by HTTP Web servers:

1. The Transport Control Protocol (TCP) used by HTTP Web servers to distribute information to Web browsers in small units known as data packets, resends the packet if the server does not receive confirmation that the packet was received without error by the browser. Retransmission of even a small number of data packets significantly increases the download time of an audio file.

2. Web servers distributing audio files were unable to stream live audio broadcasts and did not support interactive user controls such as pause, rewind, or fast-forward through an audio file.

3. Web servers are limited to distributing audio files to a small number of concurrent users at a given time.

RealNetworks developed their own protocol, User Datagram Profile (UDP) and server software RealAudio, designed to address the limitations of distributing audio by HTTP Web servers. UDP resolved the problem of lengthy download times caused by ongoing packet retransmissions. The RealAudio protocol supports synchronous communication between the server and the browser, enabling the user to rewind or fast-forward playback of the audio clip. The RealAudio server was designed to deliver just enough information to keep the audio stream downloading with an additional amount as a buffer to compensate for delays resulting from network congestion. The ability to stream audio enables the server to distribute audio files to a greater number of concurrent users using less resources.

Streaming audio is either broadcast live or from a pre-recorded file. The RealNetworks dedicated media server, RealServer supports *SureStream* technology, the ability to detect and render the correctly *encoded* (converted and compressed) audio file based on the connection speed of the user. An audio file can be encoded for multiple connection speeds such 28K, 56K, or 112K, and the file distributed will depend on the available bandwidth based on the connection speed of the user. Although RealNetworks Server *(http://realnetworks.com/)* is probably the most popular dedicated media server, QuickTime by Apple (*http://www.apple.com/quicktime/)* and Windows Media Audio by Microsoft (*http://www.microsoft.com/windows/windowsmedia)* are other options for streaming audio over the Internet.

Considerations for Distributing Web-based Audio

Before adding audio to supplement on-line course materials, consider whether the sound elements support and enhance the content of the page. Audio requires additional bandwidth, hence it is critical to identify the types of connections of your target audience and design accordingly depending on the connection speed, file format, sound quality, compression scheme, and browser support required for the intended audience.

Connection Speed

The connection speed of your audience will ultimately define the quality, size and download time of the audio file created. *Bandwidth*, measured in Kilobits per second (Kbps), is the amount of data that can be sent through a network connection during a defined period of time. Connection speeds vary from slower speeds of 28.8 Kbps or less, 56 Kbps, to faster connections of 200 Kbps or greater. A compromise is necessary between reaching the largest target audience by creating a lesser quality audio file, or limiting the audience by creating a higher quality audio file. Audio files created for distribution on the Internet may require encoding to a lower sampling rate or bit depth to decrease sound quality and reduce file size and download time.

Digital Audio Formats

Historically, the file format chosen to distribute audio over the Internet depended on the computer platform generating the file. Apple developed *AIFF* for playback on Macintosh, NeXT Computer and Sun Microsystems jointly developed *AU* for UNIX, and Microsoft and IBM jointly developed *WAV* for Windows. There are a myriad of file formats used to distribute audio over the Internet such as MIDI, QuickTime, MPEG, and RealAudio as well as newer media formats such as RealMedia, Shockwave Audio, Flash, and Windows Media.

MIME Support

To play a digital audio file, the appropriate plug-in or helper application that can play the format of the audio file must be installed on the user's system. *Helper* and *plug-in* applications are external or internal applications to the browser that are executed as media elements are invoked from within the Web page. RealMedia, QuickTime, and Windows Media Player are three common applications that play audio files. The browser identifies the plug-in or helper application that can play the audio file based on the file extension such as AU, WAV, AIFF, RA, RM, QT, MOV, AVI, or MP3 by referring to the Multipurpose Internet Mail Extensions (MIME) configuration specified in the browser's preferences settings. The browser and the server must be configured to support the MIME type of the audio element.

Audio Compression

To create an audio file for distribution on the Internet, analog audio data is recorded into a digital format, typically in an uncompressed format such as WAV, AU or AIFF. Before converting to a compressed audio format, it is preferable to start with the best quality "master copy" obtainable in an uncompressed format and then encode the file as RealAudio or RealMedia, QuickTime, MP3 or other compressed format. An *audio codec* (COder/DECoder) is a software scheme that encodes analog audio data and converts it to a binary format for processing on a computer and then decodes the data for playback on analog devices such as speakers or headphones. A number of compression methods are available to encode an audio file into a smaller file format suitable for distribution on the Internet. *Lossy* is a commonly used compression scheme that discards the high and low ends of the audio source file at the expense of quality to achieve a highly reduced file size. RealAudio, MEG Layer III (MP3), QuickTime Qdesign 2, and MS Audio are three popular audio products that provide a number of compression codecs designed for a variety of applications and connection speeds.

Distributing Digital Audio

Distributing digital audio for distribution on the Internet is a four-step process: (1) digitize sound from the source, (2) optimize audio file, (3) encode audio file, (4) publish to Internet.

Digitize Sound from the Source

Sound is recorded from an analog source such as speaking into a microphone, input from a previously recorded cassette or reel-to-reel tape, or from a digital source such as CD, hard disk, or digital audio tape (DAT) using a sound editor. The digital file format generated is typically WAV, AIFF or AU. Record using a high quality sampling rate and bit depth such as CD quality, 44.1 kHz, 16 bit audio, and decrease to a lower level during the encoding step. *Keep a backup of all original high quality source recordings.*

Tips for Recording Audio

To obtain a better sounding audio file, use a good quality microphone and digital interface sound card to help minimize hiss and distortion. Record using a high quality sampling rate, such as CD quality, 44.1 kHz with 16 bit depth resolution and encode to the lowest quality sound needed in the Web page. If using pre-recorded audio files, use the best quality source file available. Experiment using different audio codecs and settings. Reducing the sampling rate is more effective than reducing bit depth to achieving smaller, good quality audio files for Internet distribution. Record in a quiet environment, minimizing room reverberations or reflections by choosing a smaller room, with carpet and soft furniture.

If recording a single sound source such as spoken voice, keep the microphone close to the source and away from the sound of the computer fan. Avoid holding the microphone with your hand. Record speech in mono, and set the balance for all inputs to the center to prevent losing the right input channel frequently discarded by some sound cards when recording in mono mode. Use a pop screen to reduce plosive "P"s and "S"s. Decrease distortion by setting input levels to as close as possible to 0 dB without exceeding 0 dB during the loudest section of the file.

Avoid damaging the computer speakers during playback by setting the volume of the input device (tape recorder, CD player, etc.) to a low level and slowly increase the volume. Set the volume to the half way mark and then change the volume using the device's volume control. If sound cannot be heard, check the operating system recording and playback levels and ensure the *mute* box is not marked for the master volume, line in, line out, microphone, CD and any other connections for the sound card.

Optimize Audio File

The audio file should be edited to improve the quality of the sound file. Empty space at the beginning or end of the file should be deleted to eliminate long pauses. *Normalization* balances the sound wave by maximizing the input level of the loudest peak of the file after recording and should be used if the sound level is too low. Normalize the audio file to –0.5 dB. *Equalization* (EQ) adjusts the high and low tones in the audio file so that bass and treble can be made less or more pronounced.

Encode Audio File

Due to the tremendous size of the sound file generated from recording at a higher quality level, the digital source file must be encoded to compress the file into the appropriate sampling rate and bit depth required to distribute audio over the Internet. The size of the audio file is significantly affected by the sampling rate, bit depth, and the number of channels (mono or stereo). The *sampling rate* is the number of samples or snapshots of sound taken per second. For example, the sampling rate for CD quality audio is 44,100 samples per second. *Bit depth* defines the dynamic resolution of the audio. The greater the number of bits that are used to represent the sampled value, the more accurate the sample will be with respect to the original analog sound wave. Decreasing bit depth to 8 kHz increases distortion and hiss, especially at higher sampling rates. Stereo requires two channels, doubling the file size required for recording in mono. The determining factor regarding the selection of these variables is based upon balancing the sound quality and storage requirement. File size can be decreased most effectively without compromising sound quality by reducing the sampling rate and using one mono channel. The disk space required for one minute of sound varies significantly from 10.5 MB for 16 bit, 2 channel (stereo) CD quality audio to .6 MB for 8 bit, 1 channel (mono) telephone quality audio (Tab. 1).

Sample Rate	Bit Depth	Channels	Disk Space for One minute of Audio
44.1 kHz	16	stereo	10.5 MB
44.1 kHz	16	mono	5.2 MB
44.1 kHz	8	stereo	5.2 MB
44.1 kHz	8	mono	2.6 MB
22.05 kHz	16	stereo	5.2 MB
22.05 kHz	16	mono	2.6 MB
22.05 kHz	8	stereo	2.6 MB
22.05 kHz	8	mono	1.3 MB
11.025 kHz	16	stereo	2.6 MB
11.025 kHz	16	mono	1.3 MB
11.025 kHz	8	stereo	1.3 MB
11.025 kHz	8	mono	.6 MB

Table 1: Storage Requirements for One Minute of Audio

An encoding tool such as *RealProducer* (*http://www.realnetworks.com/developers/index.html*) is used to select a codec based on the bandwidth target (connection speed) and the audio content (music or voice) to compress the original sound file and create a new audio file. If you need a large dynamic range of sound, use 16 bit resolution. If all sounds are about the same volume, 8 bit may be suitable. Full-bodied vocal requires 16 bit resolution. RealNetworks' RealAudio consistently rates highly at generating the best quality speech and music audio clips at various sampling rates (Tab. 2).

	Speech (28Kbps)		Rock Music		Classical Music		Electronic Music	
	Female	Male	28 Kbps	56 Kbps	28 Kbps	56 Kbps	28 Kbps	56 Kbps
a2b	Poor	Fair	Fair	Fair	Poor	Fair	Poor	Poor
Liquid Audio	Fair	Fair	Good	Good	Fair	Excellent	Fair	Good
MP3	Good	Excellent	Poor	Poor	Poor	Poor	Fair	Fair
MS Audio	Excellent	Good	Good	Excellent	Fair	Excellent	Fair	Good
QuickTime	Fair	Fair	Good	Excellent	Good	Good	Fair	Excellent
RealAudio	Excellent	Excellent	Good	Excellent	Good	Excellent	Good	Good

Table 2: Streaming Audio (PC Magazine, 1999)

Publish to the Internet

Audio files are distributed over the Internet by *file downloading* or by *streaming audio*. Irrespective of the method chosen to incorporate an audio file for playback within a Web page, the user's system must have the appropriate plug-in application installed that can play the audio file format, and the server and browser must be configured to support the MIME type of the audio element. Assist users by including a link in your Web page to the vendor Web site where the player can be downloaded.

File Download

The simplest method of adding an audio file to a Web page is to create a link to an audio file. When the user clicks the link, the audio file is downloaded and the player configured to play the file type begins playback once the complete audio file is downloaded.

```
<A HREF="audioclips/filename.ext">Listen to Narrative Audio Clip</A>
```

Streaming Audio

An audio file can be streamed from an HTTP Web server. Within the Web page, a link is established to a text-based metafile with a *RAM* file extension containing the URL of the file. The user clicks on the link in the Web page and the browser downloads the RAM metafile, launches the player and starts streaming the audio file.

Link in Web page: `<A HREF="audioclips/audioclip.ram">Listen to Narrative Audio</A>`
RAM file contents: `HTTP://web.uvic.ca/~bgerth/audioclips/audioclip.rm`

Embedding the Player

A variation on streaming audio is to embed the player into the Web page rather than launching and opening a separate window for the player. The link in the Web page is established with the *embed* command. The *noembed* and *href* tag provide the alternate method for downloading the audio file if the browser does not support the embed tag. The *type* attribute specifies the type of plug-in player to embed in the page.

```
<EMBED SRC="audioclips/audioclip.rpm" type="audio/x-pn-realaudio-plugin"
CONSOLE="Clip1" controls="All" height=125 width=275 AUTOSTART=false
loop=false></EMBED>
<NOEMBED><A HREF="audioclips/audioclip.rm">Listen to Narrative Audio
Clip</A></NOEMBED>
```

The metafile is named with the file extension of *RPM* and contains the URL of the audio file:
`http://web.uvic.ca/~bgerth/audioclips/audioclip.rm`

Background Sound

Setting *autostart* to *true* forces the audio file to begin playing automatically when the page loads and setting *loop* to *true* forces the audio clip to repeat until terminated by the user (not recommended), or *loop* to *X* where *X* represents the integer specifying the number of times to repeat the audio clip.

Copyright Issues

Many Web pages provide sound clips that can be downloaded for use on a Web page, often illegally. Before downloading a sound clip to distribute on your Web page, ensure you are not contravening copyright laws by obtaining permission to use the audio file by the copyright owner. Otherwise, create your own audio clip, find a site that offers free sound clips and has the right to offer them, or obtain permission to use the audio file.

A simple method of protecting your own works is to indicate the intent to copyright by attaching a copyright symbol, the date, your name, and the term *All Rights Reserved* by the link within the Web page to load the file. Audio editing programs such as RealProducer enable the copyright information to be embedded within the audio file and the copyright information is displayed by the media player during playback.

Conclusions

This paper has explored some of the design techniques and strategies for incorporating digital audio into the delivery of on-line course materials. Factors such as the connection speed, the type of fidelity, the file format and the use of compression significantly affect the successful implementation of digital audio on the Internet. Digital audio when carefully prepared and judiciously added, will enrich learning and enhance the delivery of Web-based instruction.

References

Hecht, J.B. (1999). Bleeding on the Edge II: Instructing with Live Audio, Video, and Text over the Internet. *World Conference on the WWW and Internet*, 1999, Association for the Advancement of Computing in Education, Charlottesville, VA. 1290-1291.

Ho, T.I. (1999). Experiences with Real-Time Streaming Audio/video in Delivering Web-based Courses. *World Conference on the WWW and Internet*, 1999, Association for the Advancement of Computing in Education, Charlottesville, VA. 1296-1297.

Krauss, D., Steffanos, G., & Steffanos, M. (1998). *Streaming Audio.* [WWW Document], http://www.skwc.com/WebClass/Task-Sound5.html.

Mudge, S.M. (1999). Deliver Multimedia Teaching Modules via the Internet. *Journal of the Staff and Educational Development Association*, 36 (1), 11-16.

PC Magazine. (1999). *Streaming Audio.* [WWW Document], http://www.zdnet.com/products/stories/reviews/0,4161,2313783,00.html.

RealNetworks, Inc. (1998). *RealProducer User's Guide Version G2.* [WWW Document], http://docs.real.com/docs/produceruserguideg2.pdf.

RealNetworks, Inc. (1998). *RealSystem G2 Production Guide.* [WWW Document], http://docs.real.com/docs/smil/prodguideg2_7.pdf.

Weber, R.K., Schoon, P., & Gonzalez, A.R. (1999). Designing Multimedia and Web-based Units for Technology Integration: Motivation and Student Learning Styles. *World Conference on the WWW and Internet*, 1999, Association for the Advancement of Computing in Education, Charlottesville, VA. 1133-1137.

The Role of Assessment in Online Instruction

Panelists: Robert J. Hall, Texas A&M Univ., USA; G. Donald Allen, Texas A&M Univ., USA; Michael S. Pilant, Texas A&M Univ., USA; R. Arlen Strader, Texas A&M Univ., USA

Abstract: The topic for this panel discussion is how assessment can be used to inform instruction in an asynchronous environment. We will explore how technology can add to our understanding of human learning and performance and how carefully designed web-based supplemental study-aids can impact the relationship between confidence and "classroom" performance as measured by course exams. In that regard, we are interested in questions such as "How will performance and confidence metrics for a web-based course be assessed?" and "How can we determine the rate at which learning is taking place?" It is clear that some kind of assessment strategy is necessary in order to deliver material in the right sequence and at an appropriate rate. In this roundtable discussion, we will focus on four issues:

1) Assessment strategies.
2) Assessment of behavioral variables such as confidence, and motivation.
3) Cognitive foundations of assessment.
4) Practical aspects of implementing assessment strategies.

TRES FACIUNT COLLEGIUM – Paderborn's Collaboration Centred Approach for New Forms of Learning

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Abstract: This paper defines several key requirements for successful cooperative learning, which we have elaborated during the last years with goal to set up new forms of cooperative learning. Without bringing them into a special order, these main design criteria are the integration of synchronous and asynchronous forms of cooperation and the persistence of a learning process, the formation of a common group context or common information room, roles and access rights, annotations and structured chat as well as rooms as places for collaboration.

Key requirements for successful computer supported learning

"My claim is simple: in order to make truly effective groupware, we will need new eyeglasses and methodologies for probing how and why collaborative tools work. Why? After all, isn't our natural tendency to collaborate rather than to work in isolation? Probably yes, but often the more natural something is, the more subtle or unnoticed the mechanisms are which make it fantastic."[1]

Since the beginning of the nineties, in Paderborn, we studied new concepts and solutions to enhance cooperative and active forms of human learning. Spanning from the design of so called learning supportive infrastructures which even includes the set up of learning theatres up to new understandings of human learning the bandwidth of our activities tries to bring new media and cooperative forms of learning into a form of every day viability. Therefore our goal is to develop tools and solutions not only to justify our concept and research goal, but to change our way of learning and teaching with lasting results.

For four years now, the development of our sTeam–"structuring information in a team" approach is in progress.[2] Our idea is to set up an open source project for a framework covering various tools and applications in the field of computer supported cooperative learning. To do so, it is of main importance to develop very detailed concepts and architectures and to get a clear understanding of the functionality and metaphors which might be applied to human forms of cooperative learning. With the aim of achieving a firm understanding of the odds and ends and limitations of computer support in group work, we continuously evaluated and adapted existing solutions out of the field of computer supported cooperative work systems for our particular needs.

Hundreds of software solutions have been developed in the last decades to enhance cooperative work and cooperative learning (for a early overview see (Mandviwalla & Olfman 1994)) but only a few have left the design labs for larger practical use. May be Greenberg is right, stating that the reason might be the concentration of the developers on technical more than on human factors when shaping such systems. "*In summary, groupware for real time collaboration requires careful attention to both technical and human factors. The human factors should drive the design, for there are many requirements and nuances that determine whether a system will support collaboration effectively.*"[3]

The following article outlines several main criteria and design goals for our system which might hopefully serve as key requirements for successful computer supported learning and computer mediated communication. Other surely important criteria apply, such as the flexible support of attributes and various document formats, the allowance of user definable server objects and the overall extensibility and scalability of the server. These requirements will not be further discussed in the course of this article.

Here, we will mainly enlighten our theoretical concepts and design goals and not the selected technical architecture or its implementation. First prototypes exist now for three years and have constantly been redesigned. Currently we are in process of doing a complete technological redesign which facilitates the transformation of the whole project into an open source approach. The upper mentioned proceeding provides us with the time and the

[1] stated by J.S.Brown at the panel titled "breakthroughs for user acceptance", 1988, see Greif, I., Brown, J.S., Dyson, E., Kapor M., Malone, T. (1988). Computer-supported cooperative work: breakthroughs for user acceptance, *Conference proceedings on Human factors in computing systems*, May 15 - 19, 1988, Washington, USA.

[2] see Hampel, Th. & Selke, H. (1999). Customizing the Web – Two Tools for individual and collaborative use of hypermedia course material, Collis, B., Oliver, R.: *Proceedings of ED-MEDIA 99*. Charlottesville (Va.): Association for the Advancement of Computing in Education, 634–639.

[3] see Greenberg, S. (in press). Real Time Distributed Collaboration. In Partha Dasgupta and Joseph E. Urban (Eds.) *Encyclopedia of Distributed Computing*, Kluwer Academic Publishers.

chance to revise and enhance our fundamental conceptual ideas. The following main requirements reflect this process.

Integration of synchronous and asynchronous forms of cooperation – persistence of the learning process

When trying to categorize different computer supported cooperative work environments it is quite important to look both at technical features and at the even more important underlying concepts and metaphors for cooperative learning and working. During the process of the "proofing the concept" of our prototypes for the sTeam approach, we found ourselves confronted with a series of topics which serve as essential pre-conditions for later design of a successful co-operative learning environment.

Learning at university takes place at different locations such as lecture halls, tutorials, the library, at the students` home, but as well in different learning situations, such as face-to-face meetings or synchronous virtual meetings and of course in asynchronous forms of cooperation. To be successful, tools have to support these different ways of working in groups, we call this a mixture between asynchronous and synchronous forms of cooperation. Another elementary factor for the integration of synchronous and asynchronous forms of communication is the persistency of artefacts, such as all forms of electronic documents and objects, during the process of cooperation. Meaning the environment has to provide persistency for all objects created by learners. Thus, as a basis for cognitive learning the learner must be enabled to create, rearrange, structure and transport learning objects. The abilities provided are called the basics functions of media, the media functions. [4]

Closely related to the media functions and an important aspect for a successful working with different media is the reduction of so called discontinuities in the use of electronic media. Discontinuities appear each time a learner has to switch to a different media while transporting information, e.g. they have to make personal (paper based) notes on an electronic presentation held by the lecturer. These discontinuities in the application of media naturally put an end to any consequent use of computer mediated learning supportive infrastructures. Therefore it seems to be fundamental when shaping infrastructures for cooperative structuring and building of knowledge to adapt learning supportive infrastructure to the behaviour of the learner and not the other way around.

A common information room and group context

When discussing basic concepts of cooperative learning it seems to be essential, that learners form a common information room for the group. Ellis defines this common information space as the common group context (Ellis et al. 1991)[5]. Most systems interpret the common group context as a space, a room. The definition of the metaphor room ranges from a room being a space to arrange documents over a social space for group interactions up to a virtual counterpart of the real world. The latter finds its expression in the so called CVEs (Collaborative Virtual Environments), such as the avatar worlds of DIVE or MASSIVE. [6]. One good example for the idea of mapping natural understandings of our world into behaviours and laws of the virtual world is the structuring of conversations in MASSIVE, where "nimbus" and "focus" of an Avatar defines the range an direction (audience) of its chat[7]. Thus people grouped in geographical proximity form a local chat group. This spatial understanding of a virtual room partly allows learners to interact with objects like they do in the real world—closeness defines semantic relationships between objects, avatars must be in reach of objects when interacting with them. Awareness in all forms–from simple information about people joining a chat session up to complex Avatars (which sometimes have graphical representations) of virtual worlds plays an important role in forming a feeling of being part of a social environment.

Another phenomenon takes place when people interact in rooms, which Bly, Harrison and Irwin [8] experienced in their MediaSpace System. People develop a common feeling of being at home—a space develops into a place —people behave in the social and cultural pattern of the real world. Out of the same reasons players of most MUDs and MOOs develop a feeling of being a virtual community – they develop laws, netiquette and social forms of interaction for their world!

For the further exploration of the concept of learning supportive shared media spaces we set up a few prototypes providing virtual rooms. (Technically speaking we connected document management functionality and a highly

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[4] For a short description of our concept of media functions see: Hampel, T. (2000). Scenarios of a New Dimension of Learning by the Co-operative Structuring of Knowledge, *Proceedings of the World Conference on Educational Multimedia, Hypermedia & Telecommunications*, Bourdeau, J., Heller, R. (Eds.), Montreal, Canada, June 26-July 1, 2000.

[5] *"Many task require an even finer granularity of sharing. What is needed is needed are shared environments, that unobtrusively offer up-to-date group context and explicit notification of each user's actions when appropriate."*

[6] For an overview on CVEs see e.g. Benford, S., Brown, C., Reynard, G., Greenhalgh C. (1996). Shared spaces: transportation, artificiality, and spatiality. *Proceedings of the ACM 1996 conference on Computer supported cooperative work*, November 16 - 20, 1996, Boston USA , 77-86.

[7] see Greenhalgh, C., Benford, S. (1995). MASSIVE: A Collaborative Virtual Environment for Teleconferencing, *ACM Transactions on Computer-Human Interaction*, Vol. 2, No. 3, September 1995, 239-261.

[8] for the notation of *media spaces* see e.g. Bly, S., Harrison, S., Irwin, S. (1993). Media Spaces: Bringing People Together in a Video, Audio and Computing Environment, *Communications of the ACM*, 36(1), January, 1993.

event-oriented communication server.) These rooms are both private working spaces for learners and public group work environments. Learners may easily create personal rooms and rooms are administrated by cooperating learners themselves. We call this idea the concept of self-administration. Our first experiences show, that through the metaphor of rooms learners develop a quite accepted and natural understanding for document- and learning spaces. Semantic relations to other rooms are expressed through doors and exits provide a real world understanding of the structure of the virtual. This does not mean that a door must be represented by an icon of a door or even has to be in three dimensional or virtual reality, just the expression "door to library" forms a correct understanding of the plan of entering a door, leaving the room and the need to have appropriate access rights to do so.

Roles and access rights

Another crucial characteristic for flexible forms of learning in session based environments are social roles. In nearly every of today's learning situations social roles are an central form of structuring the learning process. Let's imagine a typical tutorial situation, where a student presents some findings of a small group and therefore enters the role of a moderator. The moderator structures the flow of the communication, as he/she allows parts of the group to interfere or to suggest different topics to discuss. A moderator may also record or make notes of important contributions for the target discussion. Classical policy systems and access control lists normally comprise only a static definition of access rights and therefore support only static roles in group work. But it is a quite natural process of every face-to-face or virtual meeting situation that flexible changes of roles take place. So systems have to support an easy mechanism for the change of roles during an cooperative learning and working process. (See the concept of dynamic roles in (Edwards 1996)). Our prototypes accomplish this by a very flexible set of access rights which can be specified for every object (e.g. room or document) and can be inherited by parent objects or an master object within the room, or the room itself. Flexible temporal relations between learners and appertaining groups allow the adaptation to different learning situations and open forms of cooperation. A significant factor for people learning in such groups is that the participants in a discussions are aware of the persons joining the discussion and are also aware of the roles the different persons inhabit. For an computer mediated communication it seems essential to support such flexible forms of roles and access rights for documents and learning objects. Our approach of cooperative learning which aims to support face-to-face and all forms of tele-learning situations allows flexible roles through four key requirements: Firstly the easy attachment of person to roles, which is another form of self-administration as a room administrator gives other learners or colleagues temporally access to learning objects. Secondly, the flexible visualization of the roles a person inhabits at a certain time–which may be one form of awareness. And finally the free change of roles and therefore the flexible modification of access rights to documents and learning objects.

Annotations and structured chat

Another idea which smoothly fits into the concept of flexible roles is the flexible usage of annotations and a new form of chat that we call structured chat.

From the very beginning of hypertext and hypermedia systems[9] annotations played an important role in the research on cooperative group work. The simple concept of allowing learners to add personal notes to documents is a crucial pre-condition for the personal structuring of knowledge. Many closed hypertext systems supported various forms of annotations, including access rights on annotations and the differentiation between personal and annotations of the group. Surprisingly not one of the systems developed to be a common success and today's world wide web provides only browser bookmarks as marginal way to personally structure the web.

Our understanding annotations is two-dimensional: The ability to add personal or public information to internal and external resources and the ability to connect communication mechanisms and various media.

The first demand includes the challenging problem of allowing external annotations on every material found on the web. Closed hypertext systems usually provide for several forms of annotations, but the claim to do this also for every media on the web is hard to solve, because of the lack of WWW technology which is not prepared for any annotation mechanism.

Existing solutions use some sort of special annotation server which stores user annotations on web pages in a database modifying the pages on the fly while browsed by the user. (This is necessary out of several reasons, e.g. normal web users are not allowed to modify extraneous web servers.) Existing systems such as CritLink[10] are to be distinguished from our approach. Their software mediator implements the idea of web annotations for everyone but is not part of any cooperative work or learning environment. Out of this reason annotations are sepa-

[9] A Conceptual Framework for the Augmentation of Man's Intellect, Douglas C. Engelbart, Vistas in Information Handling, Howerton and Weeks [Editors], Spartan Books, Washington, D. C., 1963, pp. 1-29, Republished in Computer Supported Cooperative Work: A Book of Readings, Irene Greif [Editor], Morgan Kaufmann Publishers, Inc., San Mateo, CA, 1988, pp. 35-65. Also republished in Organization and Groupware, T. Nishigaki [Ed.], NTT Publishing, 1992.

[10] see the CritSuite website at http://crit.org. Refer this site also for links to other approaches such as Xanadu, CoNote, ComMentor.

rated from any learning scenario in which learners integrate personal learning materials with external web resources. Our demand goes far beyond this approaches: Annotations should be attachable to every page on the web (only a few restrictions apply e.g. when the pages are dynamically created) and annotations are part of the learners' cooperative learning environment. For a period of two years we worked on solutions to implement systems which allow a free combination of internal and external annotations. Our latest prototype allows the learners to annotate most documents of the web. These annotations are integrated in our sTeam system for cooperative learning and are handled as "normal" steam objects. Therefore access rights, all sorts of properties[11] and functionalities to rearrange objects within the learners context may be applied. Parallely, we developed a small prototype which explored concepts of connecting annotations and structured discussions—we call this concept structured chat.

Structured chat—bringing chat into context

The concept of structured chat aims at a the scenario of small groups of learners discussing and working with learning materials. This may take place in a virtual meeting, but also as part of an face-to-face situation during tutorials or lectures. Looking at such a scenario typically several discussion topics appear in parallel during a conversation. Sometimes smaller groups of learners work on a different topic than the rest of the group. Often, chat-statements refer to a much earlier contribution of another learner. In productive sessions, chat contributions refer directly to objects in the context of the group, e.g. documents or web pages. Our experiences show that out of this reasons a classical chat does not work properly. Another reason is, that in traditional chat communication every chat line must follow the earlier statement of another learner.

The concept of structured chat is a combination of classical synchronous chat and a tree widget. Here chat lines may be attached to every object within the learning environment. Every object in the learners context is represented by a branch in the structured chat. In a special area below the tree section learners may enter contributions to previously selected topics of the chat. Simultaneously, chat annotations may be attached to every object and appear in the tree at the section of the corresponding item. In this way each branch of the tree represents related objects and corresponding chat entries and annotations. It generates a persistent collection of related contributions which may be also used by learners who are not engaged in the entire discussion as a repository for questions and answers. If learning objects are grouped or linked (a simple relation may be defined by dragging one object very close beside another one) these objects are arranged on one level within the structured chat. Accordingly documents representing a common learning subject (e.g. documents and web pages describing a criteria of software design) are grouped in spatial proximity, which complements our human capacity for manipulating spatial memories.

Our initial goal regarding the concept of combining chat and annotations is two dimensional: On one hand chat conversation somehow develops the structural quality of an annotation and on the other hand annotations simultaneously inherit the flexibility of an chat. Important for the idea is, that the creation of objects in a room (comparable to an cooperative whiteboard) automatically generates a new subject within the structured chat. This entry may later be deleted, but learners are directly able to contribute to each others actions. (A concept which may also be described as a new form of workspace awareness.) Actions of learners create anchors for the annotation of relevant contributions of other learners. Analogous chat lines within the tree are visualized as annotations on the corresponding objects (may be viewed by the learners by pressing the right mouse button, or used as a tool tip by placing the cursor over the object for a while). In further developments different forms of chat persistency may be implemented. May be it would be a good strategy just to store annotations directly made on objects on the cooperative workspace and not to record every chat statement. It could be also necessary to provide a very informal not persistent chat as a second instrument for learners to communicate.

In addition, we experimented with different design solutions for the visualization of the learners' awareness of each other and their actions. In cooperation with the project group for media design at the University of Münster, we developed a form of awareness visualization which is specially shaped for rather small groups of learners. Here, in a kind of circle, members of a chat are visualized as small coloured dots. The names (or nicknames) of the group members are shown right beside these dots. To illustrate the group activity the distance between the centre of the circle and a learners dot is proportional to their chat activity (e.g. chat statements per ten minutes). With the help of this simple approach we become aware of members actively working on a special subject and it seems easier to contact them or to integrate less involved learners into the conversation. One example for the importance of such information awareness might be that the silence of an online interlocutor may be interpreted as him/her not attending the monitor. A similar "Babble" approach by Erickson (see Erickson et. al. 1999) calls this

[11] sTeam supports an approach of user-definable attributes of learning objects, compare Dourish, P.W. Edwards, W.K., LaMarca, A. Lamping, J. Petersen, K. Salisbury, M., Terry D. B., Thornton J.: Extending Document Management Systems with User-Specific Active Properties, *ACM Transactions on Information Systems*. 18, 2 (Apr. 2000), 140-170.

graphical representation of users and their activities a "social proxy". Their system integrates elements of bulletin board systems and chat. A topics list provides an overview about the ongoing conversation, and a social proxy creates a view on human activity on different channels. The research prototype from Rodenstein and Donath (see Rodenstein & Donath 2000) takes the same direction: A representation of coloured circles in a two-dimensional space provides awareness of users` actions over various audio-channels.

Rooms - Private and public boundaries – modes of cooperation – access rights and self-administration

Another crucial design issue when discussing the design of a computer supported cooperative learning space is the interrelations between personal and group/public workspace. Working with documents means to arrange them. This well known personal process of structuring the document world around us is one of the main forms of building personal cognitive structures and relations between things—just remember the typical "chaotic" forms of working which means arranging documents on everybody's personal desktop at home or office. (Büscher et al. 2000) describes this process quite well: *"We found that manipulating the presence and absence of materials, bringing them into dynamic spatial relations, and referring between them, are not just context or perquisite for doing the work; rather, they are an integral part of accomplishing the work itself."* When transporting this form of individual work into the scenario of group learning our findings of setting up learning supportive infrastructures show that both different modes of cooperation and different boundaries of a working space are necessary to be designed.

Haake and Wilson distinguished three main modes of cooperation: *individual mode, loosely coupled mode* and *tightly coupled mode.* These forms of cooperation were first explored and defined by (Haake & Wilson 1992) working on a collaborative writing tool and we adapted them for the scenario of cooperative learning. The notation of a loosely coupled mode may be described as a form of cooperative working and learning where learners access a common document space, but an appropriate locking of the learning objects takes place when a person makes modifications. This implies that the environment has to provide a form of activity or workspace awareness to recognize the actions of other learners. Tightly coupled modes of cooperation are characterized by their all synchronous, active forms of cooperative learning. Our approach prefers a mixture of individual mode and loosely coupled modes of interaction. In our first prototype individual working and learning is supported through personal workspaces which allow to structure and arrange documents individually. These personal workspaces may be expressed through the metaphor of a learner's private room or in form of a personal workspace beside the group workspace/room.

The public or group workspace adopts the concept of the relaxed "What You See Is What I See (WYSIWIS)" (Stefik et al. 1983) version. Learners do not share a strict meaning an identical view on artefacts and actions of other learners, but a individually generated, relaxed perspective. Note that the separation between individual and group workspace does not intend restriction on interactions between these two spaces. Learners should be able to freely transport objects from their personal working space to group working spaces and vice versa. Therefore a tight coupling between these two spaces is initiated. Taking a more detailed look at the concept of rooms, the metaphor room concerning our approach serves many different functions. First, as mentioned before, it is a natural metaphor for the arrangement and storage of learning artefacts. A room is therefore a space to store, arrange and transport artefacts. Thus rooms define boundaries for the accessibility of the cooperative learning artefacts. Normally access rights for learning objects are derived from the accompanied access rights of the room. A simple metaphor could be a closed room door excluding people who do not belong to a particular group of learners. Secondly also the spatial layout of a room works as a natural boundary for social interactions .

This quality of virtual rooms was shown the first time by various studies about the social interactions in MUDs and MOOs (Becker & Mark 1998). People develop a feeling of being at "their place" within the MUD and thus develop complex rules for social interactions (e.g. netiquette) in the virtual world. Consequently, our prototypes limit a chat to the participants which are virtually present in one room and is even more structured through its content (learning artefacts) regarding our concept of structured chat. As a result, rooms define areas which support different social groupings and simultaneously are boundaries for co-presence of other learners. Thirdly, in comparison to the real physical world, a room can unite both functionality and tools. In such a grouping functionality stands for different activities the room is place and stage for. A room may be described as a discussion or brainstorming room, holding special tools to record a conversation or graphical whiteboard systems to support a creative design process. Other rooms may contain tools for cooperative browsing and for the search of electronic libraries and may therefore be called a library. And last but not least a room could function as a lecture room sharing cooperative presentation- and protocol tools for the learners.

Indeed connections between rooms (called exits in our approach) allow to built semantic structures of rooms. Analogous they represent the social structure of the learning community and should be arranged in a layout reflecting courses and groups of learners.

In summary, one can say, rooms containing tools and persistent learning artefacts may be one of the key concepts for successful cooperative learning processes. Combining our interpretation of necessary access rights and social roles, we came to the logical conclusion of self-administration of these learning rooms. We developed a system of access rights which explicitly defines rights to give away/handle over rights to other learners within the system.
Starting at the point a new learner wants to join a learning group up to the specific adapting of a social role in a discussion process self-administration means that administration is a distributed and constantly applied process of changing access rights and group memberships.
The quality "distributed" serves our demand for social places and boundaries for documents that are administrated completely by the group itself. (This does not imply that there must not be a person in the group holding the predicate of the room administrator, which e.g. could be a tutor or lecturer. However, administration is a distributed process over several persons and groups of learners.)

Conclusions

Research on computer supported co-operation in learning processes is now conducted for more than twenty years. Unfortunately, only a few applications out of the field of computer supported cooperative work made their way into our offices. Today at the universities and schools only common standard web-technology is used to place learning materials (courseware) onto web servers—a one way road of co-operation which leads to isolation. Some people think this isolated learning situation could be eased just by providing bulletin board systems and e-mail to guide a learning process and establish successful connections between learners and teachers. This may be right to a certain degree, but lacks persistency, as long term learning processes as well as the every day viability of the learning materials is not guaranteed. In this article we have intended to elaborate why this deficit can only be solved by the combination of various key concepts, such as the metaphor of places and rooms, awareness components, the integration of synchronous and asynchronous forms of cooperation and communication, and new methods of structuring and through the annotation of learning materials. Therefore the selected infrastructures aim at both situations of cooperation and learning—the support of unanticipated group activities and all the forms of long-term participation.
The system which is currently under development does not claim to solve all existing deficits—it is rather an "open" approach regarding both the concepts and the implementation (source) allowing people to easily join our initiative. We, the developers, will hopefully benefit from the prolific and creative process of the co-operative improvement of concepts and applications.

References:

Becker, B. Mark, G., (1998). Social Conventions in Collaborative Virtual Environments, In: Snowdon, D., Churchill, E., *Proceedings on Collaborative Virtual Environments*, CVE`98, June, 17.-19., Manchester, U.K. 47-55.

Büscher, M., Christensen, M., Grøbæck, K. Krogh, P, Mogensen, P., Shapiro, D., Ørbæck, P. (2000). Collaborative Augmented Reality Environments: Integrating VR, Working Materials, and Distributed Work Spaces, In: Churchill, E., Reddy, M. (Eds.), *Proceedings of the ACM conference on Collaborative Virtual Environments*, San Francisco, CA, USA, September, 10.-12., 2000, 47-56.

Edwards, W.K., (1996). Policies and Roles in Collaborative Applications, In: Ackerman, M.S. (Ed.), *Proceedings of the Conference on Computer Supported Cooperative Work*, November 16.-20., Boston, Massachusetts, USA, 11-20.

Ellis, C.A., Gibbs, S.J. Rein G. (1991). Groupware: some issues and experiences, *Communications of the ACM*, Volume 34, Issue 1 (1991), 39-58.

Erickson, T., Smith, D.N., Kellogg, W.A., Laff, M., Richards, J.T., Bradner, E. (1999). Socially Translucent Systems: Social Proxies, Persistent Conversation, and the Design of "Babble", In: Williams, M.G., Altom, M.W., Ehrlich, K., Newman, W. (Eds.), *Proceedings of the Conference on Human Factors in Computer Systems*, CHI99, Pittsburgh, PA, USA, 72-79.

Haake, J.M. & Wilson, B. (1992). Supporting Collaborative Writing of Hyperdocuments in SEPIA, Turner, J., Kraut, R. (Eds.), *Proceedings of the ACM Conference on Computer Supported Cooperative Work*, October, 31. to November, 4., 1992, Toronto, Canada.

Mandviwalla, M. & Olfman, L. (1994). What do groups need? A proposed set of generic groupware requirements, *ACM Transactions on Computer-Human Interaction*, Volume 1 , Issue 3 (1994), 245-268.

MITRE (2000) The open source Collaborative Virtual Workspace web site, MITRE Corporation, http://cvw.mitre.org/

Rodenstein, R. & Donath, J.S. (2000). Talking In Circles: Designing A Spatially-Grounded Audioconferencing Environment, In: Turner, T., Szwillus, G., Czerwinski, M., Paternò, F. (Eds.), *Proceedings of the Conference on Human Factors in Computer Systems*, CHI2000, The Hague, Amsterdam, 81-87.

Stefik, M., Bobrow, D.G., Foster, G., Lanning, S., Tatar, D. (1987): WYSIWIS Revised: Early Experiences with Multiuser Interfaces, ACM Transactions on Office Information Systems Vol. 5 No. 2, 147-167.

USING STUDENT PROJECTS TO MEET THE INFORMATION NEEDS OF TEACHERS ON THE INTERNET

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Abstract: Teachers in South Africa are confronted with a new educational paradigm and rapid development in information communication technologies. In South Africa there is still a considerable lack of locally developed and relevant educational resources on the Internet. Students from the *Teacher Training College* in Pretoria were involved in a project to develop relevant online learning support material for Afrikaans First Language teachers. Their participation in this project not only empowered them with ICT skills, but also made them possible facilitators of change who can help to disseminate educational technology throughout the entire school system.

The South African education system has changed twice since 1995 from a conventional to a learner-centered outcomes based curriculum. The changing education paradigm created new information needs amongst teachers. Textbooks are outdated and teachers have to implement a new curriculum and adopt new teaching strategies without sufficient learning support materials (Chisholm et al 2000).

The Internet can be a solution to many of the problems educators experience. It can be utilized as an information resource and a tool towards teacher development (Jackson 2000). But, with the South African curriculum still in flux, there is not yet sufficient learning support material for the South African curriculum available on the Internet.

There are only a few initiatives in place online to support educators in South Africa. These are all in English - *one* of the eleven official languages of the country. There is a considerable lack of relevant, locally developed material on the Internet - such as learning support materials and opportunities for teacher development. There is even less information available for teachers of the other minority language groups and subject-specific information for the mother tongue speakers.

At the Pretoria Teacher Training College this huge gap in information provision for Afrikaans First Language Teachers led to a project with benefits for both the students training to become teachers *and* current teachers of this subject. A web site for Afrikaans First Language teachers was started late in 1999 with translations of the new curriculum policy regarding the learning area Language, Literacy and Communication; including descriptions and explanations of the specific outcomes, range statements, performance indicators and assessment criteria for the learning area. The web site was expanded with links to relevant sites, a calendar of activities/ seminars for these teachers and room for contributions from the teachers themselves.

Second year students at the College were given an assignment to prepare outcomes based Afrikaans lessons on an electronic template. They had to save their lesson plans in HTML format. It was edited and hyperlinks to the descriptions of the specific outcomes were made. The first 12 lessons were published in November 1999 on the WWW.

During the 2000 academic year the project was expanded to include more good quality lessons and final year students had to use the Internet as information resource for their lesson plans. They could use any theme/ topic and wonderful language lessons on Aliens, Star Wars and an

Olympic Games for Fairy Tale characters were added to the web site! The students had to activate the URL(s) they used by themselves. Up to November 2000 36 lesson plans were added to the web site.

A questionnaire was given to the participating students to evaluate the strengths and weaknesses of the project. 78,9% of the survey group mentioned that the assignment improved their computer skills. They felt very positive about the fact that their work was published on the Internet and 84% said they would definitely tell others of the project. Of the group that had to use the Internet as an information resource, all said that they would use the Internet again for preparing lessons.

Another project was that of the 3rd year Academic students. They had to research the status quo of Afrikaans on the Internet and did a thorough analysis of the current situation of Afrikaans Literature on the Internet. They had to identify an Afrikaans artist or author of their choice and search for information on them. Their findings made it clear that there is not much information available in this field. For example, a prize-winning South African author - Riana Scheepers - who published ALL nine novels in Afrikaans, was only referred to in a short biography on her publisher's web site - and this in English!

The students were then given an assignment to create a web-based biography with a photograph of their chosen celebrity. The results were amazing. One student claimed to be computer illiterate. Four weeks later she delivered an ultra-modern, high-tech product on CD-ROM! She downloaded Hot Metal 5 from the Internet, mastered it and I quote: *"When everything was done and the CD-ROM produced, I felt very proud of myself and my work. I really learnt a lot... This assignment wasn't just another assignment, but an eye-opener to the world of computers and the Internet"* (Van Schalkwyk 2000).

The benefits of this young project far outweigh the problems encountered. Problems were more of an infrastructural kind that can be solved with better planning in future. To involve student teachers in creating relevant, up-to-date learning support material for teachers on the Internet empowers them with ICT skills. They are investing in their own future as the teachers of tomorrow. They become facilitators of change who can help to disseminate educational technology throughout the entire school system.

For the Afrikaans First Language teachers, there is up-to-date information on the new curriculum and examples of lesson plans in a ready-to-use format. They can download worksheets and access Internet resources with a click of the mouse. Afrikaans language teachers who attended a seminar at the University of Pretoria in September 2000, rated their most important information needs as lesson plans and information on implementing outcomes based education in the classroom. As the web site endeavours to provide in these needs, this project can only benefit all the stakeholders.

References:

CHISHOLM, L. et al. 2000. *A South African Curriculum for the Twenty First Century*. Report of the Review Committee on Curriculum 2005.

JACKSON, G. 2000. Technology for Teacher Support. *TechKnowLogia*, Vol 2(6). [Online]. Available: http://www.techknowlogia.org

VAN SCHALKWYK, L. 2000. *Internet 2000. Unpublished report on Internet assignment*. Pretoria: Teacher training College.

Developing and Teaching a Computer-Mediated Second Language Course in Academic Reading

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Abstract: This paper will describe a new endeavour in the area of distance education: the design and teaching of an e-mail supported academic second language reading comprehension course. The intermediate level course was intended for mature adult learners and implemented at the Open University. The course spans 15 weeks and comprises three kinds of student participation: face to face meetings, e-mail sessions and written assignments. The teaching materials are pre-prepared and include a collection of reading passages; workbooks dealing with nine texts that include approximately 20 questions and relevant teaching points. The course consists of three 3-hour f2f meetings and nine asynchronous e-mail sessions. Students have a week to complete each e-mail assignment and they receive the tutor's feedback within 3-4 days. Student feedback on the course is obtained through a questionnaire.

Distance education (DE) is not a new concept. Applying modern technology to distance learning enhances the advantages that DE is known to have over traditional programs (Holmberg 1995). DE is flexible in terms of its adaptability to students' conditions in time and space and thus provides a platform for independent learning since the student is the deciding factor in when, where and how the learning takes place (Knowles 1975, Mezirow 1981). There are, however, some serious criticisms of DE: the fact that students work completely on their own, that they have impersonal contact with tutors, that the turnaround time for feedback is lengthy, that they do not interact with fellow students, and that, generally, they experience a disheartening feeling of isolation. These disadvantages may explain why drop out rates in distance courses are far higher than in regular programs (Delling 1987). This paper will describe a new endeavour in the area of distance education: the design and teaching of an e-mail supported academic second language reading comprehension course.

Computer-mediated communication (CMC), in its various forms, attempts to compensate for some of the disadvantages of distance learning. Since most CMC distance courses developed to date are, by nature, content rather than process courses, their major advantages are the opportunities they provide for collaborative learning and easy access to information resources (McConnell 1994). In this, CMC reading courses differ from other courses. CMC allows for the adoption of a learner-centred approach so suited to the nature of reading. If we consider reading as a mode of language use, and DE as a mode of language instruction, we encounter striking parallels: the reader (when reading in real-life) and the learner (when learning to read) both function in isolation when interacting with a text. In both cases, discourse is enacted at a distance, a disassociated first person (the author or the instructor) is actively present, and no reciprocity is manifest, within the interactive context. One could, therefore, argue that reading instruction and distance education are particularly well-suited.

Because CMC has the capacity to empower students to direct their own learning to a greater extent than traditional DE courses (White & Weight 2000), it seemed appropriate to utilise it to create a reading course that would offer a more motivating and rewarding medium of instruction to existing face to face (f2f) text based reading programs available at all colleges and universities in Israel. Traditionally, Reading Comprehension programmes rely entirely on pre-defined and pre-produced teaching/learning materials which are predominantly syllabus-writer led in the selection and organisation of the reading texts and the tasks. It is the instructor who controls and promotes the learning. With CMC, on the other hand, it is the learner who mediates and manages his/her own learning through a set of bearings which need to be clearly outlined in the syllabus. Tasks are pre-designed and explicitly shared out in advance, so that all participants know exactly their share of responsibilities, what is expected of them, and when.

The following description is of an e-mail mediated reading course implemented at the Open University. The objective of the course is for students to reach the same level of proficiency as students taking a parallel, traditionally taught course. This is determined by having the students sit for the same mid-term and final examinations taken by all students registered for the course nation-wide.

Participants: In order to make the course manageable for the tutor, the number of participants in a group is limited to 20.

Structure: The course spans 15 weeks and comprises three kinds of student participation: face to face meetings, e-mail sessions and written assignments.

Materials: The teaching materials, which are pre-prepared and handed out to the students, comprise: A collection of reading passages consisting of articles selected on the basis of topic interest and level of difficulty; Workbooks dealing with nine texts, arranged in modules according to test organisation patterns (comparison/contrast, description, cause and result, argument, research). Each text has approximately 20 questions to guide the reading process and relevant teaching points (reading strategies and linguistic features). In addition, the students receive a booklet of cloze exercises to provide additional vocabulary practice for each of the texts and a "Resource Centre" which brings together all the major teaching points dealt with in all modules as a handy reference.

Process: The f2f meetings are three hours long. The initial f2f meeting provides the students with the opportunity to get to know each other, to familiarise themselves with the structure of the course and to understand what their responsibilities are. This meeting serves as a kick-off point for the course and its main focus is to deal with students' queries and technical problems, as well as an introduction to pre-reading activities. The second meeting, a week before the midterm examination, serves to prepare the students for the exam by explaining the format of the exam, and doing a practice examination together in class. The third f2f meeting, at the end of the course, combines a farewell session with tips for the final examination, and a practice exam.

The rest of the course consists of nine asynchronous e-mail sessions. Prior to each e-mail session, students are sent a list of the questions they are assigned by the tutor. The questions deal with pre-reading, close reading and post-reading. Each student is assigned 8-9 questions for each text. The pre- and close-reading questions are rotated among the students so that for each text, the student is assigned questions of a different kind. All the students are assigned identical post-reading questions. The date of submission is mandated in advance as a specific day of each week, and the students have a week to complete each assignment.

The weekly tasks demand active learner engagement rather than passive participation in classroom sessions. The tutor's feedback at the end of each session, which provides correct answers, as well as specific comments regarding language features, useful reading strategies and general and individual feedback relating to students' cognitive and metacognitive awareness, is sent out to all students within 3-4 days and serves as additional English-language reading material. The students were told in advance that they only had to hand in seven of the nine e-mail assignments.

The course described above was designed to suit the needs of mature adult learners who are best motivated when they can choose to study at a time that is most convenient to them; they are actively involved in meaningful tasks; they are given the chance to self-direct their own learning procedures; they can work in ways that suit them best.

On the mid-term and final examinations, the students achieved grades as good as or better than the entire population. Student feedback on the course is obtained through a questionnaire administered at the end of the semester, and includes open and closed questions. In all four groups which have taken the course to date in this format, students' enthusiasm is apparent. They are especially enthusiastic about the close contact they have with the tutors. The tutors seem to enjoy the course as much as the students do.

References

Delling, R.M. (1987). Toward a theory of distance education. *ICDE Bulletin*, 13, 21-25.

Holmberg, B. (1995). *Theory and practice of distance education* (2nd ed.) New York, NY: Routledge Studies in Distance Education.

Knowles, M.T. (1975). *Self-directed learning: A guide for teachers and learners*. Chicago: Follett.

McConnell, D. (1994). *Implementing computer supported cooperative learning*. London: Kogan Page.

Mezirow, J. (1981). A critical theory of adult learning and education. *Adult Education: A Journal of Research and Theory*, 32, 3-24.

White, K.W. & Weight, B.H. (Eds). (2000). *The online teaching guide: A handbook of attitudes*. Needham Height, MA: Allyn and Bacon.

Lessons Learned: School based Reform and its Impact on the Restructuring of a Teacher Preparation Program

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Abstract: The reform in teacher technology integration at our university is based on a school reform project. Thirteen area classrooms were equipped with the latest technology. We were selected to train the teachers to use technology and inquiry-based, student-centered learning. Monthly meetings, training sessions and classroom visits were instituted. Our teachers were eager to learn and returned to their classrooms ready to try the new technology-rich, inquiry-based projects with their students. The result: student scores improved, students' projects became more professional, and the students became empowered by their success. We based our strategies on the success we had with our involvement in the aforementioned school reform and we relied heavily on the thirteen classrooms as observation sites for our preservice teachers. Our success during our first year far exceeded expectations. We are on our way to preparing our students to be the facilitators of technology-enriched, activity-based classrooms of the future.

Background: K12 Technology Integration Initiative

Four years ago the Multimedia Interactive Networked Technologies Project (MINTs) began in 13 classrooms in the St. Louis area. Due to a settlement from Southwestern Bell, money became available to equip these classrooms with the latest in educational technology: one IBM computer for every two students, a teacher's station, scanners, interactive white boards, LCD projectors, color and laser printers and video conferencing capabilities. Each teacher selected for the project also received a laptop computer for home use. The teachers that were selected to teach in these classrooms were not technologically literate. They were, however, willing to try something new.

The timeliness for this type of project has been documented by the report: Technology and the New Professional Teacher: Preparing for the 21st Century Classroom (NCATE, 1998). That report predicted that technology will revolutionize the classroom of the future. When used correctly, technology has a strong potential to facilitate cooperative, inquiry-based learning, support different student learning styles, reinforce positive behavioral and social skills, and model real-world applications. Researchers involved in reform (e.g., Newman, Griffin & Cole, 1989; Pea, 1993; Polman, 1997) have argued that inquiry-oriented instruction is most appropriate because it provides for active engagement by learners, involving rich social interactions in real-world experiences.

The Missouri Research and Education Network (MORENET), a state agency in charge of providing bandwidth to Missouri's schools and public institutions, became the lead agency for the MINTs project. MOREnet offered technical training to the 13 MINTs participants during a weekend meeting at the Lake of the Ozarks. This training covered the basics of using their laptop computer, dial-up features, and email. The University of Missouri-St. Louis was sub-contracted to provide ongoing technical and curriculum support and additional training for the MINTs teachers. Our online discussion list was very active as the teachers shared the web sites they found and were using with their students. They also shared their accomplishments, students' "wow" moments and the ideas that were working in their classrooms. The online discussions and our monthly meetings provided a way to build camaraderie in our group of 13 and bind them together by their shared experiences.

Our plan consisted of monthly meetings of all the MINTs teachers and weekly visits to their classrooms. We also provided two-week training sessions during the summer and held sessions after school and/or on Saturdays. All the teachers attended the MOREnet Technology Conference, held yearly at the Lake of the Ozarks, compliments of MOREnet. The first year they attended, the MINTs teachers found the technology enlightening and interesting and they left excited to use what they had learned. By the second year they found the presentations to be routine and by the third year four of the MINTs teachers presented at the conference.

The success of the MINTs project was not coincidental. Unlike other projects that had failed in the past due to lack of teacher support (Cuban, 1986), we provided ongoing support and training, first in the technological skills needed, then in creating projects that required the use of cooperative, activity-based learning and higher order thinking skills. We held monthly meetings where all the teachers could share their successes and frustrations and receive feedback from their colleagues. We also had a MINTs listserv used for sharing ideas, web sites, classroom success stories and questioning other MINTs teachers regarding a particular problem. The list proved to be very beneficial. A teacher embarking on the creation of a new project could send out a message in the morning to the list asking for advice or web sites and have four or five responses by the afternoon. New sites that proved useful in one classroom and held potential value for other classrooms were quickly shared via the list. The list served to help develop a cohesive group among the MINTs teachers.

Our classroom teachers were not left to their own devices in the classroom after a brief period of instruction. They had continuous training and support, and they knew they had someone to call on at anytime for assistance. Jan Mastin, the MINTs Area Technology and Curriculum coordinator, received many requests to visit classrooms. When the MINTs teachers were introducing a new program or technique, they wanted an extra pair of hands in the room to work one on one with the students. We also had some teachers who were comfortable using certain software, but did not feel expert enough to teach it to their students. Ms. Mastin would visit their classrooms at the teacher's request and demonstrate the needed software.

During the MINTs project we learned that students are quite industrious when learning new technologies; as soon as they learn the basics they are ready to explore more. When they discovered something new, they were eager to use the interactive whiteboard to share what they had just learned with the rest of the class. They were always open to helping their fellow students as well. One of our MINTs teachers had her students hold their hands behind their back when helping another student. That way they had to talk the other student through the problem, improving their communication skills while the other student learned how to carry out the particular task himself.

Overall, the MINTs project did succeed. However, not all of our teachers reached the level of technology enriched, project-based learning for which we had hoped. One teacher in particular never quite believed that project-based learning would result in increased scores on the standardized tests that were required during the fifth grade. This teacher's students used their computers but they could have completed the same tasks using paper, pencil, and textbooks. The students would be working on a project while the teacher sat behind the desk. We suggested that the teacher needed to be monitoring the students as they worked, asking questions and making sure they were on task. He preferred to sit at his desk and grade papers.

Not everyone is cut out to teach in this type of classroom. We found that a teacher must be very flexible, open to new ideas, and acceptable of controlled chaos to succeed in this type of classroom.

As the MINTs Area Technology and Curriculum Coordinator, Ms. Mastin has been working with the MINTs teachers for about two and one half years. This experience became a major influence when it came time to plan our PT3 grant proposal.

A College of Education poised for Technology Integration

The College of Education at the University of Missouri-St. Louis was undergoing a curriculum redesign at the time, grouping courses by three levels and requiring 40 hours of observations in the "Exploration Level" and "Analysis Level" classes. Students would now have the opportunity to observe what a teacher really does in a K-12 classroom before their junior or senior year. Through reflection and class discussions, the preservice teachers would gain a deeper understanding of what it meant to be a classroom teacher. One part of this redesign targeted observations in technology-enriched classrooms.

At that time all of our faculty members had computers in their offices. However, they were mainly used for word processing, email and preparing syllabi and class handouts. Approximately 2% of our faculty members were using email and online discussion groups with their students. About that same percent referred their students to web resources and taught using technology. This lack of technology integration by the rest of the faculty was what we wanted to target in our PT3 proposal. Ms. Mastin had seen firsthand that project-based, technology-enhanced learning could raise students' enthusiasm, increase test scores, improve self-worth and generally improve a student's attitude about school. We wanted our faculty and preservice teachers to be made aware of those outcomes and to become adept at integrating technology in their classrooms.

Dr. Charles Schmitz, who became the Dean of the College of Education in 1996, was a firm believer in the power of technology. Paper copies of "The Dean's Weekly Update" were banished upon his arrival. If there were faculty members who did not use email before his appointment, they began using it soon after. He also envisioned a Technology and Learning Center (TLC) for our College and an Endowed Professorship of Technology Education. With the TLC and the Endowed Professorship funding secured in the spring of 1999, we were poised to begin a comprehensive program of technology training and integration for our faculty. At that time, we applied for a Preparing Tomorrow's Teachers to Use Technology (PT3) grant.

Faculty Teaching Reform through the Support of a PT3 Grant

We planned our grant with great zeal, based primarily on the success and knowledge gained from the school-based reform of the MINTs project. We were convinced that the procedures that worked for the MINTs project would, with some adjustment, work with our faculty, as they began learning about the rewards of technology integration. Our PT3 grant application was approved in September 1999 and our new TLC had its grand opening in March 2000.

Cadres of five full-time and five part-time faculty members were chosen first from the Level I "Exploration" courses. The idea was to begin modeling and teaching technology integration when our students began their education courses. Our professors would teach with technology, but first we had to teach them.

We chose our first cadre members carefully. We wanted people who were not afraid of trying something new and we wanted those faculty members who agreed with the basic principle that the use of technology would improve their students' learning experiences and better prepare them for the classrooms of the 21st century.

At one of the first meetings, participating Cadre I members and the PT3 staff created a list of technology integration options that people could select from to begin using technology in their classes. This approach, of asking our faculty members for their input and ideas, provided them with a sense of control and paved the way for a commitment to carry out their choices. Only later did we realize that there was a lack of accountability in this model.

During the following semester we presented the list of technology integration options to Cadre II members and also had them sign a commitment paper, agreeing to initiate the five items they selected. Posting their syllabus on the web, using email with their students, and holding online, asynchronous discussions were a top priority for everyone. These served the dual purpose of acquainting the instructor with technologies that they may not have used before and requiring their students to do the same. We also encouraged the use of PowerPoint presentations, both for the instructor and the students, posting assignments to the web, and student web page creation for class.

Unlike previous technology integration projects that had failed in the past due to lack of teacher support (Cuban, 1986), our instructors had a lot of support. Small, informal workshops were held in the TLC on numerous technologies; file management, FTP, PowerPoint, HyperStudio, Netscape Composer, and web search techniques. Four of the five faculty members in the first Cadre attended these sessions. The PT3 PI and Project Director were available for one on one meetings with each Cadre member to discuss technical issues or the details of how to incorporate technology into their curriculum that would enhance course content and most benefit students.

During our monthly meetings we invited some of the most successful MINTs teachers to talk about their experiences with technology integration and highlight assignments, student projects and outcomes. At our first meeting we discussed what experiences a preservice teacher needs to fully understand the meaning of technology integration and how this type of learning works in a K-12 classroom. Most of our instructors had no idea that 4^{th}-6^{th} grade students were capable of such sophisticated projects using technology. They left the meeting impressed with what they saw -- the enthusiasm of the MINTs teachers, the student projects and the positive results this type of learning has on test scores and student outcomes.

The MINTs classrooms were used as technology-rich observation sites for our preservice teachers and a guide sheet for observations was provided. We found that the observation sheet was not enough. Some of the MINTs teachers reported that the preservice teachers would visit and just sit in the back of the room. The preservice teachers did not understand why the classroom teacher was not "presenting information" and some of them left thinking that what they had just witnessed was a chaotic, unmanaged classroom where the teacher was not in control. What we apparently had not clearly conveyed is that the classroom structure and management in a technology-enriched classroom is quite different from what our preservice teachers might expect. Most of our students are products of teacher centered classrooms. When faced with the project-based model they did not quite know what to make of it. We needed to make sure our faculty members had a clearer picture of the realities of project-based learning so they could impart that to their students prior to sending them out for their observations. We also needed to convey that the preservice teachers needed to interact with the students in high-tech classrooms. Sitting in the back of the class, watching students work in collaborative groups proved to be a less than enriching experience.

Some Lessons Learned

Coordinating the schedules of classroom teachers with the availability of 300 preservice teachers proved to be a real challenge. The classroom teachers want to be notified by email at least two days before a visit. We are in the process of devising a better system than the one we currently use to accomplish this. One major roadblock is the mindset of our faculty. Some of them do not believe that they can send their students to a high-tech classroom to observe "things you would see in a normal classroom." In one way that may be true. Classroom management in a high-tech environment is not the same as the teacher-driven model that most of our students are used to from their own experience in high school.

One of the professors who teach Level I classes did not really see any reason to change the way he was teaching. He had no desire to use web sites as resources for his class, even if they were presented to him for his use. Correspondence by email or listserve was not an option for him either. He was aghast at the thought of tracking the correspondence of his 40+ students. He did, however, see the possibilities as he listened to the other Cadre members as they talked about and shared their excitement of using listserves and web resources. By the second semester this professor was using web resources in his class.

Our PT3 listserv is not the solidifying resource that it was for the MINTs teachers. Lack of time on the part of the Project Director has prevented the posting of questions to the list and the encouragement of PT3 faculty to share their experiences there.

We had also envisioned a close relationship between our MINTs teachers and our PT3 faculty. All but one of our faculty members has yet to go to a MINTs classroom to observe. The Project Director tried to initiate these visits for Cadre I, but scheduling problems proved to be insurmountable. We see a close relationship between our faculty members and the MINTs teachers as beneficial for both, but we are still trying to devise a way to accomplish that goal.

Time is on our side though. Our successes and near successes have been enlightening. As our Cadre members share their experiences with us, we are envisioning new ways to work with the faculty to bring about a shift to a technology-integrated curriculum.

One top priority is to ensure that our faculty members visit a technology-enriched classroom. Cadre 3 members will take at least one field trip to a high-tech classroom during one of our scheduled meetings. A new assistant will take some of the workload off of Ms. Mastin, and allow more time for her to schedule monthly visits with each faculty member, sit in on some of their classes and spend more time monitoring the listserve so that it becomes an important resource for the PT3 faculty members.

This coming semester we will schedule our panel discussion by technology using teachers early in the semester. We received a lot of positive feedback from the discussion, but we also learned that it would have been even more helpful earlier in the semester.

References

Cuban, L. (1986). *Teachers and machines: The classroom use of technology since 1920.* New York: Teachers College Press.

National Research Council (1996). *National science education standards*. Washington, DC: National Academy Press.

Newman, D., Griffin, P., & Cole, M. (1989). *The construction zone: Working for cognitive change in school.* New York: Cambridge University Press.

Pea, R.D. (1993). Distributed Multimedia Learning Environments: The Collaborative visualization project. *Communications of the ACM*, 36(5), 60-63.

Polman, J. (1997). *Guiding science expeditions: The design of a learning environment for project-based science.* New York: Teachers College Press.

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Putting the Instructor in Charge: Component Architecture and the Design of a Course Web Site.

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Abstract: This paper describes the "component architecture" of the web and how teachers can use various existing components of the web – plugins, websites, applets, web services etc., to develop complex applications with limited investment of resources. Furthermore, the pieces of independent software units can be coordinated towards a final product that effectively hides the "duct tape" that holds the pieces together. This "mix and match" approach towards developing educational software saves money and time and allows information sharing across activities in an integrated fashion which in turn.

Introduction

One of the most important tasks faced by a teacher is designing the classroom learning environment. Either consciously or instinctively (or a combination thereof), teachers chose the topics that will be covered, they structure the classroom conversations, they assign tasks for students to work on, and they provide tools and resources to students. It can be argued that some of the resistance teachers felt towards technology (specifically computer-based technologies) could have been caused by a feeling of losing control of their classrooms. Until recently, teachers did not have access to technology, could not participate in its design and its integration into their teaching practices.

Introducing Component Architecture and the Web

We believe that we are at a new position now. New technologies (such as the Web) allow teachers to take on a far more proactive role in the design and implementation of new technologies. One concept that we believe is key to teachers becoming designers has been called "the component architecture of the web." That is, using various existing components of the web (plugins, websites, applets, web services etc.) instructors can develop very complex applications with limited investment of resources. Furthermore, the pieces of independent software units can be coordinated towards a final product that effectively hides the "duct tape" that holds the pieces together (Zhao, Mishra, Ferdig, in press). This "mix and match" approach towards developing educational software has two main advantages: (a) it saves money and time; and (b) it presents different functions in an integrated fashion which in turn; (c) allows information sharing across activities.

Teachers as designers

It is our contention that the component architecture of the web allows us to easily, and inexpensively, develop complex, diverse, dynamic, and pedagogically sound web sites. It is for these reasons that we argue for teachers to become designers of their own technological solutions. To support this claim, we describe a web site that was used to support a teacher professional development course taught by the first author. We describe the goals of this undertaking, how existing components of the web were used to meet these goals, and the lessons we learned from this undertaking. We conclude by contrasting our approach with a course web site developed using an existing prepackaged approach offered by Blackboard.com.

Putting the pieces together for a course web site

The web site was designed for use in a graduate educational technology course consisting primarily of in-service teachers (with a few master's students in educational technology). Students in this course worked in design teams to develop computer-based products that would be useful for teaching and learning. To meet the needs of the course, we needed to develop a technology environment that would help us with effectively communicating within project teams, across project teams, and among all class participants, managing projects, providing access to readings, and archiving artifacts developed in the course. Instead of developing or purchasing a large software package, we assembled an efficient environment from mostly free software and existing services on the web. All of these components were integrated into the course web site seamlessly.

The web site included standard course information—the syllabus, readings, pictures of artifacts developed, and powerpoint presentations based on lecture. Beyond these basic resources, the web site employed several other technologies to meet other course needs. The technologies, or components used for the design of the web site were as follows:

Blogger.com: A free web service that allowed the faculty to update and ftp web pages to one part of the web site without having to use any web- or HTML-editing facility.

Egroups.com: A web service for managing mailing lists and threaded discussion groups. Egroups also offered, (a) an archive of all communications; (b) a classlist (with pictures) and contact information; (c) web polls; (d) a group calendar, and (e) 20 MB of web space for archiving files and readings.

Idrive.com: Each student in the class was required to register for an Idrive account. Idrive offers its users 50MB of free web space to upload, save and share files. In addition, Idrive also offers unlimited web space for files that are saved directly off the Internet. This feature is useful to practicing teachers who wish to "file" useful lesson plans and other web sites for future reference.

Apart from the organizational and pragmatic uses of these free services, the course web site also attempted to offer a new way of thinking about learning in today's networked environment. These options were seamlessly integrated into the class site by maintaining all of the course options in one frame while presenting the "outputs" site in the other frame.

The History Channel: The course page linked to the History Channel web site that provided information about "this day in history" and "this day in the history of technology."

Searches via Google, Encyclopedia Britannica and Meriam Webster: To emphasize how information on the web could be easily accessible the course web site has fields that allow students to search Google, Encyclopedia Britannica and Merriam Websters Dictionary.

Lessons learned

We see the development and maintenance of such a system as an ongoing experiment to study and reflect on what is possible using freely available services on the Internet. Some things we have learned are: (a) Users of the system see an integrated web-site and were unaware of how the entire system is cobbled together from what is essentially freeware on the web; (b) One can reinterpret the functionality of software i.e. they can be used in ways and within contexts that were not envisaged by the designer of the original computer program. For instance, Blogger was used to maintain an announcements page. This was not something that Blogger was designed to do but which worked out quite well; (c) Trouble shooting the system is quite easy. If the mailing list does not work for some reason it is because egroups is down, not because there is something wrong with the whole class site. In fact, the loss of one component does not bring down the entire course site; (d) This system gave the instructor much more freedom and flexibility than the system run by the university; (e) Such a system should be within the reach of common teachers financially and technically.

Course web sites using Blackboard.com

We offer a contrast of our component approach with a pre-packaged system such as Blackboard.com. This company offers an integrated web course site development and presentation environment, developed for and by educators. However, Blackboard.com constrains the options the instructor would like to have. For instance having a listserv (which could be accessed just through email), with built-in web archives (as in Egroups) was important to the instructor. However Blackboard.com allows just web based discussion forums which would be hard to access on a slow phone line. Also, the instructor may want to disable certain options available (say, on-line chat). Though Blackboard.com allows instructors to disable online chat it provides no way of removing the chat button from the options. Moreover integrating functionalities such as the web search from within the course site, is not easily done with Blackboard.com. And finally, using Blackboard.com as a solution does not allow students to learn about the messy process of design of through an actual case study—the course site itself.

By constructing this class web site, we not only provided students with tools that made their participation in the class easier, we also gave students an example of how to design and integrate technology into classrooms. Since the main goal of the class was to help teachers integrate technology, the web site was one way to help "lead by example."

References

Zhao, Y., Mishra, P., & Ferdig, R. F. (in press). Putting the pieces together: The power of component architecture and the design of web-based learning environments. Computers in Schools.

Troubleshooting Windows

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Abstract: This information was written to help teachers understand steps that they can take for to keep their equipment running longer and better. It will walk them through steps to see if they can troubleshoot their problem or if they do need to send for help.

Preventative Maintenance

1. *In a low traffic area*-Place computers away from chalk dust or other contaminants, on a sturdy table or countertop. Store power and printer cords away (no entanglements for feet, no accidental unplugging of power or other cords.
2. *Preventative actions for computer hardware and disks*-Avoid exposure to magnetic fields, avoid exposure to static electricity (touch something metal to ground yourself first), void exposure to extreme temperatures (don't leave hardware or disks in an environment where the temperature can fluctuate several degrees either), avoid exposure to liquids or to conditions that could result in condensation on the equipment. Run Scandisk on hard drive and floppies to keep disks in working order. Run Disk Defragmenter on hard drive to ensure fastest storage and data retrieval rates.
3. *Preventative actions during computer use*-Close applications that are running but don't need. This will free up memory. Look at the taskbar and see the number of buttons you have representing programs running or windows opened. If you have more than four buttons present, consider closing some windows, especially if you have less than 32 Megabytes of RAM. Save your work regularly!!! This doesn't prevent "crashes", but it reduces the level of stress within the computer user in case of a crash. If your Windows computer "crashes", press ctrl-alt-delete, then ctrl-escape. It will bring up the start menu allowing you to safely shut down your system. If you have to turn it off without going through the shut down procedure, don't turn if off and on again rapidly. Wait 10-15 second before turning it back on. If your Windows computer shows a window that says it needs to run Scandisk to check for errors on the drive-- let it run and correct the errors—do NOT exit Scandisk before it has completed its procedure.

Keep your system running more smoothly by following just a few steps:

SCANDISK-A Microsoft utility, which acts as a disk analysis and repair tool that checks a drive for errors and corrects any problems that it finds. A Standard SCANDISK should be done *once a week*. A *Thorough SCANDISK* should be done about *once a month*.

⇒ Double click on My Computer.
⇒ Right click on the C drive--choose Properties.
⇒ Click on the Tools tab
⇒ Under the Error Checking Status click the Check Now box
⇒ Click on Thorough, and then make sure there is a check in the box Automatically fix errors, and then choose Start.
⇒ When SCANDISK has completed, results will appear and let you know if it found errors.

DEFRAG-It's a disk defragmenter, which reorganizes the files on a disk to optimize the disk performance. Running Defrag periodically will help your PC run more efficiently and speed up performance.

Correct Shut Down- Close all programs. Click the Start button; choose Shut Down Select one of the options from the Shut Down Windows dialog box. Click Yes.

General Troubleshooting Techniques

1. Check connections - Whenever some component (CPU, mouse, keyboard, monitor, printer, etc.) doesn't work, you should check the connections of that device (e.g., power cord, printer cable, mouse connector wire, keyboard connector wire) and make sure the cords and connectors are securely attached.
2. Try swapping devices to pinpoint the problem. (*CAUTION*: If you haven't done this before, do not attempt it without help from the building technology person or another knowledgeable source) - For a device like a mouse, keyboard, or monitor that doesn't appear to be working, try attaching the device in question to a different computer. For example, a monitor doesn't show a picture. If you attach that monitor to another computer and DO get a picture, you know the problem is not with the monitor, something to do with the computer (such as a bad video card or cord). For school-owned computers, limit your efforts to devices that connect to the outside of the CPU case (don't open the case).
3. Use diagnostic and/or repair software to help pinpoint and possibly correct problems.
   a. Scandisk - this program comes with Windows. It can detect and fix some errors in the way files are written to disks. It can also help free up unusable disk space.
   b. Disk Defragmenter - moves data around on a disk so that files are not "fragmented" (parts of individual files saved in different locations). The process of defragmenting can result in faster file access from disks because the disk drive doesn't have to look at a wide variety of locations on a disk to find and retrieve a file.
   c. Software such as Norton Diagnostics, Norton Disk Doctor, and Conflict Catcher (Conflict Catcher is for Macintosh computers). Use this on your home computer, but not on your school computer without permission and assistance from the Technology Department.

Consult with your school technology person and/or any other qualified personnel (Example: Customer Service Desk)

Correcting Common Problems

When Your Computer "Crashes"

1. DON'T PANIC - it happens to the best of us!
2. On a Windows machine, use the keyboard command Ctrl+Alt+Delete to see if you can bring up the "Close Program" dialog box.
3. If you CAN bring up the "Close Program" box, look for applications listed as "not responding". If there are any, click on their name and click the "End Task" button.

If you CANNOT bring up the "Close Program" box, try using Ctrl+Alt+Delete again to see if you can restart the computer. If that doesn't work, turn the computer off and back on again after 15 seconds, or press the "Reset" button. Realize that, upon restart, Windows will want to run Scandisk. Let it do so!
Press F1- A great Help utility that can walk you through the troubleshooting process.

Error Messages and What They Mean

Mapl DLL Error-Sometimes found when trying to run Netscape. Go to Edit>Preferences>Mail and News. Uncheck the last box that enables the Mapl. Exit and Log off then log back in and Outlook should work.
Save changes?- This usually appears when you close a program and haven't saved the work.
The device is not ready-This message usually means you have forgotten to place the CD or floppy in the drive securely. Just place your CD or disk in the drive and click on Retry.
The item this shortcut refers to has been moved or changed-The shortcut to the original file has been altered on the hard drive or totally removed. Point at the shortcut, right click and choose delete. Find the original file and make a new shortcut.
The disk in the destination drive is full-If your disk if full or Windows knows it won't be able to fit your entire file on the disk; you'll get this message. To fix this problem, just delete a few things from your floppy disk or use another disk.

The specified path is invalid-This message appears when you try to open a program from the Start menu and Windows can't find the file. More than likely, someone's removed the program from the hard drive and forgot to take it off the Start menu. The names and icons on the Start menu are placeholders directing the computer to the original files on the hard drive.
This filename is not valid-You've probably typed a filename that contains one of the forbidden characters: "*/:<>?\| Rename the file and leave out any of these characters.
The file has a resource conflict-This happens when one piece of equipment is trying to use a port of other piece of hardware. Use the Hardware Conflict Troubleshooter. Click on the Start button, and choose Help from the menu. On the Contents tab, double-click on Troubleshooting, then click on the entry labeled "If you have a hardware conflict". You'll see a dialog box. Click on the appropriate button to get the process started, then follow the detailed instructions.

Desktop Problems

Missing Task bar- Most of us have lost the Task Bar at one time or another. Move your cursor to where it used to be. Did it appear? It may be on Autohide. If not move your cursor further toward the edge. Hold down the left mouse button and try to drag it back into sight.

***A flawed* program**

√ The icon on the desktop turns black.
✓ Your system freezes up. You might be able to move the mouse but nothing happens when you tap the keys or click the mouse. The usual cure is to turn the machine off and back on.
✓ The picture on your monitor starts to act up. Windows might refuse to go away, or you'll see dark holes in the background.
✓ Everything begins to move at a glacial pace. Save what you can and prepare to restart.
✓ You see a bright blue screen with a white error message on it. That generally means something bad. If you're lucky, you can hit the Enter key and get back to work.

You see a Windows dialog box; telling you your application has caused a general protection fault. Click OK and see if you can get back to work. You'll probably lose anything you haven't saved lately.

Mouse and Keyboard problems

Left-handed Users in a right-handed world-From Start go up to the Control Panels. In the Control Panel you will find an icon entitled Mouse. Double click on it and it will give you the choice for right or left-handed.

Troubleshooting a mouse or keyboard freeze

1. Close all applications if possible.
2. Power down the machine.
3. Check the cords.

Disk Space Troubleshooter

This troubleshooter helps you solve problems you may encounter if you run out of disk space.

Empty the Recycle Bin
Use ScanDisk to check for errors that may be using up disk space
Back up unneeded files and remove them from your hard disk
Remove Windows components that you don't use
Create more disk space by using DriveSpace disk compression.

Recovering from a Hang

Press ctrl-alt-delete, then ctrl-escape will bring up the start menu allowing you to safely shut down your system.

Restart Windows

To restart Windows with a full warm boot, select shut down from the Start menu. Click the Restart Computer option, and hold the shift key down while affirming "Yes".

Peripherals

When Windows starts, it automatically scans your computer for any device without a driver and install drivers as needed. (Plug and Play)

If you think that keeping those old drivers loaded is a good idea in case you need to re-install Windows, you are mistaken. You will have better performance and stability if you use the native Window drivers.

Connect SCSI devices without restarting Windows

Right click on My Computer, and select Properties.

Click the Device Manager tab, and select Computer at the top of the list.

Click on "View Devices By Connection".

Press Refresh. This will take several seconds, but the new device should appear in the list.

If you don't see the new device, choose "View Devices By Connection", find the SCSI card in the list, and expand it out to see all the devices attached to it.

Printers

Troubleshooting steps:

- Is the printer connected to your computer (Check the plugs on either end of the connection, just to be sure.)
- Is the printer plugged in and turned on?
- Does Windows know about your printer? (My Computer-Printers) Did you log on to your computer?
- Is the printer out of paper?
- Are there any lights flashing on the printer's front panel? If there are, try turning the printer on and off to clear its memory and reset it, then try again.
- On the Windows Start menu, click Help. Click the Index tab, and then search for "print troubleshooting." Click Display, and then follow the instructions in the Windows Print Troubleshooter.
- If your Windows printer setup looks correct, check your Word printer settings.

Make sure that the selected printer matches the printer you're using. On the File menu, click Print, and then click the name of the printer you want to use in the Name box.

Make sure the page range you've selected in the Print dialog box corresponds to the pages you want to print.

Does your computer say that it has printed your job but the printer doesn't print?

This may be caused by selecting the wrong port to print from. For instance if you have a network printer and try to print to a local port you will not get any printout. Check by going to the printer folder and highlighting the appropriate printer. Click the right mouse button and check to see if the correct port is selected by clicking on the Details tab.

Is your printer spitting out sheets with strange characters on them?

Go to the Printer folder and check to make sure you are using the correct print driver. Highlight the printer and then right click. Choose Properties and then click on the Details tab. Look to see if the print driver being used is correct. Select the appropriate drive, remove the bad print job. Turn the printer off and back on to clear out the garbage.

Is the printout streaky?

Clean the print cartridge head with alcohol. Let it dry, and place it securely back in the carriage. If this doesn't work, it's probably time for a new cartridge.

Does the paper keep jamming?

Check for small bits of paper in the paper path.

Humidity sometimes causes paper to stick together. Manually separate the pieces of paper and put them back into your printer.

Windows Websites

http://www.aspbc.org/gen/BTSWin95.html
http://www.spintheweb.com/win95.htm
http://www.annoyances.org/win95/
http://www.worldowindows.com/
http://support.microsoft.com/servicedesks/msdn/default.htm
http://support.microsoft.com/support/tshoot/

Moving from a Macintosh to a Windows

Operation/Function	Mac OS	Windows
Major parts of the Desktop/Finder	Hard drive, trash, control panel, Apple Menu, Finder	My Computer, Network Neighborhood, Recycle, Start button and task bar
Mouse Shortcut menu	Ctrl + Mouse Click	Right button Mouse Click - content varies depending on what is selected
Stay open Menus	OS 8 no longer need to hold down mouse button	
Recent Documents	Recent Document List (Apple Menu)	Documents in Start Menu
Configuring/Settings	Control Panel	Settings in Start Menu
Find Files	Find Menu (Apple Menu) OS8 has Sherlock Qualifiers= Starts with, ends with, etc	Find in Start Menu Name, Location, date, contents Wild cards= * and ?
Close Windows, not Applications	Application Menu - Hide, Minimize, Drag to a bottom Tab	Minimize Window, Right click taskbar & "Minimize All"
Close Applications	File & Quit, Apple+Q, Upper Left window button	Upper right window X, File & Close, Alt+F4, Right Click Title Bar and Close
Shut Down & Restart	Special Menu - Shut Down or Restart, or use the keyboard command	Start Menu - Shut Down - Radio button choice, Ctrl+Alt+Del
Programs Running	Application Menu or floating menu	Taskbar buttons, Alt + Tab
Window Manipulation		
Moving	Grab title bar on top of window	Grab title bar on top of window
Resizing	Lower right corner or edge	Lower right corner or sides
Maximizing	Lower Right Corner and Move, Option+Zoom	Middle button in upper right corner or resize
Hiding or Minimizing	Application Menu & Hide Application, Option+Click menu	Left button in upper right corner, Right click on Title bar & choose Minimize
Hard Drive Access	Double click on HD icon on desktop	Double Click on My Computer & then HD icon
Initializing/Formatting Disks	Special - Erase Disk - choose formatting	My Computer - Right Click on Floppy drive - Format
Ejecting a Disk	Drag icon to trash	My Computer - Right Click - Eject Disk or Push the eject button on the drive
File Management -	Double left click drive or folder to open	Double click drive or folder to open
Viewing files in a window	Open window, View - as Icons, as Buttons, as List	Open window, View - Large Icons, Small Icons, List & Details
Copying and Moving files	Open both windows and drag-n-drop, Drag+Option makes a copy	Open both windows and drag-n-drop, Copy/Cut and Paste, Ctrl+Drag makes a copy
Creating Folders	File Menu - New Folder or Ctrl+Click	File - New - Folder or Right Click
Rename	Click on title or Ctrl+Click	Click and hold mouse on title or Right Click and Rename

Working between a Macintosh and Windows computer is possible if you format your disk in DOS and have the same program versions on both computers(example: Word 6 on a Mac can be read by Word 6 on a Windows machine).

<u>End-of-Year Maintenance Windows Computers</u>

Clean up your Hard Drive

√ *If you haven't used the file or document in the past year, delete it.*

1. Double click on "My Documents"
   If it is not on your desktop, double click on "My Computer".

2. Double click on the "C" drive. A list of all your files should appear. Most people default their documents to this folder. If you save to the desktop or to another folder, you will need to go to those locations.

2. To delete an item, right click on the item and select "Delete".
3. To delete multiple items, hold down the "CTRL" key. Click each item you wish to delete. Right click on any one of them and choose "Delete" from the menu that appears.
4. Right click on the "Recycle Bin" (on the desktop) and choose "Delete All". The items are still on your computer until you empty the recycle bin.

Backing up Files

Backing up to the server

1. Double click on "My Computer".
2. Double click on the folder with your username on it. This opens your folder on the server.
3. Locate the documents you wish to back up. Drag the documents to your folder on the server. You are copying the files, not moving them. You will now have them on both the server and the original location.

Backing up to a Floppy Disk

1. Insert a blank disk into the disk drive.
2. Double click on "My Computer".
3. Drag your documents over the icon for the "Floppy Drive".

Cleaning up Microsoft Outlook

1. Open "Outlook".
2. Click on your "Inbox". Hold down the "CTRL" key and click on all items you would like to delete. Click on the black X on your tool bar OR go to the edit menu and choose "Delete" OR right click on the item and choose "Delete". This will delete all the highlighted items at once.
3. Click on the "Sent Items" folder. Follow the above instructions.
4. Right click on the "Deleted Items" folder. Choose the "Empty Deleted Items Folder".

Local Printers (Except for the Epson 740)

√ *Removing cartridges from the Epson 740 destroys them.*

1. Open the printer's cover and remove the print cartridge. Place the cartridges in a ziplock plastic bag. This will help to keep your cartridge from drying out. Don't touch the metal parts.
2. When you return in the fall, put the cartridges back in the printer. You may have to clean the bottom of the cartridge with alcohol if it gets dried out.

Defragment your Hard Drive

1. Double click on "My Computer".
2. Right click on the "C" drive. Choose "Properties".
3. Click on the "Tools" tab.
4. There are three different choices on this window. Click the "Check Now" button for "Error-Checking Status". It takes awhile so don't waste your time watching it.
5. In the "Defragmentation Status" click the "Defragment Now" button. This also takes awhile but improves the efficiency of your computer.

Before you leave for the summer

1. Change your password. Passwords are good for 120 days so it is better to change it now than to try to figure out why you the internet doesn't allow you in after vacation. You may want to write the password down.
2. Unplug cords from the wall and television. (Feel free to color code or label cords so you can reattach everything yourself in the fall.)
3. Leave the cords attached to your computer. Wind the cords up and secure them with a rubber band or twist-tie.
4. Cover your computer with a large piece of paper or cloth (not plastic). This helps your computer to stay clean.
5. Although it is best to store the computers in a dry cool environment, that is not always possible. Your principal and Building Technology Specialist can tell you if you need to move your computer to another location.

Dancing with Technology to Teach Technology

Tweed Ross, Kansas State Univ., USA

"Those who cannot hear the music believe the dancer is mad."

Those who believe modern electronic technologies are fundamentally changing the learning of young people are faced with an intractable conundrum. To teach the new technologies to the uninitiated they are relegated to the old practices used in education for some considerable time: lecture, textbook, guided demonstrations, and lab exercises. In short while they believe in discovery learning and constructivist theories they end up using didactic process and behaviorist means. Is there a better way?

Colleges of Education setting about to reform the teaching of the future teachers in the K-12 classrooms of this century would do well to consider how their student learn technologies differently than the professorate. To reinforce the need for new learning strategies spend a Saturday morning at the electronic arcade in the mall and watch juveniles solve complex, action packed, eye-hand exercises for as long as their pocket change lasts.

The College of Education at Kansas State University set about seven years ago to revamp the way it's undergraduate, required, introduction to technology class was taught. Some years earlier the move from bulletin boards, filmstrip, overhead transparencies, and 16mm. projectors had been navigated. The new instructional media course was designed to meet the outline of then current ISTE standards.[1] However, the teaching method was still much the same: regular class meetings, professorial lectures and graduate student supervision of lab assignments followed by paper and pencil tests.

The Dean of the College along with the administrative council recognized this was not good enough and started on a new, ambitious project to "teach technology using technology." The first iteration of this effort was a video based project. This project was produced using a digital video editor. Video tapes were produced for students to watch and work through exercises in their own time frame. There were no established class times and assignments were project based for activities likely to be encountered by beginning teachers.

As new technologies became available to the College of Education and students the course was rewritten into be delivered in a CD-ROM format. As the Internet became an effective part of modern technologies the course was once again revamped to make use of this new resource.[2]

A close reading recognizes that while new asynchronous methods of teaching were employed, the course was still a self-contained course taught essentially by a "technology guru." This guru was responsible for its design, implementation, staffing and supervision. In short, the course was isolated from much of the rest of the pre-service teacher program. Teaching the use of new technologies to undergraduate education majors was the responsibility of the technology person. Technology was something to be learned, not something to be employed. Recently public schools and general experience have provided incoming students with far greater technology. To meet these new abilities of students to "dance with technology," the bar has been raised to higher levels by the NCATE 2000 standards[3] and the new ISTE standards.[4]

These standards, if they are to be incorporated by Colleges of Education, requires that the delivery, implementation and evaluation of a technology component for pre-service teachers no longer remain an isolated course taught by the computer guru. Technology must be integrated into the pre-service program of the college.

> *The unit's conceptual framework(s) reflects the unit's commitment to preparing candidates who are able to use educational technology to help all students learn; it also provides a conceptual understanding of how knowledge, skills and dispositions related to educational and information technology <u>are integrated throughout the curriculum, instruction, field experiences, clinical practice, assessments and evaluations.</u>*

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[1] ISTE (1997). National Standards for Educational Technology
[2] http://Courses.educ.ksu.edu/EDETC318/)
[3] NCATE. (2000). NCATE 2000 Unit Standards
[4] ISTE, (2000). National Education Technology Standards for Teachers.

(NCATE, 2000. Emphasis mine)

On the surface these new standards require several things to occur in relatively short order.

1. Members of the academy responsible for pre-service teaching must model and demonstrate effective technology. This requires that available resources, support, reward and development be readily available.
2. Members of the academy must be able to evaluate pre-service student teaching practice for both the appropriate use and quality of use for technologies. This requires a qualitative understanding of when technology should be used and what how to evaluate and advise others in technology application for teaching.
3. Members of the K-12 community must be prepared to support pre-service teachers in their intern experiences, evaluate technology teaching efforts and cooperate in pre-service teachers' growth and appropriate use for technology.
4. Pre-service teachers must be able to demonstrate that they can appropriately integrate technology into their repertoire of skills for teaching. K-12 schools must search for and hire graduate who can demonstrate these abilities.

At this point is becomes apparent that "those who cannot hear the music" i.e. those who do not have a vision for integrating technology into the teaching skills of pre-service teachers, must think those who do are mad. Therefore it is important that "technology guru" step out of the role of the technologist who knows how to make the tools perform and enters the role of " instructional support" vs. "technical support."

Faculty members must be encouraged to use email, not just to dialog concerning professional papers, but to react with students in a new sense of time and space. Internet applications for course management most evolve from electronic syllabus to interactive vehicles for class presence. PowerPoint presentations need to grow from electronic transparencies to ways for students to constructively collaborate on demonstrations of content. Internet searches and activities change from what is fun and flashy on the web to what has real meaning for constructing a deeper understanding of content.

Colleges of Education must insist that their technology programs not just teach the playing a musical instrument, but how to effectively appreciate the music and join in the dance. Clearly not an easy task, but one made possible if we think of ways to "use technology to teach technology."

Development of English Department of Computer Information Systems as a Way of Worldwide Educational Integration

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Abstract: reforms started in Ukraine caused creation of new speciality "Economic Cybernetics" which combines mathematical modeling and information technologies and is applied in national economy. One of the most important task during Faculty development it is curriculum development. Analysis of Ukrainian post-secondary school curricula showed, that they are oriented on traditional methods and do not consider international experience of training specialists of profile given above. There are a number of potential results, which possible to obtain, the main one consists in the *developing new Faculty*, "English Department of Computer Information Systems". The results of the proposal faculty development may be used as a basis for curricula development by post-secondary schools of Ukraine and other countries, which are going to integrate in the World community.

Introduction

As young independent state, Ukraine started reforms in economy, policy and education and began integration into worldwide international institutes recently. Economy reforms entailed development of enterprises of small and middle business, political and economic reform assisted to stormy development of new information technologies. In connection with that there appeared a need in highly skilled specialists of economic profile, which would have a command of information technologies and methods of their implementation in business-activity. It caused creation of new speciality "Economic Cybernetics" which combines mathematical modeling and information technologies and is applied in national economy. Besides, taking into account swift expansion of Ukraine co-operation with most progressive World countries, appear joint enterprises with allotted capital the employees of which ought to be skilled in information technologies, business, and also to have education, in accordance with World standards.

Curricula Development as a Main Task of the Faculty Development

One of the most important task during any Faculty development it is development of the curriculum. Analysis of Ukrainian post-secondary school curricula showed, that they are oriented on traditional methods and do not consider international experience of training specialists of profile given above. That's why the development of new curricula for speciality "Economic Cybernetics" according Western Universities Standards is an actual and important problem, and Institute of Computer Information Technologies (ICIT) of Ternopil Academy of National Economy carries it out. Analysis showed that the popular two specialities "Business Information Systems" (West Europe) and "Management Information Systems" (USA) are the most closed relative to "Economic Cybernetics". Therefore ICIT has started with some partners from West Europe together to develop new BIS's curriculum. The main result of collaboration, which can be obtain, lies in the *developing new Faculty*, "English Department of Computer Information Systems" consisting of ICIT where all subjects will taught in English (similar department has been successfully functioning in TU Sofia, Bulgaria since 1995).

Potential Results

There are a number of potential results, which possible to obtain:

- Assisting to reform system of post-secondary education in Ukraine;
- Widen co-operation of the Department with business-structures (specially with those dealing with international business and computer technologies);
- Increasing the co-operation of workers of post-secondary school with universities of different World regions.

Moreover, as for the Western Countries the obtained results allow to:

- Enrich the Western Partners by experience elements and activity peculiarities of post-secondary school in Ukraine and post Soviet Union countries;
- Increase prestige of countries and post-secondary schools participating;
- Widen the co-operation of western countries as well as Western and Eastern Countries;
- Assist the unification of World market of labor resources that is important in period of world integration.

Conclusions

The results of the proposal Faculty development may be used by post-secondary schools of Ukraine (and other countries, which are going to integrate in the World community) as a basis for curricula development for Business Information Systems as well as for other similar specialities and branches. Thus the principals of post-secondary school system of Ukraine and other post Soviet Union countries are similar, the obtained results can be adapted to national peculiarities.

References

A. Melnyk, A. Sachenko, P. Stolyarchuk, L. Sopilnyk, O. Salo. (2000). Computer Education in Ukrainian Universities: Problems and Perspectives. *Proceedings of Interdisciplinary Conference on Electrical, Electronics & Computer Engineering in the Third Millenium.* Davos (Switzerland) 10-15 September.

A.Sachenko, I.Gibson. (1993). The Teaching of Electronic Engineering - Related Subjects in the Ukraine. *Int. J. Elect. Enging. Educ.,* Vol.30, p.28-32. (Manchester U.P., Great Britain).

A. Sachenko, I. Tkachenko, A. Voronova. (1997). About valuation of quality of curricula structure in training of specialists and masters. *Proceedings of international scientific conference "Problems of economic integration of Ukraine in European Community: microeconomics aspect",* Yalta-Foros, Ukraine, 23-25 September, pp. 202-203.

Applying Social Learning Theory to the Teaching of Technology Skills: An Interactive Approach

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Abstract: Advanced technology has a relatively short life span before it substantially changes; this is especially true of computers and information technology. Acquiring skills that are well developed and flexible will allow students to adapt to the rapid changes and innovations in technologically advanced environments. As the demands of teaching have changed over time educators have examined a variety of approaches in order to make the process of computer and technology education as efficient as possible. Albert Bandura's Social Learning Theory offers both concepts and techniques which can aid the professional educator in optimizing classroom instruction in technology and computer skills. Bandura's descriptions of the learning process and mechanisms by which they operate are especially well suited to the teaching of computer and technology skills. Techniques and theory from this approach are applicable to almost any level of education from grade school to college.

Introduction

The impact of technology on the process of modern life is undeniable. In the past two decades we have experienced the development and dissemination of a new form of mass and interpersonal communication, namely the Internet. The Internet, made possible by affordable advanced computer technology, is quickly becoming a staple of education, businesses, public administration, and private life. The same advances which drive the Internet are also revolutionizing many traditional areas of human endeavor; this impact is certainly felt in all levels of education from preschool to the college/university arena. Changes in elementary, secondary and higher education with respect to technology are rapid and widespread. Computers as teaching tools provide access to staggering amounts of information. Modern audio/visual aids, including cable televison, digital recording and imagery, and satellite broadcasting can produce phenomenal lesson plans and bring the individual student into direct contact with experiences that would have only been abstract concepts even twenty or thirty years ago. Education at all levels is beginning to focus more and more on the student's acquisition of relevant technology skills both in and out of the classroom; these same advances which facilitate the process of education will also be the tools of many trades and vocations awaiting the prospective graduates.

The Dynamic Nature of Technology Skills

Advanced technology, unlike most aspects of education, has a relatively short life span before it substantially changes; this is especially true of computers and information technology. As of this writing the one gigahertz microprocessor is now commonly available from many computer manufacturers; just five years ago the most advanced processor was less than a tenth of this speed and the platform to which it was attached could not handle streaming audio or interactive video without prohibitively expensive modifications. By the time this article reaches publication the one gigahertz microprocessor likely will be found in budget computers and will no longer be state of the art technology. Operating systems, word processing programs, and other software packages are functionally reinvented every three to five years. To use these tools to their maximum advantage requires a degree of multitasking from the learner. They must first learn the basics of the device or the software package and while they are learning this they must also adapt to any real changes in the software or hardware which impacts the capacity for output, how it is put into operation, and exactly what its new, expanded capabilities may be. The dynamic nature of technology places added demands on the instructor; unlike course content in history, philosophy, or mathematics the substance of a college level computer science course or an elementary level internet familiarization program can change dramatically in just a few months. This can present special challenges and complications to educators who strive to offer students the most current topic related information and experiences.

The next logical consideration is one of maximal efficiency; how can we, as educators at different levels, facilitate the development of technology skills in students and also ensure the flexibility of those skills so the student can adapt to these rapid, major changes? One possible solution lies in Albert Bandura's Social Learning Theory. Bandura's Social Learning Theory can be seen as an update and an expansion of Skinner's Radical Behaviorism. Bandura essentially saw Behaviorism as sound but incomplete (Hjelle & Ziegler, 1992); he postulated that there were other learning processes operating in humans that have been ignored or undiscovered in behavior theory. Behavior theorists demonstrated that external reward and/or punishment was necessary for the acquisition, maintenance, and modification of behavior. Bandura noted that while the behaviorist description of learning was accurate, people also learn in the absence of external reinforcement or punishment. Bandura described the processes of vicarious learning which involve observation, reading, oral communication, and social interactions with others. Much of the behavior we display, according to Bandura, actually is the result of learning by example or by observation.

Social Learning Theory

Bandura postulated that people have the ability to preserve experiences acquired via the observational process by generating mental imagery and through verbal representations. Through our ability to predict future consequences we can anticipate when this behavior or skill may be needed in the future. This gives us the ability to problem solve without the need for laborious trial and error learning. The experience is remembered and is translated into new behavior patterns. These patterns serve as a guide for future action.

Exactly how this learning occurs in Social Learning Theory is depicted in a specific, linear process. The individual attends to a new behavior or skill (Attention), the individual codes the experience into long term memory (Retention), the individual uses the new behavior in the future (Motor Reproduction) and when the individual predicts the future need for the behavior they are ready to use it (Motivational Process).

The skills acquisition process of Social Learning Theory is easily adapted to the teaching of technology skills, especially computer and software skills, to students of all ages. As long as the task is approached in a systematic manner, including an assessment of the student's current skill set, the student's level of development is functionally irrelevant. The application of the new skills will likely reflect where the student is on the various relatively common developmental scales and this application should broaden as the student develops and matures.

One of the major advantages of Bandura's theory is its inclusiveness. It does not refute the power of reinforcement based procedures or the efficacy of reward systems in learning, especially in the classroom. Social Learning Theory includes the time tested procedures of reinforcement based learning but expands on them with the procedures of Observational Learning. In essence, Observational Learning processes, when used with reinforcement, can dramatically increase the outcome and efficacy of instruction. Observational Learning includes reinforcement but is not dependent on it.

Observational Learning is especially applicable for the teaching of technology skills to children in grade school or young adults in college. It effectively removes one of the shortcomings of reinforcement based instruction, namely the integration of several tasks which are conceptually very different. Teaching a grade school child how to use the internet, for example, involves both simple, concrete motor skills and more abstract conceptual abilities. The simple mechanics of using a dial up adaptor and an internet browser are different from conducting a subject relevant search for a school assignment. Instead of looking at a total task as a series of steps in which each step is reinforced until the whole is acquired (chaining) or rewarding successive approximations to the target behavior (shaping), Social Learning Theory's principle of Observational Learning and Learning via Modeling provides an avenue to effectively teach a total task without having to break the task down into equal steps. Technology skills, especially software skills, may prove to be very difficult to break into steps for a purely behavioral approach to applications education. Reinforcement still plays an important role in the Social Learning Theory approach but it is subsequent to skill acquisition; the process by which skills are acquired may initially have little to do with overt reward. Instead reward is viewed as that which maintains the skills and makes future use of the skills attractive to the individual. Bandura also argued that success itself is rewarding; a student who learns to use a computer is likely to continue to do so because using the computer is "fun", or because the student's interaction with the computer is itself the reward.

As individuals learn by observing others and attempting to duplicate observed performance they form opinions about their own ability to successfully execute a skill. Bandura's concept of Self Efficacy acts as a mediating variable in observational learning. Self Efficacy is essentially the individuals' subjective belief in their own ability to complete a task or successfully engage in an activity. Persons with high degrees of personal self efficacy display confidence and willingness to try new things. Self Efficacy can be seen as operating in both a specific (general skill, a particular activity) and a general (large undertaking, life itself) context.

The development of positive Self Efficacy is managed by several factors. The most powerful is the performance accomplishment; effectively individuals raise their own self appraisal of their ability to successfully execute the skill with each rewarding application of the desired ability. Verbal encouragement can also be a very powerful motivator, especially for children and adolescents with whom the teacher/instructor has good rapport. Peer models who are very similar to the student can also raise self efficacy when the student sees someone comparable successfully execute a task such as operating a computer or applying software to solve a problem.

The Social Learning Theory model is one of a number of interacting components. The Observational Processes of attention, retention, motor reproduction and motivation for future skills use essentially describes the basics of learning. Reinforcement acts as the cement which crystalizes information acquisition and makes the individual more likely to engage in the skills in the future. Self efficacy also mediates the individual's likelihood of approaching tasks which require the new skill. Learning in a social context can help develop and maximize efficacy achievement in students through performance accomplishments, verbal persuasion, and vicarious reward.

Applying Social Learning Theory

The application of Social Learning Theory does not require special modifications to the environment as the majority of the processes emerge from the social context itself. Social Learning Theory is very flexible and can be applied in almost any area of traditional education. Focal points for the efficacy of this approach stem from observable behavior demonstrated by a model for the student and a context in which the student can mimic the model's behavior and receive feedback from others. The behavior, or skill, which is modeled should be practiced in a number of different settings and with a future focus in mind. Competition between individuals is discouraged as the social experience of learning is important to the vicarious process. The attention/retention/motor reproduction/motivation model of learning is coupled with special attention to the student's Self Efficacy. This model includes reinforcement at various stages and assumes that students will engage in behaviors because they are both rewarding, in that they allow them to solve problems and gain reinforcement, and because they are reinforcing in and of themselves.

Promoting the generality of a skill is less of a social process but it still requires the attention and motivation components of Bandura's model. Generality is important in that a student is more likely to apply a skill if they can see (predict) its utility in a number of different situations. To apply a skill to abstract problems a student has to be able to conceptualize the problem in the future sense and see how the skill helps the student solve the problem. An example would be using a computer to make a sign which lists a car for sale, using a computer to print a newsletter or a bulletin to avoid costly printer's fees, developing one's own greeting cards, keeping a digital record of valuable property on disc, scanning important documents for safekeeping, electronic banking or business, and so on. Teachers are in a unique position to help students learn how to apply technology skills in the broadest sense; they not only have their own experience but also that of each student in the classroom. The social learning model allows for verbal representations of ideas to be shared among students and for vicarious modeling to take place in a 360 degree context.

Modeling

Modeling is an important aspect of Social Learning Theory and is already present in most aspects of traditional education; the teacher/instructor/professor is a model for the student. Modeling can be maximized by recruiting students as models as well and by establishing controls over the social context in which skills are displayed. The following example involves using modeling and social context control in teaching basic computer operations to elementary school students.

The instructor demonstrates the basic operation of a personal computer to a small group of students who will later become models themselves. She turns the computer on, creates a user name and password for herself, checks the computer for errors using a basic utility program, and then demonstrates how to use the basic functions of the PC. She then supervises each student as they complete each step of the operation: turning on the power, creating their own personal identity, and so on. The students then work as a group to complete a basic assignment involving the newly acquired skills. After this small group of students has demonstrated basic competency in computer operation she then familiarizes them with the basics of a word processing software package. This small group of students is now ready to act as models for a larger class.

In class the instructor assigns a number of students to each student model, effectively forming small groups with their own access to a PC. The instructor then takes the class through the prepared lesson in basic computer skills; she models the behavior in front of the class and directs the class' attention to the student models in each group (attention process). The student models then demonstrate each step as the instructor describes it. After a complete cycle of the skill the student models then assist each member of their group in duplicating the instructor's performance while other group members watch (retention process/motor reproduction). The instructor moves from group to group and provides supervision. The student models and the instructor provide encouragement and suggestions to the students learning the skills; the instructor also provides praise to the student models (verbal persuasion, reinforcement).

After the students have acquired basic skills, the instructor and the student models demonstrate problem solving and apply the skills to a certain task, such as installing a simple program or running a virus scan. The instructor then provides each student model with a list of tasks to be completed by the group using the new skills. The student model supervises the group members as they each in turn use the new skills to complete an assigned task (retention/motor reproduction/motivational process) on the group computer. The other group members are encouraged by the model to provide verbal support for the student currently applying skills but not to give them answers outright. The student model can stop the exercise and demonstrate the required behavior as needed to refresh the memory of group members.

After the basic skill set is present in all class members the student models are trained in the next set of cogent operations such as using a word processing program or connecting to the internet and establishing an E-mail address. The process then repeats itself with the new skills being presented to the class to build on the old ones and the student models serving to reinforce the instructor's efforts.

Self Efficacy

Student Self Efficacy is very important in the acquisition of new skills. Students who appear to be "technology resistant" likely have a negative belief about their ability to succeed, despite the assurances of an instructor. Student self efficacy can be bolstered by using the same process as above except more care must be taken in establishing the social context. Pairing the student with a model who appears to be very similar to the student in question is useful. The student can make positive vicarious comparisons between the self and the model. Verbal persuasion from peers is often more encouraging than the same encouragement from an authority figure such as an instructor; this is especially true of students in the elementary through high school range. Peer models can encourage a student to try a simple exercise with the new skill (positive peer pressure/verbal persuasion) and provide praise when they successfully complete the task (performance accomplishment). The peer model then reminds the student of how easily they completed the last task and provides them with the next. The peer model makes sure the student understands that the new task incorporates the previous skills with a few extra steps or some variations. Once the student is able to demonstrate the behavior of interest on demand a further useful approach is to get the student to demonstrate the skills for other students, effectively turning the student into a model.

The effects of performance accomplishment and social reward on the student models is pronounced. The student models likely receive great benefit from teaching others. This is due to the attention/retention process they have to display in the course of learning the skill and the motor reproduction involved in demonstrating it repeatedly for new students. The models also already have the motivational process in play; they know while learning the skills for the first time that they will be using them in the future to teach other students.

Promoting Generality of the Skill

After a certain set of skills has been acquired by the learner it is very useful to challenge the students to develop personalized ways of using the skills. This personalization encourages generality of the skill, or the likelihood that the student will use the skill to solve problems and complete activities which are not directly related to the context in which the skills were learned. For example a student learns to use a popular word processing package, photo editing software, and develops the skills necessary to operate a PC and connect to the internet. The student, a college sophomore in a computer course, now types all of his term papers using the word processor and searches the internet for humorous stories to send his friends via E-mail. The student is challenged by the instructor to apply all of these skills to their favorite hobby.

Within the social context the instructor can challenge the group, including the student model, to develop a group specific project which incorporates all of the desired skills. Each group member has input into the process and is required to demonstrate how they used their skills in the creation of the final project. Another project to encourage the generality of skills is to ask each student to demonstrate a set number of distinct operations using all or some of the skills under development. Exactly what those operations are would be left up to the individual but they would have to meet a set criteria. An example would be using the word processor to keep up with homework, develop an accounting sheet for budgeting purposes, and making a sign or a banner which runs the length of the paper. This approach, along with verbal encouragement and a demonstration from peer models, can help a student find more abstract (and more general) applications for their skills.

Generality is also promoted outside of the classroom. The instructor can give assignments to the students to find uses for the new skills at home or at work and to at least hypothetically demonstrate the use of the new skills (motivational process, motor reproduction).

Emphasize Cooperation

When students are competing they not only tend to work in isolation but they also tend to avoid sharing information and providing encouragement to others; this is true of elementary students and college students alike. The pitfalls of cooperative work among students include no assurance that the individual has actually met the standards of evaluation for the course and that a few individuals in the group may be completing the majority of the work. The benefits of the social cooperative approach include constant feedback from other group members (especially when the group includes a peer model), peer support and encouragement, and a number of different sources of observational learning. The negative aspects can be controlled by encouraging group effort and participation in learning and demonstrating the tasks while evaluating each student's participation on an individual level. This evaluation would include the peer model. The instructor would establish the skills to be learned by the students and inform the students how each person will be evaluated by the instructor (motivational process). The peer model and the instructor demonstrate the skill so each person has the opportunity to observe and duplicate the model's performance (motor reproduction). The individual student is then required to participate in a practice evaluation with the other group members providing encouragement but no direct assistance. Each step is reinforced by the group and the peer model (efficacy) as it is successfully completed. Students who display difficulty in acquiring the skill during the practice evaluation may receive more direct instruction from the peer model and the instructor. A second practice evaluation is attempted without peer support; after this evaluation is completed each group member practices the skills while waiting their turn for the actual evaluation.

The social context in which cooperation occurs is not much different from that of competition; the difference lies in the emphasis placed by the instructor (the primary model). Cooperation itself is a skill which is useful outside of the educational arena, especially where technology skills are concerned. This should be emphasized when the instruction is taking place; it provides a basis for the student to imagine a future using these skills in an occupation or recreational setting. For example software developers, journalists, music producers, and engineers are all dependent on technology for their vocations and rarely do they work on projects outside of a team environment. In using a Social Learning approach to the teaching of technology skills the students not only learn the skills in question but also learn how to apply them outside of the strict context of the educational setting and how to act as part of a team, a skill which will be necessary in the pursuit of a career dependent on computer technology.

Conclusion

Bandura's theory has tapped a number of different processes which relate to human learning. These processes include the demonstrated efficacy of reinforcement/punishment based learning espoused by traditional behaviorists and the previously ignored vicarious/observational processes which tend to occur in the absence of reinforcement. Bandura's theory is a flexible approach which adapts well to many settings and is especially well suited to the teaching of technology skills. Social Learning Theory also includes the subjective component of Self Efficacy. Self Efficacy is not only important but it may explain why some students appear to be resistant to learning technology skills. The social context also helps students prepare for future team-oriented work environments; software designers, engineers, editors, journalists, and many other professionals rely not only on advanced technology but on team contributions to the completion of a project. Computer technology, software design and capabilities, and media technology all progress and change at a rapid pace. The social learning perspective not only helps students focus on the future and prepare for potential changes but also provides them with skills necessary to acquire new information and update old skills with maximal efficiency. The model of attention/retention/motor reproduction/motivation, coupled with opportunities for the individual student to develop and demonstrate Self Efficacy, can be very powerful tools for helping learners acquire and apply technology skills.

References

Bandura, A. (1989a). Social Cognitive Theory. In R. Vasta (Ed.), *Annuals of Child Development.* (Vol. 60, p. 1-60). Greenwich, CT: JAI Press.

Bandura, A. (1986). *Social Foundations of Thought and Action: A Social Cognitive Theory.* Englewood Cliffs, NJ: Prentice Hall.

Hjelle, L. & Ziegler, D. (1992). *Personality Theories.* McGraw-Hill: New York

Applying Rogerian Theory to Technology Resistant Students

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Abstract: This paper proposes ways of helping technology resistant (TR) students in terms of Carl Rogers' theories. In this view, students are motivated by the single, unitary motive of actualizing—maintaining or enhancing their lives to their fullest potential. Resistance to technology is defined in terms of incongruence among the Real Self, the Ideal Self, and the technological task to be learned. Suggestions using Rogerian principles are given to assist educators in working with technology resistant students.

Introduction

The theories of Carl Rogers do not find much application in the various applied disciplines of education because of the preference for more learning oriented approaches. However, it appears Rogerian principles and methods may well be suited for facilitating the acquisition of technology skills in the modern classroom, especially with the so-called technology resistant (TR) students who otherwise demonstrate adequate performance to overcome resistance toward learning technology skills. As the world progresses through the computer and the mass media revolution, technology skills are rapidly becoming a required skill set of the modern student. Students who have no computer or technology skills may find themselves at a disadvantage educationally and occupationally. Many students have difficulty acquiring computer and technology skills, especially when their access to computers outside of the learning environment is limited. Children, whether very young, the adolescent high school student, or the young adult leaving for college, learn most of their attitudes towards the processes of life from their parents. Trying to help a student overcome a counter-productive belief about the self or the self's abilities, especially about technology, can be a source of frustration. Instructors and educators at all levels have certainly experienced frustration with otherwise good students when confronting the statement "I just can't do math." This self-statement not a statement of incompetence but rather a self-expression of one's own beliefs about the self as the person understands it. Such self-statements lead to internal beliefs about the self's ability to operate in the world. These beliefs, in turn, impact the individual's future perceptions and behavior. The same statement regarding computers in the place of math is no different. For example, an elementary student who uses the self-statement "I can't understand computers" is actually making an assessment about his or her own ability to interact in any situation where computers are important. This leads the person to seek situations that are more congruent with his or her perceived strengths. Fortunately, such a self-attitude concerning computers is easier to correct than math. This is because technology skills, for the most part, are hands-on and concrete, at least initially. Math is also highly structured and sequenced but is abstract in the extreme and is almost entirely conceptual. A Rogerian approach can quickly get to the heart of the matter: the conflict between the individual's assessment of his or her abilities and the individual's perceived requirements of the skill.

Students, from grade school to college level, can display TR in a number of ways. These students have the capacity to learn the skills but are just not learning them. Resistance can take the form of quitting easily and becoming quickly frustrated when presented with a technology oriented task. Resistance can be simply avoidance of anything related to a particular theme, such as the internet, media technology, or computers in general. Some students may display apprehension of the device or its applications. Others may insist that the problem has little to do with technology but instead internalize the problem and insist that they do not the necessary requirements to learn the skills. These problems are most likely simple self-concept dilemmas.

Self Concept and Learning

Self-concept is a key element in Rogerian theory. It is basically composed of two parts: the Real Self and the Ideal Self. The Real Self is the person's subjective, phenomenological, interpretation of how he or she is right now. Because reality is subjective and is interpreted differently by all who view it, the student's perception may be very different from that of the educator. The Ideal Self is the personalized, hypothetical "perfect" self of the student. This is the goal to which the student aspires to become, and the metaphysical yardstick by which everything the person does now is measured. Any disagreement between the Real and the Ideal Selves, or between the Real Self and the person's assessment of the task at hand will cause problems. Human nature is growth oriented, or actualizing. The Actualizing Tendency is the tendency to maximize experiences and develop perceived strengths and talents as they relate to the Ideal Self. The Actualizing Tendency can be blocked or frustrated by social pressure, outside influences, and any situation that places conditions of worth upon the student.

Educators can overcome TR in otherwise capable students by applying a fundamental method of communicating and problem solving. Many educators who enjoy good rapport with their students may already apply some of these techniques in a general sense. These techniques begin with a one-on-one dialogue with the student away from other social influences. The components of this dialogue consist of empathy, communicating unconditional positive regard, understanding of both the individual and the problem, and a firm willingness to actively seek a resolution *with* the student, not *for* the student. Empathy is best communicated through simple statements and nonverbal communication. Coupled with eye contact and open body posture, such statements can help students feel that the educator understands their feelings. Unconditional positive regard for the student can be communicated by showing respect for the person and his or her ability to learn, and by avoiding criticism of a student (even if deserved). Focus on the student as a person, not just a learner. This does not mean that the educator has to accept everything that the student does, just that the student is a person with his or her own feelings, fears, and dreams of the future. Statements such as "I think you're all right" communicate this regard. Once the educator has a sense of the student as a person they can begin trying to understand the nature of the problem. Understanding the person as well as the problem will lead to the most effective solutions. Ask students general questions about what they think of the task and if it is important to them. Communicate that there is no wrong answer but that these skills are important.

Many otherwise good students can have a difficult experience in acquiring technology and computer skills. These students may appear to be motivated, frustrated, confused, or even hostile. It is possible that the students themselves are not disrupting the process for its own sake but rather have difficultly in conceptualizing their role as learners and consumers of technology and related skills. The theories of Carl Rogers may have a solution for educators who are trying to reach a TR student. Rogerian theory centers upon the person and how that person perceives others, the environment, and the self. Using Rogerian techniques and principles the educator can approach a student, even one who is actively resistant, and find mutual solutions which not only will aid the student in overcoming TR but will also serve to reinforce and maintain positive rapport between the educator and the student.

Remote-Control Computing

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Abstract: This interactive session presents remote-control computing from the perspective of the educator. If you have ever taught a class where your students use software at home, or have ever had the need to access your office computer files from home, then remote-control computing is for you. Remote-control computing software allows you to connect to remote computers from your computer, and control those systems as if you were right there in front of them. You can take over the remote system and provide problem solving assistance, upload and download files, and even change system parameters and re-boot. And it works over the Internet! In this interactive session, participants will gain an understanding of what remote-control computing is, who the major players in the industry are, and how educators can use it. Session attendees will also see remote-control computing software in operation, performing tasks in the academic environment.

Introduction

As a computer technology instructor, I teach classes in which students use software that they run at home or in a lab remote from me. Often they will have problems that are difficult to resolve over the phone, via email, or even in a classroom discussion. In fact, some problems are nearly impossible to solve without seeing the actual conditions surrounding them. If only I could be there with the student to help...

Have you ever been working on a project at home, only to discover that you need a file from your office computer or access to a campus information system? Wouldn't it be nice to be able to handle this without driving out to work?

Remote-control computing

Remote-control computing refers to the ability of one computer system to control another computer system from a remote location. It is implemented over a network using software that resides on both computers. One system acts as the Host (or server) and the other system as the Guest (or remote controller). The guest system takes control of the host system.

There are many software packages that provide some level of remote-control processing capability. Generally, they are categorized into two groups: consumer-oriented remote control and enterprise system remote control (Fratto, 2000). The marketplace is fast and furious, with products refreshed quarterly with new features and functionality (Doherty, 2000). Enterprise remote-control products have the highest level of functionality and are the focus of this paper.

The role of remote-control computing in the academic environment

Student Assistance / Distance Learning

Many problems students have when using a software product can be resolved when they occur, by taking over control of the students' computers using the remote-control capability of the software. This allows you to connect to their computers (using a number of different connection options) and control the systems as if you were right there. You can run the software, confirm input requirements, check output, etc., and in fact, try anything you would do if you were sitting at their keyboard. This certainly beats troubleshooting through a conversation over the phone, or sending software files back and forth via the Internet.

Administration

Remote-control computing also allows you to link to your office computer and access other systems on the campus intranet. This includes applications on network servers and other operating system platforms. For example, I've used it to register students on the internal campus registration system from my home computer.

Telecommuting

It's very handy for administrators and faculty who need to access work files at home as they telecommute or put in those extra hours sometimes required to get the job done. You can even transfer files - interactively sending and receiving data or programs that may assist with your project or problem resolution activities.

Research

The ability to share computer-controlled research equipment is enhanced by remote-control software. The Oak Ridge National Laboratory uses remote-control software at its High Temperature Materials Laboratory to allow researches from across the country to use a million-dollar electron microscope (Krause, 2000). Even if we don't have million dollar pieces of equipment, the ability to remotely monitor and control research processes is valuable to most of us.

Remote-control computing software

As stated earlier, there are many players in the remote-control software marketplace. Many of the consumer-oriented products are available as Freeware or Shareware. These products provide some level of remote-control and/or file transfer capability, but generally do not contain all of the features and functions required by the enterprise system user. For those interested, a table identifying many of these systems and their capabilities can be downloaded from the Internet (Winfiles, 1998).

The following table consists of a number of the more robust enterprise system remote-control software packages.

Software Package Name	Developer
Carbon Copy	Compaq Computer Corporation
ControlIT	Computer Associates International
CoSession Remote	Artisoft
Laplink	Traveling Software
NetOP Remote Control for Windows	Cross Tec Corporation
PcAnywhere	Symantec Corporation
PCDuo	Vector Networks
Proxy	Funk Software
ReachOut Enterprise	Stac Software
Timbuktu Pro	Netopia
VNC	Oracle Research Laboratory

Table 1: Enterprise System Remote-Control Software

Features & Functions

The features and functions of these software packages fall into the following categories:

Remote control capabilities: what you can do/control on the host machine. This describes the extent to which the software can recognize and utilize the hardware and software components on the host (Doherty, 2000). This might range from limited capabilities to run programs on the host computer all the way to being able to run programs on any network server attached to the host.

Connectivity: the options for connecting the guest system to the host system. Most remote-control software products offer multiple connectivity options that may include: direct connect (cabled serial or parallel ports), modem to modem, LAN, WAN, Internet, and wireless infrared. Most systems utilize TCP/IP communications.

Supported operating systems: the operating environments supported by the software. Most of the packages support only the Microsoft Windows environments, although VNC and Timbuktu support Apple MacIntosh, and VNC also supports Unix.

File Transfer: the ability to transfer files and programs between the guest and host systems. Features of this capability include the ability to handle long file names, drag and drop transfer functions, the ability to synchronize files so that they are the same on both systems, and the ability to continue interrupted file transfers.

Security: this includes password protection of the guest and host systems, encryption of data transmissions, virus protection, and host system screen blanking and keyboard locking to prevent an onlooker from observing confidential processing (Robinson, 1998).

Printer redirection: the ability to print at both the guest and host locations.

Chat: the ability to conduct a PC chat with a user at the host site during the remote-control session.

Drive mapping: the ability to map the disk drives from the host system to the remote system so that the remote system may use the files and programs located on them as if they were local disk drives.

Product Ranking

In my research, I was able to find three different organizations that have tested and ranked some, though not all, of the remote-control software packages listed in the table above. The test criteria was similar in all three organizations; focusing on performance in terms of screen refresh and file transfer speeds, security features, remote-control functionality, and ease of use.

The comparison done by Network Computing concentrated on solutions that offered operating system and network integration, advanced security options, and enhanced network installation capabilities (Fratto, 2000). The News-Times Computer News focused on security and connectivity, as well as remote-control functionality (Robinson, 1998). Smart Computing looked at file transfer features, security, and chat capability in addition to remote-control ability (DePasquale, 1996). All three organizations were unanimous in selecting Symantec's pcAnywhere product as their remote-control product of choice.

pcAnywhere

Supported hardware & software platforms

Designed for the PC architecture, Symantec's pcAnywhere was one of the first remote-control software products available. While the current product level (pcAnywhere 32) was developed for Windows/9X, Windows NT, Windows 2000 and Windows ME environments, it is backwards compatible to Windows 3.1 and DOS (DePasquale, 1996).

Connection options

pcAnywhere can be configured to connect via modem, serial port, parallel port, infrared connection, ISDN connection, and several network protocols including TCP/IP, Novell and netBIOS. Access over the Internet is achieved by using the TCP/IP protocol over a dial-up or dedicated connection to an Internet Service Provider.

Security features

Security is a primary consideration when you run a remote-control host on a critical system, especially if it is networked to other systems on campus. You can setup passwords at both the host and guest system to protect the configuration data from being viewed or modified by unauthorized people (Rockett, 1999). Several levels of data encryption can be invoked to protect data transferred between the systems. You can even blank the host screen and lock the keyboard and mouse so that people present at the host site cannot observe confidential information.

File transfer

pcAnywhere provides a File Manager window of files and directories for both the guest and host systems. You can drag and drop, select a group of files or directories to transfer, and synchronize (or clone) files between systems. Files are compressed for transmission and transfers can be restarted from where they left off if the connection temporarily drops.

Miscellaneous functions

Drive mapping, virus checking, and interactive chat between the guest and host systems are also supported by pcAnywhere.

Demonstration

During the interactive session, features and functions of pcAnywhere will be presented to demonstrate how the educator might use this remote-control computing tool.

Software Installation

The minimum system requirements to run pcAnywhere are:

486sx 25MHz processor or higher
16 MB of RAM (20 recommended)
32 MB of hard disk space
VGA video minimum
Windows 95/98, Windows NT Workstation and Server 4.0
CD-ROM drive

Installation is very simple and can be accomplished in just a few minutes. Just load the distribution CD into your drive and select "Install Software". An installation wizard is loaded that guides you through the process. Documentation and technical manuals are also included on the distribution CD.

Host Setup & Operation

For the demonstration, a host system will be setup to allow remote control over the Internet. To create a host environment, start the pcAnywhere program, and then click on the "Be a Host PC" tool bar icon. Next double-click on the "Add Be a Host PC Item" icon to start a wizard to guide you through the process. The first thing you must enter is a name for this host session. Next, select the connection option you want to use. Since this is for an Internet connection, you select TCP/IP. That's all there is to it. The wizard will ask if you want to start the session immediately. It will also add an icon to the "Be a Host PC" folder and you can select it whenever you want to start the session.

In order to link to this session for remote control, the guest computer will need to know the TCP/IP address of the host computer. To get the TCP/IP address, connect to the Internet through your Internet Service Provider (ISP), and then start your pcAnywhere host session. The TCP/IP address will be displayed on the pcAnywhere window.

Remote Setup & Operation

To create a guest environment to control a host session over the Internet, start the pcAnwhere program, and then click on the "Remote Control" tool bar icon. Next double-click on the "Add Remote Control Item" to start a wizard to guide you through this process. The first thing you must enter is a name for the remote-control session. Next, select the connection option you want to use. Again, since this is for an Internet connection, you select TCP/IP. This window also asks you for the name of the computer running the host session. Leave it blank and end the wizard without starting the session.

Now right-click on the remote-control icon you just created and select "Properties" from the menu list. Click on the settings tab and enter the TCP/IP address of the host computer into the "Network Host PC to control or IP address" field provided. Click on "OK" and you're ready to start your remote-control session. To start it up, connect to the Internet through your ISP, then start pcAnywhere. The systems should connect in just a few seconds.

Security

Passwords can be entered for the guest and host sessions that will restrict the ability to view or modify the configuration of the sessions and to prevent unauthorized people from starting the sessions. This is done by selecting the "Protect Item" tab from the session properties dialog window. Simply enter the password and select the level of security wanted.

The keyboard and mouse of the host or remote system can be disabled from the settings tab, and data encryption levels are selected from the security options tab. You can also blank the host screen from the security options tab.

The host session also allows you to set up a folder of authorized callers and the passwords required for them to gain access to the host system. This is done from the callers tab. This is where you also configure what resources a given user has access to on the host.

Remote-Control

Once the guest and host systems are communicating, you can begin remote control operations immediately. You can literally do anything a local user could do (provided it isn't restricted by the security options), including linking to networks and other equipment connected to the computer.

File transfer

While you're in remote-control mode, you can begin file transfer activities by clicking on the "Load file transfer" icon in the pcAnywhere tool list. This starts the pcAnywhere File Manager window that allows you to navigate through the files on both systems, including network drives. To send a file, select it from one of the navigation windows and press the Send button. You can also select groups of files and folders to transfer. Other feature will be demonstrated as time permits.

Academic Simulation

The interactive session will include the simulation of student assistance and administrative uses for pcAnywhere to demonstrate how it can become a useful component of our information system resources.

Conclusions

Remote-Control computing has a place in the software portfolio of the academic user. It has many uses in the areas of student assistance, administration, research, and telecommuting. As our information systems become more network centric, and we look at using Internet technologies to deliver education, we must develop skills at using tools that can help us provide better support and assistance to our students. Remote-control computing can help us provide this support and be more productive at our administrative tasks.

References

DePasquale, E. (1996). Remote Control Software: Extending The Boundaries Of Your Office -- Guide Series: Computing Basics, September, 1996, Vol. 4, Issue 9

Doherty, S. (2000). Remote Control Saves Steps [63 paragraphs]. Network Computing [On-line]. Available: http://www.nwc.com/1102/1102f3.html [2000, Nov 7].

Doherty, S. (2000). PC Duo 5.03: Remote Control Takes Hold of the Enterprise [11 paragraphs]. Network Computing [On-line]. Available: http://www.nwc.com/1114/1114sp3.html [2000, Nov 26].

Fratto, M. (2000). Take Charge Of Enterprise Resources With Eight Remote-Control Solutions [62 paragraphs]. Network Computing [On-line]. Available: http://www.networkcomputing.com [2000, Nov 26].

Krause C. (1998). From a Distance: Remote Operation of Research Equipment. *ORNL Review*, v30n3-4.

Robinson, P. (1998). Computing by Remote Control [35 paragraphs]. TheNews-Times Computer News [On-line]. Available: http://www.newstimes.com/archive98/apr2998/cph.htm [2000, Oct 27].

Rocket, W. (1999). Symantec pcAnywhere 9.0 Is Just Right for Control Freaks [17 paragraphs]. Network Computing [On-line]. Available: http://www.nwc.com/1023/1023sp3.html [2000, Nov 14].

Winfiles (1998). Windows 95/98 Remote Computing Tools. [42 paragraphs]. Winfiles.com [On-line]. Available: http://winfiles.cnet.com/apps/98/remote.html [2000, Oct 27].

The Use of Instructional Technology to Enhance Teaching Outcomes on Site and at a Distance

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Abstract: Constant changes in technology are a major threat to the survival of traditional education systems. Instructional technology (IT) has to become a major component to the educational system to help teachers effectively and efficiently integrate new media in their teaching. Several factors such as a greater demand for technological learner graduates, the teaching of knowledge for distant learners and a more effective delivery of the curriculum influence the use of IT in academic institutions. The author of this article will present a practical framework to help faculty and academic staff to incorporate IT into the teaching process.

Introduction

Ample computer and Web-based resources, technologies, and media installed in several academic institutions (Schools, Colleges, and Universities) are not used either efficiently or effectively to enhance teaching on site or at remote locations. On one hand, teachers use very little computer resources and instructional technology in their teaching. Methods of instruction do not include the use of Web-based and computer resources. In several situations, development programs for faculty fail to incorporate modern technologies as resources for instructional units. On the other hand, educational budget cuts and a greater demand for technological learner graduates force higher educational systems to incorporate instructional technology in the curriculum. Morrison (1999) focuses on the challenge that learners needed to be well prepared to face new highly-technical skilled jobs in a world market where the professional knowledge base is rapidly changing. The author mentions that these students should be able to use information and communication technology tools competently.

The objective of this paper is to describe the factors influencing the incorporation of IT in Schools, Colleges and Universities, to present a framework for integrating IT in the teaching process, and to examine the use of a Web-based instructional model (WBIM) with sound instructional design principles.

An assessment of the factors influencing the use of IT in academic institutions

Due to external factors such as education and government policy, education systems have to do more with less resources (budget cuts in education), and a greater demand for technological learner graduates require teachers to use modern media to create teaching prototypes and deliver the course contents. Internal factors such as better network and communication infrastructures, wide installation of computers on the campus, pressure by the learner body for incorporating modern media in teaching. However, several barriers as Garland (1995) describes in his paper are major factors to be considered by the instructional technologist for the diffusion and adoption of IT: individuals including cultural traditions, lack of knowledge, cost issues, infrastructure (if cost savings do not justify major changes in the infrastructure), and user acceptance. The author mentions that

> "the culture developed within an institution can act as a barrier to change, ...the difficulty encountered with transplanting the open classroom approach from Great Britain to United States during the 1960s is a good example of this (p. 254).

Jacobsen (1998) points out in his paper that academic institutions have great difficulty in integrating computer technology for teaching and learning in higher education. He also mentions that many faculties are highly motivated to integrate computer into the teaching process, but schools provide poor financial and technical support for the use of technological media. The literature describes several barriers that are impediments to integrating technology in the curriculum: lack of time to develop instruction that uses technology; lack of computer resources in the classroom and no connectivity to the Internet; old classrooms without new technological media; poor technical support for the incorporation of computer and Internet resources to the curriculum; inadequate financial support for computer and Internet integration in the creation of open learning prototypes and its delivery; too few computers for the number of learners; inadequate training for staff and faculty; inadequate financial and technical support for the development of instructional uses of Internet services and computers; poor planning and lack of coordination of computer and internet resource usage in the curriculum; and poor assessment and control of the computer-mediated resources uses in the classroom and at a distance

A framework for integrating IT in the teaching process

Over time, the teaching environment evolved from a closed traditional classroom to a open virtual classroom. The field of technology has evolved from an information technology era to a communication-networking technology environment where teachers and learners can exchange ideas and knowledge. Figure 1 presents the technologies that are needed to support teaching and learning in higher education. With the introduction of new media and technology for learning and teaching, academic institutions have begun to enrich their once impersonal lecture classes using E-mail, discussion groups, and personal Web pages (Perrone, Repenning, Spencer, and Ambach, 1997). However, institutions will have to be cognizant of the pros and cons of instructional technology used in the curriculum.

Kurshan (1990) states that telecommunications must become a part of daily classroom activities. A practical framework must exist for incorporating IT into the curriculum. First, the academic institutions have to implement an efficient network infrastructure (LANs and WANs) to support the communication infrastructure as shown in Figure 1. If these infrastructures are not working properly in synergy, the faculty will not be able to develop effective open learning systems. Academic institutions have to create computer services centres (Web help desks) and instructional technology centres to support teachers in the development of open teaching prototypes (St-Pierre, 1998). Several academic institutions have a network to store and deliver distance-learning courses. The teachers should use the Web server on the Internet to store and deliver teaching materials and services to the learners.

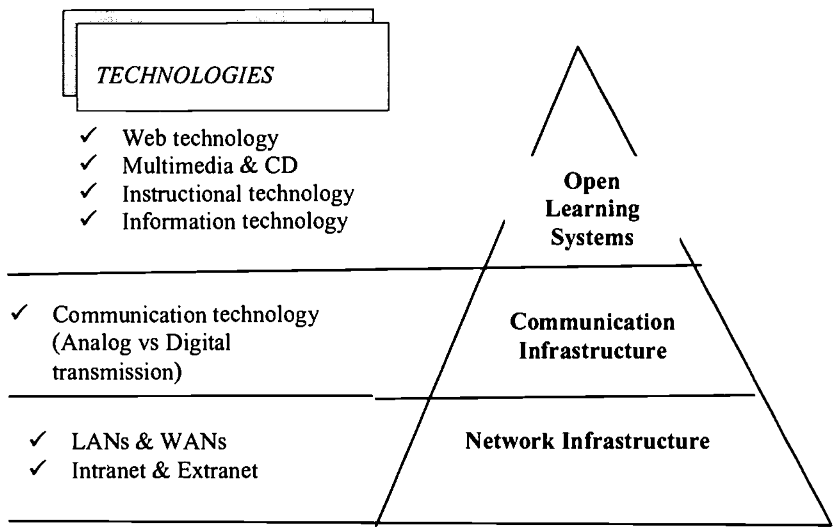

Figure 1: The technologies in support of teaching and learning

The use of a Web-based instructional model for teaching and learning

Crossman (1997) and Rossner & Stockley (1997) see the Web as an instructional technology tool comprised of a variety of media with the potential to carry substantial information to a great number of people all over the world. In their research, Shaw and Gaines (1996) experimented with the application of the Web to undergraduate collaborative learning and the development of special-purpose tools supporting the learning process via the Web. With the constantly increasing popularity of the Internet, distance learning becomes available to everyone. The Web could become an effective delivery system for the courses on site and at a distance. Academic institutions should establish incentives to encourage the teachers to use the Web technology for creating open learning systems as shown in Figure 2.

Modern Web communication media such as Web bulletin board, chats, e-mail, Web audio and videoconference systems present a good communication platform to exchange ideas, homework, and course materials for the teachers and the learners. There are several Web authoring tools on the Web, such as WebCT, Lotus Learning Space and the Blackboard, that help teachers to design open teaching prototypes. Butler (1997), using a multiple-case study, builds several Web-open teaching prototypes, and views the Web as an educational tool for bringing outside knowledge into the classroom and opening the classroom to the world.

OPEN LEARNING SYSTEMS

- E-mail
- Listserv & bulletin board
- Chats (text, sound & video)
- Search engines
- Java, CGI and VB scripts
- Imaging technology
- Sound and video clips
- HTML Web pages and PDF Web pages
- Web authoring tools
- Others (virtual reality, electronic commerce, .XML,.)

Figure 2: The use of Web technology for creating open learning systems

The use of sound instructional design principles for Web-based teaching models

Ritchie and Hoffman (1997) feel the Web, with its constant change in technology, provides a dynamic platform wherein sound instructional design principles could be incorporated to present teachers and learners with a more intuitive, interactive, and easy-to-use medium. Teachers could create maps to guide the learners through their learning paths. Online delivery using the Web is a means of fully augmenting or replacing other methods of teaching and learning. Mediated forms of delivery using the Web make it easy to update dynamic, constantly changing information. A well-designed Web-based instruction provides an efficient delivery medium for the teacher and an attractive content for the learner on site and at remote.

A list of instructional design principles should be considered while the teacher is developing Web-based teaching prototypes (St-Pierre, Bettin, Dilliger, & Ferraro, 1999). The instructional designer should introduce sound design in the Web-based learning prototype such as a good navigation structure to help the learner to navigate nicely the Web course without being frustrated. He/she should insert images to attract the learner to key components of the learning prototype such as course objectives, course materials, online tests and assignments. The Web course should clearly identify learning objectives early in the course and define precisely what is expected from the course. The open learning prototype should include learning and discussion activities to involve the learner actively in the learning process. Guidance and quick feedback such as a help function and interactive forms could guide the learner to a more appropriate learning path.

Online tests should exist to assess the students' learning and to assure that the learners have integrated the desired knowledge. The open learning prototype should provide communication media to allow the student to exchange ideas with his/her peers and the teacher. Technical and moral support is a necessary ingredient for distance learners so he/she will be encouraged to complete the course.

During the design of a Web-based learning system, instructional strategies need to be diverse and robust. For example, a distance course needed to be supported by online materials with the learners, collaborative technological media, such as videoconferencing, and communication media, such as e-mail, for a better learning environment. The strategy will move away from the traditional rule-based, procedure-oriented mode to a more dynamic, interactive learning mode. In designing a Web-based open teaching course for distance education, a set of criteria have to be defined for its success and effectiveness: enhances student-to-student and faculty-to-student communication, encourages students-share perspectives, enables student-centered teaching approaches, accommodates varied learning styles, provides opportunities for exploration and discovery, promote additional rehearsal time, provides 24/7 accessibility to course materials, provides just-in-time methods to assess and evaluate student progress, and adds pedagogical benefits such as providing self-testing (Porter, 1997; Pahal & St-Pierre, 1999). The author developed web-based instructional models that meet the above criteria (StPierre, 2000).

The author of this article believes that Web media and technology should be used simultaneously in the teaching and learning processes, i.e. there should be equilibrium between the left-hand side (teaching) and the right-hand side (learning) of the equation with respect to the uses of Web resources in the curriculum. If the teachers were using Web media in the delivery of course contents, the learners should be learning how to integrate these tools into their learning process and vice versa. The technological delivery platform for the curriculum is ineffective if the learners are frequent users of Web resources and technology in their learning process; whereas, teachers do not know how to integrate these media into their teaching process. Based on the author's experience in using technology in teaching for several years, the author firmly believes that Web media and technology have to be in equilibrium if the institution wants to effectively deliver the curriculum. For instance, Athabasca University, located in Edmonton, Alberta, offers a Lotus notes environment where teachers and students use the same media and technology to do collaborative work. Surveys showed that Athabasca University rank among the best distance education schools in business that promote learning outcomes and provide rich learning experiences with asynchronous learning media such as bulletin boards and database discussions.

Conclusion

IT plays an important role in educational systems as it brings new media and technologies to the teaching world. Continuous changes in technology create major changes in educational systems, and IT has to evolve to help teachers bring new teaching media and instructional strategies in the classroom to deliver the curriculum (Salisburry, 1996). Teachers have to learn these new media to enhance the teaching process.

Young learners are brought up in a multimedia environment and they expect to find a similar learning environment when they come to institutes of higher education. The field of instructional technology is evolving, especially due to the change in multimedia (CD-ROM), Web, networking, and communication technology. We are living in a communication age and open learning systems will dominate traditional classrooms. The Web teaching tools and services now available such as Bulletin Boards, chat rooms, Web pages, listserv, e-mail, etc., are present in this society and will be more effective than the old methods for many aspects of teaching.

In conclusion, IT will play an important role in the 21st century with the advent of new media and technology, and a younger teaching body that will be motivated to work in an open-learning environment. Distributed knowledge database will be available to any learner at any time as educational systems will promote the development of sound instructional teaching systems. E-commerce will promote the development of electronic education malls where teachers and students can communicate and interact using University-based telelearning approaches (Langenback & Bodenforf, 2000). The teacher will play the role of a facilitator and/or a mentor in several teaching instances.

References

Butler, B. S. (1997). Using the Web to support classroom-based education conclusions from a multiple-case study. In B. H. Khan (Eds.). Web-Based Instruction (pp. 417-423). Englewood Cliffs, NJ: Educational Technology.

Crossman, D. M. (1997). The evolution of the Web as an emerging instructional tool. In B. H. Khan (Eds.). Web-Based Instruction (pp. 19-23). Englewood Cliffs, NJ: Educational Technology.

Garland, K. P. (1995). Diffusion and adoption of instructional technology. In Anglin, G. J. (Eds.). Instructional Technology: Past, Present and Future (pp.253-257). Englewood, CO: Libraries Unlimited.

Jacobsen, D.M. (1998). Adoption patterns of faculty who integrate computer technology for teaching and learning in higher education. Proceedings of the ED-MEDIA AND ED-TELECOM 98: World Conference on educational Multimedia and Hypermedia & World Conference on Educational Telecommunications. Freiburg, Germany, June 20-25, 1998.

Kurshan, B. (1990, March). Educational telecommunication connections for the classroom - part 1. The Computing Teacher. 30-35.

Langenback, C. & Bodendorf, F. (2000, September). The electronic education mall: A virtual service center for distance learning. International Journal of Electronic Commerce. [On-line Web page]. Available HTTP: http://www.cba.bgsu.edu/ijec/v4n2/p005.html

Morrison, J. L. (1999, February). Transforming the role of students and teachers in the information age. [On-line Web page]. Available HTTP: http://horizon.unc.edu/horizon/online/html/

Pahal, D. & St-Pierre, A. (1999). Distance delivery on the Internet platform. Presentation at the Sunrise Session, Nova Southeastern University: Fort Lauderdale, Fl.

Perrone, C., Repenning, A., Spencer, S. & Ambach, J. (1997). Computers in the classroom: Moving from tool to medium. Conversation, Vol.2 (3), 1-13. [On-line Web page]. Available HTTP: http://www.usc.edu/dept/annenberg/vol2/issue3/perrone.html.

Porter, L.A. (1997). Virtual classroom - Distance Learning with the Internet. New York: John Wiley & Sons Inc.

Ritchie, D. C. & Hoffman, B. (1997). Incorporating instructional design principles with the Web. In B. H. Khan (Eds.). Web-Based Instruction (pp. 135-138). Englewood Cliffs, NJ: Educational Technology.

Rossner, V. & Stockley, D. (1997). Institutional perspectives on organizing and delivering Web-based instruction. In B. H. Khan (Eds.). Web-Based Instruction (pp. 333-336). Englewood Cliffs, NJ: Educational Technology.

Shaw, M. L. G. & Gaines, B. R. (1996). Experience with the learning Web. In P. Carlson & F. Makedon (Eds.). Proceedings of ED-TELECOM 96 : World Conference on educational telecommunications. pp. 320-325. Charlottesville, VA: Association for the Advancement of Computing in Education.

Salisbury, D. F. (1996). Five technologies for educational change: Systems thinking, systems design, quality science, change management, instructional technology. Englewood Cliffs, NJ: Educational Technology Publications

St-Pierre, A. (1998, December). A proposal for an instructional technology and media center for distance educators. [On-line Web page]. Available HTTP: http://www.magnet.ca/stpierre/research/center.html

St-Pierre, A., Bettin, A., Dillinger, L., & Ferraro, S. (1999). Applying system design principles to the design of web-based training systems. WebNet Journal. July-September.

St-Pierre, A. (2000). A Web-instructional model for a business data communication course. Department of Decision Sciences & Management Information Systems, Concordia University, Montreal: Canada.

How On-Line Collaborative Study Improve Human Cognition
A perspective on the evolution of modern education

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Abstract: This paper is a research to investigate the growth of Internet which will give rise to new adventure of teaching and learning strategies in the decade to come. A series of more recent education approaches that come into play will be examined by addressing their advantages versus shortcomings to identifying why they have come to contribute the collaborative study method and how they are taking shape in the new education trend. The principle of "Collaborative Study" and how it fits appropriately and closely into the modern network media revolution will be demonstrated and explained. Virtual Learning and developing highly effective human cognition techniques through investigative problem solving, thinking and creativity are the major components that will assist the success of Collaborative Study and in fact new ideas in education. This research also brings teaching and learning to a higher level by exploring collaborative study and modeling it as the future education template to be deployed countrywide in Taiwan.

Introduction

The idea of Open Study in this context is to tailor the instructional materials and methods to individual who undertakes the study. The nature of Open Study consists of the following features: Great emphasis on individualism; Learning by exploring subjects of interest; Learning through getting in touch with real world problems; A wider domain of teachers and professions; Student-dominated teaching-learning process in contrast to instructor-dominated.

The arrival of on-line or Web-based Information retrieval in learning the environment also opens the possibility of fulfilling Open Study. While the idea of Open Study is beginning to take shape in modern education practice, the Summer Hill School in England has blazed the trails in this new area. Students are the center of the school and they can also determine the content of what they can study and the way of life in the school f(Van Vliet, 1999). Students' creativity should never be hindered by the heavy, century-long pedagogy and rules (Khan, 1997). Another example in a Japanese primary school also reveals that real world problems are amongst the best materials to use for instruction purposes, and organizing instructional and curricula should accommodate differences between students. Through this combination of features, Open Study sets forward a clear image for developing a new education strategy: *Student-oriented; Problem-Solving, and Creativity-Enhancing.*

The Internet provides an ideal setting for Open Study by its nature of being individual-orientated and irrespective of time and space. Despite the fact that adopting the Internet as a major channel and media is currently favored by most educational practitioners, there are still some limitations to be overcome by Open Education's developing community before the approach can become mainstream in Taiwan. For instance: The Fear from Parents, Bridging the gap between open education Curriculum and Current School Curriculum, Lack of Measurement of Study Performance, Parental Guidance and Control and The Need to be more Convincing.

Findings

The idea of collaborative study will let learners be equally and mutually.treated and respected and thus this, in turn, pushes learners to become more willing to carry out study in this specially catered environment. The gain is mutual and this provides a fearless environment that is rarely sought in conventional schooling (Barron & Ivers, 1998). "Collaborative Study" is achieved by grouping and sharing topics of interests. Collaborative Study has been identified the most effective approach among individual tutoring, studying by competition and collaborative study that are currently deployed by many primary schools and high schools in Taiwan. In fact, this study method can also promote student awareness and participation in community and social skills. Highly Effective Cognition technique is essential to collaborative study. The job of any teacher/instructor is to clearly identify and rectify what students need most (Forcier, 1999). However, in the virtual learning world, teachers and students are altogether taking up the roles of learners and students in fact need to be able to know what to grab as their highest priority. In the interests of developing individualism of value and practice, the collaborative study aims to bring students to the upper level of the pyramid of human cognition.

Unresolved problems will often stimulate the creation and persistence of human's thinking capability. The term "Problem" which is different from "Question", has the following distinctive characteristics (1) More than two variants exist in a special manner and relation; (2) the relation between variants can stimulate seeking a solution to the problem or exploring the "how" and the "why" of the concerned topics. There are various levels of study in which learners might receive a problem in different ways (Drake, 1967). Organizing highly effective levels in study complexity and exploration requires clear distinction of the purposes of study and its relationship and coherence in context.

The government in Taiwan is looking at how to best qualify teachers in primary and high school systems to be able to adapt to new thought and technology. Meanwhile, government has been aware of the consequence resulting from the training of most teachers in the fundamental school system. Invention can be difficult because most teachers were not themselves trained in such a way. Providing new channels and media of education for adult learners and teachers becomes the responsibility of national education policy.

Taking a psychological perspective of Internet communities, the problem arising from over-indulgence of on-line resources and improper relationship between information provider / service provider can harm people enjoying the education through surfing the Net. In implementation of study on the network webbed by the Internet communities, education practitioners have to be very aware of the danger caused by negative aspects of the Internet. Developing high quality of human cognition through developing creativity poses a contrasting revolution to the long tradition in Taiwan where more focus is on memorizing skill and less focus on realizing the significance of how to think. The first step toward the cultivation of thinking capability in school is Knowledge. These changes in form of knowledge in modern society will have significant meaning and raise new questions in education: how to define knowledge, how to best capture the knowledge and how best to make use of it. Psychologically, creativity is based on a fundamental mastering of the subject of interest and then carrying out certain levels of exploration and taking risks of desired proportion. This involves a thinking process in which an in-depth understanding of required "Knowledge" is essential (Drake, 1967). Thinking, by the definition in psychology, is a process of mental activity. There are two types of thinking, one related to the situation where the learners stay and another one related to the cause-effect.

Problem-solving and Collaborative study can enhance the outcome of study by giving more freedom to the student, creating a better opportunity of demonstrating both teachers' and learners' inventions, evoking study by virtually placing students under real-world constraints and environment and emphasizing an active study approach. Therefore, Problem-solving and Collaborative study open a window in introducing new ideas of education.

Conclusion

Teachers in this age should learn to adapt to new technologies and models of teaching and learning, particularly in this age of rapid technical advance. The enormous potential of applying the Internet into education community will extend both teachers' and students' creative skills that are required in changing society. High quality study must be assisted by advanced skills and mental training strategies, such as those discussed in this article. Education policy-makers should also examine many possible ideas and aspects of knowledge to clearly see what society is heading for.

References

Barron, A and Ivers, K. (1998). *The Internet and instruction: activities and ideas.* Englewood, Colo.: Libraries Unlimited

Khan, B. (1997). *Web-based instruction.* Englewood Cliffs, N.J. : Educational Technology Publications

Drake, W. (1967). *Intellectual foundations of modern education.* Columbus, Ohio, C. E. Merrill Books.

Van Vliet, L. (1999). *Media skills for middle schools : strategies for library media specialists and teachers.* Englewood, Colo. : Libraries Unlimited.

Forcier, R. (1999). *The computer as an educational tool : productivity and problem solving.* Upper Saddle River, N.J. : Merrill.

Impact of Technology on Student Socialization in the Classroom

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Abstract: The use of technology and computer mediated communication is changing the lives of students in the classroom. Research is beginning to emerge examining the effects that technology is having on the social behavior and adjustment of students. Computers and technology are influencing the interactions between teachers and students, as well as other interactions in a student's life. Research is sparse at this time as to the effects of this new form of communicating, however, it appears that it can have many positive as well as negative impacts on students development and adjustment. The use of technology appears to down play the importance of social contact and may lead many students to not develop the necessary social skills to function in the world. This article exams the impact that technology may have on educators will be cognizant of the potential social and developmental pitfalls that can occur when blindly implementing technology into the educational process.

Introduction

The use of computer mediated communication continues to grow in today's society and the impact of this new technology is just beginning to be investigated. Scholars and technologists believe that advances in technology and computers are altering people's lives in numerous ways (Atewell & Rule, 1984; King & Kraemer, 1995). Although, most researchers would agree that technology is changing the lives of people, the question still remains open to what extent the use of these technologies is influencing student's academic achievement and social development. Research is beginning to emerge examining the effects that technology is having on the social behavior and adjustment of students. The extent and influence of technology on student development will remain an open debate for years to come. This article reviews some of the more pertinent findings and thoughts on the influence of technology on student development.

By 1998, roughly 40% of all U.S. homes owned a personal computer; about one third of these homes had access to the Internet, with these numbers increasing on a daily basis (Anderson, Bikson, Law, & Mitchell, 1995; Attewell & Rule, 1984; King & Kraemer, 1995). It can be assumed that as households increase there exposure to technology, students living in those households will be increasingly exposed to and use technology. With these technologies the availability of alternative modes of interacting and spending leisure time has changed. Individuals and students may be spending more time interacting with technology than in more traditional activities. Internet, e-mail, and chat rooms have become a major form of communication and social interaction for millions of individuals in general and students in particular. Although the Internet has many uses (communication, commerce, information source, etc.) the dominant use for most people is interpersonal communication (Kraut, Mukhopadhyay, Szczypula, Kiesler, & Scherlis, 1998). With personal computers becoming an integral aspect of our lives, researchers are questioning whether computers, Internet, e-mail and chat rooms are enhancing or hindering individual's personal wellness and social involvement (Kraut, et al., 1998). There is little question that online relating will increasingly become a major way in which teachers and students interact on a daily basis in the classroom. In addition students at home are spending a great deal of time on computers, Internet, E-mail, chat rooms and playing games like "Dungeons and Dragons". The extensive and continued use of computers in the classroom, at home and in the world may be becoming a problem for students and society in general as students and individuals spend more time interacting with technology and not each other.

Computers and technology have become an important and integral aspect of student's education. Teacher-student interactions, student friendships, family relationships and students socialization is being influenced by technology. Researchers differ as to whether technology is a positive tool with the power to change schools and revolutionize students' learning or a force that can undermine students' education and social development. Lepper & Gurtner (1989) indicated that the potential positive effects of computers on students' growth pertain to using the computers as personal tutors, multipurpose tools, and the motivational and social effects of computers. Research has consistently demonstrated that the effects of computer assisted instruction is generally positive. In fact, the effects are more positive with programs involving tutorials rather than drill and practice, with younger rather than older students, and with lower ability than average or unselected populations (Lepper & Gurtner, 1989). For learning, computers are excellent mediums for students facilitating an open-ended, exploratory and experiential learning environment. Collins (1986) found that computers are helpful in particular for improving adolescents' writing and communication skills.

Impact of Technology on Student Development

Additionally, research has appeared indicating that computer use has a positive influence on student's development. Lepper (1985) believes that computers make learning more internally motivating. Other computer advocates believe that computers make learning more fun, increased computer use in school will add to increased student cooperation, collaboration as well as increased intellectual discussion among students (Becker & Sterling, 1987).

Some of the possible negative effects of computers on student growth in the classroom pertain to regimentation and dehumanization of the classroom and shaping of the curriculum. While some students may prefer to work alone, and learn while progressing at their own pace others students may rely on social interaction and cooperation to learn and may need guidance by the teacher (Malcom, 1988).

In the classroom setting, students interact with students, teachers and administrators on a daily basis. They learn that many real world relationships begin with face-to-face (FTF) contact. In FTF interaction students make quick judgements based on physical attributes and other observable qualities while beginning a relationship. This has been the traditional way of initiating relationships for many years and will continue to be important in the future. With the use of computers in the classroom or at home, electronic relating offers a different format of interaction compared to FTF contact. Use of these new technologies may lead to a decrease in social contact as students spend more and more time on computers in school and home and less time with other individuals. The reliance on technological mediated communication may not allow students to develop and practice the socialization skills that will be necessary for future success. Early research investigating the importance of social contact (Gove & Geerken, 1977) found that when people have more social contact, they are happier and healthier. Currently, some researchers argue that the Internet is already causing students to become socially isolated as they spend hours in front of their computer communicating with other Internet users in the evenings and all day during school hours (Stoll, 1995; Turkle, 1996) and not in physical social contact with others. Time spent at the computer prevents many students from physical activities, social interaction, and outside activities. In addition, for some students staying up all night on line, in chat rooms, or playing games prevents them from getting necessary sleep and some cases not completing homework or interacting with friends or family. Clearly, technological and communicational advances are continually influencing society in general. However, due to the personal nature of some of these technologies and ease of access, the impact on education processes, students' socialization and development appears to be greatly influenced.

Current Evidence and Theory

The research to date on the impact of computer and Internet use on social relations is spare. However, some theoretical positions have been posited concerning the use of electronic mediated communication in forming social relationships and the potential effects of this new relating style. It is possible that negative or positive effects of the Internet may be related to the balance of strong or weak ties that people can generate and maintain with others (Kraut, et al., 1998). The Internet potentially reduces the importance of physical contact in developing and maintaining networks of strong ties due to the fact that communication via the Internet does not depend on the distance between parties. This may have severe consequences for students, as part of the education process is not only academic learning, but also learning many of the social skills that will be needed in life. With educators relying more and more on technology and distance education, it may be decreasing the opportunity for students to interact with others (students and teachers) in a personal way which leads to the development of appropriate socialization skills. With electronic relating becoming very appealing to some individuals (Schnarch, 1997) as a way of relating and gaining support without the risk of FTF interaction, students and individuals may be forgoing experiences that would lead to the development of appropriate social skills that will be needed in the future.

As computer technology and the Internet infiltrate every aspect of student's lives and as a possible negative consequence of technology and computers, marriage and family therapists are encountering clinical cases in which these technologies are having a serious impact. Many clients are involved in Internet usage, and cyber-dating/relating as an everyday part of communicating and developing a social network on the computer, while in some cases ignoring their friends, families and significant others.

Evidence is supporting possibly a new type of clinical disorder that will impact society, namely "Computer/Internet Addiction" (Young, 1996). This addiction refers to students and individuals who spend the majority of their time interacting with computer technology and using the Internet for a variety of purposes, while not spending time in more traditional social and recreational activities. These students and individuals would appear to have a preoccupation with the use of the computer and Internet as a centralized activity in their life. Based on current data, "Computer/Internet Addiction" and online relating will continue to increase and become a major way in which individuals and/or students interact or not interact and function on a daily basis. It may also be construed that this is leading to greater social and civic disengagement, which will have an even greater effect on individuals in society.

Griffiths (1997) in reviewing the available data on "Computer/Internet Addiction" stated that it is an area worthy of further research. Specifically, "Computer/Internet Addiction" research need to focus on its effects on students. In response, investigations of this phenomenon have found a specific personality type that tends to become addicted to the Internet. Shotton (1991) found that predominantly object-oriented males are more likely to become addicted to the computer and Internet. This addictive personality type was investigated and described by Hybels (1995). He suggested that the typical addict is a teenager, usually male, with little social life and self-confidence. Internet relating and relationships offer lonely or emotionally isolated people the opportunity to talk easily and conveniently to strangers instead of being open with themselves about their difficulties in relationship development (Shaw, 1997). Clearly, the introduction of technology into the classroom and educational endeavors may be providing students who are in need of help with social relations, an opportunity to fulfill some basic needs for relating. While at the same time ignoring the potential impact that this may have on their long term development.

Conclusion

Currently, the impact of computers and Internet usage on individual's, their relationships and families are difficult to evaluate. Based on the recent influx of clinical cases with a computer/Internet-related concern it has become apparent that this is an emerging area of concern and research. Clearly, the question is still out on whether computer and Internet use in general has a negative or positive impact on individuals, students, their relationships or other aspects of development. It is possible that the influx of technology may have both positive and negative effects and by only examining the issues can we develop and implement technology in a way that will have the most benefit while keeping the potential negative effects to a minimum. It is clear that technology can be implemented in a manner that does eliminate many of the traditional roles of the educational process, which include the learning of social rules and relationship development. It is hoped that educators will be cognizant of the potential social and development pitfalls that can occur when blindly implementing technology into the educational process. By being aware of these pitfalls, educators can better devise technological rich learning environments that meet the needs of the whole student and not just the students academic needs.

References

Anderson, R.H., Bikson, T.K., Law, S.A., & Mitchell, B.M. (1995). *Universal access to e-mail: Feasibility and societal implications*. Santa Clara, California: Wiley and Sons.

Attewell, P., & Rule, J. (1984). Computing and organizations: What we know and what we don't know. *Communication of the ACM*, 27, 1184-1192.

Becker,H. J. & Sterling, C.W.(187). Equity in school computer use: National data and neglected considerations. *Journal of Educational Computing Research,* 3,289-311.

Collins, A. (1986). Teaching reading and writing with personal computers. In J. Oransanu (Ed.), *A decade of reading research: Implications for practice.* Hillsdale, NJ: Erlbaum.

Griffiths, M. (1997). Psychology of computer use: XLIII Some comments on "addictive use of the Internet by Young". *Psychological Reports*, 80, 81-82.

Gove, W.R., & Geerken, M.R. (1977). The effect of children and employment on the mental health of married men and women. *Social Forces*, 56, 66-76.

Hybels, S. (1995). Terminal Addiction. *Internet and Comms Today.* No. 4, May Issue.

King, J.C., & Kraemer, K.L. (1995). Information infrastructure, national policy, and global competitiveness. *Information Infrastructure and Policy*, 4, 5-28.

Kruat, R., Mukhopadhyay, T, Szczpula, J., Kiesler, S., & Scherlis, W. (1998). Communication and information: Alternative uses of the Internet in households. In *Proceedings of the CHI 98*: New York: ACM.

Lepper, M.R., & Gurtner, J. (1989). Children and computers: Approaching the twenty-first century. *American Psychologist*, 44, 170-178.

Lepper, M. R. (1985). Microcomputers in education: Motivational and social issues. *American Psychologists,* 40, 1-18.

Malcom, S.M. (1988). Technology in 2020: Educating a diverse population. In R.S. Nickerson & P. P. Zodhiates(eds), *Technology in education: Looking toward 2020*, Hillsdale, NJ:Erlbaum.

Schnarch, D. (1997). Sex, intimacy, and the Internet. *Sex Education and Therapy Journal*, 22, 15-20.

Shaw, J. (1997). Treatment rationale for Internet infidelity. *Sex Education and Therapy*, 22, 1-14.

Shotton, M. (1991). The costs and benefits of "computer addiction." *Behavior and Information Technology*, 10, 219-230.

Stoll, C. (1995). *Silicon snake oil.* New York: Doubleday.

Turkle, S. (1996). Virtuality and its discontents: Searching for community in cyberspace. *The American Prospect*, 24, 50-57.

Young, K.S. (1996). Psychology of computer use: XL. Addictive use of the Internet: A case that breaks stereotype. *Psychological Reports*, 79, 899-902.

DISTANCE EDUCATION

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The Internet and asynchronous delivery continue to dominate distance education presentations this year. As web-based learning becomes more commonplace, scholars are turning from writing about discovering the medium to investigating the underlying issues related to designing and evaluating distance education. Instructional design and program development papers occupy prominent roles in the Distance Education section, and the descriptions of exemplary programs include extended discussions of the implications for development across the discipline. Several presentations center on broad management, technical, or cost-effectiveness issues of distance delivery, overall. Video and other delivery media than the web have a place in this year's collection, with studio and desktop video the most regularly occurring.

How distance delivery affects instructional design continues to be the central question in distance education, and that centrality is reflected in the number of papers in this section. Nada Dabbagh addresses the issues that arise in The Challenges of Interfacing Between Face-To-Face and Online Instruction," while Michael Kadlubowski probes the impact of design on faculty in "Is A Paradigm Shift Required In Order to Effectively Teach Web Based Instruction?" Kasprzak and Nixon raise – and significantly answer – the troubling issue of "'Cheating' in Distance Education. Broader considerations comprise the "Kaleidoscope of Designing, Administrating and Teaching Distance Education" in a panel led by Shelia Kieran-Greenbush, Victor Alusine, Pamela Furline, and Elsie Szecsy. "Kaleidoscope" implies many views and many choices, and that variety is explored by Karen Lemoine, who examines the role of "The distance teacher: the ultimate distance learner."

The faculty member's role in distance programming is also the subject of "One size does not fit all: designing distance education Support" by Euncie Merideth and Peggy Steinbronn; while Kevin Oliver and John Moore describe faculty development in the process of "Transitioning from online teaching to online learning." "Web-based instruction: what should we know?" explores the full scope of technical and design skills necessary, in a paper by John Ouyang and James Yao. Technical tools form the center of the discussion of the vital subject of providing education to persons with disabilities, in "Access for all: developing an online course about online courses" by Loye Romereim-Holmes and Denise Peterson.

Equity in distance education extends beyond overcoming handicapping conditions, of course, and Luiz Senna introduces the changing equity picture in "Autonomy and knowledge—comments on distance education design," while Osama Shata and Mohamoud Abaza, in "Distance education: an ultimate subject for teachers and students," and Ya-Ting Yang and Timothy Newby ask "Does distance education resolve the current problems of education?"

Three papers investigate the relationship of learning theory to distance education. In "Using constructionist principals in designing and integrating online collaborative interactions," Blocker and Tucker make a case for a necessary relationship between constructivism and distance education. In "Learning styles and potential relations to distance education" Buboltz, Wilkinson, Thomas, and Jenkins present theory and strategies for meeting the needs of different kinds of learners, as do Jenkins, Buboltz, Wilkinson, and Beatty in "Matching distance education with cognitive styles in various levels of higher education."

Theory and design alone do not characterize distance education, of course. There still is a place for explorations of computer programs and delivery platforms. Five papers present a broad spectrum of technical variety within the general framework of asynchronous delivery. In "The road ahead: the evolution of online learning," Alicia Balsera explores the changes that technology will permit, and require, in the near future, while Hossein Jahankhani presents a cross-discipline review in "How information technology can help education, distance learning."

Some familiar specific technology solutions have a new life in three papers. "Simple is good: course content, electronic mail and the benefits of asynchronous online forums" is Kevin Lee's exploration of text-based tools in student interaction and reaction. The electronic discussion board within otherwise traditional classes is explored by Richard Pountney and Alice Oxholm in "Supporting and evaluating distance learning students' use of an electronic discussion board"; while Web-CT as a delivery platform forms the way Ingrid Thompson-Sellers moved delivery "From "inches to miles": Web-based instruction using WebCT (V 3.1)."

Though many presentations focus either on post-secondary or general issues, training and staff development continues to grow in its importance within distance education. In "A hybrid online course to enhance technology competencies of school principals," Sally Beisser and Peggy Steinbronn describe an approach to the important task of providing graduate education to working school principals. Electronic media sometimes replace printed material, of course, and "A comparative project: web-based faculty development versus print-based faculty development" describes Melissa Diers's analysis of the effectiveness of both forms of delivery. Chris Koble compares distance to face-to-face development in "Action research results: on-line vs. traditional face to face professional development." As distance education closes distances, problems and their solutions continue to be broadly interesting without losing a local flavor, and Marina Moisseeva and Victor Krivoshokov provide a particularly interesting example. "Academic stuff development course for coordinators of distance education: Russian experience" details a national project addressing needs that are perceived world wide.

No form of professional development is more important to SITE readers, overall, than teacher education. The pioneering role of distance education in preservice teacher education programs has only grown, as have the burgeoning needs for electronic portfolios, field experience, and alternative certification. Gerald Burgess and Barbara Holmes describe how to use "Electronic portfolios to support accountability and preservice teacher preparation" in their poster session, while David Gibson focuses on "Online personal learning in teacher preparation." Personal growth and exploration is the focus of Helflich and Putney, in "Reflections of reality: online conversation in a teacher education seminar" and of Stinson and Stanbrough's "Reflections of K-12 teachers on graduate education via distance learning." Discipline-specific preparation, on the other hand is the focus of Allen and Pilant's "The distance education degree program for the master of mathematics with a teaching option at Texas A&M University."

Instructional programs aren't limited to teacher preparation, of course, and four papers present lessons learned from elaborate and innovative projects. Baumbach, Bird, and Eastman present "Teaching & learning online: lessons learned" describes the experiences of a technology resource center, and Krin Bryson presents a poster session on the "SETTEN distance learning project." A national support system is described by Salvador, Santos, and Lima in "UGF Virtual Campus: integrating information, communication and cooperation in the web," while Jean Kueker and Jerrie Jackson ask, simply, "Are we there yet?"

Management and budgeting are never far from consideration by the technology educator, so three papers review issues that concern us all. Dickey and Dickey describe a model for calculating "Cost effectiveness and distance education: a perspective decision," as does Michalski, in "Cost effective electronic course development and delivery via the Internet." Judith Smith, more ominously, describes "Managing the dark side of online courses — while enlightening your online students."

The management considerations across borders and among institutions are the focus of "A survey of internet based distance education" in the United Arab Emirates, by Emad Bataineh, and of the Canadian perspective on "Real concerns on distance education when distances are real" by Leo Wells.

Not all distance education is delivered through the Internet, of course, and video applications continue to grow in popularity as they cost less. Even "Interactive television: the good, the bad, the ugly" interest Allen, Gustafson, Holt, Kysilka, and Dickey. The international implication of "Videoconferencing in practikum of educational studies" is the focus of Jukka Maki's description of a program in Finland, while "The use of two-way audio video at the University of North Texas as a tool for practicum supervision" is a description of a vital link in field experience, presented by Pemberton, Tyler-Wood, Cereijo, Rademacher, and Mortensen.

McBride, Fuller, and Gillan describe the details of Desktop video conferencing: the optimum solution for synchronous distance learning", and Pierrou and Musset present "The use of videoconference in the learning and teaching process: emergence of new mediations?" Then, Zimmerman and Greene detail "Effective strategies for the information highway."

Practice, of course, rides on research. Five papers describe the considerations both practitioners and researchers must make when designing effective models of enquiry for distance education, either for assessing programs or creating knowledge. "Assessing best practices in online learning: A review of the literature" summarizes many of these studies, compiled by Dwyer, Sunal, Giesen, Sunal, and Trundle. Participant opinion in one program is gauged in "Distance learning: Perceived effectiveness and student satisfaction in higher education" by Donna Gabrielle. And

Hartley, Gibney, Heflich, and Strudler describe "Developing standards of quality for educational technology distance education courses." Assessing multiple roles forms the center of "Teacher and developer: compromise for the creation of CSCL applications" by Osuna, Dimitriadis, Martinez and Anguita, while Burcu Tunca predicts "Distance education and what is coming next."

Every reader is touched, in some way, by distance education; none of us is immune to its effects, and few can help feel excited by its implications. The authors of these papers share that interest and excitement. From international programs to innovative research strategies, there is some thing in this section to intrigue, inform, and challenge every reader.

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The Distance Education Degree Program for The Master of Mathematics with a Teaching Option At Texas A&M University

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Abstract: This paper is a report on the planning, development, and implementation of the online Masters degree program offered by the Mathematics Department at Texas A&M University. The degree, which is completely online, is targeted primarily to secondary high school teachers that desire to sharpen their mathematical skills or advance their overall learning, particularly to qualify for teaching positions in community colleges. The issues, far exceeding those of a new program in the traditional form, range from recruitment of students to negotiating intellectual property contracts.

Introduction

In the spring of 1999, the Provost of Texas A&M issued a Request for Proposals to develop online graduate programs. With funds up to $150K available, the RFP attracted many proposals. Fortunately the authors had already established a record of accomplishment of producing Web assisted and Web-based materials. (Allen 1998, Pilant et al. 2000). The next step towards establishing a Web-based degree program was not a large one. There were details, primarily logistic in nature, regarding timetables and deliverables.

In this paper we consider a number of the most important aspects of putting together such a program, making it as generic as possible, so that it may apply to areas other than mathematics. The process is new to most institutions, and the issues are far-reaching. In this paper, we will discuss:

1. Creating the program
2. Designing online courses (two examples)
3. Intellectual Property
4. Publicizing the program
5. The students.

Creating the Program

Making a case for a graduate program to serve schoolteachers is not difficult. The facts of the current educational state of the country make the case for us. The first few lines of our proposal read as follows:

With current State of Texas mandates to offer more AP level courses, the educational needs and demands on the high school teaching faculty of State high schools are greater than ever before. These and state requirements for CEU's (Continuing Education Units) give a ready market of potential students for a distance master's level program in mathematics education that in numbers alone exceeds almost every other potential distance masters program. That this program already exists in traditional format and has graduated many students serves to establish that it already enjoys a credible market.

The need, as we argued, was certain. However, was the desire actually there? That remained to be determined. Programmatically, our department already operates a Masters of Mathematics with a Teaching Option, which has been fully approved by the State of Texas Coordinating Board of Higher Education. Therefore, the implementation of the online program did not require the massive procedural measures of that process.

To complete the program, that is, to obtain a master's degree, the student must complete the **same requirements** as the on-campus student. Students must take 36 hours of courses, of which at least 24 hours must be mathematics courses. Enrichment courses in statistics and education or educational psychology are required, as well. There is no diminution of the course requirements. At present, students must appear on campus to take a one - three-hour comprehensive oral examination to satisfy the degree requirements.

Designing Online Courses

The issues are becoming well known: Before constructing an online course, a Web assisted course, or a Web-based course, it is important to consider the many choices available to accomplish the project (Pilant et al. 2000). We collect a few of the choices of greatest urgency, focusing on the various styles and features that can be brought to such a project. We will also consider some of the logistic details of Web course creation, deployment, and use. Just to mention a few:

- What are the merits of Java Applets?
- How much does it cost to produce a course?
- Can online course be cost effective?
- What about video-streaming?
- What are the basic tools?
- How can we provide help online? Is there really a way to do it?
- What types of skills does the faculty member need?
- How much time does it take?

Full or partial content or textbook-based courses are current choices. The value-added features can make the difference between a mere sequence of Web pages and a truly online course. What sorts of features you add will make the course a success or failure. Content should be relevant. It should be easy to navigate, and your design should be intuitive. The online course should consist of several features: content, links and resources, quizzes, homework problems, navigational devises, and a table of contents. If your course is full content, you must of course write the equivalent of a textbook, a time consuming task, as one knows. Still, writing such a course is sufficiently different from writing a print text that considerable time must go into its creation. This is not the place to describe these features; so, it is best for the author to find examples of online courses and note their differences from a full print text.

If the course is to be primarily text based, then the value of the course is equal to the portion that is value-added to the textbook. For example, if all that is added is the syllabus portion, with assignments, this is little more than a self-study course. However, it is well known that such courses have limited efficacy for most students and none at all for some. Therefore, it is important to include a variety of materials that will aid the student in comprehending the text. This can include further or fuller explanations of important issues. It can include links to and discussion about resource links; it can also include particular goals of selected readings or text chapters. The student should feel that the online course is an essential part of the course, without which comprehension would be difficult to achieve. In addition, your portion of the course should include content, which the student must learn to be successful on exams. The partial content course should not conflict with the primary text. If it contains supplementary examples or chapters, this is ideal. It could also present alternative viewpoints for comparison. However, it should avoid dual sources of course materials. In most cases, the student will select one of the sources over the other as the primary authority.

There are more issues. For example - assessment (Hall et. al. 1999), streaming media, JavaScript, Java, testing instruments, bulletin boards, chat rooms, development tools, homepage, and course management systems (Allen 2001). Each of these requires an equivalent chapter of discussion. However, in this note we limit the discussion to two particular courses.

Math 629 – History of Mathematics.

This course is full content based. The course page is primarily a collection of goals, readings, and problem sets. In appearance, it looks much like a book online. Most of the readings are PDF Acrobat files that can be printed by the student. It should be noted that one of the major issues still facing the technical sciences is how to adequately display mathematics on the Web. There are many ways to do it poorly, but the ultimate way embodied in MathML (a markup language akin to HTML) has yet to be implemented by the major browsers (Allen, 2000b). A popular alternative to MathML is Adobe's Portable Document Format, PDF. It makes the document look exactly the way it was typeset. However, inserting interactivity, or almost anything else is either time consuming or difficult.

In addition, there are a large number of links to readings at other Web sites. The reason is two-fold: First, there is a wealth of material about the history of mathematics on the Web, and much of it is first rate. Students should learn to explore the Web and use it to their advantage. The second reason, is that it is almost impossible to write in a single document all that should be available to the students.

Math 696 – Mathematics Communication and Technology.

This course is based on the idea of directed tracks, a set of which will be selected by each student enrolled. With each track, specific milestones of accomplishment will be attached. The course will be complete with a capstone project that will bring the various tracks together in a large project. Below we list some of the envisioned tracks.

1. Mathematical document preparation
2. Computer algebra systems (e.g. Maple, Mathematica)
3. Web page development (incl. math-to-web conversion)
4. Programming (Java, C++, asp)
5. JavaScript
6. Test preparation/Online testing
7. Using graphing calculators
8. Graphics design for Web pages

As is apparent, the skills of the instructor should be broad based for this course format. Indeed, at this time, no faculty member in our department would feel comfortable directing students in all the possible tracks. Yet, people are continually emerging with new skills. We are excited about this course, particularly its nature that seems very much in concordance with the paradigms of the Web. More information about this program can be found at http://distance-ed.math.tamu.edu/index.html

Intellectual Property

With two authors producing content under the terms of the proposal, with the University contributing funds toward the production, and with the assumption that the materials generated have market value, the natural question to ask is: ***Who owns the material?*** Concomitant with that question is another one of equal importance: ***How should the distribution of royalties or income from these materials be made?*** Both of these complex questions required ongoing discussions with university lawyers and licensing officials for more than a year before an accord was reached. Before outlining what contractual terms we regard as fair, it worthwhile to mention and discuss other questions that may be even more complex.

1. If Professor X writes online content for Math YYY partially using institutional resources, does the institution have the right to revise those materials at some future point? (Naturally, the "shelf" life of one of these early efforts of online courses is brief – perhaps two years. To keep the course viable, it will need to be updated or upgraded. Who controls that process? What remedy is accorded the institution if Professor X declines the task?

2. What if an author permanently leaves the institution? Does the author have the right to load the course on a server at a new institution? Can he subsequently revise it there and offer it in competition with the version running at the original institution?

3. Should students at the home institution pay to use the materials?

The answers to these questions hinge critically upon the definition of the term "substantial resources." For example, if the faculty or staff member is assigned the task of creating an online course and that becomes part of the job requirements, the "work-for-hire" model may apply. In this case, the university owns what is created, and may at its discretion distribute future income to the creator. When the compensation is more than just an office computer and secretarial help but less than the full salary, the question becomes this: Does the contribution of the institution measure up in a tangible way as a substantial contribution to the production of the online course? Some institution will argue in even this case that ownership resides with them because an employee created the product. We regard this view, which makes sense in industry, to be stifling to the creativity of their faculty. Such a narrow and constrictive (even greedy) policy may well result in diminished quality or quantity of production that over the long run may be more costly, when that same institution, in order to operate their Web-based and distance education programs, will have to license products generated elsewhere.

Since the creation of one of these courses requires time far in excess of writing the equivalent amount of material for a textbook, and since only a handful of faculty have anything near the skills to produce such an effort, it would seem prudent for the institution to be as generous as it can and to nurture this talent for maximum creativity. Faculty members treated fairly work tirelessly in such an environment.

At the opposite end of the work-for-hire model is the professor that produces a Web-based course solely on his/her own initiative. In this case, the university does not contribute any meaningful resources toward the effort. In this case, the creator of the materials should have 100% IP ownership and should be accorded 100% of income distributions. Moreover, the university may not revise the materials without consent of the author. Succinctly, the traditional textbook model applies.

Somewhere in the middle is where the real difficulties reside. Most institutions will regard any amount exceeding $20K, or several course releases, as substantial. Admittedly, they have a case. Nonetheless, authors should be granted 100% IP ownership. If the author owns it, the product will undoubtedly be better. However, the distribution of income can be negotiated. With regard to our particular program, the university agreed to just these terms and to giving the authors a majority of future royalty income. As is the custom here at Texas A&M, authors do not benefit financially from students at their own institution using their books or online materials. That means course fees are either not assessed or are returned to the university.

Texas A&M University has recently proposed a meditated technology instruction policy with terms similar to these at its cornerstone. The basic belief is that an open and fair policy will foster participation by qualified and competent faculty to produce the highest quality online materials.

Publicizing the Program

Advertising our program was an aspect that we did not originally anticipate nor fully understand. Normally, it is a process transparent to the faculty members' duties. Colleges are established institutions that attract students in traditional ways. For online programs, the rules change. We have prepared brochures, we have given numerous talks at teacher conferences and conventions, and we have engaged in direct mail advertising and we collect mailing lists. Below is one part of some advertising material.

The Masters of mathematics with a teaching option taken online has four tremendous advantages:

- **You can take courses at your convenience.** ***There is no residency requirement.***
- **Partial courses, called *certificates*, are available.**
- **Special courses, such a Maple, Java, and Web design will be available – with a mathematical emphasis.**
- **Courses are transferable.**

In this brochure, we review the procedures for getting started.

Prospective students don't have a historical perspective of these programs or what they are about. We must educate the students to what the program is like, how courses operate, what is expected, and even how to enroll. They want to know. At the recent CAMT[1] meeting in Houston, we presented our new program to an overfilled room of more than one hundred teachers. The interest is genuinely profound. Many teachers said how appreciative they are that such programs are becoming available.

Because of these efforts, we receive inquiries about this program on a daily basis. The questions are similar. All want to know what, how, and sometimes how much. Typical questions follow. "Are there scholarships?" "I haven't been in college for twenty years. How will I do in math courses now?" "What courses are offered now?" What about the summer?" "I just finished a degree in computer science, but I want to teach math. Will this program enable that?" It is gratifying for professors at a large university such as Texas A&M to see impact of their work so quickly, and with such enthusiasm.

The Students

The demographics of teachers that have enrolled in the program range far beyond what we expected. Excepting a few regularly enrolled graduate students, all teach mathematics at some public institution. We anticipated the bulk of our teacher/students would be high school teachers. However, they span a wide range from elementary school teachers to community college instructors. Their reasons for taking the course are as many as their number. None of them have indicated that their direct goal is to get a master's degree at Texas A&M University. A couple of them desire better positions in their own schools, and taking these courses as CEU's will help them. One requires 18 graduate hours in mathematics to qualify to teach in a community college, a SACS requirement. Another is enrolled in a masters program at another institution and is taking online courses from us to transfer. Yet another has been teaching 25 years and just wants to take a mathematics course.

All the students have full and complete lives – job – family – children – community involvement, etc, and many of them are taking several courses simultaneously. Indeed, two are teaching full time and taking <u>three</u> graduate courses! Both have expressed some regret about that. We have tried hard to be flexible about assignment dates, realizing that these students are fully mature individuals and do not merely shirk their scholastic duties. It is important to accept these facts about this new educational landscape, and to remember that the educational service we are providing is crucial to many, many people. Strict construction of assignment dates seems somehow inappropriate.

We suspected that the mathematical strength of our new distance students would not be up to full time regularly enrolled students. What was the case was that they were mathematically weaker than we hoped. This has required some adjustment in the types of assignments given. For example, in the History of Mathematical course, mathematical problems are typically assigned to be solved with period techniques. These problems are not difficult but do require advanced problem-solving skills. Many teachers in the field for several years or those that focus on educating the very young have seen those skills erode over time.

[1] Conference for the Advancement of Mathematics Teaching. This is the major annual conference for schoolteachers of mathematics in Texas. It normally attracts about 8,000 attendees. Teachers come for many reasons: to gain CEU's, to learn about new programs, to present results of their classroom activities, and more.

Therefore, to compensate for this, optional assignments of essays were given wherein the teacher could relate the period methods or problems to teaching and pedagogical issues. For example, one essay given to all students was to analyze the use of pictures in (mathematical) proofs. This essay question, which was based on a current paper in the Notices of the American Mathematical Society, allows the student to bring in a wide array of historical resources and then to relate it to their personal teaching philosophy. Other questions of this nature have been created to challenge all students, whether pursuing a Ph.D. here or whether just learning some more mathematics.

Conclusions

Creating an online degree program today has very much the same comprehensive, all encompassing nature of forming a new business. There is little one can simply plug-in to existing infrastructure. The delivery is different; the assessment is different; the student demographics are different; recruitment, retention, and motivation of students are also different. The desire for learning is intense. However, the need for temperance of course administration is essential. As well, an acute understanding of student backgrounds in contrast to regular on-campus students is paramount.

Finally, as must always be mentioned in a forum such as this, we are in a transition period. In just a decade, perhaps less, online education, online degree programs, and the like will be institutionalized. Students will have clear expectations, and faculty will again have established ground rules. Course administration will be established in comfortable grooves. Methods universities use to compete for and recruit students will be once again transparent to faculty, and developers such as these authors will spend all of their time developing online courses, new techniques, and learning new skills for the next generation of interactivity.

References

Allen, G. D., M. Stecher, M. S. & Yasskin, P. (1998). The Web-Based Mathematics Course, a survey of the required features for an on-line math course and experiences in teaching one, *Syllabus Magazine.*

Allen, G. Donald, (2000a). Online Calculus - The Course and Survey Results, to appear in *Computers in the Schools,* in press.

Allen, G. Donald, (2000b). What Do We Do Until MathML?, in the *Math/Science Online Newsletter*, Fall 2000. Available: http://www.math.tamu.edu/ms-online.

Allen, G. Donald (2001). Online Choices, to appear in the *Proceedings of the Thirteenth Annual ICTCM Conference – Atlanta, GA, Nov 16-19,2000,* Addison-Wesley-Longman.

Hall, R., Pilant, M, Strader, R. (1999), The Impact of Web-Based Instruction on Performance in an Applied Statistics Course, (pp. 261-266), *Proceedings of International Conference on Mathematics/Science Education and Technology*

Pilant, M., Hall, R., Epstein, J., Hester, Y., & Strader, R., (2000), Issues Involved in a Large Scale Implementation of Web-Based Mathematics Instruction, (pp. 334-339), *Proceedings of International Conference on Mathematics/Science Education and Technology*

The Road Ahead: The Evolution of Online Learning

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Abstract: This paper will focus on the structural and interfacing mechanics of the software that will facilitate support efforts and minimize the frustrations encountered by new users whether they are students, faculty, or course creators. The course shell creation process, student enrollment, passwords, faculty loading, role definitions, reusability, reliability, scalability, all provide potential challenges--even for the best pedagogical designs. The goal is to define a comfortable environment for technology application to classes so that online instructional tools may be assumed as much a part of the academic environment as classrooms and chalkboards.

Introduction

Institutions with mission-critical needs for their online teaching and learning environments require a comfortable environment and a sophisticated technology base for their large-scale systems. Considerable attention has been paid to estimating the effectiveness and general pedagogical value of classes using web-based courseware as the delivery mechanism. Aside from the learning dynamics themselves, there are features of the courseware that can lead to adoption- and support-related challenges. These features are often inherent and not under the control of course creators. Unfriendly access procedures can create enormous frustrations for novices. The resultant loads on faculty can lead to disenchantment at the least.

The course shell creation process, student enrollment, passwords, faculty loading, role definitions, reusability, reliability, scalability, all provide potential problems --even for the best pedagogical designs. The goal is to define a comfortable environment for technology application to classes so that online instructional tools may be assumed as much a part of the academic environment as classrooms and chalkboards.

This paper will focus on the structural and interfacing mechanics of the software that will facilitate support efforts and minimize the frustrations encountered by new users whether they are students, faculty, or course creators.

Thesis

Online education can be defined as an approach to teaching and learning that utilizes networked technologies to communicate and collaborate in an educational context. This includes technology that supplements traditional classroom training with web-based components and learning environments where the educational process is experienced online.

The application of computing to the teaching/learning process often follows a sequence of this kind:

- Adoption of a small number of tools (either for presentation preparation or specific tools for the disciplines)
- E-mail as an aid to communication
- Electronic threaded forums
- Instructional modules and class materials

These "islands of applications" often lead to a fragmented environment requiring multiple authentications (i.e., logins), with system administrators adopting a cottage-industry approach to class management issues such as class rolls and grading. Integration to the Student Information System seldom exists.

Nearly all of higher education institutions currently engage in some type of online learning. Academic and professional organizations agree that using web-based learning environments can offer sound pedagogical benefits. Researchers from Cornell University estimate that "the web provides significant new functionality in transmitting information to the student and providing forums for exchange. The web is revolutionizing some areas of study through increased opportunities for learning and alternative formats for information" (Dwyer, Barbieri, & Doerr, 1995). The American Distance Education Consortium has derived a set of *Guiding Principles for Distance Teaching and Learning* based on the assumption that "principles that lend themselves to quality face-to-face learning environments are often similar to those found in web-based learning environments" (ADEC, 1999).

The web's facility for synchronous and asynchronous interaction provides the medium of choice for online learning offering educational advantages such as:

- 24x7 accessibility to course materials
- Student-centered teaching approaches
- Enhanced student-to-student and faculty-to-student communication
- Just-in-time methods to assess and evaluate student progress
- Reduced administration overhead via course management tools

Again, there are the issues of the islands of applications.

Online Class Concerns

In an effort to streamline the online educational delivery systems and create more of a "one-stop shop" for teaching, learning, and doing business with the university, USF began to investigate methods for improving its on-campus course offerings in 1994. Tasked with finding a software platform that would be valuable for students and instructors, administrators, as well as IT staff, we began by compiling faculty-defined requirements for class delivery. The checklists of critical issues considered are provided below. The first deals with the functions delivered by the courseware, the second with issues critical to the successful deployment and operation of the instructional environment provided by the courseware.

Desired Functions

- Single point of entry, one integrated application for users
- Web interface (no client required)
- Easily used by students, minimal learning curve
- Ability to include text, graphics, video, audio; minimal use of HTML if at all (but available if desired)
- Threaded discussions
- Full text search
- Support character sets for other languages, and for mathematical symbols
- One-to-many, many-to-one, many-to-many communications, public and private, asynchronous and synchronous
- Record students viewing material (attendance record and timing)
- Online testing of various kinds with provision for feedback if desired; test record/grade book

Academic Issues

- Carry-overs for incompletes
- Semester-to-semester course migration
  - Same course number, different instructor, different content
  - Serially in time or at the same time
- Completely distant learners (no access to campus) vs. campus visiting learners
- Student Internet skills

Support Issues

- Security
  - Student privacy
  - Intellectual property
  - Assessment integrity
- Ability to easily and automatically import class lists and associated information from external sources
- Ability to easily and automatically create course sites for many classes (i.e. templates); batch registration tools
- Ability to easily and automatically transport material easily between courses
- A global view, calendar, task scheduler, etc. for students in multiple classes
- An organizational chart (equivalent to a site map) for the class
- E-mail/chat/discussion groups created automatically for the class, with the ability to be reorganized by the instructor
- Web-based vs. application-specific e-mail
- Industry standard database interface vs. proprietary database
- Server requirements, storage estimates
- Scalability
- Extensibility via open API's

Online Educational Delivery Systems

In August of 1998, three course management systems were selected for evaluation based on the measures defined previously:

- TopClass - WBT Systems
- Web Course in a Box - MadDuck Technologies
- WebCT - WebCT, Inc.

The comparison criteria used in the assessment took into account the roles of the learner (consistent navigational interface, student tools, etc.), the instructor (access to grade book, course/lesson tools, etc.), as well as, the administrator (batch mechanisms, help desk tools, etc.). A significant number of instructors used the delivery systems as an adjunct to classes and provided feedback with respect to the breadth and depth of the features of each courseware for a period of one year.

Although these multimedia courseware-authoring systems facilitate the creation of more flexible and customized educational environments, no single product by itself contained all the desired features. In addition to the applications concerns, areas connected with technical support issues, scalability and reliability were also explored.

In January of 1999, Blackboard's CourseInfo was added to the evaluation pool, and by August of 1999, two of the applications were identified as desirable vehicles for the delivery of online courses warranting further appraisal:

- CourseInfo - Blackboard Inc.
- WebCT - WebCT, Inc.

Enterprise Electronic Aid to Instruction

The University of South Florida wished to deploy a portal with implementation of single sign-on access to a full range of applications and information (represented below in Figure 1). In the first phase USF's efforts were to focus tightly on courseware delivery. The tasks associated with this phase would involve mapping more than 36000 students and their instructors into 3000 classes each semester. This courseware development was tempered by our concern to ensure that the authorization process and other related procedures would also facilitate the development of the portal as a vehicle for delivery of other services to the entire USF community.

With the intent of unifying USF's diverse online campus systems into one fully integrated platform that incorporated the university's administrative systems, such as registration and grades, with a course management system to deploy Web-based courses, the task at hand was finding a software platform that would be valuable for students and instructors, administrators, as well as IT staff, and that could satisfy the following requirements:

- The platform must revolve around teaching and learning, with a robust course management system as its backbone
- The platform must offer opportunities to create a *community* of teachers and learners
- The platform must integrate with pre-existing administrative systems, specifically SCT® Banner™, to create a complete online environment

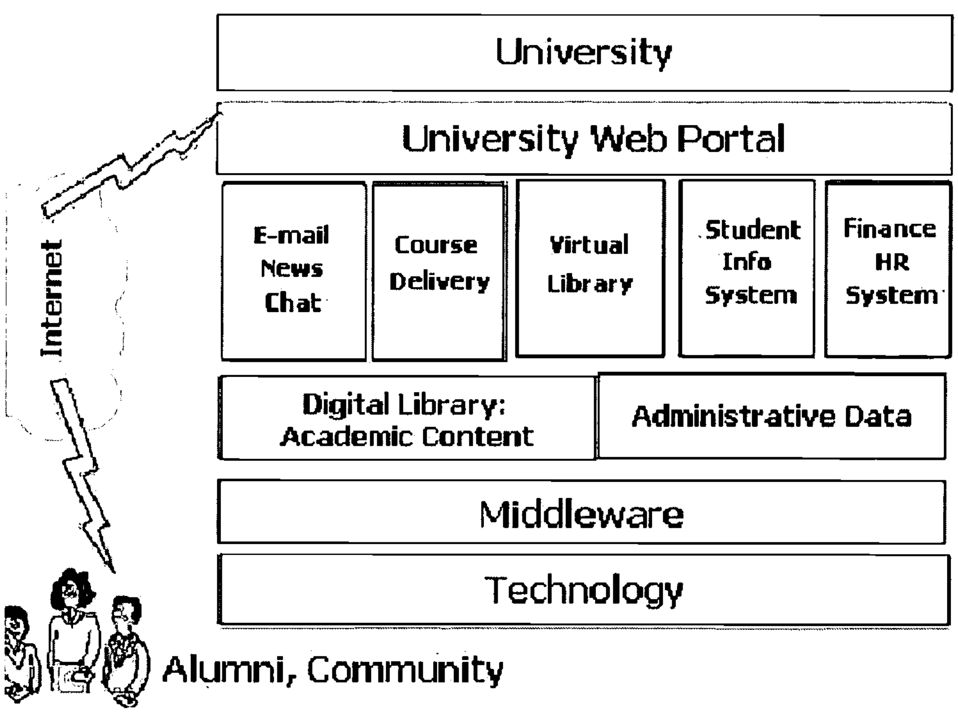

Figure 1: Single sign-on campus portal providing access to a broad array of services and data

In September of 2000, Blackboard, Inc. and USF signed an agreement to integrate the Blackboard 5 Level Three advanced course and portal manager platform with the institutional back-office systems. In addition to Blackboard' s course management technology and new portal capabilities, Level Three includes system integration tools that combine data from the existing Student Information System, Financial Aid Office, and other data-rich environments.

The levels of customization, flexibility, and scalability in Blackboard allow instructors to concentrate on providing high-quality content while administrators concentrate on managing the platform itself. The portal capabilities allow for the development of an online campus, giving distance learners and commuter students the ability to participate in on-campus life without needing to be physically present, minimizing the distinctions between distance learners and on-campus learners.

As a considerable number of faculty members use the courseware live in the classroom, as an adjunct to classes, even a brief loss of service is extremely serious. There is also almost no time available for loss of service for system maintenance, as the concept of the academic year becomes invalid in terms of extended online delivery of instructional materials. Thus, to provide the capabilities instructors need to leverage technology within the traditional classroom, these challenges inherent in bringing a campus online must be addressed. Disparate academic computing resources must be unified and integrated with existing back-office systems, and bombproof support services must be facilitated.

The integration concept involves process design, integrative software, effective training and support, and technological tools:

- Automatic assignment of an e-mail ID and computer account for every student
- Automatic creation of a set of electronic tools available for every course (listserv, chat, etc.) --to be used optionally at the faculty member's discretion
- Student name and address information captured once, and automatically made available wherever needed
- Cumulative student portfolio
- A single portal for students to access information for all courses, to financial aid information, to book purchases, etc.

This institution-wide portal is to provide single-login user authentication, as well as capabilities that allow each school, department or campus within the university to maintain its own customized environment. Some of the core features and functionality of this system are:

- Personal information management tools
- Powerful course management tools that enable instructors to provide their students with course materials
- Course communication and collaboration tools, such as discussion boards and virtual chat rooms
- Online assessment tools
- Dedicated academic resource center on the Web
- Web-based e-mail, calendar, announcements, and tasks scheduler
- Community management
- Institutional services management
- Institution-wide content sharing and management
- Course e-commerce management
- Customizable portal modules and information services
- Extended customization for institutional branding
- System administration management tools
- Enterprise-level database user management tools
    - API for user information batch extracts
    - API for event-driven (real-time) user updates
- End user authentication (security) API
    - Protection of intellectual property
    - Safeguard online enrollment and fees payment

These criteria enable the development of a mass-customization model for the development of an online teaching and learning environment that is both sustainable by our institution's infrastructure and flexible enough to adapt to the emerging technical environment. This approach comprises the linking of both existing corporate databases and purpose-built data stores linked to web pages that can be operated upon via standard web interfaces. Thus full extensibility and interoperability is provided for.

The intent is to concentrate on a functionality that can be accessed via a standard browser interface without the need for the installation by the user of client software. The Blackboard platform, while including text-based materials, online discussions and interactive quizzes, can also be used to extend the richness of the resource base for teaching and learning by increasing the use of a range of multimedia forms. It provides a simple and consistent user interface for all of the university's online offerings.

The USF Web Portal is to be implemented in stages. Underlying these is the strategic intent to:

- Establish first an online presence for every course in the university that affords student access via a standard browser to a simple and straightforward set of teaching and learning resources
- Use the experience of this minimalist online presence as a basis so that instructors can author materials via web forms, thus enabling them to focus on content rather than technical detail
- Integrate over time online other forms of student support and online administrative functions with teaching and learning resources
    - Access to a range of Library services
    - Access to online enrollment and fees payment

Ultimately, our goal is to service online all of a student's engagement with the university.

References

Dwyer, D., Barbieri, K., & Doerr, H. (1995). *Creating a Virtual Classroom for Interactive Education on the Web*. The Third International World Wide Web Conference, 1995.

ADEC (1999). *ADEC Guiding Principles for Distance Learning and Teaching*. American Distance Education Consortium, 1999.

A Summary Look at Internet Based Distance Education

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Abstract: The Internet has truly and significantly changed the way we live, learn, work, and communicate. In today's digital information age, electronic services are constantly growing and becoming an integral part of our daily life. One of these popular electronic services is e-education through distance learning, and in particular Internet-based learning, which uses the Internet technology as a medium to deliver instructions as well as a communication tool to support interaction between faculty and learners. Distance education is originally designed as a self-paced alternative to traditional classroom instructions and becoming a major trend in higher education. Community colleges seem to be leading the way in the application of Internet based distance education technology by providing more educational opportunities to adult learners than those in four-year institutions, should four-year universities pursue this trend? especially small and private liberal arts colleges who are suffering financially as a result of low students enrollment, should they consider investing in electronic instruction delivery methods to expand their classroom-based academic programs.

Introduction

In today's digital information age, where e-education, e-business, e-commerce, e-government, e-communication, e-banking, e-entertainment, and other forms of electronic services are growing and becoming more and more closer to the mainstream, all of these services share one common technology and that is the Internet; which is used as a platform to deliver the above services. The Internet is a global network that consists of a large collection on interconnected computer networks around the world. The Internet contains a vast amount of information, estimates of several hundreds of thousands of terabytes (one terabyte almost equal to one trillion characters) that can be searched, retrieved, processed, and distributed electronically. The information found on the Internet exists in a multimedia form, and that is a combination of text, graphics, still images, sound, animation, and video. There are several services available on the Internet including electronic mail, world wide web (www), ftp, telnet, gopher, newsgroup and others. A synonym of the Internet is information superhighway, which emerged in early 90's; it provides a high-speed digital transmission system capable of providing connectivity to homes, schools, universities, businesses, and government offices (Kushwaha, & Whitescarver, 1994). It is capable of delivering and receiving multimedia information instantaneously.

The Internet has significantly changed the way we live, learn, work, and communicate. The Internet has revolutionized teaching and learning in many positive and effective ways. In addition, the Internet has a strong influence on distance education. Education has always been a challenge for many people to obtain, because it demands time, effort money, and high level of concentration and determination. But, sometimes people are faced with limitations that prevent them from pursuing their education; therefore, they start exploring other alternatives that can be the solution. Distance education is one of these alternatives, which offers educational opportunities at a time and place convenient for the learner. It also has increased people's access to the higher education.

"In the past, universities tended to own a local geography area, but there is no geography to it anymore. In the industrial age, we went to school. In the communication age, the school comes to us", DiPaolo said.

There is a growing number of faculty using the Internet to complement conventional classroom based courses (Pittinsky, & Chase, 2000). Current research has shown that one-third of all four public institutions and nearly 30 percent of all four-year private colleges and universities offer a complete degree programs through distance education (Wong, 1999). An estimated of 55 percent of four-year colleges and universities now offer online courses (Telg, & Irani, 2000). With increasing population of Internet users (80 millions in the US only), and the availability of personal computers at homes, with almost 50 percent of American households have a PC at home; this made it so convenient for people to acquire education through distance learning.

The common uses of the Internet in education include: research, communication, training, and curriculum as well as distance education. Internet based education is one way to implement the conceptual framework to use Internet technology in teaching and learning. In the past decades, there have been several medias and technologies used to deliver distance education such as regular mail, radio, television, facsimile, satellite broadcast, video tapes, telephone, teleconference, audioconference, videoconference, and recently the Internet. The three popular methods of distance education include one way prerecorded video-using satellite technology, two way interactive video and audio - using compressed technology, and Internet based technology (Pittinsky, & Chase, 2000). Internet based distance education is quickly becoming the predominant technology in distance education. This growth is attributed to the increasing power of personal computers, increasing telecommunication bandwidth capabilities (ISDN, ADSL), and powerful interactive communication and collaboration software and technology.

In this paper, my primary objective of this study is to provide a comprehensive understanding of several aspects, issues, and ideas related to the Internet based distance education and its technology. It will provide a look at the history, uses, technologies, challenges, effectiveness, advantages and disadvantages of the Internet based distance education as well as the characteristics of a typical distance education learner.

What is Internet Based distance learning

Internet based distance education is a form of distance learning in which the course content is delivered and the interactions are provided by the communication tools, technologies, and methodologies of the Internet (Jung, 2000). Internet based distance education has three major components: teacher and learners, separation by time and/or space (geographic distance), and communication mediated by Internet technology (Telg, & Irani, 2000). Through Internet based distance education learning occurs at the student's own pace, at a time and place convenient to the learner, with courses that meet his/her personal, educational, and professional goals (Weller, 2000).

The purpose of distance education (online classroom) is designed to reach a diverse population of learners and to provide open and convenient learning environments 24 hours and 7 days a week (Hara, & Kling, 1999). Distance education is designed as a self-paced alternative to traditional classroom instruction and becoming a major trend in higher education. It is suited best for self-motivated, self-directed, and self-disciplined individuals. Internet based education with the use of Internet based technology creates something called the virtual classroom or campus environment, where online it can provide learners the instructions, library resources, student learning assessment, course evaluation, student support services, and admission and courses registration. Through Internet based distance education, an individual can earn college credits, college non-degree credits, college degree (Bachelor, Master or Doctorate) or professional certificate as well as be able to participate in workshops, seminars, or training sessions.

Distance Education Learner Profile and Characteristics

Distance education is definitely not for everyone. A typical distance education learner usually belongs to one or more of these categories:

- Nontraditional learner
- Full time worker
- Parents
- People living in rural areas
- People with disabilities
- Females with children

In addition, each learner preferably should have the following key characteristics or skills in order to be a successful distance education learner:

- Good computer and Internet skills: basic computer, email, and www knowledge.
- Good time management skill: be able to complete tasks within the allocated time.
- Independent learning style: be able to work, study, and learn independently.
- Effective communication skill: be able and comfortable in writing.

Forms of Internet Based Distance Education

The five common Internet services used in distance education are electronic mail, file transfer protocol (ftp), world wide web (www), newsgroup, and chat lines. www is a hypertext based information service; it provides access to multimedia information in documents and databases. www is the most popular and fastest growing part of the Internet. E-mail is an electronic messaging communication system, which allows users to send and receive electronic data messages. Newsgroup is an electronic bulletin board that allows public discussion groups containing a set of articles about a single topic. File transfer protocol allows the transfer of data files and software between computers. Some or all of these Internet services might be incorporated into the Internet based course, depends on the pedagogical needs and instructional design used in the course (Telg, & Irani, 2000). Internet based education ranges from posting the course syllabus on the www to fully delivered, managed, evaluated, supported through the Internet. The four popular categories of web-based courses are:

- Web-presence courses: Only very small portion of the course is presented on the web, such as a course syllabus.
- Web-enhanced courses: Almost half of the course material is delivered through the web, including course syllabus, supplementary course material, assignments, projects, and additional resources.
- Web-centric courses: The majority of the course material is delivered through the web. It integrates a significant use of web technology and services in the course, plus support for communication between the learners and the instructor.
- Web-based courses: The entire course is taught, delivered, assessed, evaluated, managed as well as the communication between students and instructor occurs entirely through the web. Neither face-to-face interaction. required between learners and instructor, nor physical attendance in a specific location is required.

The two popular forms of delivery of web-based courses are synchronous and asynchronous modes. The synchronous form requires real time communication and fixed time class meeting as in conventional classes where as the asynchronous form does not require the learner or the instructor to be in a fixed time or location and no real time communication. An example of successful models of distance education are British Open University (international model), Western Governors University (consortium model), California Virtual University (Virtual model).

Internet Based Distance Education Technologies

Currently, there are several Internet based technologies such as communication tools, services, and products that can be used by instructors to help them develop and maintain their online courses. An example of synchronous delivery is web based videoconferencing technology, which provides two visual connection and real time interaction and collaboration between instructor and learners. A synchronous learning environment requires a monitor or TV screen, web camera, microphone, and speakers. Some of the software tools available in the market to implement synchronous learning mode are NetMeeting and CU See Me tools and both provide Internet videophone system and real time communications.

Other type of commercial products and services used to implement Internet based courses are Blackboard, WebCT, Real education, and e-college. All of these services help colleges and universities to plan, design, create, manage, and maintain web based courses as well as creating virtual campus. Another option available for higher institution is to purchase programming development tools such as Java, HTML, and FrontPage or authoring software tools such as Macromedia Director, Macromedia Author ware, and Macromedia Dream weaver, and let the faculty develop their own courses. This option entitles higher education institutions to provide faculty with strong technical support and intensive training workshops to prepare faculty with basic and advanced skills and knowledge in technical, instructional design, and web based programming.

Distance Education Effectiveness

Here are some factors that help make distance learning more effective than traditional classroom instructions.

- When methods and technologies used are appropriate to the instructional design and learning activities.
- When there is student to student and instructor to student interaction through interactive communication tools such as e-mail, newsgroup, electronic bulletin board, and chat rooms.
- When there is fast and timely instructor to student feedback (exams, quizzes, assignments, and projects)
- The web-based courses should be interesting and appealing and should address a wide-range of learners with diverse learning styles and different needs and interests (Weller, 2000).

Many studies have indicated that students participating in distance learning courses perform as well as their counterparts in a traditional classroom (Phipps, & Merisotis, 1999). The student performance is measured using test scores and grades in the courses. Similar studies have also concluded that students and faculty have a positive views and attitudes toward distance learning (Phipps, & Merisotis, 1999). In the contrary, there are other studies have shown students' frustrations and dissatisfaction due to the following reasons/ factors (Hara, & Kling, 1999):

- Lack of prompt feedback
- Ambiguous instructions on the web
- Experience technical problems

Advantages and disadvantages of distance education

Most research studies emphasize the positive aspects of distance education.
Here are the advantages so far for distance education technology:

- Offers educational opportunities at a time and place convenient for the learner.
- Remove geographical boundaries between learners and the instructor (students in remote areas can take advantage of learning opportunities with traveling long distances)
- Increases access to higher education.
- Offers learners a wide rang of choices, topics, courses as well as degree programs to students.
- Cost effective, travel costs are saved, especially in times of high gas prices.
- Reduces the need to build and maintain college buildings and facilities.

But, disadvantages of distance education can also be summarized as follows:

- Start up costs to students and institutions are high, a learner will pick up the cost to purchase a computer with all necessary software to get connect to the Internet, in addition to monthly fees for an Internet service provider company. Institutions also need to provide the all required equipment and proper faculty training to use the technology effectively.
- Labor intensive, web-based courses usually take long hours to plan, design, develop, manage, and deliver.
- Most educational institutions still do not have adequate infrastructure to design and deliver web-based education.
- A lot of legal issues such as copyrights and intellectual property rights need to be clarified and explained.

Conclusions

In conclusion, Community colleges seem to be leading the way in the application of distance education technology in course delivery and assessment by providing more options to adult learners those four-year institutions. Should four-year state universities pursue this trend? Especially small and private liberal arts colleges who are suffering financially as a result of low student enrollment should consider investing in electronic instruction delivery methods to expand their classroom-based academic programs. The fact that the course contents and support services exist 24-7 online on the web, it does not mean by any way that the instructor will also be available and accessible online 24-7, this misunderstanding among learners sometimes lead to frustration and dissatisfaction

References

Hara, N. & Kling, R. (1999). *Student's Frustrations with a Web-Based Distance Education Course.* Peer-Reviewed Journal on The Internet.

Jung, I. (2000). *Internet-Based Distance Education.* . The Pennsylvania State University: The American Center for the Study of Distance Education. Available at http://www.ed.psu.edu/acsde/annibib/annbib.asp.

Kushwaha, R., & Whitescarver, J.(1994). *Integration of Virtual Classroom and Multimedia on the Information Superhighway.* ISMM International Conference on Distributed Multimedia Systems Applications, August 15-17, Hawaii.

Phipps, R. A. & Merisotis, J. P. (1999). *What's the Difference? A review of Contemporary Research on the Effectiveness of Distance Learning in Higher Education.* Washington, DC: American Federation of Teachers and National Education Association.

Pittinsky, M. & Chase, B. (2000). *Quality on the Line: Benchmarks For Success in Internet-Based Distance Education.* The Institute for Higher Education Policy. Washington, DC.

Telg, T. & Irani, T. (2000). *The Distance Education Handbook: A guide for university faculty.* University of Florida, Available at http://www.ifas.ufl.edu/~rtelg./handbook3a.html.

Weller, M. J. (2000). *A web based, Distance education course on computers and the Internet for entry level students.* Open University, U.K., Available at http://www.technology.open.ac.uk/tel/people/weller/martin/icee99.html.

Wong, C. J. (1999). *Developing an Internet-Based Distance Education Program: The Planning Phase.* SITE 10th Annual International Conference of the Society for Information Technology and Teacher Education. San Antonio, Texas.

Teaching and Learning Online: Lessons Learned

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Abstract. Currently, there is a great deal of interest by school districts, educational software companies, teachers and others in providing staff development through the Internet. While research findings in this area are only now beginning to appear, a great deal can be learned from the "pioneers" in this area, including course developers, facilitators and participants. After designing and facilitating several online staff development components as well as from participating in some, the staff of a statewide technology resource center for educators began to document "lessons learned" from their experiences. In addition, a thorough literature review was conducted to validate these lessons and identify additional lessons. Online course developers, facilitators, and participants were surveyed to validate the lessons and to add additional ones. The result is a document, available in both hard copy and online, which delineates over 200 lessons learned in online staff development from three different perspectives.

Introduction

At a time when teachers face growing needs for ongoing professional development, online courses and components, delivered via the World Wide Web, are becoming increasingly popular. Individuals, institutions and commercial organizations are developing online staff development courses and lessons in order to effect more timely and, hopefully, less expensive training. Proponents see online learning as a potential solution to all training needs; opponents see it as less effective than face to face instruction. Meanwhile, course developers and staff development offices are looking for guidelines and ideas to make the most of this potentially exciting opportunity for leveraging existing resources, utilizing technology effectively and meeting the increasing demands of educators for updating and training.

While research findings are just beginning to make their way into the literature, a great deal is being written about distance learning, online training and "eLearning" for both K-12 students and their teachers. For educators, courses and components are being developed, offered, evaluated and revised. Participants are learning from online components, as are online instructors, those charged with facilitating the learning experiences and developers, those who design the instruction. We can learn a great deal from these "pioneers."

Background for the Project

The Florida Instructional Technology Resource Center (ITRC) at the University of Central Florida has been supporting educators statewide for 18 years. Recent efforts by the ITRC have focused on web-based tools and staff development. The ITRC staff has developed online staff development components to assist teachers in several different areas: learning to integrate the Internet into the classroom, school library automation, online learning, and web-based tools for teachers. As a result of developing and offering these components, the ITRC staff has learned a great deal about what leads to successful online teaching and learning in the context of staff development for professional educators. A review of the literature and a survey of participants from a variety of online staff development programs resulted in a document that compiles these "lessons learned" in online staff development for professional educators. The document, available in hard copy and online in HTML and PDF, examines online learning from three different perspectives:

--*From course developers:* Those who are responsible for the creation of the course or component. They are responsible for choosing appropriate online activities, sequences, strategies and resources to match content and desired learning outcomes.

--*From course facilitators (or instructors)*: Those who are responsible for the day-to-day monitoring of the course, providing expertise in the course content as well as technical assistance and feedback on participants' progress. The facilitator may also be responsible for revising activities and lessons based on assessment data and participant input. (The course developer may also be the facilitator, but this is not always the case.)

--*From course participants:* The learners in online courses or components; in this case, participants are educators who have taken a course or component as part of their inservice training or for their own professional development.

The Document

These "lessons" have been gleaned from a thorough review of the literature—examining both print and web-based documents, which are listed in the "sources" section of the document. Additionally, a survey instrument presenting a draft of the "lessons" was emailed to over 200 developers, facilitators/instructors, and participants who reviewed, validated and critiqued the lessons and/or contributed additional lessons from their own expertise and experiences.

The document includes: 92 Lessons Learned from Developers: These are grouped by category: Planning; Contact and Support; Online Community; Content; Format; and Miscellaneous; 53 Lessons Learned from Facilitators: These include lessons learned about Contact and Support; Online Community; and Miscellaneous; and70 Lessons Learned from Participants: These include lessons about Pre-requisites; Course/Time Management; Communication; Online Community; Attitude; and Taking the Course.

A comprehensive reference/resource section and a listing of survey participants is also provided in the document. *Online Staff Development: Lessons Learned* can be viewed at http://www.itrc.ucf.edu/LL and free single copies can be ordered from that site as long as supplies last.

Conclusion

As we move toward more "anytime, anyplace" staff development, we would be well advised to take advantage of new technologies, research and lessons learned along the way. While not all "lessons" listed in this document apply to all courses or components, educators involved—or contemplating involvement—in any way in online staff development should consider each lesson.

As all educators know, "learning never ends." Now, through online staff development, there are more and more opportunities for educators themselves to continue to learn and to grow not only as participants, but as course designers and facilitators.

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A Hybrid Online Course to Enhance Technology Competencies of School Principals

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Abstract: Administrative leaders do not necessarily perceive themselves as leaders in technology in schools. Educational administration graduate students in this study acknowledged that their computer skills were often surpassed by their own faculty, staff, or students. This paper describes an online graduate level course for future administrators, "Principles of Curriculum" (EDUC 276), taught at Drake University. The course was developed with on-campus face-to-face classroom meetings to build future administrator's skills and confidence followed by completion of the course using online web based instruction. Results suggest that administrators who completed the hybrid online course report lack of technology proficiency, have greater willingness to engage in distance learning, and provide technology leadership and support for teachers.

Administrative Leadership in Technology

Exemplary computer-using teachers differ from other teachers in a variety of ways. They teach in an exemplary instructional environment of collegiality and social networking where there is school support for technology. These teachers have strong academic backgrounds and are employed in schools with adequate financial resources and relatively small class sizes (Becker, 1994). Other factors include relevant staff development, on-site computer coordination, and technical assistance. However, a key participant in making these decisions is the building principal.

Today, prevailing views of leadership suggest that the principal's role should not be to direct others but to create a school culture in which decisions are made collaboratively. "Facilitative" leadership exercises power through others, not over them (Conley & Goldman, 1994). However, this leadership style emphasizes organizational culture, thus creating a dilemma for school leaders who wish to build technology-using teachers in their schools. On the one hand, school administrators have long realized that quality schools use technology effectively (Dwyer, 1994; Sivin-Kachala, Bialo & Langford, 1997; Kosakowski, 1998; Technology Counts, 2000). They know that technology-using teachers need technology training and support (Becker, 1994). On the other hand, building principals may lack technological skills themselves in order to provide facilitative leadership in making decisions to support staff development, computer coordination, and technical assistance.

Factors influencing the success of technology-rich schools include administrative support in the form of funding, restructuring schedules, physical space, and curriculum decisions to reflect a new learning environment (Glenna & Melmed,1996; Technology Counts, 2000). However, administrators in this study report that they need adequate skill development themselves in order to provide facilitative leadership in funded efforts, space and scheduling, and curriculum design to build or lead a technology-rich school.

Educational institutions have clearly recognized the need to prepare preservice and inservice teachers to make technology an integral part of their teaching and learning environments (Thompson, Schmidt, & Hadjiyianni, 1995; Davis, Kirkman, Tearle, Taylor, Wright, 1996; Pelligrino & Altman, 1997; Davis, 1998; Stuhlman, 1998; Strudler & Wetzel, 1999). Yet many school administrators seem to lag in their competencies and confidence in using computer technology for purposes beyond e-mail communication and word-processing capabilities. The "hybrid online course" was especially designed for educational administration graduate students at Drake University. It gave future principals an opportunity to develop their technology skills with a common goal to complete one-third of the course online, as well as to consider ways to support effective use of technology in their roles as school administrators.

Background of Web Course Development at Drake University

Drake University's web program, formerly called "Virtual University," began in 1997 with 12 online courses enrolling 149 students with 359 credit hours. This faculty driven web program operated on a budget with no funding for training and support. Faculty who participated did so because they were professionally interested in creating a web presence for the university in order to engage students in online learning. A "Director of Web Education" was appointed the following year. A faculty program called "Academic Computing Fellow, was also instituted. This program gives two faculty members the opportunity to give support to other web faculty, as well as to learn, create, and experiment with some of the more advanced technology features of web education.

In January 2000, an Internet System's Manager position was created to provide technical, pedagogical, and other training support for faculty. Workshops provided hands-on training to learn web software, principles of web design, and elements of effective online teaching and learning.
Faculty workshops provided instruction for interested participants to use WebCourse in a Box™, a commercial software for developing online courses. Academic Computing Fellows assist in this effort and provide one-on-one mentoring for faculty new to the online teaching environment. As web courses go "live" students enrolled in web courses also receive technical support from the Internet System's Manager when necessary.

Enrollment in the web program continues to increase. Currently Drake University offers 65 web-based course for a population of 5200 undergraduate and graduate students. This year 624 students took advantage of web-based learning opportunities.

Table 1: Web Course Enrollment at Drake University

Year	Number of Students (Undergraduate and Graduate)	Credit Hours
1999	433	1325
2000	817*	2440

*Note: Actual enrollment of 624 students resulted in 817 registrants because some students enrolled in more than one web course.

Elements of Successful Online Education Courses

Research studies indicate that online learning environments constitute additional space in which people can learn, teach, communicate, work, trade, and spend leisure time (Harris, 1998; Somekh & Davis, 1999; Picciano, 2001). Educators are well aware of the potential of web technology, have adopted it for creating new learning environments, and have harnessed its power for relevant educational uses (Mioduser, Nachmias, Lahav & Oren; 2000). For example, key features of web-supported courses include the sophisticated *manipulation of information*. Students generate, transmit, store, process, and retrieve information from online libraries, databases, journals, virtual museums, and other Internet repositories of information. The web also serves as a *communication facilitator* for e-mail, group conferencing, and threaded discussions enabling peers, instructors, and experts to collaborate. The web is a *creation environment* to allow students to generate and publish their own research or websites with minimal technical assistance. Finally, the web serves as an *instructional delivery medium* to disperse intellectual material, connect to relevant URLs, and assess student understanding through quizzes and feedback analysis.

Key Features in Developing "Principles of Curriculum" Online at Drake University

The hybrid online course, "Principles of Curriculum" used these key features in the development of the course. Specifically, educational administration students *manipulated information* in order to search ERIC databases, ERIC Digests, OERI Research Syntheses, and selected websites through WebCourse in a Box™ hotlinks in order to write required research papers. Students read books on educational issues or topics of interest. Following an analysis of their book, the assigned research paper provided a critique of the ways in which this author's work or point of view impacted their role as an administrator.

Communication was facilitated as students e-mailed one other and the course instructor using "Learning Links" featured in WebCourse in a Box™. Students also communicated with three others to provide critical feedback on their research papers. Class members had access to all posted research papers. One graduate student remarked, "I had three times the feedback on my work. Comments were very insightful." Another student in the class exclaimed, "In three years of grad school, I have never had an opportunity to read someone's research paper, thus being able to learn from their thinking and writing." Threaded discussions through the use of a forum were available to all class members. Access to course research and discussion was restricted to enrollees.

The online course provided a *creation environment* as educational administration students "uplinked" their research papers in the WebCourse in a Box™ student portfolio section. Practice time in the computer lab was provided during the on-campus portion of the course. Students were required to electronically publish their own research work, as well as access the work of their classmates. Four members built websites to share their research while others added resumes to their electronic portfolios.

In order to promote the *delivery medium* function of the online course, there were intellectual interactions with the assigned text readings on curriculum theory, educational theorists, and curriculum design. Students connected to relevant curriculum URLs, had a chance to respond to the textbook author's interactive website, completed quiz questions on the web, check their grades, and provided online feedback to the instructor. Interestingly, because the course feedback was requested online, the grad students referred to the technology components of the course. Their responses were favorable and encouraging. One student said, "I am a computer dinosaur. This course helped increase my skills and decrease my anxieties."

Online learning meets the needs of adult learners (Imel, 1998; Collis, Winnips, Moonen; 2000; Johnson, Aragon, Shaik, Palma-Rivas, 2000). It is an approach for integrating technology into adult learning. It helps students consider how technology can be used to support and expand learning in their role as a school administrator. Not only did the adults learn content through technology, they also learned about the technology itself. One student said, "At first, I was not thrilled to take the last block of instruction through the Internet. But, now I am now sold on it."

Specific to the hybrid course was the use of web-based courseware as more than an electronic syllabus. The web-based software was used to communicate announcements of encouragement, reminders of due dates, and trouble-shooting suggestions from other students who had solved specific problems relating to the technology.

Because most students did not have prior online course experience, class was held in the computer lab during the on-campus sessions. Working together initially helped build skills in a sequential, developmental process. Skills and strategies for solving problems were acquired gradually and in stages that were more or less predictable (Hilgard & Bower, 1974). Effective teaching must involve a sensitive assessment of the individual's status in the learning process, as well as a presentation of problems that slightly exceed the level already mastered. Tasks must be neither too easy nor too difficult to understand. Hunt (1961) describes this as the "problem of the match" based on the principle that learning occurs only when there is an appropriate match between the circumstances that the learner encounters and the schemata already assimilated into his repertoire. Technical assistance, provided by the Drake University Internet System's Manager, was critical in teaching appropriate skills and troubleshooting.

Technical support issues impact the success of an online experience. The learner's confidence and comfort level with the technology was enhanced when direct online instruction occurred prior to the online portion of the *Principles of Curriculum* graduate course. Besides direct instruction by the Internet System's Manager, hard copies of directions that included screen shots taken directly from the web course software was provided to the students. Students were given time to practice the various components of online interaction during the instructional time. This included posting to the forum, replying to someone else's post, uploading files, and submitting assignments and adding information to an online portfolio. Students were encouraged to log onto the course to ensure that technical difficulties could and would be kept to a minimum and/or eliminated prior to the online weekend. They were also encouraged to contact the Internet System's Manager to help smooth out any technical difficulties that might arise. Technical online support web pages linked to the course software, as well as a "Request for Technical Support" form was demonstrated for the students. Phone calls and/or email requests for technical help were encouraged to help the students successfully meet the course requirements during the final, online weekend of the course.

Features of the Drake Hybrid Online Course for Administrators

Student feedback revealed that the features of the online class that were particularly meaningful included:

-Building electronic portfolios
-Participating in threaded discussions regarding their research papers via the Research Forum.
-Strengthening their research skills.
-Completing one third of the course at a time and pace that was convenient for adult learners.
-Exploring technological resources and representing information in electronic forms.
-Becoming more confident and aware of what their computers can do in teaching and learning.
-Communicating effectively about complex processes (research and trouble-shooting).
-Becoming independent learners through their online experience, yet helping each other spontaneously and willingly in collaboratively ways.
-Increasing research and writing skills from exposure to quality work of others.
-Better problem solving and critical thinking skills utilizing technology

Conclusions:

In reality most educational administrative preparation programs lack sufficient technology instruction or support in using technology for administrators to assume new leadership roles. Many principals lack the necessary proficiencies to provide leadership and support to their faculty and staff members. Encouraging principals to use technology in teaching and learning is possible using effective strategies and shared experiences such as a hybrid online course designed to enhance technological competencies.

As Harrington (1991) suggests, there is a difference between preparing teachers to use technology and using technology to prepare teachers. If we only prepare teachers to use technology we limit the conception of the role of technology in education. Administrators, too, must be empowered to take more responsibility for both acquiring technological competencies and to facilitate technology usage and capabilities of teachers and students through effective leadership.

References:

Becker, H.J. (1994). How exemplary computer-using teachers differ from other teachers: Implications for realizing the potential of computers in schools.

Collis, B. Winnips, K., Moonen, J. (2000). Structured support verses learner choice via the WWW: Where is the payoff? *Journal of Interactive Learning Research, 11*, (2), 131-162.

Conley, D. and Goldman, P. (1994). *Facilitative leadership: How principals lead without dominating*. Eugene Oregon: Oregon School Study Council.

Davis, N. (1998). *Images for teacher education.* [Online]: World Wide Web: http://telematics.ex.ac.uk/fr-tltp.htm

Davis, N., Kirkman, C., Tearle, P., Taylor, C., Wright, B. (1996). Developing teachers and their institutions for IT in education: An integrated approach. *Journal of Technology and Teacher Education, 4*(1), 3-18.

Dwyer, D. (April, 1994). Apple classrooms of tomorrow: What we've learned. *Educational Leadership*, 51(7), 4-10. (EJ 508281)

Education week on the web. *Technology Counts: Schools and reform in the information age. A special report.* [Online]:http://www.edweek.org/sreports/tc/ (version current at April 2000).

Glenna, T. K. & Melmed, A. (1996). Fostering the use of educational technology: Elements of a national strategy. *A Rand Report.* Santa Monica, CA: Rand. [Online]: World Wide Web: http://www.rand.org/publications/MR/MR682/contents.html (Version current at April 1998).

Harris, J. (1998). *Virtual architecture: Designing and directing curriculum-based telecomputing.* Eugene, OR: International Society for Technology in Education.

Harrington, H. (1991). Normal style technology in teacher education: Technology and the education of teachers. *Computers in the Schools, 8*(1/2/3), 49-57.

Hilgard, E.R. & Bower, G.H. (1974). *Theories of learning.* 4th ed. Englewood Cliffs, NJ: Prentice-Hall.

Hunt, J.M. (1961). *Intelligence and experience.* New York: Ronald Press.

Imel, S. (1998-00-00.). Technology and Adult Learning: Current Perspectives. ERIC Identifier: ED421639. *ERIC Digest No.197.* Columbus, OH: ERIC Clearinghouse on Adult Career and Vocational Education.

Johnson, S.D., Aragon, S.R., Shaik, N. & Palma-Rivas, N. (2000). Comparative analysis of learner satisfaction and learning outcomes in online and face-to-face learning environments. *Journal of Interactive Learning Research, 11*,(1), 29-49.

Kosakowski, J. (1998). The benefits of information technology. Syracuse, NY: *ERIC Digest Clearinghouse on Information and Technology*, ERIC Identifier: ED420302. Publication Date: 1998-06-00.

Mioduser, D., Nachmias, R., Lahav, L., Oren, A. (2000). Web-based learning environments: Current pedagogical and technical state. *Journal of Research on Computing in Education,33*(1), 55-76.

Martinez, M. & Bunderson, C.V. (2000). Building interactive world wide web (Web) learning environments to match and support individual learning, *Journal of Interactive Learning Research, 11*, (2), 163-195.

Pelligrino, J. & Altman, J. (1997). Information technology and teacher preparation: Some critical issues and illustrative solutions. *Peabody Journal of Education, 72*(1), 89-121.

Picciano, A.G. (2001). *Distance learning: Making connections across virtual space and time.* Upper Saddle River, NJ: Merrill/Prentice Hall.

Sivin-Kachala, J., Bialo, E. & Langford, J. (1997). The effectiveness of technology in schools. *ERIC Database* ED 413875. Available: [On-line] World Wide Web: http://www.spa.org

Somekh, B. & Davis, N. (1999). *Using information technology effectively in teaching and learning: Studies in pre-service and in-service teacher education.* New Fetter Lane, London: Routledge.

Strudler, N. & Wetzel, K. (1999). Lessons from exemplary colleges of education: Factors affecting technology integration in preservice programs. *Educational Technology Research and Development*, 63-82.

Stuhlman, J. (1998). A model for infusing technology in teacher education programs. *Journal of Technology and Teacher Education, 6*(2/3), 1125-1140.

Thompson, A.E., Schmidt, D. & Hadjiyianni, E. (1995). A three year program to infuse technology throughout a teacher education program, *Journal of Technology and Teacher Education, 3*(1), 13-24.

Exploiting and Evaluating A Web-Based Learning System Six Days and Seven Nights In The Basement

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Abstract: Discussion of the value of Web-Based Learning System (WBLS) takes place at two levels, the theoretical and the practical. The practical value of a WBLS depends on numerous factors including: extent of course enhancement, degree of dependence on web-based technologies, the software platform, technology support, students skills, and institutional issues. At the theoretical level the debate on the value of a WBLS occurs both within the discipline as well as within academia itself. This report examines our experience with a WBLS in the context of a new integrated studies course.

We teach at the University of Wisconsin-Waukesha, a two-year transfer institution within the University of Wisconsin System. It is a commuter campus without residence halls. Most of our students work at least twenty hours a week. Over half of our students are from the lower quartiles. Faculty at our institution typically teach 12-credit hours each semester and in addition they are expected to contribute in a variety of ways outside of the classroom, i.e., student advising, committee service, and professional activity.

The institution provides office computers, network access and a web-based learning system (WBLS) for its faculty. While significant dollars are targeted toward the development of on-line, asynchronous courses, there few institutional resources allocated for web-enhanced courses. This despite the fact that the faculty is expected to develop and support web-based activities for their courses in addition to their other professional and pedagogical responsibilities, i.e., "six days and seven nights in the basement."

Furthermore, instructors on our campus have little technological support. For example, our computer center staff is unable to assist either instructors or students having problems with a WBLS or other instructional technologies. Technology assistance is the responsibility of a limited-term employee, who is a half-time student at another campus. Needless to say, much of time the instructor is left to his or her own ingenuity to figure out the solutions to technical problems. These problems range from helping students login to the system, to discovering why the colors they have chosen for their personal web pages look different when they view them at home. The upshot is that at the beginning of the semester we devote many hours to wrestling with these problems while at the same time trying to prepare for and teach the course itself.

Currently, there is really little merit recognition for including web-based activities into our courses. Rather, it is largely a matter of instructor choice. And that choice may be driven more by institutional priorities than by compelling research demonstrating the soundness and efficacy of web-based pedagogies. Although there is ample evidence that students "like" web-based experiences, important questions about the educational value of such experiences remain unanswered. Does more technology mean better pedagogy? Just because we can now put materials on the web and provide virtual discussion forums for our students, should we? The problem is we simply do not know. It seems that such questions ultimately focus on resource deployment. When much of what we do or do not do is driven by enrollment, it is important to determine how to allocate limited dollars. Do we invest in technological infrastructure, while encouraging the deployment of web-enhanced, hybrid, and asynchronous courses? Or do we support opportunities for greater student-faculty contact, smaller classes, and first-rate teachers. Obviously these choices are not mutually exclusive, but the tension they engender is very real and it has implications for our future as an institution as well as for our students.

A primary motivation for integrating a WBLS into courses is course enhancement. There are several ways instructional technologies can enhance a course. Clearly they encourage interpersonal communication. Discussion forums, group activities and email permit asynchronous exchanges to occur. Student and faculty home pages help in getting to know something about each other. In the absence of opportunities for face-to-face interaction a WBLS can help to foster communication among students and faculty.

However, our aim in using the web is not communication for communication's sake. Rather we want our students to present clear, coherent, and consistent arguments. We seek to accomplish this in three ways. First, we try to be role models. We provide examples of the kind of analysis we expect. Whether we are presenting our own views or discussing the views of another philosopher or psychologist we emphasize the importance of justifying our conclusions. We provide hypertext links to sites that exemplify empirically based and logically sound arguments. Second, we ask students to evaluate each other's arguments. And third, we take the arguments presented on the course web site back into our classes to stimulate discussion. This is especially helpful where we have students who don't say much in class. We use their web comments to get them involved in the face-to-face discussion. The technologies used in our courses also enable us to demonstrate the richness of resources available on the web. Not only do we provide supplementary course materials but external links as well. As we discuss each main topic we provide students with a set of hypertext links that elaborate on the issues. Often the links are directly to the authors who write the articles or to discussion groups currently analyzing the concepts and arguments. Along with web discussions we also present self-check quizzes. The quizzes receive a fair amount of attention. Students will often have follow-up questions about their answers. Thus web-based instruction not only aids in teaching our courses but enables us to tutor the course as well.

Web-enhanced courses present unique involvement challenges. It is difficult to motivate student to participate in web projects without grade inducements. We have offered courses that have included web components where the web work was not required for the class grade. While there was initial interest, the web activity dwindled as the semester progressed. In fact, according to class surveys, one of the student's greatest concerns about web work is the time it takes. Since most of our students have jobs and many have family obligations, they must carefully budget their time. When we first integrated web work into an interdisciplinary course, we received a lot of student complaints about what they perceived as excessive work. In response to these concerns we have since cut down on the web requirements.

In large classes it takes a fair amount of time to read, record, and respond to the answers to discussion questions. We estimate that in addition the start-up time, web work adds about one hour each day per class. In order to track students' responses to their web experiences we conduct continuous student evaluations throughout the semester. We ask students to keep logs as well as having them fill out questionnaires. The tracking information is very useful in spotting problems, making mid-course corrections, and insuring that our web demands are not excessive.

There are a wide-range of philosophy and psychology courses at all academic levels now offered on-line. Additionally, there are electronic journals, articles, papers, opinions, and discussion forums on the web. Our professions have certainly embraced the web as a vehicle for exchanging information. The sheer quantity of information is overwhelming and often this makes it difficult to find a useful signal in what sometimes seems little more than a sea of random noise. Within the disciplines there is debate over the advantages and disadvantages of web v face-to-face instruction. Do on-line courses tend to negate the dynamic interaction needed to teach philosophy and psychology? Would Socrates ever teach an on-line course? Can one "deliver" instruction as if it were a pizza? Are courses that are taught on-line better than no courses at all? Fortunately value-added or web-enhanced courses need not answer these questions, although they beg for answers. Instead, we believe that we have the best of both worlds. We interact in-person with our students. Also we exchange ideas with our students over the web. We can take advantage of the richness of information that the Internet makes available, while preserving and celebrating the face-to-face interaction of the classroom. Most of our students are not well adapted to the demands of independent study. For them and for us as well, value added learning technologies provide another means for reinforcing and enriching in-class instruction.

Using Constructionist Principals In Designing And Integrating Online Collaborative Interactions

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Abstract: This paper describes a study that took an action research approach to investigate learners' experience using CMC to engage in a collaborative project in an online learning environment. Communication messages were archived for analysis and a post-questionnaire was administered to provide feedback on the students' experience with the project. Findings from the study were then used by faculty at Northern Arizona University (NAU), a small institution that serves mostly rural students in Arizona, to design and implement one of the foundational web-based courses in their online Master's of Education in Educational Technology degree. The course design for *ETC 567: Technology, Society, and Education* was based on findings from the described study investigating online collaborative interactions and founded on constructionist principals to enhance learner interaction through collaborative writing projects in the online learning environment. Furthermore this paper provides examples for practitioners desiring to integrate collaborative projects in online learning environments.

Introduction

In the 1960's, Seymour Papert and colleagues initiated a research project on how children think and learn and to develop educational approaches and technological tools to help those children learn. From this beginning has evolved a theoretical foundation, which has become known as constuctionism. The term constructionism, first coined by Papert (1991), involves two main tenets. First, it affirms the constructivists view of learning and asserts that knowledge is not simply transmitted from teacher to student, but actively constructed by the mind of the learner (Kafai and Resnick, 1996). To this constructionism adds the idea that people construct new knowledge with particular effectiveness when they are engaged in constructing *personally meaningful products* (Bruckman & Resnick, 1996). Thus constructionism involves two intertwined types of construction: the construction of knowledge in the context of building personally meaningful products (Kafai and Resnick, 1996). It is through this avenue of "constructing" that technology can be integrated into the instructional process such that it promotes teachers to teach from a constructivist model.

Moore (1989) described interaction within distance education as that interaction between a) the learner and the content, b) the learner and the instructor, and c) the learner with other learners, and suggested that it is most desirable to incorporate all three types into instruction. Interaction between these shareholders permits sharing of ideas, concepts and valuable feedback. Hillman, Willis, & Gunawardena (1994) suggest that learners also interact with the instructional interface – the technology.

In today's distance learning environments Computer Mediated Communication (CMC) becomes the venue or vehicle where the social construction of knowledge (Vygotsky, 1978) occurs for learners to build their understandings through their communication, social interactions and collaborations. CMC supports collaboration among learners, instructors (experts), content, media, and writing/composition (Misanchuk, Morrison, and Peterson, 1997; Sproull and Kiesler, 1991; Seagren and Watwood, 1997; Gunawardena, Lowe, and Anderson, 1998; Jonassen, 1996; Moore and Kearsley, 1996; and Harasim, 1996). The learning and interaction that occur in environments that employ CMC encourage collaboration and teamwork and require active rather than passive participation.

The Study

An action research study was conducted with fifty-seven graduate students from two different sections of the same course taught by two instructors who team-taught both sections at a large southwestern university. The study included one traditional face-to-face section that met once a week in a computer lab and another section that was televised over an Interactive Instructional Television system (IITV). To enhance these students' learning experience and increase peer to peer interaction, the sections were taught as one class and all students were required to interact with one another via Soft Arc's First Class® computer conferencing system in both asynchronous and synchronous sessions. In addition, the First Class® venue was used as a location to upload assignments and other documents for the collaborative assignment. Furthermore, students were given a collaborative project where they would use CMC and First Class® to organize and communicate on their common task.

Anecdotal data were collected via the First Class® conferencing system in the form of a discussion of the collaborative project. Students were also asked to respond to a questionnaire and then reply to their peers' responses. The questionnaire was designed to elicit basic information about their experience and asked for general comments for making the assignment better.

Findings

The results from this study indicated that these individuals successfully used CMC for this student collaboration project. Overall students reported in greater numbers that the experience was better than they expected. However, as in all classroom collaborations, this activity did have some difficulties that arose to flavor the students' experience. While students generally reported that it was better than expected and overall a positive experience, they also made suggestions that they felt would have made it a better experience. Those suggestions included some very specific changes.

Overall students reported in greater numbers that the experience was better than they expected.

60.78%	Reported that the collaborative project **went better than they expected** and felt it was a positive experience.
25.49%	Reported that the collaborative project **went better than they expected** and felt it was a positive experience.
13.73%	Reported that the collaborative project was **neither better nor worse than they expected**.

Table 1. Questionnaire Results

Positive comments included:

- "It was actually better than I expected. The hardest part was our first chat. After that it flew. I expected a lot more communication problems and we actually only had one. I also had a very good group. I have had so many projects where group members did not pull there weight."
- "Our group (The Red Team from Group 3) had a good time doing our web pages! We didn't have any serious topics in mind so we had a little fun! The experience was better than I expected. Since this was an on-line collaborative effort, I thought we were going to have trouble communicating, but we didn't!"
- "What I liked most about the project, and about my group, was our helping each other out. Sometimes one of us knew something and other times the other group members figured things out. We worked really well together. We weren't trying to outdo each other's pages."

- "Though my group experienced a few glitches, I feel working on the group project collaboratively online was very interesting. It turned out better than I expected. I thought it would be very difficult to get things organized. The members of the group were at different levels of watching the class, and on downloading and understanding the workings of Claris Home Page. This is why I thought it would have been difficult. It did not turn out being as hard as I had expected."

Negative comments included:

- "My experience with the online collaborative activity didn't go as well as I would have liked it to. I moved house in between all of the collaboration and had a lot of other work to do with my other classes. To top it all off, something went wrong with my computer and I had to get it fixed. By the time I got in contact with my group, everything had been decided for me as far as what page I would do and the subject which I knew nothing about. So I had to scramble for ideas and research the web for images etc... and get it all done by the due date. Needless to say, there was nothing that I liked about this activity. It was hard to connect our ideas (for me) without using the telephone because of the time element involved. It would have been better if we were given a list of phone numbers at the start so that I could have at least gotten to talk with my group members as to what all of our duties would be and a topic that was agreeable with all. Another suggestion would be to have a sign in place where people could choose to be in a certain group and talk/meet/chat at a common time. It's hard to collaborate when there is a missing link."

- "It was worse than I expected simply because of the technical problems I encountered on my end. But though it all I learned something I could use."

- "It turned out worse than expected, due to delays in getting input from team members, and a team member missing from the organizing chat. Most of our team's difficulties were from outside sources. We didn't have a lot of technical problems because I already have some web page construction knowledge. But we were delayed one day when the teammate who was supposed to be designing the colors, college name, etc. could not get one of the ASU computers to work. So better, quicker help for her would have made it better for the team."

- "I found the online collaborative activity to be frustrating. Perhaps because it was my first attempt. It was worse than I expected. We had a hard time getting together and communicating. It was helpful however to know someone else was as frustrated as I was and we did figure out how to solve some of our technical problems. I'm not sure what could have made our experience better. Each one of us was at a different skill level and that made it hard. This wasn't anyone's fault - it just increased the anxiety and frustration level. I think group projects via distance learning can work - I think it takes practice, patience, consideration and commitment. I would not be opposed to doing another group project in this manner."

Interestingly, many indicated that they were surprised that some expected difficulties did not occur and that unexpected difficulties did occur. For example one student commented,

- "I think the group project was better than I expected. My fear was that one or several students in the group and team would not be able to meet to chat due to excuses, meaning that the assignments may not be thoroughly completed. However, I am happy to report that my group and team had no problem at all chatting and coordinating our ideas, though there ultimately was a little problem linking one of the pages to the other two. On th other hand, I guess that I may have bee fortunate by being placed in a group with "serious" students since I heard of others who were less fortunate and could not complete the assignment on time nor chat at the scheduled chat times."

Another student commented,

- "The group project was neither better nor worse – I've learned not to predict in this class. I was surprised at what was easy and what was hard. I thought it would be really hard to link the three pages, and it was easy. The problem was that two of us had problems getting our images uploaded – I thought it would be automatic. Constructing the web page itself was very easy."

Course Design

Based upon the findings from the study, a re-design of *ETC 567: Technology, Society, and Education* was conducted and is being taught implementing many of the recommendations from this study and based upon constructionist principals where students interact and construct meaningful products. Two different types of *very structured* online interactive collaborations were set up to foster better groups, greater support, and leadership. Using both synchronous and asynchronous CMC systems provided learners with several venues for interaction. First, a Homework Network was devised and scheduled which groups students into rotating teams of three for specific peer evaluation of reaction papers written in response to weekly reading assignments. Second, semester-long Discussion Groups were formed in teams of three.

The Homework Network

The Homework Network is designed to provide a way of interacting with course topics, readings, and other members of the class in the online environment. The objective of the Homework Network is for each individual student to complete the assigned readings, create a one-page reaction paper on the assigned "Topics of Discussion" based on the readings and personal knowledge, and share this paper with the members of their network.

Students complete 6 Homework Networks through out the course and are given a grouping assignment at the beginning of each. Once Homework Networks are assigned, they are instructed to establish email contact with the others in their network as soon as possible. They then write and email a copy of their reaction paper to the other two members of their Homework Network as well as their instructor. Once they receive their peers' papers, they read and rate the paper using a rubric (see Table 2.) and email the rating to the instructor.

Paper illustrated both depth and breath of thought	Paper illustrated either depth or breath of thought.	Paper illustrated neither depth nor breath of thought.	I did not receive the paper.
5	4	3	0

Table 2. Grading Rubric

The Discussion Group

The Discussion Group is a semester-long team with each member having a very specific role. The roles will rotate after each assignment so that each person completes each role by the end of the semester. The roles have been designed to provide structured leadership and include; a) Presenter, b) Team Leader, and c) Observer/Commenter.

The Presenter

During the semester, the instructor will present three "condition of the world" topics of discussion based on the readings for the course and the group discussions. The Presenter will examine the topic of discussion and from that determine a specific direction that the group will pursue. The Presenter can ask for input from the group if they wish. Based upon the direction of thought, the Presenter begins a Threaded Discussion by posting a question for discussion on the Discussion Board.

Each member of the team will be required to post two substantive responses each week to the question posted by the Presenter. The Presenter then facilitates the discussion. If new threads of discussion are to be begun, the Presenter must begin them. Other members can suggest new threads but it is the responsibility of the Presenter to post them.

The Team Leader

The role of the Team Leader is take the responsibility for leading the cooperative group to produce a 3 to 5 page position paper on the topic of discussion (assigned by the instructor). Through cooperative effort directed by the Team Leader, the Discussion Group uses the Virtual Chat "whiteboard" to facilitate the creation of the position. The paper should be based upon the threaded discussions of the Group Discussion Board and the discussions in Chat. The Team Leader then takes the suggested changes and creates a final document, which he or she emails to the Instructor. The Team Leader also evaluates the performance of EACH member of the group but NOT themselves.

The Observer/Commentator

(Note: In groups that might have 4 members these roles can be separated. If there are only 3 in the group then both roles will be completed by one individual).
The role of The Commentator is to facilitate the Virtual Chat. Upon the completion of the Chat conference, the Commentator is to write a summary of the discussion, and email the document to the instructor.

The role of The Observer is to write a reflection and email it to the instructor on the group dynamics that occurred during the creation of the position paper. The reflection is to discuss what went well and areas of difficulty in creating the product. In the reaction, they are also to comment on the participation of each member, and use the evaluation rubric above evaluate the performance of the Team Leader.

Summary

As web-based courses and degree programs continue to be developed at an increasingly rapid pace, the literature suggests that practitioners design develop learning environments that foster learner interaction and collaboration. The faculty at Northern Arizona University's Educational Technology department strive to do so; providing a learning experience that is rich with interaction and that is based upon constructivist learning theory. The foundational course *ETC 567: Technology, Society, and Education* provides these graduate Educational Technology students with the opportunity to begin their M.Ed program by using constructionist principals in designing and integrating online collaborative interactions.

References

Bruckman, A., and Resnick, M. (1995). The MediaMOO Project: Constructionism and Professional Community. *Convergence, 1*(1): 94-109.

Gunawardena, C. N., Lowe, C. A., and Anderson, T. (1998). *Transcript analysis of computer-mediated conferences as a tool for testing constructivist and social-constructivist learning theories.* In: Distance Learning '98. Proceedings of the Annual Conference on Distance Teaching & Learning (14th, Madison, WI, August 5-7, 1998).

Harasim, L. (1996). Online education. In T.M. Harrison & T. Stephen (Eds.), *Computer networking & scholarly communication in the twenty-first-century university.* (pp. 203-214) Albany, NY: State University of New York Press.

Hillman, D. C., Willis, D. J., & Gunawardena, C. (1994). Learner-Interface Interaction in Distance Education: An Extension of Contemporary Models and Strategies for Practitioners. *The American Journal of Distance Education 8*(2): 30-42.

Jonassen, D. H. (1996). *Computers in the classrooms: Mindtools for critical thinking.* Englewood Cliffs, NJ: Prentice Hall.

Kafai, Yasmin B. and Mitchel Resnick (1996) Introduction. In K.B. Kafai & M. Resnick (eds.), *Constructionism in Practice, Designing, Thinking, and Learning in a Digital World.* Hillsdale, NJ: Lawrence Erlbaum Associates

Misanchuk, E. R., Morrison, D., and Peterson, M. E. (1997). *A beginner's guide to computer conferencing.* Paper presented at the Annual Conference of the Association of Educational Communications and Technology. Albuquerque, NM, February 12-16, 1997.

Moore, M. G. (1989). Three types of interaction. *The American Journal of Distance Education. 3*(2), 1-6.

Moore, M., and Kearsley, G. (1996). *Distance education: A system view.* Belmont, CA: Wadsworth Publishing Company.

Papert, S. (1991). Situating constructionism. In I. Harel & S, Papert (eds.), *Constructionism.* Norwood, NJ: Abex.

Seagren, A. and Watwood, B. (1997). *The virtual classroom: what works?* In: Walking the Tightrope: The Balance between Innovation and Leadership. Proceedings of the Annual International Conference of the Chair Academy (6th, Reno, NV, February 12-15, 1997).

Sproull, L. S., and Kiesler, S. (1991). *Connections: New ways of working in the networked organization.* Cambridge, MA: MIT Press.

Vygotsky, L. S. (1978). *Mind and Society.* Cambridge, MA: Harvard University Press.

Learner Styles and Potential Relations to Distance Education

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Abstract: This article reviews the literature on cognitive/learning styles and how these learning styles can impact the design, implementation and instructional strategies used in the distance education environment. Several cognitive/learning styles have been examined over the years within the educational realm, but few of these cognitive/learning styles have been taken into account in the distance education environment. Several cognitive/learning styles are reviewed and the implications of these cognitive/learning styles are examined in the context of distance education. Without acknowledgment of the differences between students and incorporating these differences into the presentation of materials, evaluation and feedback we may be providing less efficient learning environments for students. As technology continues to change it is imperative that we as educators taken into account the many differences that students bring to the educational environment. This appears to be even more important in the distance education environment as the diversity of students appears to be larger then within the traditional educational environment.

Introduction

As technology and computers continue to infiltrate our schools and institutes of higher education, research and theory is suggesting that these technologies can go a long way in creating complex and rich learning environments (Freedman & Liu, 1996). The use of these new technologies has lead to an explosion in distance education through various mediums (compressed video and Internet courses). With this rapid move toward the use of distance education, researchers and theorist's alike have not had the opportunity to examine the effects of these new technologies and how best to implement them for maximal student performance. Only by examining these variables can we effectively design and implement distance education that will lead to maximal learning and performance. Distance education may not be for everyone. Not all faculty members are suited for the varied modes of teaching, nor are all students appropriate for attempting the various forms of distance learning. It would appear that to obtain the highest quality teaching and learning from a distance, consideration of theoretical perspectives, subject content, learning context and learner characteristics need to be considered. In traditional education many aspects of the learner, learning environment and the interaction between the two has been examined. This has not been the case for distance education. This article reviews the research on learning styles (cognitive styles) and how they may interact in the distance education environment. Finally, recommendations are made on how to best implement distance education to meet the unique needs of students with different learning or cognitive styles.

Cognitive/Learning Styles

Research over the years has indicated consistently that people exhibit individual differences in the processing of information and problem-solving. The construct of cognitive styles was originally proposed by Allport (1937) and has been refined and further expanded by several others (Messick, 1976; Smith, 1984; & Tennant, 1988). Based on the various definitions that have been proposed, cognitive/learning styles refer to an individual's characteristic and consistent predisposition of perceiving, organizing, processing, and problem solving. Typically, learning styles involve four basic steps of information processing. These four steps include: 1) data collection or gathering information; 2) relating information to current knowledge; 3) analyzing logical connections between concept possibilities and consequences of actions; and 4) evaluating the outcomes. Over the years different researchers have focused on different aspects of cognitive/learning styles including: a) cognitive complexity vs. cognitive simplicity; b) field dependence vs. field independence; c) impulsive vs. reflectivity; d) organizer vs. non-organizer; e) scanning vs. focusing; f) simultaneous vs. successive; and g) holist vs. serialist. Taken together, all of these styles have implications for the learner and instructor as they will interact in the learning and produce a variety of results depending on factors such as, material presentation, method of instruction, format of evaluations and feedback.

In general, most researchers tend to use cognitive styles and learning styles interchangeably, which will be done in the remainder of this article. Cognitive/learning styles have been viewed in three major respects structure, process, or both structure and process (Tennant, 1988). Additonally, Ausburn and Ausburn (1978) have proposed that cognitive/learning styles are characterized by three important properties: generality and stability across tasks and over time, independence of cognitive/learning styles from traditional measures of general ability, and finally the relationship between cognitive/learning styles and specific abilities, characteristics, and learning tasks. At this point is appears that a brief review of some of the more pertinent cognitive/learning styles is warranted. These will include field independence-dependence, holist-analytic, Verbal-Imagery, and sensory preferences.

Field Independence vs. Field Dependence

Witkin (1979) defined field independence-dependence as value-neutral and is the ability to distinguish key elements from a distracting environment. Research on field independence-dependence has found that field independent individuals are more autonomous in the development of cognitive restructuring skills, while field dependent individuals tend to be more autonomous in developing interpersonal skills. Additionally, other research has shown that field independent people tend to be more intrinsically motivated, enjoying individual learning, while field dependent people like cooperative learning and appear to be externally motivated. Additionally, research has demonstrated that field independent individuals tend to be analogical problem solvers, as well as perform better in situations that require parallel processing, while field dependent individuals tend to perform better in serial processing conditions and are non-analogical problem solvers. It should also be noted that some gender differences have been found in this dimension of cognitive styles, with males being more field independent and females being more field dependent (Antonietti & Gioletta, 1995). As can be seen the interaction of the field independence-dependence dimension would have some major implications for the presentation of material and how individuals may learn the material.

Holist-Analytic

Within the holist-analytic distinction, holists tend to view a situation as a whole, while analytics view situations as composed of parts and tend to focus on only one or two aspects. This dimension of cognitive/learning styles is not an all or nothing proposition, and many people fall in the middle and can switch between the two modes and thus, have the benefits of both. In general, holists are able to more easily see the whole picture and draw conclusions between large pieces of information. In contract, analytics may have difficulties in seeing the whole picture due to their proclivity to focus on parts. However, there are advantages to being a analytics, as they are able to break the whole into parts and see the interconnections between the parts that make the whole. Clearly, each of these styles has implications for the presentation of material in the distance education classroom and how individuals may learn the material.

Verbal-Imagery

Verbal-imagery style refers to how individuals represent information in their internal mental apparatus. Verbal individuals tend to represent information during thinking in a verbal format, while imagers tend to represent information while they are thinking in terms of visual images. Individuals have related both of these forms of representing information in the internal mental apparatus to various forms of material presentation and subsequent learning. Generally, imagers tend to learn best from pictorial presentations, while verbalisers learn best from verbal presentation. Additionally, due to the nature of the processing of information, imagers recall highly descriptive text more efficiently than verbalisers as they are able to produce highly complex and rich images, which aid in memory formation. Based on this, it would appear that individuals would learn best when information is presented in a mode that allows them to take advantage of their preferred mode of mentally representing information. This would tend to make sense as individuals are more efficient with the use of their prefered mode and can make more connections with other material that has been encoded into their mental apparatus via their preferred mode.

Sensory Preference

A sensory modality is a biological system that interacts with the environment through one of the basic senses to take information into the organism for further processing. The major sensory modalities are auditory, visual, tactile, or some combination of these. Dunn and Dunn (1979) found that roughly 30% of American students are auditory, 40% are visual and 30% are tactile and the remainder is some combination of the three. Each of these modes of taking information into the organism has implications for learning and performance. Research has indicated that visual processes may be incompatible with abstract thinking and thus, information that relies totally on visual information and processing may interfere with abstract thinking. Other research has demonstrated some gender differences in sensory preferences, with females being more verbally oriented and males being more visual oriented.

Taken together, cognitive/learning styles have implications for the delivery of instructions to students in both the traditional and new distance education formats. One approach will not work, as each student brings his/her own style to learning, and as educators we need to tailor our instructional strategies and modes of delivery to meet the needs of students. In the traditional classroom, with an instructor present, the instructor can alter how he/she interacts with each student to help meet the learning style of the student and promote maximal performance. In distance education it may be impossible to meet the unique learning style of each student, due to technological drawbacks and other factors related to the use of technology. However, we believe that by being aware of cognitive/learning styles of students, distance educators can more accurately design distance education opportunities to make them the most useful for a variety of students.

Characteristics of Distance Education

Distance education is emerging as viable force in the education of individuals that appears to be gaining in popularity. The growth in distance education appears to be related to the demand for education and training from a wide variety of individuals and groups, which normally would not have access to education through any other means. The primary characteristic that distinguishes distance education from other forms of education is the separation of student from instructor, as well as the separation between students. Due to this separation between individuals, there is not natural interpersonal interaction. Additionally, there is a separation between equipment and facilities, and the context in which learning is to be situated. Keegan (1986) defines distance education along six dimensions which are as follows: 1) role of educational organization, 2) place of technological medium, 3) lack of interaction between student and teacher, 4) two-way communication, 5) distance between the learners, 6) industrialization. Within the distance education field there are two primary types of distance education. The first type of distance education focuses structured, programmed learning materials, and the other is based on the use of technological computer communication. The former approach views the programmed materials as the teacher, while the latter views the computer as a channel for communication between students and the instructor.

Within the distance education movement, characteristics of the learner have also been examined as to how they may differ from traditional students and how the distance education format may impact learners. Generally, findings indicate that the typical distance education student is an adult learner and that certain styles of learning may be more conducive for distance education learning. Typically, students who attempt distance learning at this time tend to be intrinsically motivated and rely more on deep approaches to learning then more traditional students, who rely more on rote learning. Finally, attitudes toward distance education may play a role in how students accept and perform in the distance education environment. Students who approach the environment and learning tasks in a more positive light are more likely to learn and perform in this environment. Finally, it should be mentioned that distance education is not static, but is dynamic in nature with constant technological changes that lead to a variety of delivery modes and instructional strategies that are constantly changing and may not lead to a stable learning environment. In summary, the primary distinguishing feature is the separation between learner and instructor and that distance education and distance learners appear to exhibit different characteristics from more traditional face-to-face instruction.

Design of Distance Education with Cognitive/Learning Styles in Mind

Before an instructor can take into consideration the cognitive/learning styles of students, the instructor must be aware of them. Thus, the first component of incorporating these styles is to assess the cognitive/learning styles of the target audience. This can be done formally or informally, either before the instructor begins or during the first instructional meeting. Once this analysis has been conducted, the instructor can get a feel for the cognitive/learning styles of the students and tailor the instruction and presentation of materials to meet their individual needs. Instructors should include instructional materials that meet the styles of students, thus creating a learning environment that allows students to maximally use their preferred style. The following focuses on incorporating methods that match the style of students, and what evaluation techniques would be most useful given the styles of students.

To facilitate this process the instructor should be aware of several other factors that can contribute to effective teaching and learning. Specifically, instructors should match instructional materials with learning styles. Within this domain, there are several characteristics that an instructor should be aware of in selecting a teaching method, a few of which will be highlighted. Content should match the verbal-visual style of students. Thus, instructors should always provide verbal as well as pictorial depictions of information to accommodate the styles of students. Students who are more verbally oriented will be able to grasp the information, while at the same time, individuals who are more visually oriented will be able to integrate and process the information. Unfortunately, this is not the case in most circumstances and instructors present information in the format that is most comfortable for them, not taking the styles of students into account. Clearly, instructors need to be flexible and accommodate to the needs of students, as this will have a major impact on their learning success. Sensory preference should be taken into account and instructors should provide instructional material in the sensory modality best suited for the student. Thus, the instructor should provide written material to verbal individuals and graphical or imagery data to visual individuals. Ideally, instructors will provide information and material in a variety of sensory modalities that will allow students to not only use their most preferred sensory modality to learn the information, but would also be able to augment their primary modality with information that was processed through other modalities. Instructors need to aware of the holist-analytic style of students and ensure that information is presented and described in a format that allows both sets of individuals to acquire the knowledge. For instance, instructors should not only provide the holistic or total picture of information, but provide a break down of the material and how the separate materials lead to the whole. These are just a few of the many strategies that can be employed to help instructors and instructional materials meet the unique needs of each student. By employing these strategies students of all cognitive styles should have the opportunity to succeed in the distance education environment. In summary, it would appear that the best instructional strategy would be to employ a holistic approach that incorporates many different formats of information presentation through a variety of modalities. By encompassing this vast array of modalities, it is likely that each student will find the opportunity to use his or her most preferred modality to succeed in the course or training experience.

Even though we have focused on the presentation of material to meet the uniqueness of each student, several other variables can have impact on their performance. These include evaluation and feedback to students. It is clear that by being aware of the cognitive/learning style of students, instructors can tailor assessment/evaluation and feedback to match the style of the student. By accomplishing this, students will benefit more from the evaluation and feedback presented. To cover the whole area of cognitive/learning styles that may be present and allow students the opportunity for maximal performance, evaluation should be comprehensive and present assignments and questions in multiple formats to meet the unique style of each student. Failing to accomplish this may leave some students out, even though they may have mastered the material due to evaluation problems and not student related problems. Finally, instructors need to present feedback to students in a manner that best matches their cognitive/learning style. When feedback is unique to the style of the student, it will be well received and processed to a deeper level.

Conclusion

Distance education is becoming a force in the educational realm and appears to be increasing at an astonishing rate as a viable form of education. With this quick to adopt philosophy that appears to sweeping the educational community, many important variables in this new form of education are being overlooked. By focusing on these variables, especially learner characteristics (cognitive/learning styles) we can develop and implement distance education in a format and form that appeals and accomplishes its goal, namely the education of students. Without focusing on these variables, students may be disenchanted with this educational format and feel that they are not getting the education that they deserve, and therefore may seek fulfillment through other methods of education or not seek to advance their knowledge at all.

References

Alport, G. W. (1937). *Personality: A psychological interpretation.* New York: Holt & Co.

Antonietti, A., & Gioletta, M. A. (1995). Individual differences in analogical problem solving. *Personality and Individual Differences*, 18, 611-619.

Ausburn, L. J., & Ausburn, F. B. (1978). Cognitive styles: Some information and implications for instructional design. *Educational Communication and Technology*, 2, 36-44.

Dunn, R. S., & Dunn, K. J. (1979). Learning Styles/teaching styles: Should they...Can they...Be Matched? *Educational Leadership*, 36, 238-244.

Freedman, K. & Liu, M. (1996). The importance of computer experience, learning processes, and communication patterns in multicultural networking. *Educational Technology Research and Development*, 44, 43-59.

Keegan, D. (1986). *The foundations of distance education.* Dover, New Hampshire: Croom Helm.

Messick. S. (Ed.) (1976). *Individuality in learning.* San Fransico: Jossey-Bass.

Smith, R. M. (1984). *Learning how to learn.* Milton Keyes: Open University.

Tennant, M. (1988). *Psychology and adult learning.* London: Routledge.

Witkin, H. A. (1979). Socialization, culture and ecology in the development of group and sex differences in cognitive style. *Human Development*, 22, 358-372.

Using Electronic Portfolios to Support Accountability and Preservice Teacher Preparation

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Abstract: The demand for accountability establishes the framework for educational reform in the new millennium. The portfolio process represents a more authentic form of assessment in that it allows the teacher to judiciously select those work products and artifacts that portray the full range of the teacher's work. In an interactive discussion, participants will identify standards, course competencies, develop rubrics, and determine quality statements that support the evaluation and assessment of the electronic portfolio. The result constitutes not the "how to" develop an electronic portfolio but an understanding of the importance of integrating this strategy into the preparation of teachers who are more proficient in using technology to improve student learning.

Introduction

Amidst demands for increased accountability in education teachers must assert individual and collective perspective about the real work that teachers do. Georgia Governor Roy Barnes declared, "There will be no more excuse-based education in Georgia." This means that teachers will be held accountable for learning outcomes and called to account for the success or failure of schools (Hixson & Tnzmann, 1990). This demand for accountability establishes the framework for educational reform in the new millennium.

Traditional measures of teacher evaluation represent administratively directed events in which the administrator observes and records what he or she thinks the teacher does and makes judgments accordingly. Under the current process, the teacher has no formal way to integrate self-assembled documentation into the formative evaluation process that tells the teacher's story from the teacher's perspective. The current process invites the teacher to react to the evaluation rather than participate meaningfully into the evaluation process. If true accountability is to occur, both the teacher and the evaluator should assess if meaningful instruction and learning have occurred (Bain, 1996).

The portfolio process represents a more authentic form of assessment in that it allows the teacher to judiciously select those work products and artifacts that portray the full range of the teacher's work. The teacher can establish the context of the learning experience through the *Teaching Statement* that describes what the teacher sees as the result of instruction and the philosophy that undergirds the teacher's practice (Lang & Bain, 1997). The teacher is then able to select student work products which demonstrate student understanding of the content taught and the ability to translate this content into a student produced artifact. This process more accurately displays what the student knows and is able to do as a direct result of the teacher's instruction. The portfolio process also provides a way for teachers to capture students learning over a longer period of time and not just during the moment of the supervisor's evaluation visit. Through the portfolio, the teacher can show where the learner began and how the learner progressed through the learning experience. It is this growth process for which the teacher is ultimately responsible for and for which the teacher should be held accountable.

"One of the most difficult and contentious issues we face is accountability. What I want to know is how school systems, schools and personnel can be held accountable for student achievement. And, how can parents, communities and students be held accountable as well?"

Governor Roy Barnes

The Portfolio Process

The production of a portfolio is not new. Many professions, artists, models, photographers and architects are but a few occupations that have successfully implemented the portfolio process. Education has seen the value of this process and is now employing this tool in training programs for preservice and inservice teachers as (1) an evaluation tool to support professional growth and competence and (2) a strategy for accountability for the competencies acquired in the program.

Teacher preparation programs can use to the portfolio process throughout the teacher preparation program by tying specific artifacts to designated courses within the curriculum.

Under the PT3 Program, Albany State University is developing ways for preservice teachers and school leaders to learn using a constructivist and learner-centered model where accomplishments are measured by knowledge and skill based standards imbedded in the activity the learner completes. By incrementally building the technology skill level of students, each learner amasses a technology integration foundation that leads to higher levels of performance. Students can start by constructing an electronic resume formatted in a traditional word processing program then progress to teacher created lessons, which use Internet activities.

The technology skills are increasingly distributed to the point that individual learners acquire the necessary means to participate in the learning process with a wide array of information, resources, and interactivity. As these skills are acquired, learners are able to store this information electronically. Through reflective judgement, the learner can then connect these artifacts to teacher standards and develop an electronic portfolio, which documents professional growth over a specified period of time.

As students learn technology skills, the conventional paper portfolio is being revisited as a means of identifying learner success and the accomplishment of what the preservice teacher knows and is able to do upon completion of established objectives. As administrators, teachers, and learners become more technologically savvy, the traditional portfolio is giving way to electronically produced, computer-generated artifacts reflected in multimedia presentations, web pages, and interactive discussions. As a consequence of these developments, university faculty will need support and professional development to acquire knowledge about integrating and assessing technology-based tools into college classrooms.

In preservice teacher preparation programs, students often do not have time to review the standards that guide the work of the profession. But understanding teaching standards is essential to making a determination of how well one is prepared to teach.

The National Board for Professional Teaching Standards offers five core propositions for effective teaching:

1. Teachers are committed to students and their learning.
2. Teachers know the subjects they teach and how to teach those subjects to students
3. Teachers are responsible for managing and monitoring student learning.
4. Teachers think systematically about their practice and learn from experience.
5. Teachers are members of learning communities.

Throughout the teacher preparation program, electronic portfolios enable students to document (Figure 1):

1. Technology literacy skills.
2. Collegial skills working on group projects.

3. Content mastery in various courses.
4. Reflective assessments of the teacher preparation experience.
5. Experiences in the classroom where instruction is delivered and managed.

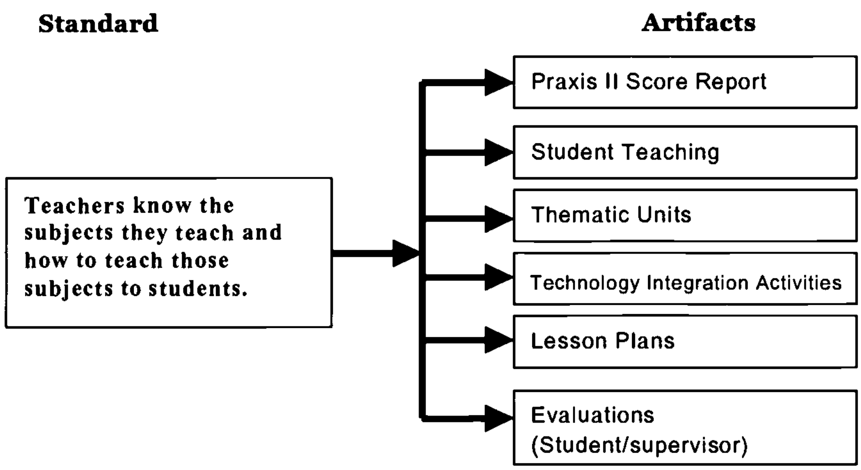

Figure 1

As students prepare to develop the electronic portfolio thoughtful consideration should be given to what it is that preparer wants to document. The following questions should be asked.

1. Why am I developing a portfolio?
2. How will I let the viewer know who I am and what I do?
3. What are the specific responsibilities that I perform?
4. What activities were implemented congruent with these responsibilities?
5. What evidence can I provide that proves that these things were done?
6. How well do I think I did?
7. How will I show this self-assessment?

The emphasis need not be on collecting "best work" when creating the portfolio. Instead, a wide range of work samples representative of the work will allow the viewer to examine progress. Working portfolios demonstrate growth over a specified period of time. At the beginning of the portfolio development process, preservice teachers should answer questions such as:

1. What standards guide my work?
2. What evidence do I have to document my effectiveness?
3. What are my strategies for assembling this evidence into a growth history?

Conclusion

As the growth history develops, preservice teachers may include interim evidence and notes on progress. Finally, when the teaching/learning task is completed, preservice teachers need to summarize what went into assisting all learners achieve high levels of learning. Work samples, plans, outlines, final products and even unfinished products might be included in the portfolio. The value then is work accomplished over time that illustrates growth and learning. Such evidence is more meaningful than a one-time snap shot during a single evaluation period. The role of the teacher is changing to include a broader use and application of technology in the classroom. What better way to authenticate a process is there to allow the teacher to judiciously select work products and artifacts that portray the full range of his or her work?

References

Bain, K. R. (1996). Teaching and Learning Issues – Student Ratings and the Evaluation of Teaching: A White Paper, http://president.scfte.nwu.edu/White.htm, Oct 3, 2000

Burgess, G., Holmes, B. (2000). *Producing a Professional Portfolio.* Conway, AR: River Road Press.

Lang, J.M., Bain, K. R. (1997). Recasting the Teaching Portfolio.

Hixson, J., Tinzmann, M.B. (1990) What Changes Are Generating New Needs for Professional Development?, http://www.ncrel.org/sdrs/areas/rpl_esys/profdev.htm, Oct 4, 2000.

Willburn, E. (1996). The Status ofTechnology in Education System: A literature Review. http://www.cln.org/lists/nuggets/EdTech_report.html, Sept. 22, 2000

Distance Education and What is Coming Next?

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Abstract: In the last decade distance education has gained more importance and attention in its century long history. The more technology and society develops, the greater need for qualified and educated people exist. In order to support this demand for education, schools at all levels started developing and implementing distance education programs. Distance education helps people to work and complete their degrees anywhere while supporting them to become more qualified. As the technology is evolving everyday, the way these programs are delivered change and become more sophisticated. This paper will give a brief history of distance education and try to explain the latest developments in higher education institutions.

Background

Distance education is a rapidly developing approach to instruction throughout the world. This approach has been widely used by businesses, organizations, medical and educational institutions. Especially, academic institutions have been using distance education to reach a more diverse and geographically dispersed audience that is not accessible through traditional classroom instruction.

Traditionally educational systems required in-class instruction by teachers and in-class attendance by students. When distance learning programs started to appear in the early 20th century under the name 'correspondence learning', their major purpose was to serve the population who could not afford to have higher education because of geographical or economical restrictions. In this form, the primary communication mode between an instructor and students was the regular mail and the medium of information delivery was customized printed material. Correspondence learning is the first of three generations of distance learning identified by Moore and Kearsley (Moore, 1996). The second generation began in the early 1970s, with the British Open University. The third generation starts with the advancement of satellite and communications networks in the early 1980s. These networks enabled real time interaction with two way video-conferencing or one-way video and two way audio communications. Multimedia CD-ROM products for self-paced learning and bulletin boards are some of the distance learning tools that emerged in this era.

The distinguishing characteristic of distance education is the physical separation of the instructor and students during the learning process.

As time has changed, distance education concept has changed as well. With the use of Internet technology, the era of the old text based and slow data exchange has evolved into fast high-speed fiber optics Internet bandwidth which allows seamless interaction between the instructors and the students from anywhere in the World. It took almost a century for distance education to gain grounds from the first approaches of correspondence study to today's Web-based technologies.

Today

With the initial developments in the Web technology, there was a concern that the old transmission model of one-way instructional delivery was going to be repeated that ignored the importance of students' interaction and left the students autonomous and isolated. Instructors initially used the objectivist (teacher-centered) approach to learning where they used Web as a mere information-delivery medium to post online syllabi, assignments and lecture notes. However, with the use of Internet technology, more interaction-based applications started to dominate the distance education such as discussion and chat rooms, whiteboards, collaborative tools and video streaming. As a result of these developments, students are having more "closer" interaction and experience than a traditional classroom. The current question is not, whether there is a physical distance between the students and the instructor. It is whether, the real 'learning space' among students and the instructor is closer or not.

Internet and the World Wide Web is the main reason for the paradigm shift from the objectivist (teacher-centered) approach of learning to constructivist (learner-centered) approach of learning. In the latter approach, students learn at their own pace and convenience. A student can now be more in charge of what, when, and where he learns. Along the line, higher education institutions will no longer be the center of power and control of dispensing information and knowledge, but service according to the students' needs for guidance and leadership.

What else can be done?

Bottleneck, bandwidth and protocol limitations on the current Internet backbone is limiting the possibilities to introduce new tools that will enhance the capabilities of distance education. "The amount of Internet content and users has grown exponentially since the early 1990s creation of the World Wide Web. But Internet hardly kept pace"(Fngerman, 1999). In October 1996, Internet2 (I2) consortium was formed by thirty-four universities to enhance the present Internet with new software applications and hardware technologies. The motivational factor behind the formation of this new consortium was to have an extremely high-bandwidth test-bed for academic research and teaching. The possibilities on this new Internet, which will not be clogged by commercial users, are beyond imagination. "Think of the entire contents of the Library of Congress transmitted in seconds. Think of three-D brain imaging transported with clear and instantaneous resolution to surgeons around the world on a particularly difficult case. Think of geographically separated engineers working together in real-time on intricate models and structures" (Fngerman, 1999). "More than a faster Web or e-mail, these new technologies will enable completely new applications such as digital libraries, virtual laboratories, distance-independent learning and tele-immersion" (Internet2 Consortium,)

I envision broader developments such as multi-point, one-to-many, many-to-one video-conferencing. Think of an instructor, sitting in his home-office and interacting with multiple students face-to-face around the world at the same time without compromising the content of the material being taught. In another scenario, a student will be able to feel and smell by using virtual reality technology just as one experience the thrill of flying by using a joystick. There will be virtual laboratories for chemistry, biology, physics and medical students where they can experiment on anything without even leaving their dorms while being guided and supervised by experts in their corresponding fields. The next radical technological development in the distance education will be the 'wearable computers'. Having a computer that you can wear and be able to access the educational material without the physical boundaries of the computer networks will bring real 'real-time' learning. For anything beyond these ideas, we will have to wait and see how technology evolves in the 21st century.

As technology develops, the delivery methods will develop as well. Therefore, now the questions are: What is next and how and when?

References

Fngerman, S. (1999) Internet2 and Next Generation Internet: Two for the Future [Web Page]. URL http://www.findarticles.com/cf_0/m0FWE/1 1_3/57785870/print.jhtml.

Internet2 Consortium. (Frequently Asked Questions [Web Page]. URL http://www.internet2.edu/html/faqs.html.

Moore, M. G. and Kearsley. G. (1996). Distance Education: A Systems View. Belmont, California: Wadsworth Publishing Company.

The Challenges of Interfacing Between Face-To-Face and Online Instruction

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Abstract: The use of the Web for instructional purposes at higher education institutions has crossed the spectrum of distance education delivery contexts, ranging from the Web being used to supplement face-to-face instruction to a primary delivery mechanism for instruction. This article discusses the migration from face-to-face classroom instruction to Web-Based Instruction (WBI) through the experience of a faculty member in the creation and teaching of Web-based courses at a higher education institution. Specifically, four areas which represent challenges for faculty will be discussed: issues surrounding course content; technological assumptions; logistical and implementation challenges; and interfacing between face-to-face and online learning environments. Guidelines for effectively integrating components of a WBI system to support the teaching and learning process in each of these areas will be provided.

Introduction

Interest in the development and use of Web-Based Instruction (WBI) in higher education has seen an explosive surge of activity. In a recent survey by the U.S. Department of Education's National Center for Educational Statistics (NCES), it was reported that the number of distance education programs increased by 72 percent from 1994-95 to 1997-98 and that an additional 20 percent of the institutions surveyed plan to establish distance education programs within the next three years (The Institute for Higher Education, April 2000). It was also reported that 1.6 million students were enrolled in distance education courses in 1997-98. A search for "Web-based courses" using Alta Vista in late 1999 resulted in more than 16 million hits, with results ranging from actual courses being offered on-line, courses enhanced with Web-based resources, and sites discussing the issues surrounding WBI. The results also revealed that the Web is being used for learning purposes in a variety of areas, including business, K-12 and higher education.

Increasingly, institutions and faculty members are feeling pressure to offer Web-based courses to meet economic and student demands. Companies like Real Education (now eCollege.com), WebCt and Blackboard have created environments to make the development of WBI easier for higher education. Despite the advertised ease of creating WBI using "Web course in a box" applications, faculty members and instructional designers working to meet this demand are discovering that the creation of WBI comes at a considerable price in terms of time, effort and resources. While there may be several reasons why the cost of creating WBI is so high, one driving factor appears to be a lack of guidance in "best practices" for creating these types of learning environments. The literature base is beginning to develop (see, for example, Khan, 1997); however, to date, there are not many resources that offer assistance in terms of guidelines for creating WBI on a course by course level. Many faculty are engaged in transforming their current traditional classroom-based courses using a "Web Course in a box" application to a Web-based format ending with a little more than another "version" of the same course. This may be very convenient for students who wish to access course materials at any time, any place, however the effort expended by these faculty is not realized due to the absence of guidelines that could help this transformation process become more effective and efficient.

Web-Based Instruction

Distance education delivery contexts range from Web-supported or Web-enhanced instruction, known as the *adjunct mode,* to the administration of distance learning courses, known as the *online mode.* In the adjunct mode, WBI can work hand-in-hand with traditional classroom instruction where classes would meet 15 times during a semester and the Web-based component is an add-on to support classroom instruction. This facilitates the organization of course materials by the instructor, provides continuous student access to these materials, facilitates student-student and student-instructor communication, and offers students a richer and more self-directed learning experience. WBI can also replace a significant portion of face-to-face instruction. This would be known as the *mixed mode* with the networking fully integrated into the curriculum and up to one half of the course conducted online. The totally *online mode* is where the network serves as the primary environment for course discussions, assignments, and interactions even though media such as textbooks, telephones, or face-to-face meetings may be incorporated as part of the overall instructional design of the course.

"Web Course in a box" applications like WebCt, Blackboard, Virtual-U, Learning Space, and many others, can be used to create any of the distance education delivery contexts discussed above due to their comprehensive nature of providing instructor tools, learner tools, technical tools and administrative tools (Dabbagh, Bannan-Ritland, & Silc, 2000) needed to ensure appropriate creation and delivery of WBI. Moreover these applications are integrational in nature in that they incorporate hypertext, hypermedia, graphics, animation, digital video and audio, self-contained interactive modules, and asynchronous and synchronous tools (Bannan-Ritland, Dabbagh, Harvey, & Milheim, 2000) which are features and components of WBI (Khan, 1997). The comprehensiveness and integrational nature of these applications however present many challenges for faculty which can be categorized into four major areas:

- issues surrounding course content;
- technological assumptions;
- logistical and implementation challenges; and
- interfacing between face-to-face and online learning environments.

In the sections that follow I will present guidelines for effectively integrating components of a WBI system to support the teaching and learning process in each of the areas listed above. The focus will be on utilizing a Web-based course management tool to support face-to-face instruction and on the ensuing challenges of interfacing between these two teaching and learning environments.

Using a Web-based course management tool to support face-to-face instruction

A Web-based course management tool is an enabling tool that supports WBI in any of its delivery modes (adjunct, mixed and online). For the sake of this discussion, WebCt has been selected as an example of such a tool. Although some Web-based course management tools may offer different features than others, the majority of these tools have similar standard features making it possible for the reader to apply what is articulated in this discussion to any Web-based course management tool.

WebCt facilitates the organization of course material on the Web and provides a variety of tools and features that can be added to a course. Examples include a conferencing system, on-line chat, student progress tracking, group project organization, student self-evaluation, grade maintenance and distribution, access control, navigation tools, auto-marked quizzes, electronic mail, automatic index generation, course calendar, student homepages, student work areas for posting content, course content searches and more. Hence the comprehensiveness of the tool. Use of these features can promote collaborative learning, enhance critical thinking skills through content generation, representation and synthesis and give every student an equal opportunity to express their views and test their ideas through online discourse and other Web-based instructional activities (Dabbagh, Bannan-Ritland, & Silc, in press 2000).

Issues surrounding course content

Of particular interest in this discussion is the effective use of Web-based features enabling the organization of course content. According to Hedberg and Harper (1998) the visual metaphors employed by Web-authoring tools restrict the learning environment by placing constraints on the organization of content and the learning strategies. WebCt is no different. Faculty using WebCt for the first time tend to follow the structure imposed by the interface which models a linear path of organizing course content. The interface mimicks the organization of a syllabus by providing a template for course information, course content, course resources and a calendar for a timeline. Course content can be organized linearly using a *course path tool*. Utilizing this tool results in a page-turner format where students can begin in one place and move forward or backward along the path from one document to another. In this case, the content is usually instructor generated and generally stable leaving learners little or no input in the organization or generation of the course content (see figure 1.1).

Insert figure 1.1 here

This method of organizing content works well if the instructor's pedagogy is didactic (instructivist), requiring students to read resources in a certain order and preventing students from getting lost in the process. In an instructivist pedagogy, resources are generated by the instructor and organized in a linear order from the instructor's point of view and every student receives the same instruction at the same pace using the same context (Dabbagh, 96). Once a faculty member becomes more familiar with the tool's features, other approaches to organizing content and resources become evident. For example the feature of 'adding a single html page' in WebCt provides the instructor with the ability to annotate resources and contextualize content based on related class activities. In utilizing this feature, the instructor has the option of using a Web-based editor to create, organize, and describe course content and resources and then upload this page(s) to the course homepage or to any other page of the existing WebCt interface. This alternative method of content organization and structure provides students with a greater degree of flexibility in selecting and using resources however the generation and organization of content is still largely an instructor's task (see figure 1.2).

insert figure 1.2 here

The shift to a more constructivist design of content in WBI occurs when students are given multiple opportunities to generate their own resources and are provided with tools to synthesize, organize, and restructure course content (Bannan & Milheim, 1997). This calls for a more learner-centered environment where the instructor requires students to search for relevant resources and upload them to a student 'posting area'. Students can work individually, in pairs, or in small groups on an assignment or a class activity and the resulting information synthesis can be uploaded to an 'individual work area' or a 'group work area' using the WebCt interface. In this situation, learner-generated resources can be characterized as reusable (e.g. in another course or in the same course for a different activity), more contextual than instructor-generated resources (students know where to find them and why they're there), and as enabling a dynamic rather than static structure to content. Figure 1.3 demonstrates resources generated by students who were working in pairs to complete an assignment about comparing and contrasting objectivist and constructivist learning environments. The resources were posted by the students in their designated work areas and later reorganized by the instructor to serve as samples for a future class.

Insert figure 1.3 here

Figure 1.4 is a result of several class activities in which students worked in small groups to generate characteristics of constructivist learning environments (CLEs) for the several models discussed in this class. The resulting information was uploaded to the student posting area and later synthesized by the instructor to form a resource for future class discussions and to serve as evaluation criteria for students' final projects.

Insert figure 1.4 here

The discussion above demonstrates how different features of a Web-based course management tool can be used to generate and organize course content and resources in conjunction with an instructor's pedagogy. Shifting from a didactic to a facilitator role, an instructor can utilize different features of a tool to vary the attributes of instructional strategies and activities from supplantive to generative, allowing students to contribute their own resources and content and structuring and reorganizing content so that it is contextualized and reusable. Figure 1.5 illustrates how an instructor's pedagogy influences instructional strategies, activities and resource generation.

Insert figure 1.5 here

Technological Assumptions

Another important aspect of using a Web-based course management tool to support face-to-face instruction is the technological expectations presumed by the instructor. For example, using threaded discussions can be a difficult concept for students to understand and often instructors or online discussion facilitators assume that if students are familiar with email then using threaded discussions is a natural extension of this skill. In the absence of proper instructional support and practice, posting to threaded discussions can be a daunting task for many. Here is what one student had to say about this issue:

> "The process of threading took some teaching time, how to respond to particular messages without creating new strands in the discussion. Navigating through a threaded discussion is also very difficult. Additionally, we are required to post files in another section, and there is some difficulty in accomplishing that."

WebCt has a main forum area which can be used as a practicing ground for first time users of threaded discussions. Instructors can post a greeting to the class containing a brief social bio and then ask students to do the same. This initiates a discussion in an environment which is non-judgmental and where no grade is associated. The instructor can model a moderator's role and provide an ice-breaker for future discussions in which postings are related to the readings and students are required to provide a studied rationale for their statements and positions.

WebCt can also pose a threat to students when it comes to uploading files and resources to the individual or group 'posting area'. There are several steps involved and the procedure is not intuitive. Students who are technologically skilled usually have little problem and are able to help other students with uploading procedures however others may struggle endlessly. These technological issues can interfere with the learning process causing frustration both for the students and the instructor. Adequate class time and instructional support should be provided for bringing students up to speed with the uploading procedure for any Web-based course management tool in order to minimize such problems.

Logistical and Implementation Issues

Another challenge facing faculty who have committed to the use of Web-enhanced instruction is administrative support for logistical and implementation issues. Many universities have initiated centers to support faculty in utilizing innovative technologies in teaching and learning and the efficacy of these centers is instrumental to the success of such endeavors. Administrative support centers for innovative technologies must keep abreast of faculty needs and provide instructional support through workshops, online tutorials and help guides. Most integrated course management systems like WebCt have extensive resources (some built into the tool itself) to support first time users however faculty are often reluctant to rely on this type of guidance as it does not take into consideration the existing course format and pedagogy which faculty have been using in a traditional classroom format. Instead, faculty find themselves spending double the time and effort in reorganizing their course materials to fit the new delivery medium losing focus of the big picture. The transformation from face-to-face to online requires what Collis (1997) refers to as *pedagogical reengineering*. This is where support centers can help. Support centers should be staffed with instructional designers who are skilled in identifying the teaching needs of faculty to help them integrate Web-based technologies as effectively as possible. The Institute for Higher Education Policy in its report on the quality of online learning listed the following elements under what it calls 'faculty support benchmarks' (April 2000, p.3):

- technical assistance in course development should be available to faculty;
- faculty members should be assisted in the transition from classroom teaching to online instruction and are assessed during the process;
- instructor training and assistance, including peer mentoring, should continue through the progression of the online course;
- faculty members should be provided with written resources to deal with issues arising from student use of electronically-accessed data.

Following the above guidelines will certainly diminish the logistical and implementation challenges associated with using a Web-based course management tool to support face-to-face instruction.

Interfacing between face-to-face and online learning environments

By far the most challenging issue facing faculty who are using a WBI component to support f2f instruction is the ability to effectively interface between the two delivery formats. According to Palloff & Pratt (1999), preparation time for f2f instruction requires between 6.5-7.5 hrs/wk while preparation for online instruction requires 18-19 hrs/wk. Just looking at this statistic one can imagine the time and effort required to prepare for both delivery formats which in essence is what a faculty member is doing when supporting f2f with a WBI component. In many instances faculty have handed print-based syllabi and assignments in class and then also uploaded these documents to the Web for students' convenience and ease of accessibility. If one is not careful, the experience can be almost like conducting a whole other course! The trick is to learn how to create activities that integrate both formats rather than creating activities for each which could result in ineffective redundancies. For example, one activity can require students to engage in a classroom discussion on course readings and then synthesize the key points of the discussion (individually or in groups) and post the synthesis on the Web in the student posting area for others to download and for the instructor to evaluate. Alternatively, an online discussion can be facilitated using the asynchronous discussion tool in WebCt and the synthesis can be presented in class. Another example of an instructional activity that integrates both delivery formats is requiring students to post drafts of a class paper online and then engage in a peer feedback exercise in class. The instructor can randomly arrange students' papers in pairs on the Web (an easy task in WebCt) and provide an evaluation rubric that students can download and use to prepare their feedback. Students can then communicate their evaluation to their partner in class making the process more effective and efficient by taking advantage of both mediums. A third example of creating activities that integrate both mediums is to provide Web-based group discussion forums when group work and group presentations are an integral part of the course. This saves student time in arranging meetings outside of class and gives the instructor more f2f class time to give lectures if needed. Groups can discuss their work in these forums independently, share documents and resources, and prepare for their class presentation. At the same time, groups can get feedback from the instructor through these forums and more importantly, the instructor can monitor the group process and group dynamics.

Another challenge facing faculty and students who are interfacing between f2f and WBI is time management skills. As one student put it:

> "Compared to a traditional f2f classroom environment where one attends a 3 hour class, goes home and has a week to prepare for the next class, WebCt forces you to logon daily to check on things and participate in ongoing online discussions. You end up putting much more time in-between classes."

Though not necessarily a negative comment, adequate time should be provided for students to get accustomed to the added WBI component. Faculty often do not take this issue into consideration and students may become frustrated in having to deal with attending class and contributing to online activities if they don't employ effective time management skills. Another student's perspective indicates that interfacing may save time in the long run:

> "Using WebCt does save time in the long run in the classroom in that everyone has a chance to put forth his/her point of view. In the traditional classroom we always seem to run out of time for discussing topics. I also think it saves time in that it gives students more time to process, question, and get feedback as opposed to just being in a classroom setting."

Conclusion

It is a delicate balance to create activities that integrate both mediums, employ effective time management skills and guard against doubling the work both for students and faculty when using a Web-based course management tool to supplement face-to-face instruction. If appropriate guidelines are applied however, the advantages of interfacing between f2f and online instruction, known as the adjunct mode include the following:

- Providing the ability for the instructor to capture class activities and archive process and product enabling access to content beyond the timeframe of the course;
- Providing the opportunity for ALL students to contribute (wider opportunity to communicate and participate);
- Allowing students to articulate reflections on content and course issues at any time through the main discussion forum area (readily accessible, time independent);
- Engaging students more dynamically in thinking about the course content by logging on to explore resources and follow discussions (just-in-time resources);
- Facilitating modeling and scaffolding more efficiently using previous student samples and expert intervention;
- Facilitating peer feedback and collaboration on group projects;
- Promoting distributed learning (multiple perspectives, multiple expertise).

Guidelines for utilizing a Web-based course management tool to support f2f instruction

The above discussion suggests the following general guidelines to be taken into consideration when utilizing a Web-based course management tool to support f2f instruction. Some of these guidelines apply for both the instructor and the students:

- Integrating not duplicating: when planning instructional/learning activities, careful consideration must be given to insure that these activities are integrating both formats and not duplicated in each.
- Don't underestimate the learning curve: using a Web-based course management tool is a new learning experience for both faculty and students. Plan for and provide adequate instruction on how to use the Web-based tool (for yourself and the students).
- Finding the right balance: interfacing between f2f and online instruction requires knowledge of time management skills. Make sure that you and your students are aware of this aspect and provide some guidelines on how to make this process effective and efficient. An example of such guidelines would

be to give students an estimate of how much online time is required on a daily basis to participate in associated activities.

- Avoid conducting a whole other course: supporting f2f instruction with a Web-based component can easily double the work for an instructor if one is not careful. It can also increase the time spent outside the classroom for students. It is important to keep in mind that the Web-based component is intended to 'support' the course and facilitate the delivery of content and the implementation of existing activities.

References

Bannan-Ritland, B., Dabbagh, N., Harvey, D. & Milheim, W. (February, 2000). *Evolution of Web-based instruction: Connecting Technical Attributes to Conceptual Bases.* Paper presented at the Association for Educational Communications and Technology, February 2000, Long Beach, California.

Bannan, B. & Milheim, W. (1997). *Existing Web-Based Instruction Courses and Their Design.* In B. H. Khan (Ed.), Web-Based Instruction. Englewood Cliffs, NJ: Educational Technology Publications.

Collis, B. (1997). *Pedagogical Reengineering: A Pedagogical Approach to Course Enrichment and Redesign With the WWW.* Educational Technology Review, Autumn/Winter 1997, n. 8.

Dabbagh, N., Bannan-Ritland, B., & Silc, K. (in press, 2000). *Pedagogy and Web-Based Course Authoring Tools: Issues and Implications.* In B. H. Khan (Ed.), Web-Based Training. Englewood Cliffs, NJ: Educational Technology Publications.

Dabbagh, N. (1996). *The Effect of Contextualizing Instruction of quantitative Subject Matter in Large Introductory Classes to Students' Most-Preferred and Personally-Relevant Interests on Knowledge Acquisition and Relevance.* Dissertation Abstracts.

Hedberg, J. & Harper, B. (March, 1998). Visual Metaphors and Authoring. [WWW document]. URL http://itech1.coe.uga.edu/itforum/paper25/paper25.html

Khan, B. (1997). *Web-Based Instruction.* Englewood Cliffs, NJ: Educational Technology Publications.

Khan, B. (1997). *Web-Based Instruction (WBI): What Is It and Why Is It?* In B. H. Khan (Ed.), Web-Based Instruction. Englewood Cliffs, NJ: Educational Technology Publications.

Palloff, R.M. & Pratt, K. (1999). *Building Learning Communities in Cyberspace: Effective Strategies for the Online Classroom.* Jossey-Bass Publishers: San Francisco.

The Institute for Higher Education Policy, (April 2000). Quality On the Line: Benchmarks for Success in Internet-Based Distance Education. Washington, DC.

Establishing a New Paradigm for On-line Education

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ABSTRACT The steady evolution of communications technology (radio, television, interactive video, audio-graphics, electronic mail, Internet, intranet) has considerably influenced the development of distance learning. This third generation of distance education, which includes interactive video, email, Internet, intranet, and audio graphics technologies, learning activities via these distance education systems has been redefined to include and focus on teacher-student interaction. This paper examines technology, student lifestyles, faculty characteristics and continuity, quality and quantity of courses, quality and quantity of students, and interactivity as the primary ingredients of a successful and effective on-line education program. In particular, the program at the Information Technologies Institute in the School of Continuing and Professional Studies at New York University, an asynchronous education programs, is demonstrated and evaluated. Instructional design principles and novel authoring concepts are introduced to the online course environment.

Introduction

The term, distance education, is not a new term, however, in recent years it has taken on new meaning. In the past, distance education was known as correspondence courses that were used to meet the needs of rural areas. The first and second generation of distance education delivery systems was designed primarily to produce and distribute learning materials as efficiently as the technology of the day permitted without any attention to interactive communication between students and teacher. Today's third generation of distance education, immediately conjures up the notion of teaching that takes place over the Internet and that is facilitated through the use of Web-Based Instruction (WBI).

In the current business climate emphasizing total quality management, it is crucial to analyze the critical factors that will help meet and exceed customer expectations. In an effort to build the foundation for a new paradigm in delivering cutting-edge distance education, the paper discusses what has been learned regarding teaching and studying through this technological medium and also identifies some of the problems encountered. It seeks to address those difficulties and incorporates design features that the research finds to be most useful for both teachers and students. Much of the information is derived from the largely successful on-line education program at the Information Technologies Institute in the School of Continuing & Professional Studies at New York University.

Evolution of the Program

SCPS's Information Technologies Institute began in 1968 under the name of the "Data Processing and Systems Analysis Institute" and offered mainly a mainframe computing and data processing curriculum for the first fifteen years. The department name was changed in 1984 to accurately reflect the interrelationships between computer and communications technologies. In Fall, 1990 the Institute offered 17 certificate programs, a 16-credit undergraduate diploma program in Computer Technology, and introduced a brand new on-site 16-credit graduate Advance Professional Certificate in Information Systems Auditing; the Institute enrolled 5,101 students during the 1990/91 academic year. Almost all of these students worked in Manhattan and lived within a 40-mile radius of the campus.

Fall, 2000 finds the Institute offering 25 certificate programs, a 16-credit graduate Advanced Professional Certificate in Information Technologies, an M.S. in Management and Systems, and the concentration curriculum support for McGhee's Bachelors in Communications Technology. The 1999/2000 academic year has not been actualized, but final calculations indicate that total enrollments will clear 6,000 students. The growth in enrollments can be largely attributed to online enrollments [non-credit and graduate]; for example, this past summer, 2000 term, there were 2025 enrollments of which 501 (24%) were students enrolled online.

Online Programs Facts & Figures

The Information Technologies Institute non-credit online initiative began in Fall 1999, and has consistently expanded over its three semesters.

Semester	# Classes Offered	Total Enrollment
Fall 99	14	176
Spring 00	18	350
Summer 00	16	374
Fall 00	24 (4 new courses)	478
Spring 01	38 (13 new courses)	673

The Graduate Programs, which consist of an MS and an Advanced Professional Certificate, have grown at an equally dramatic rate and the number of new enrollments constantly exceeds forecasts. In fact, since the 336 points enrollment of the 1994/1995 academic year the program has experienced a 400% increase. The online retention rate is an outstanding 98%, which is well above the national average of 60%.
The program boasts a geographically dispersed student body with representatives from Washington DC and 25 different states ranging across America, in addition to internationally based students from Puerto Rico, Canada, Argentina, England, Korea, Thailand, Japan, Spain and Italy. The 30-39 year old range is the predominant age group and there are more males than females, especially in the Master's Program.

Critical Success Factors

The success of the respective programs lies in the commitment to dedicated faculty, finely tuned admissions criteria, industry-driven courses, peer to peer learning, teamwork, faculty development and a meticulous auditing process that monitors both course content and student interaction.

Faculty

Faculty is carefully selected with particular attention paid to the instructor's professional background in addition to teaching ability. It is expected that each faculty member is able to draw on a wealth of industry-related experiences that can enhance the course material and embellish the students' learning process. Since a vast majority of the students are working professionals enjoying advanced positions in their respective organizations, it is crucial that the instructor is able to command respect and capture the students' attention early in the course in order to provide an effective learning experience. This is far more easily accomplished by recruiting faculty members who are proven performers in industry.

It is often the case that professional success and effective communication skills are not sufficient to ensure academic quality. In order to promote the academic excellence of the programs faculty attend workshops led by a Clinical Professor with over 15 years experience in graduate programs at major universities. The workshops are designed to help the instructors refine course content, improve delivery methods and infuse the material with a rigorous academic component. Since many of the faculty members will be involved in student advisement and/or supervision of the required thesis for the MS degree, the workshops also serve as an opportunity to introduce and develop the required skills and academic standards that must accompany the production of an advanced research paper. In addition, the Clinical Professor will work with faculty members on a one-to-one basis in the area of course development.

Students

The admissions criteria are GMAT (or equivalent) scores, undergraduate degree, professional experience and a personal statement. It has been found that no single criterion can determine whether a student will be successful or not but the most significant predictor is the personal statement. While each student must have performed well on the undergraduate level, at their job and in the graduate test, it is the personal statement that will most likely indicate their propensity for success in the program. It is the Institute's policy to seek well-educated, highly motivated self-starters who are eager to learn and can demonstrate the ability to handle the workload of an intense learning experience. The admissions committee has done an excellent job of filtering a staggering increase in applications so that the increased number of admissions has not compromised the 98% retention rate that the Institute boasts.

Course Content and Delivery

In addition to offering a wide array of new and exciting courses that are industry-driven, student learning and interest is piqued by a number of factors. The courses are delivered in an asynchronous manner over the Internet with a heavy emphasis placed on peer to peer learning and teamwork. The Learning Space is comprised of four major areas: schedule, media center, course room and profiles. The bulk of the course takes place in the course room where there are vibrant, threaded discussions groups taking place on a constant basis. Students check in on at least a daily basis and often several times a day to read and comment on the instructor and student contributions. In order to enhance the experience the media center is used for the instructors and students to post files that may contain links to pertinent web sites, or documents containing current articles, audio, video, graphics and multimedia. The relative anonymity of the course room motivates many students to voice their opinion. This is a substantial advantage over a traditional classroom in which students may be too shy and potentially enthralling class discussions simply break down.

Despite this anonymity students still develop a strong sense of collegiality. In the Profiles section, students are able to enter as much (or as little) information about themselves and their personal and professional lives as they wish. Many students even avail themselves of the opportunity to post a photograph. In the discussions, students are encouraged to relate their work experiences as they pertain to the issue at hand. As a result, students form a sense of camaraderie as they share similar occurrences. Coupled with the strong bond necessitated through extensive and complex team projects the students have ultimately formed many relationships outside the confines of the course. This is especially nurturing to the education process as the students progress through various classes together wherein they will often request to be on the same team. As mentioned previously, team learning is especially valuable and the Institute maintains a database that enables the auditors to help faculty build teams should the students not form ones on their own.

Auditing

The key to successful student participation, learning and the high retention rate has been the vigilant auditing policy in which the Institute engages. Students and faculty are expected to be online every day. Experienced academics monitor the faculty contributions to make sure that the faculty lectures and summaries are posted on a timely basis, that the content is consistent with the course description and objectives and that the instructor provides regular feedback to the students. There is also a group of internal course auditors who will contact students if they have been offline for more than 48 hours. Sometimes this could be due to a technical problem, in which case the technical staff is notified and troubleshooting takes place. Other times this could be due to personal problems or difficulty with the workload. In each case the problem is documented and the faculty member will contact the student via phone or email to try and resolve the issue. The Institute believes in a very strong and personal mentoring process to aid students through a rigorous program.

Troubleshooting

As with all technology there are times when the courses might experience technical difficulties. In an effort to provide rapid identification and response, the Institute employs technical aides who monitor the course for potential trouble spots. Sometimes, problems might be reported to the help desk by a student, in many cases the student posts an advisory in the course room. In addition to its own Technical Director who is responsible for maintaining rapid identification and resolution of technical problems, the Institute outsources to a dedicated help desk that works with vendors, faculty, technical aides and department on solving technical difficulties. The organization also provides one-on one training sessions for new instructors and will assist faculty with configuring their laptops.

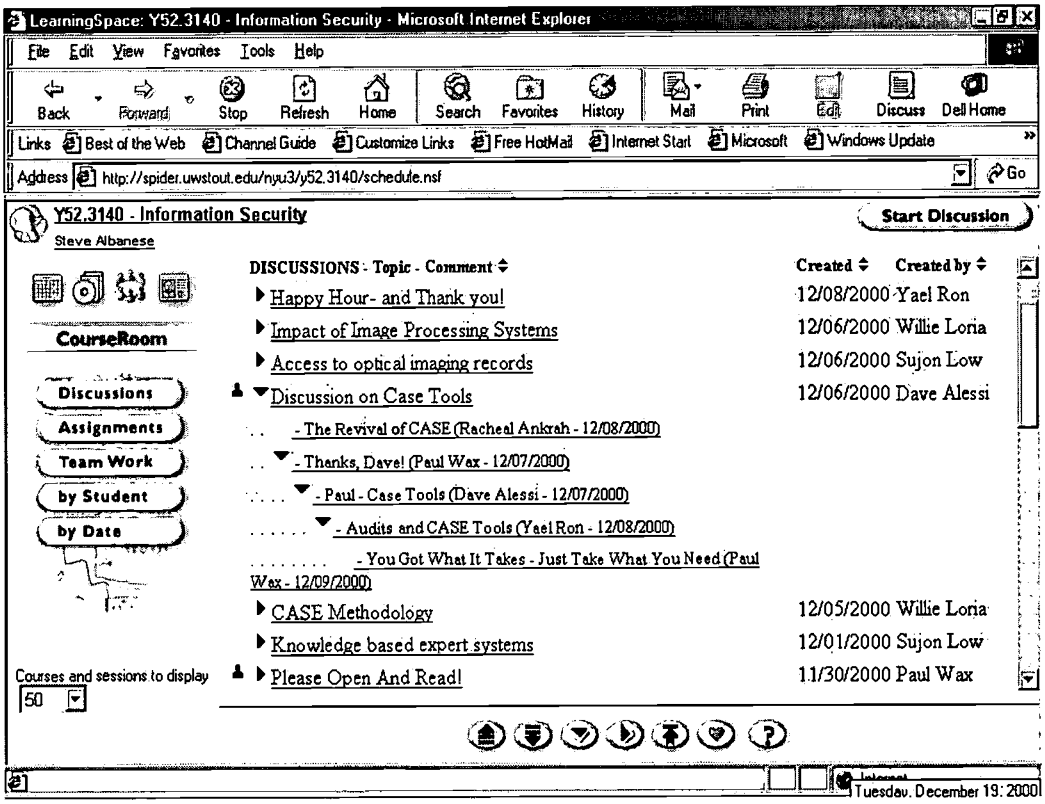
Conclusion and Summary

This paper has introduced some of the key issues that are necessary for the development and maintenance of a successful online educational program. The Information Technologies Institute in the School of Continuing and Professional Studies at New York University has evolved into a premier deliverer of superlative, stimulating and academically challenging online education at the Masters, Certificate and Non-credit levels. In addition to having industry-driven courses and faculty the Institute has identified its ability to develop a finely tuned admissions strategy as one of the main reasons for its astounding 98% retention rate. Other critical success factors are:

- Emphasis on team-based work -- the peer-to-peer learning that is fostered and cultivated online
- The equalizing force of the medium that promotes student to student learning
- Internal course auditors that contact students when they have been offline for more than 48 hours
- A database that enables auditors to help faculty build teams
- Extensive faculty training and development technically and academically
- Supervision of course content and academic integrity

Screen Shots

Included in the next two pages are some screen shots illustrating a typical interface that someone in the online course might encounter in the course room. On any given day there may be as many as 150 postings from a 20 student class in a course. The postings will range from comments on other contributions, to teamwork observations to new discussions to questions for the Professor or colleagues in the field.


LearningSpace: Y52.3140 - Information Security - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Forward Stop Refresh Home Search Favorites History Mail Print Edit Discuss Dell Home
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Address http://spider.uwstout.edu/nyu3/y52.3140/schedule.nsf
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Y52.3140 - Information Security
Steve Albanese
Start Discussion
CourseRoom
Discussions
Assignments
Team Work
by Student
by Date
DISCUSSIONS - Topic - Comment
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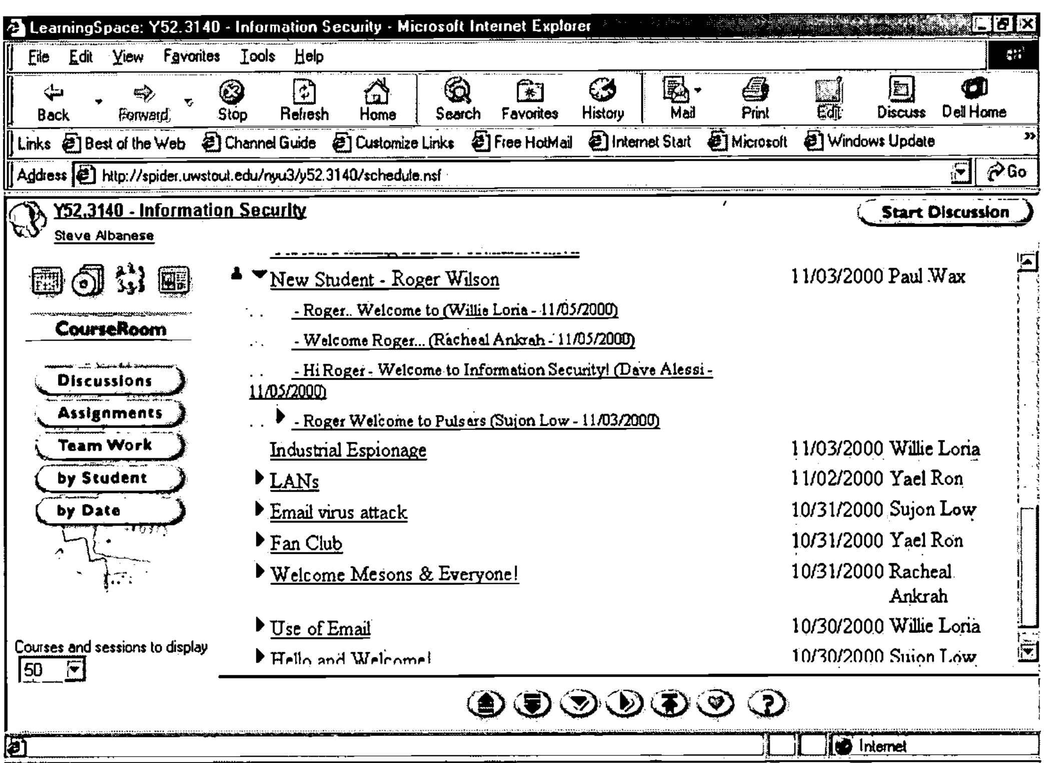
Happy Hour- and Thank you! 12/08/2000 Yael Ron
Impact of Image Processing Systems 12/06/2000 Willie Loria
Access to optical imaging records 12/06/2000 Sujon Low
Discussion on Case Tools 12/06/2000 Dave Alessi
- The Revival of CASE (Racheal Ankrah - 12/08/2000)
- Thanks, Dave! (Paul Wax - 12/07/2000)
- Paul - Case Tools (Dave Alessi - 12/07/2000)
- Audits and CASE Tools (Yael Ron - 12/08/2000)
- You Got What It Takes - Just Take What You Need (Paul Wax - 12/09/2000)
CASE Methodology 12/05/2000 Willie Loria
Knowledge based expert systems 12/01/2000 Sujon Low
Please Open And Read! 11/30/2000 Paul Wax
Courses and sessions to display
50
Tuesday, December 19, 2000


LearningSpace: Y52.3140 - Information Security - Microsoft Internet Explorer
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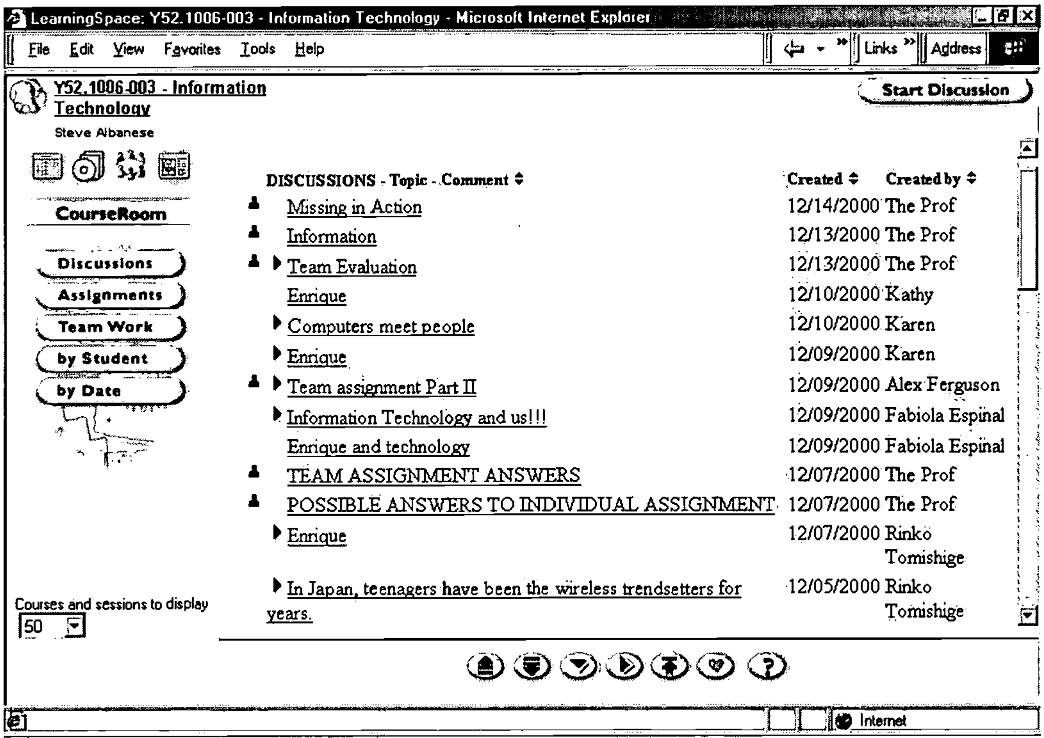
Y52.3140 - Information Security
Steve Albanese
Start Discussion
CourseRoom
Discussions
Assignments
Team Work
by Student
by Date
New Student - Roger Wilson 11/03/2000 Paul Wax
- Roger.. Welcome to (Willie Loria - 11/05/2000)
- Welcome Roger... (Racheal Ankrah - 11/05/2000)
- Hi Roger - Welcome to Information Security! (Dave Alessi - 11/05/2000)
- Roger Welcome to Pulsars (Sujon Low - 11/03/2000)
Industrial Espionage 11/03/2000 Willie Loria
LANs 11/02/2000 Yael Ron
Email virus attack 10/31/2000 Sujon Low
Fan Club 10/31/2000 Yael Ron
Welcome Mesons & Everyone! 10/31/2000 Racheal Ankrah
Use of Email 10/30/2000 Willie Loria
Hello and Welcome! 10/30/2000 Sujon Low
Courses and sessions to display
50
Internet



LearningSpace: Y52.1006-003 - Information Technology - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Y52.1006-003 - Information Technology

Steve Albanese

Start Discussion

CourseRoom

Discussions

Assignments

Team Work

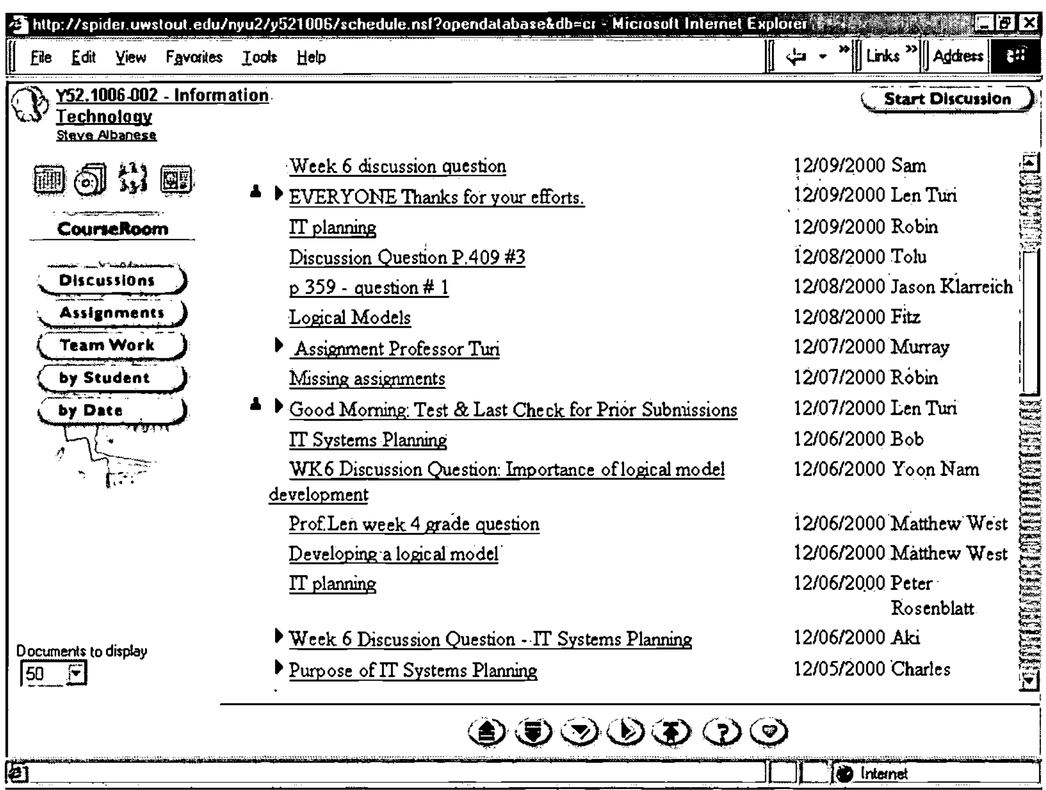
by Student

by Date

DISCUSSIONS - Topic - Comment	Created	Created by
Missing in Action	12/14/2000	The Prof
Information	12/13/2000	The Prof
Team Evaluation	12/13/2000	The Prof
Enrique	12/10/2000	Kathy
Computers meet people	12/10/2000	Karen
Enrique	12/09/2000	Karen
Team assignment Part II	12/09/2000	Alex Ferguson
Information Technology and us!!!	12/09/2000	Fabiola Espinal
Enrique and technology	12/09/2000	Fabiola Espinal
TEAM ASSIGNMENT ANSWERS	12/07/2000	The Prof
POSSIBLE ANSWERS TO INDIVIDUAL ASSIGNMENT	12/07/2000	The Prof
Enrique	12/07/2000	Rinko Tomishige
In Japan, teenagers have been the wireless trendsetters for years.	12/05/2000	Rinko Tomishige

Courses and sessions to display 50

Internet



http://spider.uwstout.edu/nyu2/y521006/schedule.nsf?opendatabase&db=cr - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Y52.1006-002 - Information Technology

Steve Albanese

Start Discussion

CourseRoom

Discussions

Assignments

Team Work

by Student

by Date

Topic	Created	Created by
Week 6 discussion question	12/09/2000	Sam
EVERYONE Thanks for your efforts.	12/09/2000	Len Turi
IT planning	12/09/2000	Robin
Discussion Question P.409 #3	12/08/2000	Tolu
p 359 - question # 1	12/08/2000	Jason Klarreich
Logical Models	12/08/2000	Fitz
Assignment Professor Turi	12/07/2000	Murray
Missing assignments	12/07/2000	Robin
Good Morning: Test & Last Check for Prior Submissions	12/07/2000	Len Turi
IT Systems Planning	12/06/2000	Bob
WK6 Discussion Question: Importance of logical model development	12/06/2000	Yoon Nam
Prof.Len week 4 grade question	12/06/2000	Matthew West
Developing a logical model	12/06/2000	Matthew West
IT planning	12/06/2000	Peter Rosenblatt
Week 6 Discussion Question - IT Systems Planning	12/06/2000	Aki
Purpose of IT Systems Planning	12/05/2000	Charles

Documents to display 50

Internet

Cost Effectiveness and Distance Education: A Perspective

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Abstract: The authors develop a taxonomy of motives for distance education, solutions for delivery and likely application situations. These concrete considerations are contrasted with the abstract character of the intentions commonly professed by institutions offering distance education. The authors discuss the problem of on-campus enrollment loss and provide evidence of its severity on their own campus. The paper concludes with a contrast between cost effectiveness and program image appeal. A major point made in the paper is that the most effective form of distance education would involve multiple delivery media

The purpose of this paper is to place into perspective the idea of distance learning or distance education. The first part of the paper will be devoted to a general overview. The remainder of the paper will be directed to the topic of remote site video classrooms.

Distance education is an alternative to scheduled in-classroom meetings between a teacher and students. Such alternatives are motivated by the desire to execute educational processes so as to allow students to allow students to learn at their own pace, at convenient/flexible times, in their home environment. It would also allow students to avoid travel to campus and allow off-campus instructed courses without instructor travel. These features would potentially provide educational resources to the handicapped. There is also the potential for increased enrollment per instructor. Several of these motivations may be present in a particular instance. Naturally, the best solution depends on the motivations in the case at hand. Different motivations can result in different solutions. Most of the solutions available (except for audio tape) are listed below.

Scheduled Live Instruction:

1. traditional television broadcasts
2. one-way video/audio course - satellite
3. one-way video/two-way audio course - satellite/phone
4. two-way video/audio course - satellite

Unscheduled Instruction:

5. paper correspondence courses
6. video taped presentations
7. interactive CDs
8. internet courses

Please note that courses based on interactive CD's offer instruction equal to internet courses and are relatively prevalent in business training. Textbooks/manuals are typically used with each form of unscheduled instruction. The point being that not that much instruction in 7 and 8 comes from the computer screen unless the student is reading text screens. Such a use of text screens is considered a severe misapplication of media. Moreover, 5 through 8 can readily be combined. One can easily imagine a course with a text for reading and reference, video tapes for instruction, CDs for demonstration and interaction exercises, and paper or the internet for communication, discussion, and assessment. In other words, each media has its best use and some advantage in that use. Therefore, optimal use of media implies use in combinations. The traditional paper correspondence course should be viewed as the low cost and minimal media solution of years past.

There are only three situations: (1) students working at home at their own pace, (2) students working at home paced with TV broadcasts, and (3) groups of students meeting at a local facility. The needs of the first situation have traditionally been met by correspondence courses sometimes with special provisions for handicaps. Multimedia approaches could readily be applied to situation (1) and the internet could be used in various ways. The second situation is the older TV broadcast course concept and will be discussed in terms of its history later. Today, we often think of situation three as what we mean when we say "distance education," the remote site video classroom.

The primary professed motive behind current efforts at remote site video classrooms, RSV classrooms, is educational outreach to the service community. This motive is abstract rather than concrete and so was not listed above. It is an important point that the target audience is stated vaguely as those students who would otherwise not receive instruction. The goal of corresponding instruction is also stated vaguely as an attempt to increase educational attainment. These statements seem to seek a continuing education context as the justification for distance education. It is a certainty that if continuing education was the only possible use for the course, the program would not have the scale to be cost effective. Therefore, the program must sell to those seeking a degree in order to be practical. If nothing else, these points clearly indicate that RSV classrooms were, are, and will remain an experiment in education spurred by technological advance.

One problem with enrollments in RSV courses must be acknowledged; they undermine on-campus enrollments. Students enjoy the convenience of remote site instruction instead of coming to campus. Note that these students are not the target group noted above. Since RSV courses are often located at facilities where off-campus courses are taught, substituting one or the other for on-campus courses is the same situation. Only because offerings at such locations are limited, can we get figures that indicate the extent of the problem. Such a figure is the percent of off-campus enrolled students that are also enrolled in on-campus courses. Zero indicates that there is no problem, while 100% indicates the most extreme problem severity. Because this figure understates the problem, the interpretation of numbers near .25 would be an indication of a substantial drain on the home campus enrollment. For Eastern Kentucky University the figures are:

1994	1995	1996	1997	1998	1999
.25	.26	.30	.29	.31	.29

At least 29% of this off-campus enrollment, and possibly a good deal more, is pure convenience, is a direct loss to on-campus enrollments, and is not in any sense educational outreach. On the other hand, one could argue that such programs pick up most of the students seeking convenience in their early small-scale stage. Then, as the programs move upscale, most of the additional students will be those targeted for outreach services. One could also argue that convenience motivated students provide the scale needed for the practical operation of the program.

For any distance education program, it is desirable for the program to be cost-effective. One-way delivery of RSV courses is dramatically less expensive than two-way delivery. Broadcast is expensive and reception is not. One broadcast site can reach large numbers of reception sites. One-way video with two-way audio comes in as a close second place in low cost and is thought to be nearly as interactive as true two-way delivery.

A one-way RSV delivery system and education television broadcasts are potentially identical. These delivery systems also parallel the auditorium mass lecture course. So it would be valid to ascribe the same shortcomings to all three. How important is interaction? One must acknowledge that it depends on the course. One must also acknowledge the use of mass lecture courses on most major campuses for the very courses that are most often offered in RSV classrooms. Since these mass lecture courses are by their very nature filled with students, it is difficult to argue that such a format compromises enrollments, but the students in such courses have no choice. On the other hand, education television courses have failed for lack of the enrollment sizes necessary to make them cost effective. It would seem that for outreach education, sufficient enrollment is as much a crucial issue as is instructional effectiveness.

While one-way delivery might be the most cost-effective method of achieving education outreach, there is very little interest in one-way delivery. It doesn't provide an image for the institution that appeals as well to grantors, legislators, and alumni as is the case with a one-way video with two-way audio RSV class or a true two-way RSV class. Moreover, we have been referencing potential benefits. Actual benefits will depend on enrollments, and that will depend on the program offering a circumstance that students want. And as noted earlier, that will depend on how the courses lend themselves to a degree program.

A Comparative Project: Web-Based Faculty Development Versus Print-Based Faculty Development

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Abstract: This paper is a report on the findings of a study conducted on a graduate level for a thesis project in partial fulfillment of requirements for a Master of Arts in Education with a focus of Instructional Technology. Two random groups of full-time faculty were selected from the total population for a total sample of 200 study participants. One group was requested to complete a questionnaire upon the completion of a web-based faculty development tutorial. The second group was requested to complete a questionnaire upon completing a print-based faculty development tutorial. Findings indicated the full-time faculty who received the web-based faculty development did not perceive themselves as more aware of the content covered in the faculty development than the faculty who completed the print-based faculty development. Faculty Development programs need to continue the traditional approach when introducing and promoting a web-based approach to faculty development.

Introduction

Universities have experienced significant changes over the decades; the impression of instructional technology has been one of the largest impacts on education. The Internet has changed the way we work and communicate, as well as the way we learn. It is serving as a vehicle for the exchange of information regardless of social, economic or geographical differences (Charp, 2000). Tools and media, which are offered via the World Wide Web have expanded the arena and have empowered educators to transform the teaching and learning process.

Many factors contribute to this change; one is "universities today face a number of internal and external pressures to become actively involved in educational applications of new technologies. Some of these pressures include increasing public access to information technology, government funding priorities for initiatives that support the development of distributed learning networks, increasing competition for students, and the need to provide cost-effective high-quality education to a greater number of students" (Rossner, Stockley, 1997).

Another factor is the indisputable fact that the citizens of the world cannot afford to avoid participation in cyberspace. The nature of the workforce requires higher technological skill level (Hudson Institute, 1987). "Thus, an "elitist" view of education will no longer serve our fast technological, globally-connected society. Faculty must be encouraged to expand their views of education and to grow professionally. Students, like faculty, must be prepared to flourish in the increasingly technological society (Millis, 1994). This change in societal expectation requires the faculty and students to expand their educational and technological skill set. The enhanced faculty technological skill set will contribute to the process of mentoring students to become active citizens within our community and prepare the students for future careers.

To enhance the technological and educational skill set of the faculty an innovative approach to faculty development needs to be implemented. In the past faculty development has appeared in various contexts, typically focused on enhancing the talents, expanding the interests, improving the competence, and facilitating the professional and personal growth of faculty, primarily in their role as instructors (Gaff, 1975).

In recent years, faculty development strategies have taken a different approach by addressing instructional improvements through skill development, enhancing support services, and ensuring that institutional reward structures reflect the challenges of the effective instructor integrating educational technologies (Willis, 1994).

The use of the World Wide Web as an instructional method represents a new way of looking at instruction and emphasizes the importance of the recent changes in faculty development. "Web-based instruction provides exciting opportunities for universities to introduce sophisticated, interactive technologies into more traditional and familiar instructional settings. These technologies will allow for greater dissemination of information and greater access to knowledge for participants within and beyond the university community" (Rossner & Stockley, 1997).

The expense of integrating the instructional technology has required many universities to restructure budget allocations. Unfortunately, many times the budget provides for hardware and software, but is not sufficient for instructional technology faculty development programs. This oversight has made it more difficult for the faculty to juggle traditional demands with the necessity to enhance technological skill sets, change of instructional methodology, and seamlessly integrate web-based technology into instruction.

Recently, the University of Nebraska Medical Center has attempted to raise the faculty level of awareness of new methods of instruction. The communication model, which has proven to be very effective, has been one-to-one sessions between a faculty member and a consultant. Though this model has been successful it has not been widespread due to the lack of personnel. This study, focused on web-based instruction, represented a cost-effective faculty communication model that has the potential to reach more faculty members by offering a self-managed introduction to the university supported web-based applications and available consultant services when integrating technology into curriculum.

This study focused on the impact of self-perceived faculty awareness of available University of Nebraska Medical Center web-based applications and consultant services after the completion of a researcher-designed web-based faculty development tutorial.

The Study

Recently, the University of Nebraska Medical Center has attempted to raise the faculty level of awareness of new methods of instruction. The communication model, which has proven to be very effective, has been one-to-one sessions between a faculty member and a consultant. Though this model has been successful it has not been widespread due to the lack of personnel. This study, focused on web-based instruction, represented a cost-effective faculty communication model that has the potential to reach more faculty members by offering a self-managed introduction to the University of Nebraska Medical Center supported web-based applications and available consultant services when integrating technology into curriculum.

At the time of the study there were 557 full-time faculty, two random groups were selected from the total population for a total sample of 200 study participants. One group was requested to complete a questionnaire upon the completion of a faculty development web-based tutorial. The second group was requested to complete a questionnaire upon completing a print-based faculty development tutorial. Both questionnaires contained three sections; section one contained demographic information, section two contained information regarding the awareness of the available web-based applications and section three contained information regarding the awareness of the available consultants when integrating instructional technology.

Immediately after the random group assignments were made, the researcher sent a packet to both Group A and Group B. The packet for Group A included a cover letter which outlined the purpose of the faculty development tutorial and directions of how to complete the duties of a study participant, campus self-addressed return envelope, and a researcher-designed questionnaire to be completed upon the conclusion of the researcher-designed web-based faculty development tutorial. The packet for Group B included a cover letter which outlined the purpose of the tutorial and directions on how to complete the duties of a study participant, self-addressed campus return envelope, and a researcher-designed questionnaire to be completed upon the conclusion of reading the researcher-designed print-based faculty development tutorial.

A blanket reminder letter to Group A and Group B. The individuals in each group who had not completed the questionnaire prior to March 13, 2000, were no longer considered part of the study.

The raw score means of Group A and Group B questionnaires were calculated, by sections:

- Section one: demographic information,
- Section two: information regarding the awareness of the available web-based applications and
- Section three: information regarding the awareness of the available consultants when integrating instructional technology.

A one-tailed t-test with a .05 level of significance was used to determine if there was a significant difference between the means of each group.

The data and findings of the study provided information about the self-perceived awareness levels of UNMC faculty members exposed to the researcher-designed web-based faculty development tutorial compared to those who were exposed to the researcher-designed print-based faculty development tutorial. Such information may provide educators with guidance towards beneficial instructional methodologies for faculty development. Such data may help those responsible for the faculty development make better decisions about suitable approaches.

Findings

The study was limited to measuring University of Nebraska Medical Center faculty self-perceived awareness level related to supported web-based applications and consultants, which are available to faculty during the process of integrating web-based instructional technology. The perceptions of the faculty were inventoried with a researcher-designed questionnaire after completing a researcher-designed web-based faculty development tutorial or a researcher-designed print-based development tutorial.

Entire Questionnaire

The total questionnaire response rate was 26.5%, with a total of 53 responses. Group A participants who were requested to complete the researcher-designed web-based faculty development tutorial and questionnaire had a response rate of 24 out 100 of the sample population. Group B participants who were requested to complete the researcher-designed print-based faculty development tutorial and questionnaire had a response rate of 29 out of 100 of the sample population.

The researcher utilized the reported results to determine the means, standard deviations, and variances for the raw scores of the entire questionnaires for both groups. A one-tailed t-test with a .05 level of significance standard was used to determine if the difference between Group A and Group B means were significant. The results showed that Group B (print-based group) (M=3.92, SD=.80) perceived themselves to be more aware of UNMC supported web-based applications and consultant services available to assist in the integration of web-based technologies than the Group A (web-based group) (M=3.15, SD=.82) (t (51) = -3.44, p=.0024, one-tailed test).

Questionnaire: Section One

The first section of the questionnaire consisted of 7 items on the print-based questionnaire and 9 items on the web-based questionnaire. The items pertained to demographic information and specific questions concerning the researcher-designed print-based and web-based tutorials.

Gender Distribution

The gender distribution within the total population of the University of Nebraska Medical Center full-time faculty consisted of 373 (66.9% of total population) male faculty and 184 (33.1% of total population) female faculty.

Group A (web-based group) sample population consisted of 69 (69% of Group A sample population) male faculty and 31 (31% of Group A sample population) female faculty. The Group A response rate population was

17 (70.9%) male participants and 7 (29.1%) female participants.

Group B (print-based group) sample population consisted of 64 (64% of Group B sample population) male faculty and 36 (36% of Group B sample population) female faculty. The Group B response population was 20 (69%) male participants and 9 (31%) female participants.

Based on statistical analysis the researcher concluded the sample population and respondent population of both groups were reasonably accurate representations of the entire gender distribution of UNMC full-time faculty population.

College Affiliation

The college affiliation population of the total University of Nebraska Medical Center full-time faculty consisted of 393 (71%) from the College of Medicine, 84 (15%) from the College of Nursing, 28 (5%) from the College of Pharmacy, and 52 (9%) from the College of Dentistry.

Group A sample population consisted of 70 (70%) College of Medicine faculty, 15 (15%) College of Nursing faculty, 5 (5%) College of Pharmacy faculty, and 10 (10%) College of Dentistry faculty. Group A response population consisted of 15 (62.6%) College of Medicine, 4 (16.6%) College of Nursing, 3 (12.5%) College of Pharmacy, and 2 (8.3%) College of Dentistry.

Group B sample population consisted of 71 (71%) College of Medicine faculty, 14 (14%) College of Nursing faculty, 5 (5%) College of Pharmacy faculty, and 9 (9%) College of Dentistry faculty. Group A response population consisted of 19 (65.5%) College of Medicine, 5 (17.2%) College of Nursing, 2 (6.8%) College of Pharmacy, and 3 (10.3%) College of Dentistry.

The College of Nursing and College of Pharmacy respondent population of Group A was greater than the sample population. The College of Medicine and College of Dentistry respondent population of Group A was lower than the sample population.

The College of Nursing, and College of Pharmacy Group B respondent population was greater than the sample population. The College of Medicine and Dentistry respondent population of Group B was lower than the sample population.

Overall the sample population and respondent population was an accurate representation of the college affiliation.

Age

The mean age of the respondent population was 41 to 50 years of age. Group A consisted 4 participants 40 or under, 12 participants 41 to 50, 6 participants 51 to 60, and 2 participants greater than 60. Group B consisted 7 participants 40 or under, 10 participants 41 to 50, 11 participants 51 to 60, and 1 participant greater than 60.

Skill Level

The Internet is making an impact on many aspects of our lives. It has changed the way we work and communicate, as well as the way we learn (Charp, 2000). All of the study participants have used the Internet, 17% self-rate their skill level at Beginner, 62% self-rate their skill level at Intermediate, 19% self-rate their skill level at Advanced, and 2% self-rate their skill level at Expert with using the Internet (World Wide Web).

The total respondent population reported only seven (13.2%), two Group A (web-based) respondents and five Group B (print-based) respondents, had personally developed an entire World Wide Web-based course. The total respondent population reported 18 (33.9%), seven Group A respondents and eleven Group B respondents, have personally supplemented a course with the World Wide Web-based materials.

Time Allotted to Completing the Tutorial

The mean time respondents allotted to complete the tutorials was ten to twenty minutes. Group A reported an average time allotment of 21 to 30 minutes and Group B reported an average time allotment of 10 to 20 minutes.

Questionnaire: Section Two

The second section of both questionnaires consisted of eleven items that addressed the level of self-perceived awareness of the UNMC supported web-based applications.

The researcher used the reported results to determine the means, standard deviations, and variances for the raw scores on section two of the questionnaires for both groups. A one-tailed t-test with a .05 level of significance standard was used to determine if the difference between the means were significant.

Questionnaire: Section Three

The third section of both questionnaires consisted of four items that addressed the level of self-perceived awareness of UNMC consultant services available to assist in the integration of web-based technologies.

The researcher used the reported results to determine the means, standard deviations, and variances for the raw scores on section three of the questionnaires for both groups. A one-tailed t-test with a .05 level of significance standard was used to determine if the difference between the means were significant.

Conclusions

The results of the second section of the questionnaire showed that Group B (print-based group) (M=3.90, SD=.81) perceived themselves more aware of University of Nebraska Medical Center supported web-based applications than the Group A (web-based group) (M=3.20, SD=.89) (t (51) = -2.97, p=.0088, one-tailed test).

The results of the third section of the questionnaire showed that Group B (print-based group) (M=3.96, SD=.87) perceived themselves more aware of the available consultant services available to assist in the integration of web-based technologies than the Group A (web-based group) (M=3.28, SD=.98) (t (51) = -2.65, p=.0212, one-tailed test).

Both questionnaires proved to be reliability based on the results of the Cronbach's alpha test. The statistical findings of the entire questionnaire, section one, section two, and section three was discussed. Section one compared the gender, college affiliation, age, skill level, time allotted to completing the tutorial, and printing the web-based tutorial of the two response groups. Section two and three concluded Group B (print-based), the participants that completed the print-based tutorial showed a significantly higher level of self-perceived awareness when compared to Group A (web-based), the participants that completed the web-based tutorial.

The implications of the results validate the current form of faculty development and emphasize the necessity of the continuation of the current programs focusing on the integrating technology into instruction. An expansion of the number of available consultants might be necessary to gain a broader coverage of the full-time faculty. A print-based promotion emphasizing the potential outcomes and focus of technology within the classroom needs to be implemented. One primary potential outcome of the promotion would be to contribute to the cultural transition period from traditional role of the faculty and student to the new faculty and student role.

The researcher recommends future studies to consider 1) the impact of college culture, 2) use of the Internet, and 3) a comparison between UNMC, a medical university to a non-medical university. With further studies, the impact of web-based faculty development can be modified and embraced to serve the needs of the UNMC full-time faculty.

Based on the results, the study showed the UNMC full-time faculty who received the web-based tutorial (Group A) did not perceive themselves as more aware of the UNMC supported web-based applications and consultant services available to assist in the integration of web-based technologies than the print-based group (Group B).

References

Charp, S. (2000) The role of the Internet. *T.H.E. Journal*, March, 8 & 10.

Gaff, J.G. (1975). *Towards faculty renewal.* San Francisco: Jossey-Bass.

Hudson Institute (1987). *Workforce 2000: work and workers for the 21st century*. Washington, DC: U.S. Government Printing Office.

Millis, B. (1994). Faculty development in the 1990s: what it is and why we can't wait. *Journal of Counseling & Development, May/June, Vol. 72, Issue 5*, 454.

Rossner, V., & Stockley, D. (1997). *Web-Based Instruction*. Englewood Cliffs, New Jersey: Educational Technology Publications.

Willis, B. (1994). *Distance Education Strategies and Tools*. Englewood Cliffs, New Jersey: Educational Technology Publications.

Assessing Best Practices in Online Learning: A Review of the Literature

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Abstract: This literature review provides an overview of recent research that has been conducted on online learning, as well as indicating the extent and type of research being carried out. Twenty-five representative studies were selected and categorized. Addressing four questions can best summarize the review of research on online learning. They are: 1) What scientific research design criteria and types of theory can be applied to evaluate the quality of research on online learning environments? 2) How do the online learning research examples that have been sampled meet the criteria for scientific research? 3) What can we learn from the results of the review of research on online learning based on the type of research performed? 4) What can we conclude from the results of research on online learning environments to date?

Introduction

Delivering instruction online is a relatively new phenomenon for educators. Concerns over student achievement and attitudes, course design and delivery, course evaluation, instructor abilities, and attitudes are currently being explored by researchers; however, detailed evaluations of these factors utilizing well-developed research plans are relatively scarce at this time. The purpose of this literature review is to provide an overview of research that has been conducted on online learning, as well as to indicate the extent and type of research being carried out. Two research questions to be answered are: What can we learn from the results of the review of research on online learning based on the type of research performed? What can we conclude from the results of research on online learning environments to date?

Planned professional use of this literature review includes; 1) identifying best online learning practices to serve as a basis for the development of guidelines and evaluation tools for online interactive learning environments, 2) developing research design strategies for exemplary online modules addressing time, place, and physical limitations for traditional and nontraditional students in education and engineering, and 3) utilization of constructivist pedagogy as the foundation of the development of the interactive learning exemplars.

Review of Research Process

The review concentrated on research findings published recently during which online learning became a common part of the use and development of the Internet. The purpose of the review was to show what is being selected, categorized, and published in the field. The professional literature sources searched were selected as representative of the core of literature databases in the area of online learning and classroom teaching and learning. The sources included Educational Resources Information Center (ERIC), Dissertation Abstracts, abstracts from the annual and regional conferences of the American Educational Research Association (AERA) and the National Association for Research on Science Teaching (NARST), Internet online journals specializing in research, and specific science education journals publishing research on learning.

Nominations of citations to consider were related to several selection criteria. The first required citations to be reporting results of studies published between 1997 and 2000. Few pre-1997 studies of online learning warranted inclusion. The technology has been changing so quickly that recent studies use significantly evolved hardware and software rendering possibly different conclusions. The second criterion required that the study relate to courses or modules involving online learning providing distance education via the Internet. The third criterion required the citation to relate to evidence of learning outcomes of students involved. Particular priority was made to find studies that compared online and classroom learning outcomes. An effort was made to eliminate citations that focused on "how to" and "show and tell." Finally, citations relating only to courses and modules for higher or adult education were sampled.

Multiple searches were performed on each database. Searching on the queries related to "online and classroom learning" and "online courses and classroom teaching" yielded more than 400 citations. Adding the term "research" reduced the yield to 155 citations. Full articles obtained for these 155 citations were read and reviewed. Final selection of the studies to be included in this review of research applied the four criteria cited above. The final list included 25 studies. The studies, by type, are as follows:

Quantitative and Qualitative Studies

Davies and Mendenhall (1998); Wegner, Holloway, and Crader (1997); Jewett (1998; two studies); Ryan (2000); Teeter (1997); Blum (1999); Newman, Johnson, Cochrane, and Webb (1996); Wegerif (1998).

Pre-Experimental and Pilot Studies

De Simone, Schmid, and Lou (2000); Saunders, Malm, Malone, Nay, Oliver, and Thompson, Jr. (1997); Gaud (1999); Shih, Ingebritson, Pleasants, Flickenger, and Brown (1998); McLellan (1997); Mende (1998); Schlough and Bhuripanyo (1988); Powers, Davis, and Tarrence (1998); Hegngi (1998); Loomis (2000); Stith (2000); Kroder, Suess, and Sachs (1999); Vrasidas and McIssac (1999).

Large Surveys

McNaught, Kenny, Kennedy, and Lord (1999); Rossman (1999); Jiang and Ting (1999).

The 25 studies were reviewed and evaluated using the following tasks and measures: type of study and comparison basis, number of subjects, data collection instruments, outcome variables measured, courses studied, and results and conclusions based on evidence obtained from students outcomes. A narrative review of the 25 selected studies, grouped by online versus traditional learning, student and teacher perceptions, and reports of online course design, was completed, as well as a summary table of this information.

Discussion of the Review of Research

Addressing four questions can best summarize the review of research on online learning presented here. They are:

1. What scientific research design criteria and types of theory can be applied to evaluate the quality of research on online learning environments?
2. How do the online learning research examples that have been sampled meet the criteria for scientific research?
3. What can we learn from the results of the review of research on online learning based on the type of research performed?
4. What can we conclude from the results of research on online learning environments to date?

Question 1: What scientific research design criteria and types of theory can be applied to evaluate the quality of research on online learning environments?

In answer to the first question, the literature identifies specific design criteria for quantitative and qualitative research (Brause & Mayher, 1991). Among these criteria are random sampling, appropriate group size, controlled variables, and internal and external validity that are addressed in the research design (Campbell & Stanley, 1963). For qualitative research sample criteria are a clear statement of the research purpose and question, research design, sample population, observer researcher, and the data analysis procedures (Stake, 1995; Denzin & Lincoln, 1994; Wolcott, 1990). Types of theory used to categorize the research studies can be summarized with a hierarchy of categories (Reynolds, 1971; Snow, 1973). The least useful type of theory involves creation of typologies that can best be identified as descriptive research. The next level of theory involves looking for correlation between events. The third level involves cause and effect. This level involves an experimental design with control and experimental groups. It may involve application of inferential statistics. The fourth and fifth levels of theory, sense of understanding and control, were not found in the research reviewed.

Question 2: How do online learning environment research studies that have been sampled meet criteria for scientific research?

In reviewing the research literature selected for online learning, no study was found to meet the scientific research design criteria given above for Question 1. The research designs were flawed, making the conclusions derived from the studies open to debate. Of the 25 studies reviewed, 16 had serious design flaws. Using these studies, it is not possible to determine whether learning online results in more positive attitudes and higher achievement, than does learning in the traditional classroom context. These studies do not meet the third level type of theory. They were, at best, pre-experimental case studies of web design courses. They used the development of typologies or determining correlations among events as the main form of analysis.

The remaining nine studies compared traditional with Web-based courses. Seven of these studies were quantitative studies and two were qualitative. In each case, the study had design flaws. Some of these flaws in the quantitative studies included: lack of use of random sampling, small sample size, lack of control of alternative variables, treatment periods that were too short, and lack of assessment of instruction or instructor quality. The two qualitative studies were designed for hypothesis generation rather than hypothesis testing. Because of a lack of triangulation, small number of subjects, and the few specific situations studied, results cannot be generalized beyond these studies' settings.

In both types of studies there was a failure to describe adequately pedagogical methods used. There was no description of the prior knowledge students brought into the learning situation, such as knowledge of the content taught or their ability and experience with the technology used. Therefore, it is not possible to determine whether improvement in achievement was the result of online instruction or other uncontrolled factors.

Question 3: What can we learn from the results of the review of research on online learning environments based on the type of research performed?

In the studies selected, it was concluded that online instruction was as good as, or better than, traditional instruction, or that online learning is a viable strategy. These conclusions were not warranted because of the flaws in research design. However, online learning research in the selected studies can inform us in regard to potential variables and best practices that should form the basis of future research. The research base to date should be seen as a basis to begin hypothesis-generating research. It informs us about suspected and potential variables that should be considered in creating research designs and performing the research process to determine cause and effect for higher levels of theory and more useful knowledge.

At the present time, the lack of adequately designed research does not allow us to rate online instruction as better, or even the same, as traditional forms of classroom instruction. However, the results of the studies reviewed provide useful information to be explored using the media with research-supported classroom pedagogical practices. Some of these pedagogical practices include adequate and timely feedback, student-student and student-teacher interaction, and a safe and supportive climate for learning. Thus, the results of the online studies demonstrate that potentially viable online courses need strong consideration of structuring, timing, and the use of specific pedagogical practices. Studies of online courses demonstrate possible approaches to successfully implement these pedagogical practices.

Question 4: What can we conclude from the results of research on online learning environments to date?

The reviewed studies provide some support for the use of particular practices in an online learning format. These best practices are described in Table 1 and are grouped into four categories: 1) student behaviors; 2) faculty-student interactions; 3) technology support; and 4) learning environment. These best practices are associated with higher positive learning attitudes and achievement. Where they can be connected to, or derive from, research-supported pedagogical practice these best practices serve as potentially effective practices in online course design.

Categories and Practices	Citations
Student Behaviors	
Demonstrate their prerequisite technology skills at the beginning are adequate for hardware, software and web-site use	Stith (2000), McNaught et al. (1999), Vrasidas & Mclsaac (1999), Wegner et al. et al. (1997)
Seek opportunities and support to interact with instructor and other students	Ryan (2000,) Wegner et al., (1997), Smith & Benscoter (1999)
Actively participate in all online activities	Saunders, (1997), Mende (1998)
Active involvement writing and interaction in web-based courses (improves student writing performance)	Jewett (1998)
Use a variety of communication techniques to enhance online learning	Shin et al. (1998), Mclellan (1997)
Personalize themselves by publishing online biographies and photographs to allow other members of the class to visualize them	Mclellan (1997)
Seek assistance in understanding and mastering different learning strategies	Shin et al. (1998)
Demonstrate prerequisite and become more proficient in technology communication skills	Vrasidas & Mclsaac (1999)
Faculty-Student Interactions	
Provide clear and adequate guidance	Wegner et al. (1997), Kroder et al.

	(1998)
Use action research regularly to evaluate the success/failure of course & meet student concerns	Gillani (1998)
Personalize communications by/with student-student and student-teacher	Jewett (1998), Powers et al. (1998)
Use a variety of communication techniques to provide for greater empathy and personal approach than e-mail and web site alone	Mclellan (1997)
Plan for increased time for student interactions as compared to traditional courses	Ryan (2000)
Delineate in clear terms the institution's policy on cheating and plagarism at start	Gray (1998)
Maintain a separate email account for web courses	Gray (1998)
Forward to all students, responses to frequently asked questions to avoid duplication	Gray (1998)
Reduced load and increased support are required to develop course materials	Gaud (1999)
Provide continuous and frequent feedback and support	Vrasidas & McIsaac (1999), Jiang & Ting (1999)
Provide scaffolding for virtual discourse construction	Pincas (1998)
Emphasize the importance of good study skills throughout online course	Loomis (2000)
Monitor closely the progress of each student	Loomis (2000)
Provide prompt feedback to students	Loomis (2000), Rossman (1999)
Create opportunities to coach and facilitate student construction of knowledge.	Miller & Miller (1999)
Insure that negative comments to students are given privately, preferably through a phone call	Rossman (1999)
Clearly dlineate course requirements	Rossman (1999)
Technology Support	
Ensure a low level of technological difficulties in accessing website and communication	Jewett (1998), Cornell (1999), Wegner et al. (1997)
Provide adequate, friendly, easy, continuous technical support	Teeter (1997), McNaught, et al. (1999), Davies & Mendenhall (1998), Kroder et al. (1998), Gillani (1998)
Learning Environment	
Use of structured activities to provide an effective framework for online learning	Powers et al (1998), De Simone (2000); Mendes (1998)
Mandate smaller class sizes for online courses to give the faculty appropriate time to deliver quality instruction	Gaud (1999)
Use flexible deadlines in online courses (helps to motivate students, maintain communication, and allow for technical problems)	Mclellan, 1997
Create social interaction through group collaboration (necessary for high achievement)	Wegner et al., (1997), Blume (1999), Jiang & Ting (1999), Kroder et al. (1998), DeSimone (2000), Mende (1998)
Use streaming audio for reading online	Kroder et al. (1998)
Organize web site to allow the student to interact with the content and other students and instructor	Gillani (1998)
Create an online environment that is welcoming, nuturing, and safe	Bonk & Cummings (1998)
Present course content in a manner that hierarchically structures the sequence of information	Miller & Miller (1999)
Obtain student feedback to insure accuracy of understanding	Miller & Miller (1999)
Provide opportunities for students to question the instructor to insure accuracy of understanding	Miller & Miller (1999)
Create opportunities for students to communicate with each other in	Miller & Miller (1999)

order to share their understanding of course content	
Present a problem-solving situation in a realistic context	Miller & Miller (1999)
Provide opportunities for learners to collaboratively construct knowledge based on multiple perspectives, discussion, and reflection	Miller & Miller (1999)
Provide opportunities for students to articulate and revise their thinking in order to insure the accuracy of knowledge construction	Miller & Miller (1999)
Ensure an equitable environment exists for gender differences in learning styles, participation barriers, and communication	Blum (1999)
Include cooperative and collaborative learning in courses to distribute workload through group (supports female students preferred method of connected learning)	Blum (1999)
Promote gender equality by encouraging females to post messages while asking males to subside if a pattern of male domination is noticed	Blum (1999)
Ensure an equitable learning environment exists for all students	Blum (1999)
Allow time for reflection at the end of the course	Wegerif (1998)
Include a "warm-up" period with light-hearted exercises aimed to help students get to know one another	Wegerif (1998)
Start an online course with all students together at the same time	Wegerif (1998)
Provide equal access to the shared conversation in online course	Wegerif (1998)
Provide opportunities for students to control online learning and structure it for themselves	Wegerif (1998)
Provide discussion forums which encourage open and honest dialog	Rossman (1999)
Conduct a teleconference during and at the end of the course to discuss successes and problems	Rossman (1999)
Use computer conferencing to develop overall critical thinking skills	Newman (1996)

Table 1: Best Practices for Online Learning Environments

References

Blum, K. D. (1999). Gender differences in asynchronous learning in higher education: Learning styles, participation barriers and communication patterns. *Journal of Asynchronous Learning Networks*, [online serial], *3*(1). Available: http://www.aln.org/alnweb/journal/vol3_issue1/blum.htm

Brause, R., & Mayher, J. (1991). Search and research: What the inquiring teacher needs to know. New York: The Falmer Press.

Campbell, D., & Stanley, J. (1963). Experimental and quasi-experimental designs for research. Chicago: Rand McNally and Company

Davies, R., & Mendenhall R. (1998). *Evaluation comparison of online and classroom instruction for HEPE 129—fitness and lifestyle management course.* Salt Lake City, UT: Brigham Young University. (ERIC Document Reproduction Service No. ED 427 752).

Denzin, N., & Lincoln, Y. (Eds.) (1994). Handbook of qualitative research. Thousand Oaks, CA: Sage Publications.

De Simone, C., Schmid, R., & Lou, Y. (2000). A distance education course: A voyage using computer-mediated communication to support meaningful learning. AERA 2000.

Gaud, W. S. (1999). Assessing the impact of Web courses. *Syllabus, 13* (4), 49-50.

Hegngi, Y. N. (1998). *Changing roles, changing technologies: The design, development, implementation, and evaluation of a media technology and diversity on-line course.* Paper presented at the 1998 American Educational Research Association Annual Meeting.

Jewett, F. (1998). *Course restructuring and the instructional development initiative at Virginia Polytechnic Institute and State University: A benefit cost study.* Blacksburg, VA: Virginia Polytechnic Institute and State University. (ERIC Document Reproduction Service No. ED 423 802)

Jiang, M., & Ting, E. (1999). A study of students' perceived learning in a Web-based online environment. Presented at Webnet 99 World conference, Honolulu, HI.

Kroder, S. L., Suess, J., & Sachs, D. (1998). Lessons in launching Web-based graduate courses. *T.H.E. Journal, 25*(10), 66-69.

Loomis, K. D. (2000). Learning styles and asynchronous learning: Comparing the LASSI model to class performance. *Journal of Asynchronous Learning Networks*, [online serial], *4*(1). Available: http://www.aln.org/alnweb/journal/vol4_issue1/loomis.htm

McLellan, H. (1997). Information design via the Internet. (Education Document Reproduction Service, No. ED 408 942)

McNaught, C., Kenny, J., Kennedy, P., & Lord, R. (1999). Developing and evaluating a university-wide online distributed learning system: The experience at RMIT University. *Educational Technology & Society,*[online serial], *2*(4). Available: http://ifets.ieee.org/periodical/vol_4_99/mcnaught.html.

Mende, R. (1998). *Hypotheses for the virtual classroom: A case study.* Paper presented at the IT97 Conference.

Newman, D. R., Johnson, C., Cochrane, C., & Webb, B. (1996). An experiment in group learning technology: Evaluating critical thinking in face-to-face and computer-supported seminars. *Interpersonal Computing and Technology*, *4*(1), 57-74.

Powers, S. M., Davis, M., & Torrence, E. (1998). *Assessing the classroom environment of the virtual classroom.* Paper presented at the Annual Meeting of the Mid-Western Educational Research Association.

Reynolds, P. (1971). A primer in theory construction. Indianapolis: Bobbs-Merrill Educational Publishing.

Rossman, M. H. (1999). Successful online teaching using an asynchronous learner discussion forum. *Journal of Asynchronous Learning Networks*, [online serial], *3*(2). Available: http://www.aln.org/alnweb/journal/vol3_issue2/Rossman.htm

Ryan, R. (2000). Lecture and online construction equipment and methods classes. *T.H.E. Journal, 27*(3), 78-83.

Saunders, N., Malm, L., Malone, B., Nay, F., Oliver, B. & Thompson, Jr., J. (1997). Student perspectives: Responses to Internet opportunities in a distance opportunities environment. (Education Document Reproduction Service, No. ED 413 816)

Schlough, S., & Bhuripanyo, S. (1998). *The development and evaluation of the Internet delivery of the course "Task Analysis."* Paper presented at the SITE 98: Society for Information Technology & Teacher Education Annual International Conference.

Shih, C. C., Ingebritsen, T., Pleasants, J., Flickinger, K., & Brown, G. (1998). Learning strategies and other factors influencing achievement via Web courses. (Educational Document Reproduction Service, No. ED 422 876.

Snow, R. (1973). Theory construction for research on teaching. In Travers, R. (ed.) Second handbook for research on teaching. Chicago: Rand McNally and Company

Stake, R. (1995). The art of case study research. Thousand Oaks, CA: Sage Publications.

Stith, B. (2000). Web-enhanced lecture course scores big with students and faculty. *T.H.E. Journal, 27*(28), 21-28.

Teeter, T. (1997). Teaching on the Internet. Meeting the challenges of electronic learning. (Education Document Reproduction Service, No. ED 418 957).

Vrasidas, C., & Stock McIssac, M. (1999). Factors influencing interaction in an online course. *The American Journal of Distance Education*, 13 (3), 22-35.

Wegerif, R. (1998). The social dimension of asynchronous learning networks. *Journal of Asynchronous Learning Networks*, [online serial] *2*(1). Available: http://www.aln.org/alnweb/journal/vol2_issue1/wegerif.htm

Wegner, S., Holloway, K., & Crader, A. (1997). *Utilizing a problem-based approach on the World Wide Web.* Southwest Missouri State University. (ERIC Document Reproduction Service No. ED 414 262).

Wolcott, H. (1990). Writing up qualitative research. Newbury Park, CA: Sage Publications.

Distance Learning: An Examination of Perceived Effectiveness and Student Satisfaction in Higher Education

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Abstract: Distance learning is a tremendous issue due to paradigm shifts in pedagogy and business. Data was collected from eight Florida postsecondary institutions, then multiple regression and conditional regression analyses were conducted. Findings indicated that technical quality and student interaction were significant predictors of effectiveness and satisfaction for distance students. When using personal characteristics as predictors, younger students, males, and students with higher levels of education were more likely to report higher levels of both instructional effectiveness and satisfaction. Finally, distance students indicated less satisfaction and effectiveness than traditional students. These differences, as well as student-material interaction, perceived quality, and prior distance experience, were found to be statistically significant using two-tailed t-tests. This research suggests that there are distinct factors that predict satisfaction levels and perceptions by distance students of the effectiveness of instruction they are receiving, stressing the importance of focusing on quality and interaction between students and instructors.

Introduction

Distance learning involves a series of controversial issues due to enormous paradigm shifts in pedagogy, demographic changes, increasing demands for both formal and continuing education, plus spiraling education costs. A growing number of new broadcast and interactive communication technologies further complicate the issues.

Prior research has pointed to the effectiveness of carefully conceived interactive radio, educational television and distance learning programs. Many of these successes, however, are shadowed by low student completion rates. Consequently, there are numerous concerns over what factors help determine students' willingness to initiate and complete distance programs. This study examines a series of educational, technological and personal characteristics that predict students' perceptions of instructional effectiveness and satisfaction with distance learning classes.

Distance Education and Distance Learning

Distance education has its roots in correspondence courses, which became popular in the late 19th century. By some accounts, correspondence education dates back to Biblical times (Bates, 1995; Holmberg, 1986), however, one of the first documented references to organized distance education was in the March 20, 1728 edition of The Boston Gazette. An instructor of the "New Method of Short Hand", Caleb Phillips, advertised that "Persons in the Country desirous to Learn this Art, may by having the several Lessons sent Weekly to them, be as perfectly instructed as those that live in Boston" (Battenberg 1971, p. 44, cited in Holmberg, p. 6).

More than two centuries later, the demand for education increased immensely as hundreds of thousands of World War II troops were granted benefits under the Government Issue (GI) Bill. Some of this demand was met through correspondence courses, but in 1969, the pass rate for such courses was less than 5 percent (Garrison, 1989). Partly in response to these low pass rates, correspondence education evolved into courses that use new educational paradigms and communication technologies to enhance traditional print media and provide more reciprocated communication. During this evolution the term "distance education" was developed (Holmberg, 1986).

Sukow (1992, p. 47) noted that the meaning of "distance learning" tends to change radically, depending on which company or government organization is approached and the technology employed. Distance learning via interactive technology refers to delivery of video, audio, and data at one site to one or more sites, where the remote sites can interactively and synchronously or asynchronously communicate through audio, text, or both video and audio to the host site. This includes instruction through Instructional

Television Fixed Services (ITFS), satellite, cable, fiberoptics, the Internet, the World Wide Web (WWW), CD-ROM, and forms of video conferencing.

Simultaneous to the progression of interactive technologies, comparable changes have been occurring in pedagogy. This shift has been brought about, in part, by the fact that educational institutions now see the necessity to reach people who might not otherwise be reached. There similarly is a growing number of work force groups that require continuing education. Furthermore, the emphasis in education has now changed, shifting much of the paradigm from teaching to learning.

In addition to the paradigm shift in U.S. education, there also are changing demographics. The average age of the population is increasing while the number of 18-21 year old college students is decreasing (Gessner, 1987). The majority of these older students are already in the work force. Many are extremely busy; most are interested in part-time education, and some are interested in lifelong learning (Burnham and Seamons, 1987). Between 1970 and 1993, part-time enrollments in American higher educational institutions increased 128 percent from 3 million to 6.6 million, while growth in full-time enrollments only increased 38 percent (Brown, cited in Johnson, 1995, p. 22). Educational institutions are expanding their clientele to include people who may have never thought of attaining a higher education.

The Open University (OU) in Great Britain was one of the first educational facilities to use technology for distance learning. When OU began offering courses in Great Britain in 1971, it changed the reputation of distance learning by providing quality education to students through the use of a variety of media (Tait, 1991). This concept of using a variety of media in a distance learning environment was considered a "radical innovation" (Bates, 1984). However, what was at one time revolutionary is now becoming commonplace. From the Teleuniversité in Quebec to the Fernuniversität in West Germany to the University of Paisley in Hong Kong, distance learning is becoming widespread. Many of these distance learning programs use innovative broadcast and interactive communication technologies.

Distance Learning Effectiveness

Previous evaluations of distance learning have been primarily concerned with its effectiveness. Research has found that exam pass rates of distance students are comparable to exam pass rates of full-time students (Perraton, 1991; Zigerell, 1991). Researchers from hundreds of studies have drawn similar conclusions. Nearly 90% of the comparisons between media assisted distance learning and traditional education conditions have shown no appreciable differences in student achievement. (Nakieru, 1985).

There are, however, differences between the retention of students in distance learning versus traditional class settings. Some recent programs have reported dropout rates of up to 80% (Perraton, 1991). Even among the best distance learning programs, such as the Open University, only about 50 to 60% of distance students actually graduate. "This is much lower than the 80-90 per cent achieved by full-time students but is probably comparable to that of other part-time students" (Perraton, 1991, p. 2).

With the rapid expansion of competing distance learning options, students now have a growing number of choices of which classes to take and which programs should be continued. These choices raise inevitable questions concerning what factors help determine students' willingness to initiate and complete programs. In particular, this raises fundamental questions over what factors predict distance learning students' perceptions of instructional effectiveness and students' satisfaction with their classes.

Perceptions of and Satisfaction with Distance Learning Classes

Previous studies point to a number of educational features, technological innovations and personal characteristics that may predict students' perceptions of and satisfaction with distance learning classes. The following sections introduce these predictor variables. A series of hypotheses are then proposed along with conditions that may affect these relationships.

Student-Teacher Interaction

Student isolation is a potential problem in any learning environment. Isolation especially is a threat to the success of distance students. Student-teacher interaction and feedback are frequently mentioned as distinguishing features of successful educational programs (Bates, 1984). Whether the interaction and feedback are immediate during the class or in subsequent discussions, the nature and frequency of student-teacher interaction have been found to be important to effectiveness (Feldman, 1989).

Student-Material Interactions

In addition to isolation, student boredom is a threat to learning. This threat can be magnified when resources are largely centered on materials (Perraton, 1991). The introduction of interactive technologies further complicates and augments the potential for student-material interactions. In the case of distance learning, instructional designers pay particular attention to the quality of the resource materials, the technologies and the degree to which students can interact with these elements.

Access to Technology

Access to technology is both a social equity policy problem, and factor that can limit the effectiveness of distance learning (Bates, 1995; Cybela, 1996). In order to make materials more available and interactive, instructional designers have turned to the Internet, satellite, cable, CD-ROMs, and forms of video conferencing. The availability and convenience of these technologies plays a growing role.

Perceived Quality

Perraton (1991) argues that that quality is of utmost importance to distance education, stressing that it must be monitored to ensure effectiveness. Others note that materials for distance learning courses are typically of better quality, more motivating and more interesting than those used in traditional classroom environments (Bates, 1984; Perraton, 1991). Since the proliferation of the Internet, quality is not as much an issue except with streaming video and other technologies that require higher bandwidth.

Prior Experience

Students bring their prior experiences to the learning setting. In traditional education, students' backgrounds have often been tested as potential biases in students' evaluations of their educational experiences (Marsh, 1984). While little research has been conducted in this area, it seems logical that students' prior experiences with distance learning will likewise influence their perceptions of and satisfaction with distance learning classes.

Technological Levels

Students' comfort with technologies is a final factor that represents a condition that can influence perceptions of and satisfaction with distance learning. Gehlauf, Shatz and Frye (1991) discuss the issues of anxiety and comfort with technology. They further discuss the role that training can play in helping individuals become comfortable with technology. As educational programs increasing involve new electronic innovations, it is important to understand the role that students' technological levels and comfort with technologies play in creating conditions where distance learning may or may not be successful.

Propositions and Research Questions

Based upon the previous literature and current issues facing distance learning, this study examined four research propositions.

H1 Student perceptions of instructional effectiveness are positive functions of:

- student interaction with instructors
- student interaction with instructional materials
- student access to technologies
- the perceived quality of instructional media utilized.

H1a The relationship among these four predictors and perceived instructional effectiveness will be greater in distance learning environments compared to traditional learning environments.

H1b The relationship among these four predictors and perceived effectiveness will be greater for students who are more technologically advanced than for students who are not as comfortable with technology.

H2 Student satisfaction with distance education is a positive function of:

- student interaction with instructors
- student access to technologies
- the perceived quality of instructional media utilized
- prior experience in distance learning environments.

H2a The relationship among these four predictors and student satisfaction will be greater in distance learning environments compared to traditional learning environments.

H2b The relationship among these four predictors and satisfaction will be greater for students who are more technologically advanced than for those students who are not as comfortable with technology.

In addition to the research propositions, three research questions were tested. The research questions were:
1. Is there a relationship between student age and the criterion variables?
2. Is there a relationship between student sex (gender) and the criterion variables?
3. Is there a relationship between student education levels and the criterion variables?

Each of these questions was examined in the overall and conditional analyses.

Methods

Data were collected in 1996 from eight higher educational institutions in Florida. The institutions employed a variety of technologies. Several of the participating educational institutions had classes that merged both traditional and distance learning students. In other classes, there were only distance students. Students responded to questionnaires via mail, facsimile, or electronic mail. The questionnaires were adapted from Bolduc (1993), with changes made to reflect the nature of this study. A total of 253 students participated in this study --- 174 distance learning students and 79 traditional students.

Cronbach Alpha analyses indicated that the reliability of the items in this study ranged from .70 to .87. Only the student-teacher interaction variable (Alpha = .70) fell below the traditional criterion level of .80. Multiple regression and conditional regression analyses were used to test the research propositions and questions. One-tailed tests were calculated where a direction was predicted. Since the research questions involving personal characteristics did not predict directions, two-tailed significance levels were calculated.

Results

The predictor variables in this study were student-teacher interaction, student-material interaction, access to technology, perceived quality of instructional media, and prior student experience with distance courses. In addition, age, sex, and highest degree completed were used as predictor variables.

Perceived Instructional Effectiveness

Multiple regression analysis was initially used to predict perceived instructional effectiveness and student satisfaction levels. The data indicated that when using the combination of educational and media factors, and personal characteristics, a significant positive relationship (= .254) was found between student-teacher interaction and perceptions of instructional effectiveness. The same pattern was found when using perceptions of media quality to predict levels of instructional effectiveness (= .332). There was also a significant positive relationship with students' highest degree completed (= .177). Student - material interaction, access to new technologies, age and sex were not significant predictors of perceived instructional effectiveness. The overall multiple correlation for the criterion and predictor variables was .532, with an adjusted R2 = .242 (p = .000).

Predicting Instructional Effectiveness - Distance vs. Traditional Students

The sample group was divided into traditional and distance students. Interestingly, when predicting perceived instructional effectiveness among traditional students, none of the predictor variables was found to be statistically significant. Among distance students, there was a significant positive relationship (= .260) between perceptions of student -teacher interaction and perceptions of instructional effectiveness. A comparable pattern was found when using perceptions of quality to predict instructional effectiveness (= .375). The remaining fact ors and characteristics were not statistically significant. In the total model among distance students, there was a R = .487, with an adjusted R2 = .163 (p = .005).

Predicting Perceived Instructional Effectiveness - Technological Level of Students

Respondents additionally answered questions related to their use of various technologies. A median split was calculated to create conditions of more versus less technologically advanced students.

When looking at the data on technologically advanced students, there was a significant positive relationship (= .499) between student -teacher interaction and perceptions of effectiveness. Again, perceived media quality was also positively correlated (= .265). There were no statistically significant predictors b etween the personal characteristics variables and perceived instructional effectiveness. The overall multiple correlation for the predictor variables was R = .660, adjusted R2 = .351 (p = .000).

Among less technologically advanced students, there was a significant positive relationship (= .209) between student-teacher interaction and perceptions of effectiveness. Once again, the same pattern was found for media quality (= .287). The overall R was .521, with an adjusted R2 = .177 (p = .012).

Student Satisfaction

In addition to effectiveness, student satisfaction levels were measured and multiple regression was used to analyze the data. When a combination of educational factors and personal characteristics was use,d a significant positive relationship (= .201) was found between student -teacher interaction and student satisfaction. Perceptions of media quality were also positively related to student satisfaction (= .415). None of the other educational factors or personal characteristics was statistically significant. The overall multiple correlation for the predictor variables was .536, adjusted R2 = .247 (p = .000).

Predicting Student Satisfaction - Distance vs. Traditional Students

As with perceived effectiveness, the sample group was divided into traditional and distance students to predict satisfaction. Consistent with the findings of effectiveness, when predicting satisfaction among traditional students, no educational factors or personal characteristics were statistically significant.

Among distance students, there was a significant positive relationship (= .246) between perceptions of student-teacher interaction and student satisfaction. A similar relationship was found when using perceptions of technical quality to predict student satisfaction (= .517). The remaining educational factors and personal characteristics were non-significant. In the total model predicting student satisfaction, the educational factors and personal characteristics were correlated R = .557, adjusted R2 = .244 (p = .000).

Predicting Student Satisfaction - Technological Level of Students

A median split was used to categorize technologically advanced and less technologically advanced students. Among technologically advanced students, there was a significant positive relationship (= .267) between student-teacher interaction and student satisfaction. A positive relationship also existed for perceived media quality (= .390). There was a significant negative relationship (= -.265) between the age of students and their reported satisfaction levels. Older technologically advanced students reported less satisfaction with their classes. The overall multiple correlation for the predictor variables was .650, with an adjusted R2 = .341 (p = .000).

Among less technologically advanced students, there was a significant positive relationship (= .361) between perceptions of media quality and student satisfaction. With personal characteristics, the highest degree completed was positively related to levels of student satisfaction (= .264). The remaining educational factors and personal characteristics were non-significant. Considering the total model predicting satisfaction among less technologically advanced students, the educational factors and personal characteristics were correlated R = .518, adjusted R2 = .172 (p = .015).

Conclusions

Distance learning is a tremendously important issue in today's world. This study evaluated how host (traditional) and remote (distance learning) students perceive the effectiveness of their instruction and their satisfaction with instruction. The findings of this study revealed that student-teacher interaction and perceived media quality are consistent positive predictors of student perceptions of instructional effectiveness and student satisfaction. These predictor variables were particularly important for distance students. Student-teacher interaction and perceived media quality are consistent positive predictors of student perceptions of instructional effectiveness for both technologically advanced and technologically less advanced students. When predicting student satisfaction, student-teacher interaction and perceived media quality are consistent positive predictors only among technologically advanced students. However, when predicting satisfaction among less technologically advanced students, only perceived media quality is significant. Finally, while not hypothesized, the means and standard deviations revealed that distance (remote) students indicated less student satisfaction and perceived instructional effectiveness than traditional (host) students. These differences were statistically significant using two-tailed t-tests.

The findings of this study are generally consistent among variables of instructional effectiveness and student satisfaction. This research shows that despite all of the studies that have concluded that there are "no significant differences" between effectiveness of traditional and distance learning, there are differences in the variables that predict traditional and distance learning students' s perceptions of instructional quality and their satisfaction with their instruction. There are many variables that need to be taken into account, but this study does suggest that in, distance learning, there must be a focus on media quality and interaction between students and the instructor.

There still are many questions that remain unanswered that could lead to beneficial research topics. For example, among distance learning students, to what extent can we anticipate class completion and program graduation using student-teacher interaction, perceived quality, perceived instructional effectiveness, student satisfaction as predictors? To what extend can we enhance these predictors (through motivation factors, self-efficacy, etc.) to promote learning, graduation, and increased satisfaction among distance learners? These are fundamental questions that distance learning researchers should help answer.

References

Bates, A.W. (1984). The Role of Technology in Distance Education. London: Croom Helm, Ltd.

Bates, A.W. (1995). Technology, Open Learning and Distance Education. London: Routledge.

Bolduc, William James (1993). The Diffusion of Digital Compressed Video-Interactive in a University Environment-1988- 1992: A Case Study. Unpublished doctoral dissertation, Florida State University.

Burnham, Byron R. and Seamons, R. Alan (1987). Exploring the landscape of electronic distance education. Lifelong learning: An omnibus of practice and research, 2(2), 8-11.

Cybela, Joan E. (1996, March 7). Quality Learning Through Distance Education. Concurrent session at Intercom 96 Distance Learning Conference, Florida International University, Miami.

Feldman, Kenneth A. (1989). The Association Between Student Ratings of Specific Ratings of Specific Instructional Dimensions and Student Achievement: Refining and Extending the Synthesis of Data from Multisection Validity Studies. Research in Higher Education, 30(6), 583 - 645.

Garrison, D. R. (1989). Understanding Distance Education: A Framework for the Future. London and New York: Routledge.

Gehlauf, DeeAnn N., Shatz, Mark A., & Frye, Tim W. (1991). Faculty Perceptions of Interactive Television Instructional Strategies: Implications for Training. The American Journal of Distance Education. 5(3), 20-27.

Gessner, Quentin H. (1987). Handbook on Continuing Higher Education. New York: Macmillan Publishing Company.

Holmberg, Borje (1986). Growth and Structure of Distance Education. London: Croom Helm.

Nakireru, Alexander Omoviekovwa (1992). The Development of Instructional Television in American Higher Education. Ann Arbor, Michigan: University Microfilms International.

Perraton, Hillary (1991, September). Administrative Structures for Distance Education. London, England: Commonwealth Secretariat and The Commonwealth of Learning.

Sukow, Randy (1992, November 30, v122, n49). Government or Business: The Developing Battle Over Who Takes the Lead in Distance Learning. Broadcasting & Cable, p. 42.

Tait, Alan (1991). Distance Education in the United Kingdom Today: Current Trends. The American Journal of Distance Education, 5(3), 42-46.

Zigerell, James (1991). The Uses of Television in American Higher Education. New York: Praeger Publishers.

Online Personal Learning in Teacher Preparation

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Abstract: Work by the National Institute for Community Innovations (NICI at http://nici-mc2.org) is leading to new web-based tools for enhancing preservice education and supporting increase use of technology, especially in Professional Development Schools. One of the tools, the NICI Online Personal Learning Plan (PLP) for preservice students, is intended to assist learners through the processes of: 1) Self-assessment of strengths, interests and aspirations; 2) Planning preservice education learning goals and projects; 3) Linking goals and projects to valued outcome standards; 4) Creating original work and sharing the work with others; 5) Receiving high quality feedback for the improvement of their work; 6) Documenting and validating the achievement of learning goals; and 7) Assisting in the selection and preparation of exhibits of learning. This paper discusses the roots and rationale of the project, and presents some of the details of the thinking that is guiding the web-tool development.

Groundwork and Rationale

The lineage of the NICI Online Personal Learning Plan comes from two sources. One source is a bold move by a local secondary school community in Montpelier, Vermont that in 1993 placed "individualized educational plans for every student" in their long term strategic plan (Gibson & Clarke 1999). This led, in 1995, to the creation and implementation of a school-wide program to place personal learning at the center of a continuous conversation involving all students, their parents or guardians, and caring adults in a school. Support for the school-based development came from the University of Vermont. In addition, early in its development, the concept of the Montpelier "PLP" was picked up by the Regional Laboratory at Brown University, and combined with similar movements and interests in Rhode Island, Maine, Massachusetts and other New England states. In Maine, for example, the concept of personal learning took on a primary role in that state's new proposal for the reform of secondary schools. In other work of the Lab, the theme of personalization became a crucial feature of the secondary reform network in the region, and was tied to the principles of "Breaking Ranks," the reform monograph of the National Association of Secondary School Principals. Thus, the concept of personalization of learning as essential to educational reform is well-founded in theory as well as practice.

The other source is the pioneering work of the WEB Project, which makes available web-tools and networked communities for original student work to be shared and critiqued online. The WEB Project successfully brings together working professionals and classroom teachers in support of the improvement of student work by focusing high quality feedback to a learner based on their articulated intentions for their work. The secrets of success of the project are probably many, but it is worth pointing out the learner-centered nature of the online dialogs and the singular focus on creation of original work. Also, the entire sequence of activity in the project only begins if and when a student shares a work-in-progress and asks for specific feedback. These qualities of learner-centeredness, creativity, self-initiative and intellectual focus have been carried forward into the web-based PLP.

The rationale for building a web-based tool focused on the improvement of preservice teacher work has two parts. First, there is a need for feedback to come from a diverse audience, yet preservice and induction programs sometimes have limited resources and structures that produce scant feedback to aspiring teachers. As a result, an aspiring teacher's work evolves in isolation, perpetuating the general conditions of teaching present in most schools today. A web-based professional network can help overcome isolation, but even more important, it can provide the future teacher with high quality information that might not otherwise be available. The advantages of "anytime, anyplace" access to experts is an obvious benefit of a web-tool.

The second rationale is that there is a need for effective documentation of learning beyond paper and pencil formats. Ideally, documentation should be a record of the decisions as well as the validation of the work produced. In small personalized programs, preservice teachers benefit from many interviews and observation/feedback sessions related to their work, but in many programs, that experience is limited to the last few months of preparation. An online personal learning plan can help create a longitudinal multimedia record of growth and change in an aspiring teacher's skills and capabilities

The sources of inspiration and rationale led us to ask "What does preservice teacher work look like?" "What would happen if we could build a site for the improvement of a future teacher's work?" "Could the principles of personalization and helpful feedback in a professional network assist teacher education programs?" The online Personal Learning Plan is a way to pose answers to these kinds of questions.

Critical Components in the Online Personal Learning Plan

Online learning is here to stay. It brings remote resources to the desktop anytime, anyplace. Yes, it is in its infancy, and lacks many important features needed for rich human communication, but so in their own way do writing, film, video, and talking. Using the new online communication tools for learning is a matter of integration and balance and their effectiveness depends on the attributes of both the learner and teacher. The Online PLP promotes a uniquely learner-centered approach to the challenge of integration and balance of technology in learning. The following basic assumptions guide the thinking behind the NICI - PLP.

Face-to-Face as a Foundation of Learning The online world is an extension of human contact. The Online PLP does not and cannot replace face-to-face contact needed for learning.

Three bases for planning and action for learning The purposes of learning can be categorized by three domains:
1. Institutional priorities – our shared community goals
2. Professional priorities – our scholarly traditions and expectations
3. Personal priorities – our source of deep meaning

The Learning Cycle The Online PLP can be a powerful extension and helpmate in the "action research" process of planning, doing, reflecting and consolidating knowledge.

Focus on the learner's work The learner's productivity and self-efficacy is the ultimate goal of the Online PLP. Work samples are the critical source for evidence of learning, the documentation of progress, and the verification that high standards have been achieved.

Self-Direction and Making Meaning Learners produce better and are more highly motivated the more they have decision-making power over their learning. Learners gain from posing questions to advisors, and from knowing about, developing and using a variety of learning assets - their strengths, interests, aspirations, community and personal resources. All learning is a matter of making personal meaning out of the alternatives presented in experience.

Flexible Thinking Tools Learners gain from scaffolding and assistance in stages and types of thinking, for example, divergent thinking, using multiple frameworks and perspectives, and so forth.

Two Initial Versions of the PLP

The Online PLP is being developed in two versions (Figure 1): one for 9-12 students and one for educators in preservice, inservice and higher education roles. The underlying structure of the PLP is similar for both audiences. At its heart, the purposes of learning fall into three primary categories.

A first set of purposes is determined by the larger societal and community goals for education. A high school student, for example, is expected to be a literate member of the community, who makes a living, votes, and contributes in other ways to community life. An educator is expected to also be a contributing member of a community, especially a school community, who in addition, has attained a license to teach, and is continually upgrading their professional knowledge and skills. This is the domain of social and institutional goals and expectations. In the Online PLP, learners find the basic social and institutional expectations that are appropriate to their setting, and are prompted to use those expectations when they set goals in this domain.

A second set of purposes is determined by the academic and professional standards that need to be mastered in order to advance and to complete the program goals of high school graduation, licensing for teaching, advanced certificates and degrees, and for continuous learning. High school students, for example, increasingly have to demonstrate mastery of a number of standards that have been defined by their states, districts and schools. Preservice educators, especially in Professional Development Schools such as those in the

NICI Virtual Professional Development School Consortium (http://nici-mc2.org/pgs/highed/hevpds.htm) work on portfolios of evidence. Most teachers in the field work on some sort of continuing education plan, and many of those plans make connections to their school's long range plan. Highly experienced teachers assemble collections of evidence for National Board Certification (http://www.nbpts.org/nbpts/) and then engage with peers in reflecting on and evaluating their work.

The third set of purposes is one that has been overlooked too often by schools and the professional development process: personal goals. Not all students are routinely asked to think about their strengths, interests and aspirations when making educational decisions. Schools do not routinely make adjustments in what they offer based on what students most dearly want to learn. Likewise, the professional development experiences of most teachers - future, present, and past - have not been designed with personal goals in mind. However, it is well known that doing so increases motivation, productivity, affiliation and loyalty (Costa 1999 ;Friedrichs 2000). The Online PLP is built around this basic theory as a starting point for purposeful learning.

9-12 Student	Preservice & Inservice Educators & Teacher Education Faculty
Social/Community Goals	Institutional Priorities
Academic Standards	Professional Standards
Personal Learning Aspirations	Personal Learning Aspirations

Figure 1: Two versions of PLP with similar goal domains.

Example Questions Prompted by the Online PLP

The Online PLP begins the process of goal planning by surveying the learner and engaging the learner in activities that help explore the three domains of purpose as well as areas of strength, interest and aspirations for the future. Questions prompt writing and thinking, which is entered into an online form that then becomes available for editing, sharing privately with advisors, and for honing into long and short term goals. As the learner nears the goal-setting stage, the questions begin to focus specifically within the domains, by asking the learner to make their ideas relevant to learning.

For example, in the educator version, the following questions are asked. Pull-down menus present national and state standards, program requirements, and lists constructed from the earlier self-assessment surveys and activities. Goals become clearer as the learner and advisors dialog about questions such as:

Institutional Priorities What are my institution's priorities for improving student results? What are the skills and knowledge I should strengthen in order to best contribute to my institution's goals for improving student results?

Professional Standards On what standards do I want to demonstrate mastery? What are the skills and knowledge I need to strengthen in order to be able to demonstrate mastery of these standards?

Personal Learning Aspirations What are the skills and knowledge areas I most want to master for my own personal development?

The answers to these kinds of questions are then used to construct an action plan to move the learner from the idea stage to the achievement of valued outcomes.

Structure of the Online PLP

The online Personal Learning Plan will allow all media formats and a multiplicity of linkages among learning goals, projects, and the evidence of attainment of standards of performance. Distinct from electronic portfolios that concentrate on the presentation and storage of completed work, the PLP concentrates on the improvement of work and the documentation of change of work over time.

Three user levels and a server administrator level are provided. Users levels include the Learner, Advisors, and a Program Administrator. The Learner is in charge of their PLP. He or she creates or chooses goals, links them to standards or other external sources, creates work that stands in relationship to the goals, makes decisions on when both goals and work will be shared with advisors, and decides when work and goals are to be archived into permanent storage.

Advisors are associated with one or more learners. When a learner's goal or work is being shared for critique and feedback, the Advisor can discuss, offer direct edits or validate the goal or work as adequate for its purpose. For example, a goal might be validated as appropriate to completion of a secondary teaching license in science; a piece of work might be validated as evidence of achieving a standard of performance linked to one or more goals. The validation process can be formalized with rubrics or left as narrative, and any rubric can be associated with any piece of work's link as evidence.

The Program Administrator can review all Learners and Advisor records, add and delete Learners and Advisors, set defaults on the number of advisors that need to agree in order for validation to be complete, create rubrics, create and edit standards, and make other selections associated with program management.

The Server Administrator controls the hardware and communication decisions needed for site maintenance and archiving.

Tools for the Learner

In what follows (Figure 2), the basic tool sets available to the learner are described, organized first by the section name, then by the specific tool available, followed by a description of the tool's primary function.

Section Name	Specific Tools Available	Description of the page loaded by the link
Home		
	Edit	Displays splash page where Learners can place personal pictures, display their address and email, publish a "motto/quote/theme" The page can become a jacket of CD or title page of printed portfolio if desired.
Getting Started		
	What is a PLP?	Displays (PLP admin editable html) pages that inform the learner about the personal learning planning process.
	How Online PLP works	Displays (PLP admin editable html) pages that inform the learner about the personal learning planning process.
	What you need to begin	Displays (PLP admin editable html) pages that inform the learner about the personal learning planning process.
Planning		
	My Personal Strengths & Interests	Displays a set of online survey forms that help the learner explore his or her strengths, interests and aspirations in three dimensions (academic, social and personal). After a learner takes a survey, the results are available for editing and copying into other forms. Results are also available to Advisors at the learner's choice of displaying them.
	Social and Institutional Goals	Allows PLP Administrator to pre-load (or Learner to upload social/institutional program goals or priorities. (e.g. Educator question: What are my institution's priorities for improving student results?)
	Academic (Professional, Licensing) Standards	Allows PLP Administrator to pre-load load (or Learner to upload) content and performance standards.
	Community Assets	Allows PLP Administrator to pre-load community contacts, program standards, Virtual library link and other resources.

		If desired by PLP admin, automatically links learner to advisors with similar interests by comparing with survey results from the above section. Allows a learner to add records for new community contacts and advisors. PLP admin can choose to moderate new resources requested for addition, or a private database can be set up by the learner that does not link with or add to the PLP admin community asset database.
	Generating Options	Displays a set of online activities that help a learner organize and prioritize their options. Results are available to Advisors and Learner at the learner's choice of displaying them.
	My Goals With Comments Status	Learner creates goal. If desired, Learner and Advisor make links between goals and external standards/institutional priorities in Academic (discipline), Social (professional/licensing) and Personal Growth. The "Status" view displays progress toward completion via a rubric.
	My Projects With Comments Status	Allows renaming a goal as a "Project" keeps all programming as above for My Goals

Creating		
	New Works	Provides help in the creation process via online tools for brainstorming, selecting ideas, making connections, making decisions about documentation, choosing media to use.
	My Works in Progress With Comments Status	Shows a view of only unapproved works and goals.

Reflecting		
	Works Completed	Shows a view of only approved/completed works and goals.
	What Have I Learned?	Displays a help page on reflecting on work accomplished, how to select examples, add commentary. Survey for suggestions for improving the learning environment. (What would help me next time, What I needed that I didn't have access to, What the organization could do to help me next time.)
	Selecting Examples for Exhibition	Prompts learner to prioritize their work, then select the most salient example that represents the desired goal or standard, builds a list of "selected" and "to be archived now" works. Can display by standard, by goal and by work.
	Adding Commentary	Allows an introductory remark or summary to be added to a selected work(s) for display.

Exhibiting		
	Prepare an Exhibition	Displays all goals and work that have completed reflection section; archives all other goal and work that were selected.
	Type of Portfolio	Assists learners to select and then use preformatted displays for work - text presentation, online with hyperlinks
	Make a Slide Show	Assists learners with multimedia presentation decisions and prepares materials for a CD permanent storage.
	Archive	Assists learner in archiving material onto a local or remote

	Send to Location Send to CD	hard drive, or sending a CD prep file for CD burning.

Discussions		
	My Advisors	Displays advisors' names and contact information, email link, link to personal profile page of each advisor. Needs a request form for learner to add an advisor/reviewer, approved by PLP Admin.
	My Subscriptions	Displays all works-in-progress that have been selected for email notification.
	General Discussion	Displays a private discussion space for Learner and Advisors for "other" conversations not directly related to a specific goal or work.

Admin		
	Preferences	Displays all editable settings of the PLP for the Learner

Figure 2: Tools in the Online PLP

References

Costa, A. (1999). Adapted from opening remarks at the December, 1999 NSDC conference.
Friedrichs, A. (2000) Dialogue, discourse and learning. Unpublished dissertation. University of Vermont.
Gibson, D. & Clarke, J. (1999). Growing towards systemic change. Providence, RI: The Regional Laboratory.

Developing Standards of Quality for Online Courses

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Abstract: This paper will report on the development of a "Standards of Quality" document for educational technology distance learning courses. This project resulted from a concern that the courses were viewed as less rigorous by other faculty and our own desire to insure quality in current and future course offerings.

Introduction

This paper will describe a project completed by the Educational Computing and Technology group at the University of Nevada, Las Vegas. The goal of the project was to develop "Standards of Quality" for distance education courses offered in a masters degree program. The impetus to the project was a concern for maintaining a quality graduate program as on-campus courses were beginning to be offered as online courses. Distance education courses are often viewed as suspect by faculty unfamiliar with its opportunities and record of success. By developing this framework, we hoped to demonstrate why these courses should be considered of equal (or greater) quality when compared to the on-campus courses. Through this project, we hoped to develop a document that was a) based on current research b) could provide guidance for new course development and c) provided a framework for evaluating current course offerings.

A literature review was initially conducted to help guide the project. Each of the four participants conducted an independent search of the literature to identify four or five publications that "provided useful insight into the design and delivery of quality distance education courses." This approach to reviewing the literature insured a diverse group of publications would result. Once the pertinent publications were identified, a copy of each was shared with the group for review. Subsequent meetings would delineate major themes from the readings that would guide the development of the "standards of quality" document. This document would then be used as a tool to review existing courses and guide further course development.

Results

The search resulted in 23 articles, chapters and guidelines that were reviewed by each member of the group. As hoped, the articles represented a very diverse group of publications that ranged from guidelines such as NCATE standards (2000) to guidelines for online courses (e.g., Palloff and Pratt, 1999) and even a chapter from Dick and Carey's Systematic Design of Instruction (1996). From this review and subsequent discussion, four major themes were identified as crucial to the delivery of a quality course. Themes identified included, interactivity/collaboration, clear expectations, design and evaluation.

Interactivity / Collaboration

It was clear from the literature and our discussions that interactivity and collaboration were crucial to components of any course. To accomplish this in distance learning courses, activities need to be designed with collaboration in mind. Individual activities can certainly play a role but if the entire course is comprised of individual activities, a sense of isolation will detract from the quality of the course (Gilbert & Moore, 1998; Mioduser et al. 1999; Paloff & Pratt, 1999).

Clarity of Student Expectations

It is vital that students understand what is expected of them from the very beginning of the course. Face-to-face courses normally inform students of expectations in terms of assignments and maybe outside time commitments, but distance learning courses require that expectations be delineated in much greater detail. What the student can expect from the instructor should also be clearly communicated. Students may expect emails to be replied to as quickly as they get responses in the face-to-face classroom. This isn't reasonable in a distance-learning course. However, a quick response is important and the instructor should let students know how quickly they can expect a reply to inquiries and feedback on assignments. We also feel that outcome expectations should be made clear. We have followed the NCATE (2000) framework for describing course outcomes. Each course will delineate the skills, knowledge and dispositions that should result from the class activities.

Design

As we become more dependent on computer based tools such as WebCT and our own Websites for the distribution of course materials, communication with students and presentation of content, we must also become more cognizant of design issues. Consistency between and within courses will help our students tremendously (Hall, 1999).

Evaluation

In light of these activities we have also become more cognizant of the need to regularly and systematically evaluate our courses. As we put our courses online, we have a much easier mechanism for evaluating and comparing courses than we did previously be simply reviewing syllabi. It was clear from our discussions that a systematic review of objectives, activities and assessments of all of our courses would improve the quality of our offerings (Dick & Carey, 1996; Jones & Paolucci, 1999).

Discussion

Although the focus was initially on courses that were primarily distance education courses, it was soon expanded to include all of our course offerings. This was necessitated by the difficulty in delineating between distance education courses, hybrid courses and face-to-face courses. Our discussion on the distinctions led to the realization that all of our courses are to some extent hybrid courses. In other words, each of our courses have at least some expectations for distance learning activities (e.g., bulletin board postings) and face-to-face activities (even distance courses have at least an introductory f2f session).

We found the work on the project to be as valuable as the product. The dialogue between the faculty members was lively and substantive. It became a wonderful way to clarify what our goals were for the program. In many ways, distance education and new technologies have given us reason to rethink our expectations and approach to a graduate program in Educational Computing and Technology. A final conclusion was the need to institutionalize this process. In effect, we knew that much of what we had discussed would change over time. Students' needs would change. The needs of schools would change. And certainly, the technologies available would change. Therefore, rather than viewing this as a project with a beginning and end, we concluded that the development and revision of our Standards of Quality document would continue indefinitely.

References:

Dick, W. & Carey, L. (1996). The Systematic Design of Instruction. New York: Harper Collins.

Gilbert, L. & Moore, D. R. (1998). Building interactivity into Web courses: Tools for social and instructional interaction, 38(3), 29-35.

Hall, R. H. (1999). Instructional Web site design principles. Virtual University Journal, 2.

Jones, H. T., & Paolucci, R. (1999). Research framework and dimensions for evaluating the effectiveness of educational technology systems on learning outcomes. Journal of Research on Computing in Education. 32, (17-27).

Mioduser, D., Nachmias, R., Lahav, O., & Oren, A. (2000). Web-based learning environments: Current pedagogical and technological state. Journal of Research on Computing in Education. 33, 55-76.

NCATE 2000 Unit Standards. (2000, May 11). Washington, DC: National Council for Accreditation of Teacher Education. Retrieved October 10, 2000 from the World Wide Web: http://www.ncate.org/standard/m_stds.htm

Palloff, R. M. & Pratt, K. (1999). Building learning communities in cyberspace: Effective strategies for the online classroom. San Francisco, CA : Jossey-Bass.

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Reflections of Reality: Online Conversation in a Teacher Education Seminar

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Abstract: The use of seminars in teacher education have often been used to stimulate reflective thought and moral development among the participants. The use of online resources, listservs and electronic mail, exapnd the scope and range of seminars by allowing students to participate at any time. This study examines the use of an online seminar with a cohort of students involved in a field-based practicum at a Professinal Development School (PDS) on the university campus. The methodology of the seminar is explored as are the topics discussed by participants. Particular attention is given to the ways in which student attitudes develop during the conversation.

Introduction

We have all experienced in-depth conversations that stay with us over time. Such conversations turn over in our minds as we relate what was said to our own experience. Conversations that lead us to rethink what was said and provoke us to make meaning from our own perspective can be termed reflective, and often lead to changes in thinking or practice. In extraordinary situations, such reflective conversations can result in changes in our beliefs (Mezirow, 1990; Schon, 1987). Such conversations have the potential to become valuable, memorable experiences because they enable us to grow, both emotionally and intellectually.

In this article we consider different aspects of reflective conversation, it's occurrence online in the form of electronic mail messages, it's role in stimulating professional thought, and it's use as a methodology in teacher education. We portray a research study conducted in 1999 that explored the impact of online technology with preservice teachers who were participating in a practicum seminar. In particular, we explore the way that protected conversational space offered by computer-mediated communication (CMC) allowed for a unique form of conversation to take place between participants. In this case, the participants explored issues in more depth than they might otherwise have done in face-to-face encounters.

CMC has been discussed as a useful tool for teaching and learning. Used as a tool for online communication, CMC has been credited with helping teachers move to more constructivist teaching practices than previously held (Heflich, 1998). An important aspect of this movement is the extent to which CMC can stimulate discourse that leads to reflection by the participants. CMC discussion groups have been used in preservice teacher education to help develop reflective thought (McIntyre & Tlusty, 1995) ,the moral development of preservice teachers (Harrington, 1992), and general knowledge building discourse that enhances education (Scardamalia & Bereiter, 1996).

Central to all of these efforts is the significance of the protected conversational space that is offered by CMC. Online conversation has previously been characterized as reflective (Heflich, 1997). For our purposes, reflective conversation is an exchange among participants in which the expression and receipt of ideas leads to the construction of new understanding of their own experience. Bamberger (1991) has described such an exchange as "conceptual chaining" in which ideas are articulated, exchanged, recreated and re-exchanged as they move from person to person in a conversation. The reflective aspect of such a chain is the way in which individuals capture the ideas that are being exchanged to construct their own meaning from them as they reflectively integrate the new ideas with previously held knowledge.

Schon (1987) speaks of three forms of reflective thought. Reflection-on-action occurs as one seeks to make meaning of events that have occurred. One may reflect-in-action while confronting a problematic situation, and constructing a solution. Conversation offers us an opportunity to reflect-on-action, as it allows us to discuss and process into our intuitive knowledge base (Iran-Nejad, 1994) things that have previously occurred. It can also involve reflection-in-action as we dynamically engage in conceptual chaining (Bamberger, 1991) in the midst of an ongoing dialogue. The third form, reflection-for-action, indicates that the participation in the reflection process serves as a guide for taking future action. From this view, the potential exists for conversation to serve as a vehicle for stimulating reflective thought and may lead to both personal and professional growth.

Reflective thought has long been considered an important aspect of professional growth. Argyris and Schon (1974) identified the contradiction between one's espoused theory, one's expressed beliefs, and one's theory-in-use, beliefs made evident by one's activity. Growth for Argyris and Schon (1974) occurred when one recognized the dissonance between one's espoused theory and theory-in-use and took steps to align them. It is inquiry among individuals that helps expose the contradictions between beliefs and practices of teachers. Feldman et al. (1996) argue that teachers in a reflective stance examine their own practice exposing and questioning tacit assumptions about their teaching. This allows them to reflectively evaluate past practices and seek alternatives for future practice.

The Project

The research reported here discusses an effort to explore the impact of exposing preservice teachers to teaching with technology. The thought that teachers teach as they were taught has become conventional wisdom since Lortie articulated the idea in 1975. It is one of the many ideas that fuel the current effort to infuse technology into teacher education, symbolized most recently by the Federal Department of Education's Preparing Tomorrows' Teachers to Teach with Technology program (U.S.Government, Department of Education, 1999). Computer use in K-12 education is at an all-time high. A recent study by Becker and colleagues (1999) indicates that more teachers than ever are using the Internet in their practice, and furthermore that there appears to be a correlation between teachers' use of the Internet and the way they teach. Access to technology is one factor affecting teacher use of technology. Another is the extent to which preservice teachers are exposed to technology use within their classes and in field placements. This project was an attempt to infuse computer-based technology into preservice teacher education. In this study we examined the use CMC as a way of encouraging members of a field placement practicum seminar to explore their experiences reflectively and to discuss those experiences with other members of the seminar.

Online Seminars

The idea of using CMC to foster critical, reflective thought among preservice teachers in field-based settings was first described by Harrington (1992). Students involved in their preservice student teaching seminar were asked to pose a reflective question to a listserv discussion group composed of members of the seminar. Harrington (1992) found that the discussion in these virtual seminars was critically reflective, and led to the moral development of preservice teachers. In the case of our study, the purpose of the online discussion was the further exploration of concepts and ideas that the preservice teachers were learning through their other courses, and their experiences in the classroom. Since they had participated in a seminar the semester before that was held in a regular classroom, these preservice teachers were already familiar with the seminar-as- forum for discussion format. The difference was that this time the discussions would take place online rather than in a face-to-face classroom setting.

The Professional Development School and the PDS Cohort

The venue in which the project occurred has its beginnings in the creation of a Professional Development School (PDS) and the resulting teacher education program embedded within it. The PDS is a joint venture between the university and the school district to better prepare preservice teachers to teach in schools with students who may be considered to be at-risk, and to provide teachers in the PDS with the support and resources of the College of Education (COE). Teacher preparation in this PDS model is conceived of as a cohort of undergraduate students, who together would engage in an integrated curriculum taught by a team of COE faculty and the faculty and staff of the PDS. The curriculum is enacted both in the classroom and through the heightened participation of the cohort in the day-to-day life of the PDS.

Cohort Culture
In discussing the culture of the cohort, we are using a localized notion of culture (Collins & Green, 1992; Santa Barbara Classroom Discourse Group, 1992; Putney & Floriani, 1999). From this perspective, classroom participants construct patterned ways of being as they construct knowledge together. From the beginning of their coursework together, the cohort participated in reflective activity as they interacted with each other and with various university faculty involved in teaching the courses. The cohort maintained a portfolio throughout their experience, and many of the activities and assignments resulted in reflection on assigned texts and their interactions with those texts. In addition, the cohort was asked to reflect on their lesson plans and their experiences in the PDS. At times the reflections were informal through small group and whole group discussions in seminar. At other times they participated in writing more formal reflection papers and in reflecting on their practice through their portfolios and curriculum notebook entries.

In particular, reflection was a component of the seminar in which they participated a semester prior to the online seminar. In the prior seminar the interns were asked to keep a daily log in which they recorded issues that arose from their reading assignments. They discussed their issues in class in small groups and selected one key point to share with the class as a whole. In addition, they wrote short reflection papers from these issue logs each week. The purpose of these assignments was to have the students reflecting on the major topics covered in the seminar such as classroom management, creating types of assessments, reporting student progress, and constructing a classroom environment conducive to learning. Therefore, self-reflection was a component of their educational process in terms of their work in the PDS. However, prior to the online seminar, the reflections were more related to the texts being used in the courses and their work with those texts and in the PDS setting.

The Context
Students in the PDS cohort began spending a greater amount of time at the school during their third semester in the program. Prior to this semester, they had observed teachers in the classroom, worked with individual students or with small groups of students at a time, and taught lessons that they constructed through their coursework. As their internship evolved, they began spending more time at the school as a field-based practicum in teacher education was supported by a weekly seminar in which topics germane to their experiences at the school were raised and discussed. The role of the seminar in the overall PDS program was to introduce and reinforce topics identified by COE faculty and PDS teachers as important to preservice teachers such as classroom management, coping with parental concerns, and authentic assessment. The seminar had been established as a forum for linking current research on teaching with the observations and experiences that access to the PDS classrooms afforded these interns. One of the important themes of this seminar in the third semester was the role of computer technology in elementary teaching and learning.

Cohort members had previously completed a required survey of technology in education as part of their undergraduate course work. In seminar they were introduced to two new ways in which technology could be used in education. The first activity introduced members of the seminar to a method of integrating mathematics, science, and computer technology into field-based learning. Mentor teachers at the PDS had previously been introduced to a similar methodology through a project sponsored by a Dwight D. Eisenhower grant (Heflich, Dixon, & Davis, 1999). The second way in which the cohort was introduced to technology in teaching and learning, the one presently under discussion, involved the use of online discussion as a venue for exploring students' experiences as they engaged in their practicum at the PDS.

The Assignment
Building upon the model first proposed by Harrington (1992), an effort was made to establish an online version of seminar in which the interns would discuss issues raised during their practicum. Each intern in the seminar was assigned a week in which to assume the role of discussion leader by posting a leading question on the listserv. Other interns could either respond to the leading question, or to one another's responses. The instructor corresponded with the discussion leaders each time, first discussing with them their ideas before they posted them to the listserv, and helping them develop the idea into a leading question. For the most part, the instructor remained invisible, monitoring the conversation, but not

contributing to it. The online seminar began during the second week of the semester and continued for eleven weeks.

The Online Seminar as a Venue for Conversation

Student participation in the seminar was overwhelmingly successful, based upon the usage of the listserv. Each week two of the twenty-two interns would questions to the listserv, to which other cohort members responded. Twenty-one separate topics were raised during the online seminar. Those topics generated a significant amount of activity on the listserv. For example, collectively the questions generated 206 responses during the eleven weeks in which it was active, an average of 18.7 messages per week. The most active topic generated 17 responses while the least active, at the very end of the semester, generated but 3 responses. In terms of the individuals involved, the most active cohort members responded 19 times to various questions, while the least active participant responded only 2 times. On average, cohort members responded 12.7 times to questions posted online.

Topics Raised by the Cohort

Student discussion in the virtual seminar revolved around their experiences at the PDS, common classroom experiences, and the other technology-related experiences in which they were engaged in seminar. The topics discussed and the activity each topic generated is contained in Table 1. Far and away the most engaging topics involved behaviors they observed while serving in the PDS classrooms. Classroom-based topics involved managing student behaviors in the classroom, the use of computers in classroom learning, the celebration of religious holidays, the death of a student's family member, managing student's "tattling" on others, working with students who are labeled at-risk or for whom English is a second language, and how to cope with irate parents. Spending time in the school outside of the classroom was the source of other topics such as what constitutes a professional dress code for teachers, or the importance of reading at home with children, or maintaining positive relationships with administrators. Other topics emerged from their ongoing classroom experience as members of the cohort. These include a discussion that developed about a video documenting efforts to mainstream a student with special needs, comments about field-based learning, and reflections on their experience as members as members of the first cohort of students in an experimental preservice teacher education program.

Topical development

The ways in which topics developed during the conversation demonstrated the extent to which cohort members reflected on the issues and how their discussion led to growth as the discussion developed. An example of this is the discussion thread concerning teacher gossip about student behavior. The leading question was relatively innocuous:

> *We have been working very closely with the teachers at PPDS for several weeks now. We are with them during prep periods and lunchtime. In these last weeks I have learned a lot about what goes on outside of the classroom, between the teachers and the staff. During lunch I personally have noticed a tremendous amount of gossip between the teachers, about students and other staff members. Has anyone else noticed this? Is it like this in every school? What effects do you think it has on the children at PPDS?*

Some cohort members quickly responded to the question by characterizing this gossip as unprofessional behavior.

> *Thank you for bringing this up. I hear teachers' gossip about students all of the times in the faculty lounge. Sometimes this gossip is downright mean and very negative. If I were a parent of one of these students, I would have real issues with some of these teachers if this is how they talk about them to other teachers, how objective are they toward these students in the class? I just don't see these students being treated the same as the students that are spoken of highly in the lounge. Don't get me wrong, I think teachers need to vent and discuss things and get new ideas from each other. I don't think all of the nastiness is necessary.*

Others looked at lounge discussion as the one opportunity that teachers, otherwise stuck in classrooms with children, had to express their feelings about the experience to other adults.

> *This is a great question. There is what I notice clicks in the teachers lounge with the teachers. You see the same teachers sit together everyday and talk about what ever. By having lunch in the lounge you hear the teachers talking about the students in their classrooms. I think that because with the job we are doing there is no one in our classrooms that we can talk to; many teachers can't wait until lunch to explode and let everything out to others who will understand and relate to what they are going through. I also hear positive remarks in the lounge about how well teachers and students are doing. This must happen in all schools.*

Still other cohort members looked on such behaviors as ways that teachers could network with one another, sharing ideas about how to cope with problems in the classroom.

> *I agree that there is much gossip around the school. I also agree that many of the teachers are just venting their long hard days to people who can understand the* sort of day they are having. I think teachers should talk to one another about some students so that the next teacher can have a handle on students who have *behavior problems. On the first day of school, my mentor teacher filled me in on the students who were coming into her class. She knew the ones who hadprevious problems and already had some ideas on how she wanted to handle them. I always like to know what I'm walking into if I can.*

These messages demonstrate student growth in the midst of discussion in the virtual seminar. Beginning with the early characterization of teacher lunchroom conversations as gossipy and mean, cohort members began to posit reasons and rationales for this form of conversation. The realization that teachers working alone in classrooms and might need to discuss their day with colleagues in the lunchroom is an important one for preservice teachers. Understanding that they are likely to find themselves in a similar situation, they look to why it happens and speculate on how they will behave when they are professionals in a school. In addition, they offered coping strategies for each other to use in dealing with gossip so that they could use the information being offered in a positive way rather than just view it as negative and mean.

Discussion

The use of CMC as a venue for discussion among students involved in field placement is evident from the results of this study, particularly when considered along with the results reported by Harrington (1992). There are some key differences between the two studies that distinguish them from one another, but do little to invalidate either. Harrington (1992) reported on students in a traditional, albeit online, student teaching seminar. This study explores the use of an online seminar during a field practicum with a cohort of students who were well acquainted with one another. Although the groups themselves are very different, the methodology demonstrates the validity of using online seminars with students in field placements.

Certainly the knowledge that cohort members had of one another added to the depth of discussion that occurred in this seminar. The participants already knew about the background of their correspondent, the fact that they were a parent, or had children in school, or worked nights at a particular restaurant. This knowledge added a perspective to the conversation that would have been missing if it had occurred among those less well acquainted. Participants' knowledge of one another though had little impact on the ideas expressed or the thought that was apparent within their responses. It is difficult to say then that the participants' prior knowledge of one another invalidates the conclusion that the use of CMC in online seminars stimulates critical, reflective thought among participants that may heighten their moral development (Harrington, 1992).

Another area worthy of consideration is the participants' choice of content for discussion. All of the ideas introduced in the seminar arose out of students' experiences either in the PDS or in their class work. Prior to posting a question they discussed their ideas online with the Instructor. In these discussions the Instructor questioned the student about their idea, encouraging them to reflect on it before posting it to the group. This helped the student craft a question that generated a response among the group.

A key to the success of online seminars is the concept of a protected conversational space (Heflich, 1997). In depth conversation be it intellectual or intimate, occurs in a protected space limited to the individuals or group for which it is intended. One feels secure in what one has to say and assurance that what is said will be respected. The asynchronous nature of text-based CMC allows one the space to write a question, or respond to a question, without the pressure of real time. One can reflect on the response, perhaps edit it to better express a thought, before posting it to the listserv. Sproull & Keisler (1993) argue that asynchronous exchanges in CMC are empowering because personal elements of gender, ethnicity, and social status are invisible online. Such elements support the use of text-based CMC as a venue for critical, reflective conversation, appropriate for use in seminars of preservice teacher education students involved in field placements.

References

Anderson, R.E., & Ronnkvist, A. (1999). *Teaching, learning, and computing: 1998 national survey report #2*. http://www.crito.uci.edu/TLC/findings/Internet-Use/startpage.html.

Argyris, C. & Schon, D. A.(1974). *Theory in practice: Increasing professional effectiveness*. San Francisco: Jossey-Bass.

Bamberger, J. (1991). The laboratory for making things. In D. A. Schon (Ed.) *The reflective turn: Case studies in and on educational practice* (pp. 37-62). New York: Teachers College Press.

Becker, H.J. (1999). *Internet use by teachers: Conditions of professional use and teacher-directed student use*. http://www.crito.uci.edu/TLC/findings/Internet-Use/startpage.html.

Collins, E., & Green, J. (1992). Learning in classroom settings: Making or breaking a culture. In H. Marshall (Ed.), *Redefining student learning*. (pp. 59-85). Norwood: Ablex.

Feldman, A. (1995). *Conversation in teaching; Conversation as research: A self-study of the teaching of collaborative action research*. Paper presented at the annual meeting of the American Educational Research Association, San Francisco.

Harrington, H. (1992). Fostering critical reflection through technology: Preparing prospective teachers for a changing society. *Journal of Information Technology for Teacher Education, 1 (1). 67-82.*

Heflich, D. A. (1997). *Online interviews: Research as reflective dialogue*. Paper presented at the annual meeting of the American Educational Research Association. Chicago.

Heflich, D. A. (1998). *The symbiotic relationship between organizational culture and the constructive use of online technology in schools: thoughts of educators in the field*. Paper presented at the International Conference for Technology in Education. Santa Fe, NM.

Heflich, D.A., Dixon, J.K. & Davis, K.S.(1999). Taking it to the field: The authentic integration of mathematics, and technology in inquiry-based science instruction. Paper under review by the *Journal of Computers in Mathematics and Science Teaching*.

Iran-Nejad, A. (1994). The global coherence context in educational practice: A comparison of piecemeal and whole-theme approaches to learning and teaching. *Research in the Schools, 1 (1)*, 63-76.

Lortie, D.C. (1975). *Schoolteacher*. Chicago: University of Chicago Press.

McIntyre, S. R. & Tlusty, R. H. (1995). *Computer-mediated discourse: Electronic dialogue, journaling, and reflective practice*. Paper presented at the annual meeting of the American Educational Research Association. San Francisco.

Mezirow, J. (1990) How critical reflection triggers transformative learning. In J. Mezirow (Ed.) *Fostering critical reflection in adulthood* (pp 1-19). San-Francisco: Jossey-Bass.

Putney, L. G., & Floriani, A. (1999). Examining transformative processes and practices: A cross-case analysis of life in two bilingual classrooms. *Journal of Classroom Interaction*, 34(2), 17-29.

Santa Barbara Classroom Discourse Group. (1992). Constructing literacy in classrooms: Literate actions as social accomplishments. In H. Marshall (Ed.), *Redefining student learning: Roots of educational change* (pp. 119-150). Norwood, NJ: Ablex.

Scardamalia, M., & Bereiter, C. (1996). Computer support for knowledg-building communities. In T.Koschmann (Ed.). *CSCL: Theory and practice of an emerging paradigm*. Mahwah, NJ: Lawrence Erlbaum Associates

Schon, D. A. (1987) *Educating the reflective practitioner*. San Francisco: Jossey-Bass.

Sproull, L., & Kiesler, S. (1993). Computers, networks and work. In L. M. Harasim, ed. (1993). *Global networks: Computers and international Communication* (pp. 105-120). Cambridge, MA: MIT Press.

U.S.Government. Department of Education (1999). Preparing tomorrow's teachers to use technology.

HOW INFORMATION TECHNOLOGY CAN HELP EDUCATION DISTANCE LEARNING

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Abstract: The aim of this paper is to review how information technology i.e. computer based studies can help education particularly in distance learning. Although this review will concentrate on distance learning it will also discuss and compare ideas such as open learning and flexible learning. The economy behind, and advantage, disadvantage of the distance learning will be analysed and compared between conventional, distance, open and flexible learning.

INTRODUCTION

This paper reviews the impact of information technology i.e. how computer based studies can help education particularly in distance learning. Although this evaluation will concentrate on distance learning it will also discuss and compare ideas such as open learning and flexible learning.
At this stage it is difficult to judge the impact of information technology and networking (internet, web sites) revolution. This remains unknown however, experiences offered by the information technology suggest that it may change our life style.
How can we define distance learning, very confusing according to various definitions. Distance learning is a generic term that means education where you are physically separated from the institution conducting the course. Open Learning, is an extension of distance learning and a buzzword for offering courses in a non-traditional way by opening up the course to those who wouldn't normally be able to use it. Open learning, flexible learning, online learning, distance learning, are very vague terms and may not mean anything in particular (Greville Rumble,1990) calls for a need for greater clarity in the use of these concepts if we are to avoid misleading others and ourselves.
Basically, all the terms mentioned refer to distance learning. Distance learning is any learning that takes place with the instructor and student geographically remote from each other. Distance learning may occur by surface mail, video, interactive or cable TV, Internet, video-conferencing, etc. Therefore in distance learning, there is a gap between the provider and the learner for some, most, or even all of the time. For example, various correspondence learning agencies, and some in-company training Foremost the Learner, Tutor (institution), learning centres for support, the media - technology for interaction and support, various forms of technology for interaction. By using a computer based training system in a distance learning environment, students not only acquire the competence needed to meet the requirements of the syllabus in question, they also enhanced their general technical and learning skills. Therefore, by employing existing staff and environmental resources, training can be delivered to student across wide geographical area who would otherwise be unable to access training resources. Of course, there are drawbacks in this process. Some courses just do not fit very well at a distance. These types of courses need a hands on and gain experience practice. For example we don't want our GP (General Practitioner to learn his or her practice through distance learning, but rather via conventional learning, but we have learned that the fact computer changes the dynamics of communication. In return it is not suggested that distance learning should replace all traditional teaching. For many purposes face-to-face learning situations have advantages over learning alone, and peer group interaction is a vital part of many kinds of learning.Also in distance learning the economical advantages are achieved, both for students and trainees, and for the institution which takes care of the learning process. Since there is no need for travelling, trainees and tutors have not to waste their time and money. On the other hand, from the point of view of these institutions, neither equipment nor lecture rooms have to be prepared.
By far the best situation in which to develop flexible learning resource materials is by being involved face-to-face with 'traditional students'. The ultimate aim may be to produce resources which can promote learning without the presence of a tutor, but the hand-over of control is best done one step at a time, with thorough monitoring of each move towards learner autonomy. A longer term aim should be to establish distance-learning pathways, built initially from those flexible learning resources that prove their worth with conventional students.

At this age of technology, the technologies can support almost all of the components of distance education. Information and communication technologies that must help in implementing such systems are already in place. We now have different types of networks system that can use applications to communicate across the whole world. From the technical point of view the major changes and development can be traced out in concepts of WAP (Wireless Application Protocol) and B - ISDN (Broadband Integrated Service).

To implement distance learning programs through development of the three elements crucial to a successful distance education program: (1) Sound instructional design; (2) Appropriate technology applications; and (3) Support for teachers, students, and collaborative partners.

A distance learning program must meet the educational goals of the institution. Therefore, implementing such a program requires time, people, funding, and careful planning.

The progress of time is inevitable and we can only hope to shape its direction, distance education is definitely the wave of the future.

As (Bates, 1996) pointed out quite categorically "the value of technology is its ability to reach learners not only well served by conventional educational institutions, but also to meet better the newly emerging educational needs of an information society, and to improve the quality of learning".

Within last decade it has become possible to work in a rich variety of ways with others at a significant distance through the use of a personal computer with an internal connection. For many people, their Web browser has already become most important program running on their machines.

Distance learning offers an opportunity to outsource teaching to specialised companies without taking employees away from their work. To gain faster acceptability and recognition, some of their companies have entered into co-operative arrangements with accredited colleges and universities.

Patterson in his paper emphasised the importance of a progression from high teachers' support levels to increased student empowerment. Where technology is concerned, a Bermuda triangle i.e., Teaching - Learning - Computers, may develop with money being poured in to little effect. The World Wide Web offers advantages in several directions. Hypertext linkages in the material mean that a student can work at a suitable pace and can revise and review on demand. The great advantage of the Web is that distance learning is no longer platform dependent it does not matter the sources. It is thus possible to provide a very rich learning environment using the Web. Hypertext links provide an advantage that a conventional course, or course notes can not provide. Although, Web based teachers and their students may be scattered all over the world, the computer can help to over come the disadvantages of physical separation.

The key economic advantage of distance learning over traditional on-site schooling is that it saves students time. The value of the time-spent learning is the principal cost of investment in human capital among adults with even moderate earnings (Duhaney, 2000, Mitchell, 2000, Ohler, 1999)

COMPUTER BASED STUDIES/TRAINING

Higher education has offered distance learning courses for several years , their numbers until recently have been relatively small. The grows use of internet are greatly changing the face of distance education. Computers have been used in many ways in education since 1960/1970's, however the types of use have expanded and the number of students using them has grown. The computer based learning allows the learner to work through pre-designed materials. The most significant feature of *'CBL'* is that the learner interacts solely with the computer.

In computer mediated communication method of distance learning the learner has opportunity to be contact with teachers and other students, through his/her computer. Through online facilities such as e-mail, video conferencing, people can easily contact each other and transfer data files, text and obtain information from computer databases.

Extensive research comparing grades, test scores, and other measures of student achievement has been compiled, and analysed. Generally seems that there is no significant difference between students in virtual classrooms and students in traditional ones.

A similar study in the Journal of Computing in Higher Education shows that, cyber learning can be as effective as traditional classroom learning, (RUSSEL, 2000), and that there was no significant difference in academic outcomes between the two groups of students tested. Indeed, so far almost

3 million students in America and Canada and Europe already enrolled in distance learning. It is expected that in near future about 80% of U.S. universities and colleges will be offering online classes (EBSCO ONLINE, 2000). Computer based training or Web based training (WBT) is used extensively in industry to train learners and accessible using a computer. The courses are designed to simulate the software being learnt and are pre-programmed and stored digitally on a compact disk (CD-ROM).. Courses usually include compressed videos, audio graphics, animations and sound. On the other hand the term WBT means that the training is delivered via internets. It is not, need to be just in the Open University that computer conferencing is used for education. However, the medium is most easily justified when students are distributed widely, and at present the Open University in the United Kingdom plays the major role in this area. Things will undoubtedly change as the

various scheme which support open learning are beginning to start up; indeed, any polytechnic or college with access to a sizeable time-sharing system could start a computer conferencing system. An interesting development in this area is the proposal to use national electronic mail facilities to support programming courses for micro users, in partnership with an educational body.

The advantages and disadvantages of distance education

Advantages:

Undoubtedly the main advantage over traditional on site learning is the amount of time it saves. Students don't have to get up, take an hour getting ready and then an hour getting to school or college and another hour travelling home - essentially three hours a day of "wasted time". They can just stay at home and spend the time learning. This is especially important for people with full time jobs or children who can choose the most convenient time for them to study (DL rarely follows a strict timetable like colleges) without affecting their work or leaving their children.
Distance Learning is also especially useful for adults who want to do a degree or executives and highly skilled workers who need to update their knowledge and skills but don't have the time to go to college.
Distance education is more flexible, accessible and rewarding than the physical classroom environment. It gives the adult learner the opportunity to choose the time, place and pace for his study without being trapped in fixed time slots at the college or time-consuming and uncomfortable travelling from his home to the campus.
Distance Learning gives more students the opportunity to take courses from top universities where physically, places are limited e.g. for every ten students who get a place at Oxford, Cambridge or Harvard, there are probably another hundred who deserve a place.
It gives the learner the opportunity to reflect creatively on his own writing. A student learns the ability to formulate the ideas and opinions in writing in such a way that their meaning is clear to other people who are not physically present essay (Bates, 1995).
In addition to that distance teaching universities such as the 'British Open University' are demonstrating significant cost advantages compared to the traditional universities because of the reduction in the need of campus based student facilities such as buildings or administrative and academic staff and because of the economies of scale. Distance Learning via the Web is much cheaper, around 50% to 90%, than traditional courses as there are less teachers, buildings, materials and so on to be paid for. This can also save the Government money along with the economies of scale achieved by many individual institutions sharing their resources and knowledge to provide courses e.g. The UK government is currently seeking to establish an "e - university" whereby they will organise a collaboration of UK universities to provide their expertise for online courses.
It offers the companies a very interesting possibility to educate their employees. Online-based distance education offers significant cost advantages. It eliminates travel to and from a specific location. With this option, employees simply log on to any Internet connected computer and begin the training session. Schlumberger PLC, a $9-billion international technical service company, began implementing "just in time" distance teaching in spring 2000 to offer his employees training when it will be most useful and when it will stick best (Ebsco Online, 2000).
Most importantly perhaps is that DL could have a great impact globally by allowing people in the "Third World" the opportunity to learn without its nations needing to find the money to build schools, buy books, pay teachers and so on. This could aid their development.

Disadvantages:

- A problem of distance teaching is that the learner doesn't get in touch with other students and lecturers compared to the traditional education with seminars and workshops on the campus. There is a lack of in developing his social skills such as working in a group and to interact with each other order to find a solution for a task, which is based on the consensus of the group.
- Though it works well with things like business studies, history etc DL can't be used to take certain courses where hands on experience is needed such medicine, dentistry, some engineering courses.
- There are individual preferences and differences particularly among adult learners. Online teaching can't suit all students. The developers and planners often seem to forget the fact that people are different and that they differ just as much in their preferences for learning modes as they do in other areas in their life. Some of the learners will benefit greatly from this medium other will rather prefer traditional teaching methods (Mason and Kaye, 1989).

- Converting courses from a classroom to the Internet is hard work for lecturers & Professionals this needs a lot more commitment of time from them e.g. A barrage of e - mails back and forth between students around the clock and more time writing up lecture notes.
- There is no physical peer contact/social interaction between students which may take some of the fun out of learning. The impersonal nature of online learning also removes the enthusiasm, skill and wit of lecturers.
- The commentator, also fears of the dangers of profit making companies entering the DL market that it is "commodifying" education and making courses competitive. This could lead to an emphasis on quantity rather than quality and individual attention. If the academic is replaced by the businessman it could spell danger for the student.

DISTANCE LEARNING (FLEXIABLE LEARNING) IN THE UNIVERSITY OF EAST LONDON

UEL has a strong national reputation for teaching students of all ages for over 30 years. One of the courses running under Flexible Learning program is BA (HONOURS) IN Business studies. The course is part of the portfolio of courses offered by East London Business School in undergraduate, Postgraduate, MBA and Doctorate levels. About 100 students registered under Business studies scheme. A primary vehicle for achieving this level of co-operation will be the electronic communications network. You will be able to "talk" to others in a group by using the electronic conferences and you can exchange information with individuals by using e-mail. Every student has personal tutor. By visiting the courses World Wide Web site they should able to collect assignment or any other information which they require.

CONCLUSION

Distance learning have played a tremendous part in education over the years, previously known as correspondence courses. Distance learning is a product of the removal of the educational barriers. It is the delivery mechanism that allow anyone access to educational institutions irrespective of where they are, time and space via the media of technology. The teaching and learning paradigm is reversed, whereby the tutor is now a facilitator and the learner has the responsibility of learning in their own time, space and place. As well as making their own decision on how to structure their course. Communication is by means of technology, such as, printed text, videotapes, electronic mail, fax, telephone, video-conferencing, audio-tapes, internet and so forth.

Like all things we have advantages and disadvantages with DL but despite the disadvantages, we must surely conclude that CIT (Communication and Information Technology) in its various forms has had a great impact on education and vastly aids the student to produce well presented and well informed coursework.

Its unlikely that DL will totally replace face to face teaching but it will definitely supplement it. At the end of the day, CIT and DL doesn't make a bad student a good student - they still have to do the work, learn the subject, pass the exam. It appears then that CIT is having a positive impact on education and hopefully, as access to the Web continues to grow rapidly, this will become a global movement whereby education can enrich the lives of people across the world.

REFERENCES

1) Russell, T (2000), No significant difference (on line),
Available : http://cuda.teleeducation.nb.ca/nosignificantdifference/.

2) Duhaney, D. (2000) 'Technology and the educational process: Transforming classroom activities', *International Journal of Instructional Media*, 27(1), 67-71.

3) Mitchell, L. (2000), E-learning makes the grade, *Infoworld*, 22(30), 53-54.

4) Ohler, J. (1999), 'Why distance education?', *Annals of the American Academy of Political & Social Science*, 514, 22-35.

5) Rumble, G. (1990) `On-line costs: interactivity at a price' in
Mason, R. And Kaye, A. Mindweave: Communication, Computers and Distance Education, Oxford: Pergamon.

6) Bates, A.W. (1996) Technology, Open Learning and distance education. Rouledge, London

7) Bates, A.W. (1995) Research and development in distance education in Lockwood, F. (ed.) Open & distance Learning Today, London : Rouledge

8) Ebsco Online, 2000

9) Mason, R. and Kaye, (1989) A. Mindweave : Communication, Computers and distance education, Oxford : Pergamon.

Matching Distance Education With Cognitive Styles in Various Levels of Higher Education

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Abstract: Technological advances in distance education have resulted in a myriad mediums available for educators to deliver course materials. As technology pervades higher education, educators should be mindful of what mediums and materials can lead to successful learning for the various individuals the course will be reaching. In order to maximize learning potential, courses need to be tailored to the learning styles or "cognitive styles" of the students in each course. The greatest diversity of cognitive styles will undoubtedly be seen in general introductory courses that are required of all university students. However, this diversity will generally narrow as students gravitate toward their field of specialization. With the increasing number of non-traditional students (over age 22), educators must also meet the challenge of designing courses that are directed toward the cognitive styles of a population that may not be as technologically savvy as their younger counterparts. Equally important is the question of, "Is distance education appropriate for all students?" During the first years of college, students are learning valuable social and relationship skills. For this population, the convenience and cost efficiency of distance education may come at the expense of interpersonal development.

Introduction

With the rapid infusion of technology into education, there has been a proliferation in the instructional mediums that are employed. Due to the fast pace of technological advances in today's society, researchers and educators alike have not had the opportunity to fully explore the characteristics and effectiveness of these new educational mediums. Research is beginning to emerge that is examining the effectiveness of various mediums, and the characteristics of these mediums that lead to successful learning in distance education environments (Molebash, 2000; Offir & Lev, 2000). In reviewing the literature, one aspect of these new educational mediums which is not receiving a great deal of attention, is the characteristics of the learner. The main question addressed in this article is, "Is distance education appropriate for all students, or do we need to design distance education to meet the needs of individual students?" It is our belief that by taking into account characteristics of students, distance education can be designed to better meet the needs of students.

In the past, where distance education was limited to such technologies as television courses (McCleary & Eagan, 1989) and telephone instruction (Burge & Howard, 1996), obtaining educational results similar to traditional classroom instruction was quite an accomplishment, considering obstacles such as lack of visual aides, or the impossibility of student interaction. With advances in computer technology, a seemingly endless list of medias are now available to deliver instruction to students (Marsh, Price & McFadden, 2000). Considering theses advances, a goal of developing distance education courses that are roughly equivalent to classroom instruction, appears to be nothing more than striving for mediocrity. We now have the potential for designing distance education courses that will allow students to maximize their potential and learning. This is not meant to imply that the classroom teacher will one day be obsolete. In fact, it is arguable that distance education courses are not suitable for certain types of classes and students.

Not all individuals process information in the same manner. The way that an individual usually processes information is commonly referred to as "cognitive style" or "learning style" (Witkin & Goodenough, 1981). Different cognitive styles require different presentation types, as well as materials, to enhance learning. Classroom teachers face the difficulty of trying to meet the individual needs and learning styles of a diverse population. In instances where the teacher must attend to the needs of an individual student, learning can slow or, at times, completely stop for the rest of the students in the classroom (Moore, 2000). With distance education courses, classes could be designed to match individual learning styles, without slowing instruction for students that do not require individual attention. Furthermore, college students are no longer solely between the ages of 18-22. Columbus State University in Georgia report an estimated 45 percent of their enrollment consists of "non-traditional" (over the age of 22) students (Langford, 2000). Students in different age groups are likely to have differences in maturity level, preferred learning style, and experience. This diversity in students makes the cognitive styles in higher education even more varied than before web-based courses were possible. In order to maximize learning potential, distance education courses must meet this diversity by tailoring distance courses to individual cognitive styles.

Cognitive Styles

Alport (1937) defined cognitive style as, "an individual's habitual or typical way of perceiving, remembering, thinking and problem solving." Over the years, several theories and constructs have emerged in the area of cognitive styles and how they relate to learning theories. Witkin's (1954) field dependence-independence theory has served as somewhat of a foundation for research in this area. He observed that people have individual differences in their ability to distinguish objects from a confusing or distracting background. This concept was expanded upon, and proved to have practical applications in the way individuals learn.

Field dependence-independence theory, as related to cognitive style, evolved out of Witkin's observation that individuals differ in their ability to separate an item from an organized field or overcoming an embedding context. He found that this concept is actually a universal dimension of individual functioning, in that it shows itself in not only perceptual contexts, but also in intellectual, personality, and social aspects of how individuals process information. (Witkin & Goodenough, 1981). Field dependent people show more interpersonal competencies, function at a more autonomous level, and enjoy cooperative learning more than field dependent individuals. Conversely, field independent individuals are superior at cognitive restructuring and independent learning, yet lack the interpersonal competencies of field dependent individuals. Although some subjects did show extreme dominance, most showed a general tendency toward either field dependence or independence with some ability in both areas. Dimensions of field dependence-independence were also found to be stable over time, and that people are likely to favor and show superior performance in educational/vocational settings that match their cognitive style (Witkin & Goodenough, 1981).

The importance of matching cognitive style with distance education is not a new concept. Dunn (1989) found that students learn, remember, and even enjoy learning more, when instruction is matched with learning style preferences. However, what is commonly overlooked (or under focused), are the vast differences within the higher education population, even at a single university. It seems highly unlikely that a universal format for distance course construction would be suitable for both an 18-year-old freshman and a returning adult graduate student. As alluded to earlier in this article, in order to maximize the potential of creating distance education courses that are superior to traditional classroom instruction, distance education courses should be constructed with an effort to match the cognitive styles of the population within each class whenever possible.

In order to insure that the cognitive styles of students are appropriately matched with the materials and mode of delivery of a course, the cognitive styles of the students should be assessed prior to formal instruction. As students progress through the various levels of higher education, the population of each course they take part in will undoubtedly vary. The design of the course must therefore evolve to meet the changing needs of students. When assessing the cognitive styles for a particular course, the level of education, technological competence, and life experiences of the students in that course should all be taken into account to design courses that will maximize the learning of those students.

Undergraduate Freshmen

The transition from high school to college is generally a period of educational and social adjustment for most students. New levels of social relationships are being developed that are important to the development of the student. This is also often a first experience of living away from ones family and friends and, according to Horn (1997), "...those who extend their associations beyond the classroom may well find their transformation into *college students* to be easier and more complete." Social interaction is, of course, limited for students taking web-based courses. Students may engage in social activities with other students and teachers via the internet. However, the levels of social interaction and intimacy of these activities are inhibited by distance. Not only are students unable to participate in social outings, they will not be able form face-to-face working relationships when collaborating on team projects or delegating project responsibilities. Hence, students are not developing the skills for face-to-face social and professional relationships that are necessary in almost any career. Likewise, distance education does not provide the development of true public speaking skills. When students deliver speeches or give presentations through distance education courses, the speeches are performed in front of a computer camera, rather than an actual audience that the student will undoubtedly have to face at some point in his or her future career. The development of social skills is often vital to the future career of the student. Work by Mintzberg (1997) showed that managers spend between 63-69% of their work time engaged in conversation. For all of these reasons, it is questionable if distance education courses are appropriate for traditional college freshmen in the first place. However, in certain circumstances (i.e., those living in remote areas) students may be left with little other choice.

In any case, lower-division classes such as; Introduction to Biology, or World History, will undoubtedly contain students with a wide range of cognitive styles. Most American universities require students to complete a number of general education courses before they can specialize in a field of preference. Distance education courses at this level should be designed with this in mind. Professors in fields such as physical science, which traditionally attract individuals who are adept at individualized learning (field independent) (Witkin, 1962), may be inclined to produce a distance education course from this perspective without regard for learners who require a more interactive approach (field dependent). Conversely, humanities professors, that are traditionally more social in nature, will need to incorporate technical concepts into the class design to facilitate students who are more cognitively field-independent.

Ultimately, professors must look outside of their cognitive style paradigms to accommodate the myriad cognitive styles students possess in their courses. While the extreme field independent learners could be accommodated with what Bates (1986) refers to as the black box approach which simply lets the computer replace the teacher, the extreme field dependent learner may be best suited with options such as interactive study guides and student video chat rooms. Preparing a lower division course in this fashion has the potential to be quite labor-intensive and costly. To accommodate a variety of learning styles, educators may have to utilize the expertise of several educational consultants, as well as incur additional expenses from computer programmers for the hours needed to implement the extensive design of the course. However, even with extensive design expenses, these courses can still be cost effective considering the large numbers of students that will utilize them. Introductory courses generally have the largest class sizes because they are pre-requisites for advanced courses in various majors. Likewise, if these courses are not constructed to match individual learning styles, a greater number of students stand to be adversely effected.

Advanced Students

As students move into their chosen field of study, media type and instruction could be tailored more closely to the learning styles of students that are attracted to that particular field of study. For students enrolled in upper division sales and marketing classes (which are people oriented by definition), a team oriented and interactive course format may be most conducive to learning. For such a course, student teleconferencing sessions could be held to brainstorm marketing strategies for a new product. Conversely, this format could be counterproductive and even aversive to those who tend to gravitate toward the physical sciences. As Kolb (1984) suggests, these students are often quite adept at technical tasks and less so at social and interpersonal skills. As the student moves further along in his or her chosen field of study and into graduate school, it may be advantageous for both student and teacher to adjust course structure, focusing more stringently on the learning style associated with that particular field. For doctoral research courses in environmental biology, the needs of the student may be best met if the instructor simply issues a course syllabus that outlines research duties and expectations, and offers periodic feedback via e-mail.

So far we have focused on academic areas that are at opposite ends of the spectrum (extreme field independence vs. extreme field dependence). As noted earlier, learning styles are not necessarily mutually exclusive. Most individuals show a dominance in either field dependence or field independence, however, most students also possess some level of competency in both fields. Therefore, educators must use caution when deciding to adapt a distance education course to strictly emphasize a specific cognitive style. Students specializing in an area such as counseling psychology, which emphasizes the "scientist-practitioner" model of training, may have characteristics of both field dependence and field independence. While scientists often prefer individualized learning, training to be a practitioner involves constant interaction with others. In such cases where the field of study emphasizes contradicting learning modalities, an optimum learning environment through distance education would include a variety of medias and instructional materials. Students would be able to utilize aspects of both field dependent and field independent stimuli for an integrated learning experience.

Non-traditional Students

Non-traditional students represent another unique population. According to Watkins (1983), non-traditional students tend to be more intrinsically motivated, and rely more heavily on an approach that is deeper than rote learning, when compared to younger students. In some universities, a substantial portion of the student body consists of individuals that are well outside of the traditional 18-22 year old range. According to the 1999-2000 San Diego State undergraduate catalogue, more than 10% of the student population was over the age of 30 in 1999. Even though learning styles are stable over time, the returning student that has been away from the academic world for quite some time will most likely have not exercised university-type study skills in many years. Most of today's "traditional" college students have had exposure from an early age to computer technology both inside and outside of the classroom. Some of the mature students, who have not had the advantage of being brought up in the technological era, may have little or no computer experience. Therefore, the technological competence of the student needs to be assessed before instruction begins to insure that each student has the ability to access and utilize all of the course materials. Aside from the obvious needs of the non-traditional student often mentioned in most literature (i.e., flexible scheduling for the employed student), tutorials and "user friendly" study guides geared toward the learning style of the individual non-traditional student, could be greatly beneficial, or perhaps necessary, for readjustment into academia.

Conclusion

As distance education becomes more pervasive throughout the higher education system, and as new technologies develop, course development that is continually conscientious of the learning style of the individual is necessary to maximize learning efficacy. An exigency to encourage all students to take part in distance education courses may be very attractive and practical for both student and professor in the interest of convenience and financial considerations. However, for students attending college directly from high school, distance education courses may not be in the best interest of the student's interpersonal development. Considerations must also be made for the non-traditional student's readjustment to academia. It seems apparent, that in order to facilitate student learning, distance education courses should be tailored to match material, presentation, format, and interactional patterns with the learning styles of students.

References

Alport, G. W. (1937). *Personality: A psychological interpretation.* New York: Holt & Co.

Bates, T. (1986). Computer assisted learning or communications: Which way for information technology in distance education? *Journal of Distance Education, 1,* 41-57.

Burge, E. J., & Howard, D. (1990). Audio conferencing in graduate education: A case study. *American Journal of Distance Education, 4,* 3-13.

Dunn, R. (1990). Understanding the Dunn and Dunn learning styles model and the need for individual diagnosis and prescription. *Reading ,Writing, and Learning Dissabilities, 6,* 223-247.

Horn, S. K. (1997). Ideas in practice: Extending collaboration beyond the developmental classroom. *Journal of Developmental Education, 21,* 26-32.

Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development.* Englewood Cliffs, NJ: Prentice Hall.

Langford, S. (2000). *Daycare question continues* [On Line]. Available: *http://saber.colstate.edu/issues98/030298/030298daycare.htm*

Marsh, G. E., Price, B. J., & McFadden, A. C. (2000). An overview of online educational delivery applications. *Information Technology and Teacher Education Annual, 1,* 165-170.

McCleary, I. D., & Egan, M. W. (1989). Program design and evaluation: Two-way interactive television. *American Journal of Distance Education, 3,* 50-60.

Mintzberg, H. (1997), Leadership: The managers job: Folklore and fact. In R. P. Vecchio (Ed.), Understanding the dynamics of power and influence in organizations. (pp. 35-53). Notre Dame, IN, USA: University of Notre Dame Press.

Molebash, P. E. (2000). What tomorrow may bring: Trends in technology and Matching Distance Education. *Information Technology and Teacher Education Annual, 3,* 2438-2444.

Moore, B. (2000). Higher level thinking skills and individual differences: Bridging gaps with technology. *Information Technology and Teacher Education Annual, 1,* 74-79.

Offir, B. & Lev, Y. (2000). Content analysis as a tool for evaluating the effectiveness of distance learning systems. *Information Technology and Teacher Education Annual, 1,* 183-188.

Watkins, D. (1983). Only rote learning needed at ANU. *ANU Reporter, 14,* 3.

Witkin, H. A., (1962). *Psychological differentiation: Studies of development.* New York: Wiley.

Witkin, H. A., & Goodenough, D. R., (1981). *Cognitive Styles.* New York: International Universities Press.

Is A Paradigm Shift Required To Effectively Teach Web Based Instruction?

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Thesis Objective

The hypothesis of this thesis is to present to the reader an argument as to whether existing educational paradigm's, philosophies, pedagogy, and practices require revision to effectively teach web based instruction. Due to the length restrictions of this paper the reader is advised that not all paradigm's, philosophies, and practices are included, and those that are evaluated as to their usefulness in web based instruction are very limited in scope, definition, and explanation. In all probability you will find that this paper will ask more questions than it answers, but in doing so will hopefully stimulate each of us to view and analyze the effectiveness of the current practices employed in web-based instruction.

Background

As early as 1973 Daniel Bell, and later in 1980, the futurist Alvin Toffler identified several massive changes that our society has undergone: from the agrarian age to the industrial age, and now entering into what some call the information age. These futurists, among others predicted a complete change in our societal values, and the reforms that would be necessary to accommodate the change from an industrialized to an information based society. In many cases, these futurists were correct in their predictions, and our society today is indeed mired in the process of adjusting itself to accommodate this new age of information and technology.

In looking at our educational systems and the population of students that these systems serve we find quite a vast array of scope and difference among students. Demands upon and within the educational sectors are changing. For higher education, demographics and workforce changes are fundamentally altering the student population. In 1995, 44 percent of all college students were over 25 years old, 54 percent were working, 56 percent were female, and 43 percent were attending college part time. In 1997, more than 76 million American adults – 40 percent of the adult population – participated in one or more adult education activities, up from 32 percent in 1991 (*National Center for Education Statistics).*

Today a students' lifestyle and objectives are also very different than those students of yesteryear. It is not at all uncommon to find that today a typical student may be a single parent, who may be working two or more jobs to make ends meet in order to provide for their family. This same person may want to pursue a higher education, but may be unable to do so as a result of time commitments and constraints that are usually and traditionally required in institutions of higher learning. Additionally we find that many students do not have specific available time blocks, which they can reserve or allocate to a particular course or educational unit of instruction on a regular basis.

More students than ever before engage in learning programs that offers courses at nights or weekends. Some educational institutions even offer courses on Sundays – which in some religions could be considered a sacrilege! Additionally schools have realized that in order to sustain themselves and to remain competitive they must adjust their offerings to accommodate this diverse and ever growing population of students.

As a result of newfound technological advancements in the fields of computer technology, education, and instructional technology, we find that web based instruction is becoming somewhat commonplace in what would be considered traditional higher educational settings. Many schools including Northern Illinois University now conduct a minimum of some type of web-based instruction. Additionally an entire new industry of web-based instruction has risen to compete with the universities in this endeavor.

In those otherwise traditional institutions where the implementation of web-based instruction has been accomplished, the school is assisting the non-traditional student in the meeting of their educational goals and objectives. The school is also meeting its' social obligation to educate even the most non-traditional of students. Now that the movement toward web-based instruction is underway, the question and thesis of this paper, is whether a paradigm shift is necessary or required to effectively support the non-traditional student in their use of web-based instruction.

Instructional Paradigms & Theory

A paradigm as defined in Webster's Encyclopedic Unabridged Dictionary of the English Language is an example serving as a model and/or a set of forms all of which contain a particular element...based on a single stem or theme. Therefore in extrapolating and interpolating the term instructional paradigm we could state that the definition would be a set of forms or examples of educational theory and practice based upon particular elements. You could in a broader sense regard this as the practice or pedagogy of instruction.

Probably the most noteworthy expert on instructional design paradigms is Robert M. Gagne, who authored the *Principles of Instructional Design*. Gagne bases his paradigms on the belief that instructional design efforts must meet intellectually convincing standards of quality and that such standards need to be based on scientific research and theory in the field of human learning. Gagne takes into consideration learning outcomes, including intellectual skills, cognitive strategies, verbal information, attitudes, and motor skills. He also considers the knowledge, skills, and abilities of learners and how the differences among learners affect instructional planning and design.

Additional instructional paradigms and principles include the behaviorist also known as the cognitive method and the constructivist orientation or theory of instruction.

Behaviorism was a term coined by the American psychologies John Broadus Watson (1878-1958) in his paper, *"Psychology as the Behaviorist Sees It."* It is a theory of animal and human behavior holding that actions can be explained entirely as responses to stimuli, without accounting for the profound influences of interpretation on introspection. Thus an educator who believed in behaviorism would tend to attribute learning as a reaction to an event or action that would stimulate the student, but would be provided by the educator. To the behaviorist teaching is essentially a matter of arranging contingencies of reinforcement so as to produce and maintain prescribed behaviors.

Constructivism is quite an opposite paradigm of behaviorism as described and defined above. Brunner first proposed the concept of constructivism in the mid-1960's and builds on earlier ideas of Piaget. Basically, the theory of constructivism holds that the learner rather than the educator develops or constructs knowledge and that opportunities created for such construction are more important than instruction than that which originates from the educator. This is certainly not to state that there is not educator guidance or involvement, but that the student essentially will have a very strong voice in the selection and completion of tasks that will aid her in their learning approach to the given subject matter.

Now that we are acutely mindful of three major paradigms, philosophies and/or theories of instruction lets determine whether a change or shift in these philosophies is required in instruction that is provided to students via the world wide web.

Web Based Instruction

If we look at the delivery of information and learning via web based instructional systems we find some similarities to traditional learning, however we find more differences than similarities. We find that many web based instructional systems do indeed make use of stimulants such as movies, sounds, and graphics. We also find that the best web based instructional sites provide a reference library of sorts, to assist the student in their understanding of the material elements of the particular course. These reference libraries are usually hyper links to other educational or related web sites, which the student can use as a resource to further their understanding of the materials. Some hyperlinks use video and animation to gain and hold the attention of the student, while others are merely "page turner" type of information sites.

But what of the interaction that takes place in the traditional classroom? What becomes of the theoretical arguments that an experienced educator would foster, stimulate and encourage among the students and/or the educator? What becomes of the personality and strength of conviction that normally results as a benefit of these stimuli? Are they lost in web-based instruction? Can a chat session accomplish and achieve the finer points of theoretical argument without having the face-to-face stimulants and reactions that are readily apparent in a traditional classroom?

I believe that the response to these questions is that it depends upon the design of the course and the process of delivery that is used. If a web site course is designed along the lines of the Gagne theory of instructional design, it could certainly achieve and accomplish its' objective. However while the elements of design are crucial, so is the interaction of the students with both each other, as well as the educator. I believe that regardless of how well web-based instruction is designed, if it is designed solely as a stand-alone product without any human interface or interaction it will not meet its ultimate goal to educate. Most students need interaction and human intervention so as to gain the sociological elements of instruction.

I have had the personal opportunity to teach web-based instruction. I have found that even on the best graphically designed web site, the student needs and actually will seek out interaction with another student or the educator. This human intervention and interaction is crucially required of most students, but not all. Some students are perfectly content viewing and reading information from a computer monitor and learning in this way. But the fundamental question remains: what is the objective of the particular course, and what is the desired instructional outcome? If these two questions do not include the learning of interaction among culturally diverse students, have we not failed to meet our social obligation to educate?

To illustrate further I have discussed web-based instruction with Professor Margaret West, Ph.D. of Northern Illinois University. In any course in which Dr. West provides web based instruction she insists on face-to-face class meetings at various points throughout the semester. This allows the students to interact not only with each other but also to be mindful of the humanness of the educator. It allows the educator also to view the humanness of the student, who may be shy, or intimidated by either the web based instruction, or the human interaction with fellow students. In any event this human interaction provides a further development of the educational endeavor, and allows for the student to learn the intricacies of the social environment of learning. In a written response to my inquiry as to the necessity of these activities, Dr. West responded as follows:

> "In the past, I taught the course entirely online with just a face-to-face kick off and a face-to-face debrief. Feedback from students in the debriefs indicated that they were seeking more external support for avoiding procrastination in the course. They also wanted opportunities to meet with their partner for the partner consulting activity. With that feedback, I decided to add a face-to-face meeting approximately once a month. The goal of the face-to-face meetings is to provide a "check-in" on course assignments so the student paces the assignments throughout the semester, and to provide an opportunity to meet with their partner."

In having the opportunity to bring to fruition a mix of the traditional class room environment along with a constructivist educational attitude, I believe that the student will learn a great deal more than merely be left alone at the web site to learn. But I am oversimplifying a bit to make a point. The fact of the matter is that much of web based instruction includes the ability of the student to engage in forum discussions with other students, and at predetermined times with an educator leading the course of discussion. Additionally in many web site based instructional settings the student can and does frequently send e-mails to the educator or other students. But fundamentally these interactions are not human interactions. These interactions are merely a substitute for the actual human interactions that would readily take place in a traditional classroom setting.

As an example in a traditional classroom it could be stated that the educator leads the instructional process in somewhat of a behaviorist viewpoint if the educator uses the lecture technique as his sole means of instructional delivery. If however this same lecturer engages the students in the lecture, and encourages them to participate or to make other contributions to the lecture, it could be said that the educator utilized a constructivist approach to learning.

Certainly there are numerous other theories of instruction that could possibly demonstrate arguments on either side of this thesis. As an example, lets briefly consider problem centered learning, within the element of web based instruction. One of the most noteworthy educators of our times, Dr. Thomas M. Duffy of Indiana University and Unext.com is a strong proponent of problem centered learning in a web-based environment.

While I certainly do not possess neither the education, the credentials, or even the experience to argue this point with Dr. Duffy, I believe that I can respectfully suggest at a minimum that problem centered learning on the web, may not be suitable to every student. Once again, without human intervention and the social implications and benefits that this type of interaction provides to the student, the student may eventually find themselves lost in their ability to intellectually engage in the most simple of arguments or discussions.

Aside from the normal fears that some students have relative to their ability to function within a PC environment, what other fears may exist if we enroll this student in a web based course to which he may possess little or no knowledge, and then "throw her to the wolves" using a problem based scenario? I fully realize that even in a problem based scenario there are on-line resources available to the student including chat forums, additional reference materials, and even periodic and timely assistance and feedback by the educator. However, without having any academic knowledge of the subject matter, coupled with a possible fear of the PC environment, within a problem based scenario, with little or no in-person intervention available would appear to me to be a situation that would have a high likelihood of failing to meet the learning objectives of that particular course of study. Even if specific learning objectives were met and determined to be successful, have we not failed to provide the student the type of human interaction and socialization that may assist them overall in their vocation? Why would we want to place a student in the position of potentially passing a course of web-based instruction, but not learn the art and beauty of social interaction and behavior?

On the positive side most web-based instruction does provide discussion forums, discussion groups and e-mail capability. I do believe that we can definitely enhance the students' ability to write philosophically and intellectually as a result of these forums. I also believe that using these forums will indeed enhance the educational benefit of web based instruction, but not necessarily to the same extent that web based instruction coupled with human interaction could.

Conclusion

The real solution to the issue of a changing paradigm is in the answer to the following question. In which ways can web based instruction bring both the best instructional process to the student, as well as bringing about the convergence of a stimulating and encouraging environment of learning while meeting learning objectives? Is a shift in paradigm necessary, or are what we are experiencing merely a juxtaposition and congruency of the instructional design principles of Gagne, coupled with the principles and practices of either the behaviorist and constructivism approaches to learning?

Is or will it ever be possible for us as a society to provide the same type of interaction that takes place in classrooms via web based instruction? If so will we loose any of our abilities as educators, or will web based instruction create more clearly defined challenges and obstacles to the educational process? Will web based instruction be able to take advantage of alleviating distances between the masses while still being in a position to provide a quality education, or will web based instruction fall by the way side as merely a technology fad that was temporary at best?

With little research or empirical data and/or analysis available on this topic or of the effectiveness of web-based instruction to accomplish learning objectives, we can all pontificate and engage in this type of hyperbole. My own personal belief is that a combination of the tried, tested, and scientific principles of instructional design and educational pedagogy must be employed in order for web-based instruction to succeed. I don't believe that under any circumstances should proven instructional principles be sacrificed in order to serve the masses more efficiently. I do believe, however that in order to succeed with the same or exceedingly difficult goal of increasing the benefit of the educational experience to the student, that a new type of web based design principles and pedagogy will emerge. I also believe that a new type of instructional delivery system will continue to emerge and evolve as a result of technology advances and convergence in the way of cameras, video, and real time conversations. I believe a new type of educator will also emerge. This will be an educator who has had the experience of teaching in a traditional classroom setting but is able to take advantage of the technology to bring forth a better delivery method of instruction within a web based instructional setting. This will be an educator who believes that personal intervention within a web based environment is not only necessary for the student, but also for the educator and indeed will provide a valued sociological benefit to both.

Is web-based instruction a suitable alternative for all subjects, for all students, and/or for all institutions? The unequivocal response to this rhetorical question is of course not. Each of us possesses certain behaviors, skills and attributes, which allows us to learn. We are as different in these processes as the night is from the day. Web based instructional methods are only a single source utilized to expedite instruction. Some students will continue to use the services of a traditional institution, coupled with web based instruction, while other students will be more suited to the rigors of a traditional classroom situation.

Will we require making a committed and concerted effort in a paradigm shift? I am not certain that a complete shift in tried, and tested philosophies and paradigms is as necessary as is the fundamental approach to education which is to recognize the uniqueness and differences in style and learning patterns that distinguishes us as human beings and students. Only with the acceptance of these learning differences can we as instructional designers, and educators utilize the technology resources to reach the masses. Only with this recognition of differences will we be in a position to challenge and to establish new paradigms of instructional philosophy. Only with the recognition of these differences will we establish and possibly redefine the instructional philosophies, which currently exist.

Time, experience, technology and the dedication of educators and students to attempt new methods of delivery and instruction will be one of the bases of foundations for any new or re-configured paradigms that may come into existence in the future. The evaluation of these success and/or failed attempts coupled with only the passage of time will eventually allow us to effectively evaluate the changes necessary to determine if a shift in educational paradigms, philosophies, and dogma are required to suit the information age.

In any event, we as educators are very fortunate indeed to be involved on the "cutting edge" of a distance learning evolution and revolution! What an exciting opportunity for each of us to participate in a new paradigm ideally suited to this new and ever changing technology as well as meeting the needs of the student and society. What an exciting time to be involved in the educational process and in the future development of intellectual stimulation, inquiry, and argument using advanced technology.

Literature References

- Book References

Anglin, Gary J. (1995). Instructional technology: Past present and future. Englewood, Co: Libraries Unlimited, Inc.

Bothamley, Jeffifer (1993). Dictionary of theories. Detroit, Mi: Gale Research International Ltd.

Gagne, Robert M., Briggs, Leslie J., Wagner, Walter W. (1992). Principles of instructional design. Fort Worth, Tx: Hardcourt Brace College Publishers

Heinich Robert, Molenda Michael, Russell, James D., Smaldino, Sharon E. (1996) Instructional media and technologies for learning. Upper Saddle River, New Jersey: Prentice Hall

Toffler, Alvin (1980), The third wave, New York, New York: Bantam Book in association with William Morrow. & Co., Inc.

Webster's encyclopedic unabridged dictionary of the English language (1996). New York, New York: Random House

- Journal References

Microsoft In Higher Education Newsletter (On-line) (February, March, April 2000) Subscription available at: http://www.microsoft.com/education/hed/signup.asp

Kaleidoscope of Designing, Administering and Teaching Distance Education

Designing Web-based Education Program

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Abstract: A program of online courses has been designed by Thirteen/WNET to meet teacher needs relating to the effective use and integration of the Internet in the K-12 classroom. Courses in the program are predicated on action, on learning by doing. Courses are built around hands-on activities, that allow participants to experience and reflect on the topic under consideration..

Online courses define a new methodology that uses the unique aspects of the Internet and is consistent with a constructivist model of education.

- Rather than using a traditional lecture based model, courses are designed to encourage students to discover and create knowledge, and apply that knowledge to real-world situations.
- The instructor acts as a facilitator. Rather than being the expert from whom students must learn, and by whom students are led through a predetermined set of facts, the instructor's role is to encourage and facilitate students' creation of their own body of knowledge, and to comment on, assess, and provide feedback on what students have discovered and created.
- Students learn from themselves and each other, through experience, collaborative processes, critical thinking, and problem solving.

At the culmination of each course, students will have a new set of resources and strategies that they can use immediately and effectively in planning and teaching their classes.

Program Design And Methodology

Although it makes use of some tried and tested concepts (for example, required class participation and the completion of assignments), the methodology of the courses transposes them into a new learning environment.

- In seeking to utilize a constructivist methodology, courses are designed such that students' contributions to a course will form a new body of knowledge to which they can refer and from which they can build further knowledge.
- The creation of an online community of learners, committed to the goals of the program is crucial. Participation in discussion forums, evaluating and responding to others' ideas and comments, and contributing to the creation and discovery of knowledge is axiomatic.
- Although there are broad outlines and deadlines for the course, participants can work through each course at their own pace and schedule participation at times that are convenient for them.
- Each course in the program will offer audio and video elements, featuring clips from the Thirteen/WNET series, The Internet in Action.

Course Components

Before the start of a course the instructor will be invited to devise and submit **INSTRUCTOR'S NOTES.** These notes will provide participants with guidelines on the instructor's learning theory, and how she or he intends them to interpret and use the course materials.

TUTORIALS are divided into three sections. Participants are guided through the topic in a sequence of **Explanation** (tell), **Demonstration** (show), and **Implementation** (think/strategize). Each tutorial culminates in an **Assignment** (do). Participants are then asked to reflect on the tutorial's content, in offline journals and in the online discussion area.

In **Explanation,** some of the big picture, general issues involved with the topic are presented. **Demonstration** takes a Web site or project that exemplifies some of the issues introduced in the first section of the tutorial and examines those issues in context. And in **Implementation**, participants are encouraged to think about what they are learning. We will frame strategies that can be used by participants in determining how, why, where, and when they will put these theories and skills into practice.

Each tutorial ends with an **Assignment**, which offers participants the opportunity to test new knowledge and try out new skills. Assignments are focused, specific, real-world tasks. Whenever possible, participants can choose to center the activity around a specific subject and grade level, thus personalizing assignments and making them as relevant and valuable as possible.

The results of each assignment are submitted online to a document called **CLASS FINDINGS**. At the end of each tutorial, this document functions as a summary of what participants have learned, as well as a collection of participant created resources. The instructor will read and summate participants' submissions, provide a commentary on them, and select two or three "tips of the week." All participants will be able to read all submissions, in addition to the instructor's commentary.

Posting to a **DISCUSSION FORUM** is required in addition to submitting results of the activities to the Class Findings. Throughout the course, participants are encouraged to reflect on the processes they undertake by keeping a **REFLECTIVE JOURNAL** and posting excerpts from that journal online. Participants will post to the discussion forum at least twice a week during the course -- once to share a journal excerpt, and once to respond to another participant's posting. Links to the discussion forum appear on every page of the tutorial, and in the Implementation section, topics for reflection are suggested. The reflective journals themselves can be kept using pen and paper, or a word processing program.

Throughout the course, participants will refer to a variety of **ONLINE RESOURCE MATERIALS**. These materials will be developed from wNetSchool content, the Internet in Action video series, and other rich and diverse sources. Resources will be primarily text and image based, with the inclusion of audio and video where available and appropriate. Online resources will be supported and supplemented with print and video materials.

Seven Pointers for Administering K-12 Distance Education Programs

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Abstract: This paper reviews seven aspects to consider when administering K-12 distance educational programs and draws from the author's experience as an administrator in a distance-learning program in a metropolitan area in the northeastern United States. This paper also suggests indirectly that administrators (1) take advantage of distance education to promote new and more effective pedagogies and (2) draw from sound practices in pedagogy, professional development, and organizational design that will support them in efforts to improve distance educational programs.

Distance education is one of a number of terms that refers to instruction where teacher and learner are separate from each other and where telecommunications technology is the bridge between them. Administering distance education programs requires creative leadership in ensuring that educational goals and needs of students are met by establishing policy, procedures, and programming components ahead of time (Majdalany 1999) that is well grounded and also flexible enough to accommodate changes in technologies, personnel, and curriculum and instructional practices over time. This paper proposes seven pointers for administering distance educational programs.

Arrange as much as possible in advance. Before program implementation, administrators should establish clear organizational arrangements, policies, and procedures, especially with reference to such areas as budgeting and finance, scheduling courses and special events, reporting grades, and recording attendance. Further, administrators should also be instructional leaders, and reframe perceived insurmountable problems into opportunities to introduce instructional innovations in the broader distance educational context where they may be easier to understand. For these and other reasons it is important that organizational and operational arrangements be spelled out in advance among existing partners, and be equitable and inclusive enough in design to ensure that all voices are heard.

Recruit faculty early. Building institutional and organizational capacity begins with the early identification and recruitment of prospective teleteachers. As technology has the ability to magnify both the best and worst of teaching, administrators should also concentrate their efforts on helping newly recruited and continuing teleteachers learn and refine the best of instructional practice. Ongoing and multi-faceted professional development (including, e.g., peer and cognitive coaching, reflective dialogue, workshops, conferences; independent learning, large group demonstration, independent and assisted practice, hands-on labs), also considered optimal for face-to-face teacher development, is an especially good mechanism to ensure progress for teleteaching (Harris 1995; Lieberman & Miller 1999; Sparks & Hirsch 1997, Szecsy 1999).

Network, network, network. As important as the physical network infrastructure is, so also is the inter-institutional and interpersonal network of relationships in distance educational initiatives. For school administrators, this means communicating with one's colleagues in the other schools or districts throughout the course of the school year to facilitate distance educational programs that they share. For project administrators, this means taking a facilitative posture and resisting the urge to micromanage. Model the use of distance educational technologies by using them to facilitate networking. Providing an interactive website and using email to support networking activities are ways to accomplish this goal (Szecsy 1999).

Technically possible does not mean institutionally or organizationally permissible. Though it may, for example, be technically possible to record classroom interactions, it may be impermissible because of arrangements and existing policies or laws that preclude recording, especially where minors are present. Likewise, it is important to consider copyright law when analyzing licensing requirements for multimedia resources to be used in the distance-learning classroom.

A distance education course that takes place in more than one site constitutes one section of that course. Though apparently self-evident, when the administrator understands the distance education class section to be one class section that takes place in more than one location simultaneously, the administrator may also understand licensing requirements for multimedia instructional resources and special requirements for staffing support personnel differently from another who interprets a multi-site distance educational environment as separate groups tethered together by technology and a teacher. The difference between the two perspectives may appear slight, but their implications for pedagogy and policy are profound.

A distance educational course that takes place in more than one site requires more planning and preparation than a face-to-face course. This reality should be factored into the teleteacher's teaching load. Allowances in a teacher's load should be made to offset the additional load associated with adjusting existing syllabi or developing new ones, and preparing for and teaching via distance learning technologies.

Use multiple means to evaluate distance educational programs. Because of the complexity of distance education programs, augment traditional quantitative, empirical, evaluative mechanisms with qualitative, naturalistic inquiry methods, such as focus groups, interviews, observation, and journal writing. Program evaluation methods should address the following: accountability, effectiveness, impact, organizational context, and unanticipated consequences. Administrators are also advised to consider the following categories of information when evaluating distance learning programs: measures of activities (e.g., number of courses, students), measures of efficacy (course persistence, workload, registrants in multiple distance-delivered courses), measures of program aims, measures of policy (market research), and measures of organization (evidence of procedures and other organizational features) (Woodley & Kirkwood 1986).

Conclusion

Though the uninitiated may consider the distance education classroom to be peripheral to the larger school community, the opposite may be a better description of the place of distance education in K-12 educational programs. Astute distance educational administrators who recognize this possibility are well positioned to leverage the power of distance education to support sound, research-based curricular innovations and effect long-lived improvements in teaching and learning across the larger school community to benefit all students. In constantly changing conditions, however, making long-lived arrangements to institutionalize distance education into the educational program in K-12 settings may appear elusive.

References

Cyrs, T. (Ed.) (1997). Teaching and learning at a distance: What it takes to effectively design, deliver, and evaluate programs. New directions for teaching and learning, 71. San Francisco: Jossey-Bass.
Cyrs, T. & Conway, E. (1997). Teaching at a distance with the merging technologies: An instructional systems approach. Las Cruces, NM: Center for Educational Development, New Mexico State University.
Harris, J. (1995). Teaching teachers to use telecomputing tools. The ERIC Review, 4 (1) 2-4. Washington, DC: Educational Research Information Center.
Lieberman, A. & Miller, L. (1999). Teachers – transforming their world and their work. New York: Teachers College Press.
Majdalany, G. & Gainey, S. (1999). Implementing distance learning in urban schools. ERIC Digest. [Online]. http://www.ed.gov/databases/ERIC_Digests/ed438338.html.
Sparks, D. & Hirsh, S. (1997). A new vision for staff development. Alexandria, VA: Association for Supervision and Curriculum Development.
Szecsy, E. (1999). Distance-delivered professional development: A preliminary report. Gale's American Education Annual, 1998, pp. 283-98. New York: Book-Builders.
Woodley, A. & Kirkwood, A. (1986). Evaluation in distance learning. Paper 10. Bletchley, England. Institute of Educational Technology, Open University (ED 304 122).

Learning American Sign Language at a Distance

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Abstract: This paper reviews strategies to consider when designing and implementing a foreign language devoid of voice using distance learning and draws from the author's experience as an American Sign Language (ASL) Teacher in a distance-learning program in a suburban area in the northeastern United States. This paper will also address the planning, development, implementation and adaptation needed to foster a successful program as well as the role and responsibility of hosting a distancing learning course.

Distance learning can be defined simply as any live interactive class in any classroom, which enables the transmission and/or receipt of such class utilizing technology and involving students, and teachers who are separated by time and space. American Sign Language (ASL) is the language of the Deaf community created for and by Deaf people (Baker & Padden, 1978). It is visual-gestural. ASL is a complete and complex language, with all the nuances and subtleties of a spoken language. Because of its signed modality, people often assume that ASL is merely a gestural representation of English. It is not. ASL differs from spoken languages in that it is (1) visual rather than auditory and (2) composed of precise hand shapes and movements. Although ASL is not derived from any spoken language, nor is it a written language, it coexists with English in a bilingual environment (Wilbur, 1987). Teaching a foreign language devoid of voice using distance learning requires innovative planning to ensuring that educational goals and needs of students are met by establishing a professional working relationship with the guest school(s) administration and personnel who will be instrumental in the success of the interactive processes.

Planning, developing and implementing. Implementing a distance-learning course requires time, support enthusiasm for, and belief by, administration, faculty, parents and students as well as careful planning. A distance-learning course that takes place in more than one site requires more planning and preparation than a face-to-face course. Distance learning requires clear planning to benefit the needs of the students enrolled. The Host school must develop a working relationship with the participating schools. It is important to establish guidelines and standards at the beginning of the course. Once these procedures have been established and understood by all, the class should be ready to begin on their new and exciting journey. However, they must remain flexible enough to accommodate unforeseen changes or problems with the technology used for the course. It is important that the teacher understands the technology's strengths and weaknesses and is able to adjust plans in case of technical failures. Course materials should be sent before the start of the course to ensure a smooth beginning. Effective teaching at a distance is the result of preparation as well as, parents', students' and administration's understanding of the special requirements necessary to ensure a successful course of this magnitude.

Goals and Benefits. One of the goals of learning American Sign Language (ASL) though distance learning is to help student develop cultural awareness, cross-cultural adjustment skills and respect for the Deaf community while sharing their experiences with a diverse student population outside of their individual communities. Learning ASL at a distance has contributed to the breakdown of prejudices that have divided many communities in this suburban area. Interacting with students from such a diverse background has helped to develop healthy competitions and personal relationships among the students as well as the staff. Each school strives to exceed the others skill level of performance in ASL.

Adaptation. As stated previously, ASL is a language devoid of voice that requires students to use a different sensory modality than the traditional auditory modality. These students are hearing and must now adjust to using their visual as well as kinesthetic/tactile modality to be successful in this course. Voice is not allowed and therefore, students must use different strategies to facilitate communicate effectively. The recommended mode to communicate is by using facial expressions, body language, mime, gestures, and writing notes to be placed on the television screen. This adaptation encourages creativeness and critical thinking among students.

Role and Responsibility of the Host School. Communication is the key to a successful program. The interpersonal relationships in distance learning initiatives means that communicating with the technical assistance assigned to the course as well as administrators from the other schools throughout the course of the school year to facilitate communication is essential to the success of the program. The Host school is responsible for facilitating effective communication among all schools involved in the course. They are also responsible for submitting progress reports and grades to the guest schools as well as supervising the technical assistant assigned to the course and maintaining classroom discipline. Establishing good working relationships with the technical assistances assigned by the guest schools is of tremendous importance. The relationship developed is of critical importance to the success of the course. Using the teamwork approach helps to ensure that the basic needs of the course as well as the adaptations can be met in a timely fashion. Unfortunately, because of budgetary constraints, it is not always possible to meet the technical assistance assigned and/or have a run through before the course actually begins. Oftentimes, during class it is necessary to give instructions to the technical assistant so that adjustments can be made that enhances the flow of the course.

Conclusion

Distance learning presents many new options for learning foreign languages. The electronic classroom is the wave of the future that is here to stay. In an effort to assist student learning, support from administration, faculty and staff, and also the communities involved, is essential for the success of the program.

References

Baker, C., & Padden, C. (1978). American Sign Language a look at its history, structure, and community. Silver Springs, Maryland: T. J. Publishers

Kerka, S. (1996). Distance learning, the Internet, and the World Wide Web. ERIC Digest (Online) http://www.ed.gov.databases/ERIC_Digests/ed39521.4.html

Majdalany, G. & Gainey, S. (1999). Implementing distance learning in urban schools. ERIC Digest. [Online]. http://www.ed.gov/databases/ERIC_Digests/ed438338.html.

Ray, C. (1990). Foreign Languages and Distance Education: The next best thing to being there. ERIC (Online). http://www.ed.go/databases/ERIC_Digests/ed327066.html

Wilbur, R. (Ed.). (1987). American Sign Language & Applied dimension West Lafayette, Indiana: A College- Hill Publication

Willis, B. (1992). Strategies for Teaching at a Distance. ERIC Digest (Online) http://www.ind.net/distance_ed/ipse/fdhandbook/mst_d.html

TEACHING WEB-BASED DISTANCE EDUCATION COURSES

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Abstract: This paper addresses the issues concerning teachers of web-based courses, drawing on the author's experience teaching graduate-level and professional development web-based courses. Teaching online requires well-planned administrative and instructional support from areas such as a library. Teachers need to explicitly state their expectations and responsibilities as well as those of the learners. Teachers must allocate time to prepare and maintain and design course materials and regularly check what is happening during the course. Text-based online courses increase the demand for new communication skills.

"Distance Education is defined as a planned teaching/learning experience that uses a wide spectrum of technologies to reach learners at a distance and is designed to encourage learner interaction and certification of learning" (University of Wisconsin-Extension, 1999). The "planned teaching/learning experience" consists of social interactions (Bellack, 1966) within the created learning environment. The teacher's role is to develop, guide and ensure the "planned learning experience."

For over a hundred years, teachers and learners have engaged in distance education using postal mail service to exchange course materials and communication. Today, the World Wide Web (web) is creating new ways to engage people in distance education courses through interactions with the course content and other participants. Teachers must adapt established teaching techniques, share their role as *teacher,* and adjust communication techniques because of the design of the web-based course and the online communication methods (e.g. electronic mail, chats and bulletin boards). In addition, teachers need to have well-planned and accessible administrative, technical and instructional resource support.

Time Allocation. As with traditional courses, teachers design their courses and activities. For new web-based courses, the course materials and all the activities must be developed and prepared for delivery via the web prior to the beginning of the course. For existing courses, the materials and links to web resources must be reviewed for currency, accuracy. Teachers must allocation time to each offering of a course for course develop, review and maintenance. Once the course starts, the teacher must be available on a regular basis. Being available means accessing the web-based course on a regular schedule, daily, every other day or once week. Teachers must make the commitment to regularly respond to students' questions and comments, guide online discussion, start new discussions, and provide feedback to student submissions. Teachers of distance education courses anecdotally state that teaching online requires a greater commitment of time than teaching a traditional course.

Teaching and Communication Techniques. Web-based courses are, at this time, primarily text-based with graphics. The course materials are textual documents with images and some limited use of audio and video. Instructional resources constitute referrals to other online sites often text-based and non-online resources. The web-based method of presenting course content emulates the lecture mode in the traditional classroom without the presence of a *real human being*. Communication between teacher and between learner and learner and learner occurs via typed text either asynchronously or synchronously. Communications methods such as email, chats or bulletin boards are the only means for social interaction. With no paralinguistic cues, teachers need to learn to gather the same information from the text-based communications of the course participants as they would in a traditional classroom. They must ask questions that invite discussion, risk-taking and creativity. They need to share the roles of controller and authority with all participants. The feedback they provide to learners either through submitted work or in direct communications, directly influences the learners' experience and engagement in the learning process.

Learner and Teacher Expectations and Responsibilities. Teachers and learners bring their past learning and classroom experiences to web-based distance education courses. Within the traditional view of school, the teachers are the source of knowledge pouring that knowledge into the minds of the learners. Teachers are responsible for the learners' learning, control everything else that happens in the class and assess the learning (Scherer, 1999). In this view of learning, students expect teachers to know all aspects of the content, control what happens in the class and ensure that the learners learn what is required. With distance education courses, the responsibility for the learning shifts to the learners. They must learn to schedule their own time, learn to ask for information or help and interact with the course materials and other course participants. Teachers are responsible for providing materials and guidance. They also must support the development of the learning environment and the learners' efforts, and provide feedback that engages the learners in the learning process.

Distance education shifts the emphasis in the learning environment to a student-centered environment. With this shift, teachers must employ new and adapt existing teaching techniques. They must clearly state what they are responsible for and what are the learners' responsibilities. Anecdotally, teachers report that learners expect immediate feedback. When it suits them, learners still seem to defer to the teacher as the *leader and controller*. Teachers must learn to ask questions and guide learners to accept their new responsibilities. Teachers must learn to take learners' expectations into account as well as state clearly what their expectations.

Administrative and Instructional Resource Support. There needs to 3 types of support: administrative, technical and instructional resources. Administrative services such as registration and course publicity need to be as fully functioned as they are for traditional courses. Teachers should be able to contact staff who will resolve questions regarding registration, academic advising and other student services. The staff will coordinate the technical support and administrative work, and ensure that rosters are loaded into the online course and that participant notifications occur. They will coordinate the Registrar's requirements with the online environment. Technical support functions include loading course materials and student information each semester into the online course and resolving technical issues facing students and faculty. Teachers need to be able to work with staff to understand what is doable within the online course. Teachers also need to have instructional resource support that includes help building course materials and finding instructional resources such as web sites and full-content/text resources that the learners will use.

Conclusion

Each learner is unique. Teachers must adapt their strategies and techniques to create individualized activities and plans that engage and motivate each learner. In web-based distance education, the technology adds new dimensions and demands on teachers to develop student-centered learning environments. With only a small body of literature available on effective teaching in this new learning environment, we can learn much from each other.

References

Bellack, A., Kliebard, H. M., Hyman, R. T. & Smith, Jr., F. L. (1966). The Language of the Classroom. Teachers College Press, NY.

Scherer, M. (1999). The Understanding Pathway: A Conversation W ith Howard Gardner. Educational Leadership. 57(3). 12 - 16.

University of Wisconsin-Extension. Definition of DE. Distance Education Clearinghouse [Online], http://www.uwex.edu/disted/definition.html.

Exploiting and Evaluating A Web-Based Learning System Six Days and Seven Nights In The Basement

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Abstract: Discussion of the value of Web-Based Learning System (WBLS) takes place at two levels, the theoretical and the practical. The practical value of a WBLS depends on numerous factors including: extent of course enhancement, degree of dependence on web-based technologies, the software platform, technology support, students skills, and institutional issues. At the theoretical level the debate on the value of a WBLS occurs both within the discipline as well as within academia itself. This report examines our experience with a WBLS in the context of a new integrated studies course.

We teach at the University of Wisconsin-Waukesha, a two-year transfer institution within the University of Wisconsin System. It is a commuter campus without residence halls. Most of our students work at least twenty hours a week. Over half of our students are from the lower quartiles. Faculty at our institution typically teach 12-credit hours each semester and in addition they are expected to contribute in a variety of ways outside of the classroom, i.e., student advising, committee service, and professional activity.

The institution provides office computers, network access and a web-based learning system (WBLS) for its faculty. While significant dollars are targeted toward the development of on-line, asynchronous courses, there few institutional resources allocated for web-enhanced courses. This despite the fact that the faculty is expected to develop and support web-based activities for their courses in addition to their other professional and pedagogical responsibilities, i.e., "six days and seven nights in the basement."

Furthermore, instructors on our campus have little technological support. For example, our computer center staff is unable to assist either instructors or students having problems with a WBLS or other instructional technologies. Technology assistance is the responsibility of a limited-term employee, who is a half-time student at another campus. Needless to say, much of time the instructor is left to his or her own ingenuity to figure out the solutions to technical problems. These problems range from helping students login to the system, to discovering why the colors they have chosen for their personal web pages look different when they view them at home. The upshot is that at the beginning of the semester we devote many hours to wrestling with these problems while at the same time trying to prepare for and teach the course itself.

Currently, there is really little merit recognition for including web-based activities into our courses. Rather, it is largely a matter of instructor choice. And that choice may be driven more by institutional priorities than by compelling research demonstrating the soundness and efficacy of web-based pedagogies. Although there is ample evidence that students "like" web-based experiences, important questions about the educational value of such experiences remain unanswered. Does more technology mean better pedagogy? Just because we can now put materials on the web and provide virtual discussion forums for our students, should we? The problem is we simply do not know. It seems that such questions ultimately focus on resource deployment. When much of what we do or do not do is driven by enrollment, it is important to determine how to allocate limited dollars. Do we invest in technological infrastructure, while encouraging the deployment of web-enhanced, hybrid, and asynchronous courses? Or do we support opportunities for greater student-faculty contact, smaller classes, and first-rate teachers. Obviously these choices are not mutually exclusive, but the tension they engender is very real and it has implications for our future as an institution as well as for our students.

A primary motivation for integrating a WBLS into courses is course enhancement. There are several ways instructional technologies can enhance a course. Clearly they encourage interpersonal communication. Discussion forums, group activities and email permit asynchronous exchanges to occur. Student and faculty home pages help in getting to know something about each other. In the absence of opportunities for face-to-face interaction a WBLS can help to foster communication among students and faculty.

However, our aim in using the web is not communication for communication's sake. Rather we want our students to present clear, coherent, and consistent arguments. We seek to accomplish this in three ways. First, we try to be role models. We provide examples of the kind of analysis we expect. Whether we are presenting our own views or discussing the views of another philosopher or psychologist we emphasize the importance of justifying our conclusions. We provide hypertext links to sites that exemplify empirically based and logically sound arguments. Second, we ask students to evaluate each other's arguments. And third, we take the arguments presented on the course web site back into our classes to stimulate discussion. This is especially helpful where we have students who don't say much in class. We use their web comments to get them involved in the face-to-face discussion. The technologies used in our courses also enable us to demonstrate the richness of resources available on the web. Not only do we provide supplementary course materials but external links as well. As we discuss each main topic we provide students with a set of hypertext links that elaborate on the issues. Often the links are directly to the authors who write the articles or to discussion groups currently analyzing the concepts and arguments. Along with web discussions we also present self-check quizzes. The quizzes receive a fair amount of attention. Students will often have follow-up questions about their answers. Thus web-based instruction not only aids in teaching our courses but enables us to tutor the course as well.

Web-enhanced courses present unique involvement challenges. It is difficult to motivate student to participate in web projects without grade inducements. We have offered courses that have included web components where the web work was not required for the class grade. While there was initial interest, the web activity dwindled as the semester progressed. In fact, according to class surveys, one of the student's greatest concerns about web work is the time it takes. Since most of our students have jobs and many have family obligations, they must carefully budget their time. When we first integrated web work into an interdisciplinary course, we received a lot of student complaints about what they perceived as excessive work. In response to these concerns we have since cut down on the web requirements.

In large classes it takes a fair amount of time to read, record, and respond to the answers to discussion questions. We estimate that in addition the start-up time, web work adds about one hour each day per class. In order to track students' responses to their web experiences we conduct continuous student evaluations throughout the semester. We ask students to keep logs as well as having them fill out questionnaires. The tracking information is very useful in spotting problems, making mid-course corrections, and insuring that our web demands are not excessive.

There are a wide-range of philosophy and psychology courses at all academic levels now offered on-line. Additionally, there are electronic journals, articles, papers, opinions, and discussion forums on the web. Our professions have certainly embraced the web as a vehicle for exchanging information. The sheer quantity of information is overwhelming and often this makes it difficult to find a useful signal in what sometimes seems little more than a sea of random noise. Within the disciplines there is debate over the advantages and disadvantages of web v face-to-face instruction. Do on-line courses tend to negate the dynamic interaction needed to teach philosophy and psychology? Would Socrates ever teach an on-line course? Can one "deliver" instruction as if it were a pizza? Are courses that are taught on-line better than no courses at all? Fortunately value-added or web-enhanced courses need not answer these questions, although they beg for answers. Instead, we believe that we have the best of both worlds. We interact in-person with our students. Also we exchange ideas with our students over the web. We can take advantage of the richness of information that the Internet makes available, while preserving and celebrating the face-to-face interaction of the classroom. Most of our students are not well adapted to the demands of independent study. For them and for us as well, value added learning technologies provide another means for reinforcing and enriching in-class instruction.

Are We There Yet? A Journey Through Distance Learning

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Abstract: Three years ago, the journey of utilizing a distance-learning format for offering coursework began with a low-tech instructional arrangement which we termed "two cans and a string". Technology has continued to be integrated in courses through software application such as PowerPoint, Internet sites and course management software such as Blackboard.com. We are now beginning to offer multiple point-to-point courses over ISDN lines using VCon videoequipment. This session will discuss key points to consider when making decisions about equipment, connectivity, infrastructure and money.

The teacher shortage in the United States is causing many teacher preparation programs to become more creative in how people can become certified. The demand for well-qualified teachers is even greater in rural and inner-city school districts. One solution to increasing the number of certified teachers is to make the access easier to certification courses. Distance education courses can accomplish this; however, the quality of the program must be maintained (Hara & Kling, 1999). Many of our courses require two-way interaction. We agree with Simonson (2000) who promotes the equivalency theory of distance education. That is to say that distance education is a formal, institutional based education that takes place using two-way interactive telecommunication systems. As sited in Simonson, Smaldino, Albright, and Zvacek (2000), Simonson states:

> It should not be necessary for any group of learners to compensate for different, possibly lesser, instructional experiences. Thus, those developing distance education systems should strive to make equivalent the learning experiences of all students no matter how they are linked to the resources or instruction they require.

In the Spring of 1998, the Special Education program at Our Lady of the Lake University began our first videoconferencing efforts. With a computer loaded with NetMeeting, a microphone, and an $80 camera at each location, we were able to set up a "low-tech" videoconference classroom at a minimal cost. The teaching site, on the OLLU campus, used a computer, camera, digital projector, and a wireless microphone, while the remote location used a computer, camera, and microphone set up in either their school's conference room or library. The total cost to outfit three existing computers with cameras and microphones was $550.

The university computer was connected by 100 MB Ethernet to a LAN that was ultimately connected to the Internet. The remote computers were also connected to the Internet via LAN; thus no modems were used. Of significant note, however, is that the school districts involved use the same Internet Service Provider (ISP) as the university, thus they are all directly connected to the same router at the ISP, and the conferences did not actually go out onto the Internet.

With the initial success of the point-to-point, low-end videoconference delivered classes we decided to aim expand on our initial success (plus we got a bigger grant) and move to a high-quality (30 fps), medium-bandwidth (384kbps), multi-point videoconference scenario to deliver several classes to multiple locations.

Technology investment and connectivity control the limits of many types of distance education instruction. Each strategy must be considered in relation to the kinds of bandwidth, development hardware, and receiving equipment it needs. In many cases, instructional strategies born of high-end technical laboratories can be modified to sell sophisticated settings. We do not have a $250,000 classroom that is "the videoconference room" with a lot of equipment, monitors, and other electronic "bells and whistles".

We are a small Catholic university. We have a limited budget with limited staff to support videoconferencing. Yet, we must extend our teacher preparation program to communities surrounding San Antonio, especially the rural school districts.

Our teacher preparation program has non-traditional components, including evening and weekend courses, but this does not reduce travel time from remote communities. Videoconferencing is a viable solution, but we still must look for cost effective solutions. Classroom space must be multi-purpose: face-to-face teaching, as well as videoconferencing. We have spent $14,000 for the university classroom videoconference set up and $8,000 for each remote site. Connectivity will also cost approximately $40,000 for nine ISDN lines running at 128kbps, plus one PRI.

This presentation will discuss decision making points: a) equipment options including issues of format (PC based or hardware), expandability, portability, b) infrastructure support (H.320, H.323, and ATM), c) connectivity issues (ISDN, T1, and IP); and d) money. A detailed Request for Proposal with videoconference specifications as well as the videoconferencing project design can be found at http://education.ollusa.edu/site_2001.

Administrators and advocates often promote technology, but true adoption and implementation occur because faculty are not given time, equipment and training (Cuban, 1996). We have the equipment; we are providing the training and release time. We are not there yet, but we are further down the road, and the way is clearer.

References:

Cuban, L. (1996). Teachers and machines: The classroom use of technology since 1920. New York: Teachers College Press.

Hara, N., & Kling, R. (1999). Student frustrations with a web-based distance education course. *First Monday*, 4 (12), at http://firstmonday.org/issues/issue4_12/hara/index.html

Simonson, M., Smaldino, S., Albright, M. & Zvacek, S. (2000). Teaching and learning at a distance: Foundations of distance education. Upper Saddle River, NJ: Merrill.

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Benefits and Problems of Asynchronous Online Electronic Mail Forums

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Abstract: The use of structured listserv assignments is an effective means of generating quality on-line discussions regarding selected readings for text-based courses. Observed benefits of the listservs will be described by focusing on three representative cohorts of student communicators who participate in the forums. Building on the instructor's experience of using listservs successfully for several years, this paper explains the how and why of structured listserv discussions and provides suggestions based on course experiences.

Introduction

The use of structured listserv assignments is an effective means of generating quality on-line discussions regarding selected readings for text-based courses. Observed benefits of the listservs focus on three representative cohorts of student communicators who participate in the forums. Building on the instructor's experience of using listservs successfully for several years, this paper will explain the how and why of structured listserv discussions and provide suggestions based on course experiences.

Description

Using listservs set up by campus computing services, the instructor posts a series of questions regarding a reading assignment for the following week's class sessions. The questions should address matters of interpretation or opinion rather than strictly factual information – "why?", "how?", etc. rather than simply "what?" Students complete the reading assignment at their own pace, then log on and respond to the questions. Sometimes they will pose some related questions.

To receive full credit, students are required to 1) make specific reference to material in the readings by using quotations, paraphrases and citing page numbers; and 2) make specific reference to answers from students who have already responded.

Benefits

Observed benefits of the listservs can be described by focusing on three cohorts of student communicators: quiet, overbearing, and typical.

a) Quiet Students – Shy, reticent students often are terrified to speak up in class, even though they may have wonderful thoughts that could contribute to the course. The quiet student will, however, respond to structured listserv questions because these assignments are graded. Shy students also will respond because they don't have to physically face a whole classroom of fellow students and the professor. A number of the quiet students prove to be quality thinkers and their on-line contributions prove to be very valuable to the life of a particular discussion and to the atmosphere and direction of the course itself.

b) Overbearing Students – The compulsive classroom talker, the speak-before-thinking blurter, and the off-task amateur comedian are much less of a problem on-line than in a traditional "live" setting. They have one shot at answering each set of questions, just like everyone else. Also, they cannot interrupt or intimidate others who are contributing. If they come up with something inappropriate on-line, other students seem much more comfortable letting them know that digitally than shouting across a hushed classroom.

c) Typical Students – The average students communicators -- who view classroom communication as something less than thrilling, but hardly terrifying — benefit in several ways from structured listserv discussions. First, they are prompted to actually read the material prior to class so that they can participate in the on-line discussion and not lose points toward their final grade. And unlike in-class quizzes, their answers are for all of their peers to read. So, they may read more closely for comprehension because – even on-line -- they do not want to make an embarrassing mistake in front of their classmates. Because of peers, the writing quality also may be improved.

Lastly, all students benefit greatly from the opportunity to read insights/ideas from their fellow students and to engage in amicable debate on the issues raised by the assignments and by their fellow students.

Challenges and Responses

Challenges and responses include the following: the first person can't reply to others (however, the same person is rarely first more than once); shy students may be shy on-line too (at least they are writing something); occasionally a student can be rude on-line (tell them you are forwarding a copy to the dean); some students generally just repeat what has already been said (at least they are reading the original thinking of others, writing something coherent, and benefiting from the repetition of cogent comments).

Conclusion

Course listservs can by used by any classroom instructors seeking to use on-line discussions to facilitate quality discussions on required readings and expand the reach of the class beyond the time/space restrictions of the traditional learning space.

The two primary intended outcomes for this information include: 1) that instructors will have an introductory understanding of how to create successful structured listserv discussions for selected courses; and 2) that they will be aware of some of the potential benefits and challenges of this teaching strategy.

The Distance Teacher: The Ultimate Distance Learners

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Abstract Distance learners have been increasingly under the microscope as teaching technologies have enhanced to include web-based courses and universities. Predictors of student success have been researched, tools created to enhance communication, thousands of courses put online, and assessments developed to show both success and comfort of students with web-based learning. Instructors share some of the same advantages and disadvantages as do students as well as some not shared by students. Little has been developed to predict instructor success or comfort. We analyze features commonly attributed to be assets and liabilities of distance learning for students and describe, from six years experience, their impact on instructors. We describe problems instructors do not have in common with students. We summarize results of a survey from students at the end of a distance learning class who were asked to describe features an instructor of distance learning classes should have.

Introduction

The traditional model of a web-based distance learning environment shows an instructor delivering a course to students who are scattered. However, if a time element were added to this picture, we would find that instructors may also be scattered: at the office, the airport, home, the summer home, a conference, an Internet cafe in Bangkok. The author has been in all of these places and others - grading, recording, monitoring and responding to bulletin board posts.

In this paper, we analyze features commonly described on distance learning web pages to be assets and liabilities of distance learning for students and analyze whether these are true for instructors. We describe features of distance learning that are particular to the instructor. Finally, we summarize results of a survey from students – some successful, some not - from a distance learning class who described necessary characteristics for an instructor of distance learning classes. From these we draw some conclusions.

Features of Web-based Distance Learning Course sites advertise and studies corroborate the following features of web-based distance learning for students. For each of these, our analysis for the instructor version has been added.

No travel to class Presuming the student has the necessary equipment where he/she wants to study, travel is not necessary. The time spent in class can be devoted to more focused learning. Also, students who are not within commuting distance can take a class they wouldn't otherwise have access to. Or if they live nearby, they needn't worry about class time conflicts. And finally, self-motivated students have always been able to learn independently, and this is a real benefit to them.

> **For the Instructor** The same is true about travel - in fact, the ability to be able to travel is a definite motivator. Being able to attend the entire session of a conference without having to rush back in order not to miss too many classes makes this mode of delivery very attractive for instructors.
>
> But it takes more time to prepare and deliver a distance learning class than to do it live, in class. Answering questions when both the questioner and the answerer are physically present takes less time to resolve the ambiguities inherent in the question-answer dialog. Written words take more time.

Flexibility This is the most common "advertisement" on course web pages, but unless the course is self-paced (many are not), due dates are still due dates. Of course the student can access the materials in the middle of the night, but the same can be said for textbooks. Few courses have the staffing to monitor the bulletin board at 2:00 a.m. In most cases, flexibility means no class (see "No Travel to Class" above) and the ability to access the materials when the student wishes to.

> **For the Instructor** As long as the materials are ready when the syllabus tells the student they need them, they can be prepared at any time. But isn't this true for in-class courses? Also, that which is flexibility for the student (asking a question at 2:00 a.m.) is hardly flexible for the instructor or staff member who may be expected to answer it.

World-wide access to experts and colleagues This is a particular asset for discussion type courses where students can converse with someone from another country and/or culture. A discussion of events at Pearl Harbor would be different if some of the students are Japanese and some are American. For motivated students, searching for supplementary material increases their learning. In fact, students who are motivated to search for answers are enabled by the web.

> **For the Instructor** This is a major benefit for the instructor of web-based courses in general and distance learning web-based courses in particular. In one of our courses, our Hypertext module uses the material (with the author's permission) of a leading expert in the field. Instructional "reuse" is an emerging pedagogy.

Class size A recent study [Institute for Higher Education Policy, 2000] found that class size did not affect quality of online distance learning courses. But studies [Lemone, 1997, 1999] show that class size does affect comfort, however. A study of a class of 30+ students compared to the same course taught with ten or fewer students showed much more anguish. The questions: "Did the staff respond in a timely manner" and "Did the instructor appear to care about the students" received lower scores in the larger class. More students in the larger class indicated that they would not like to take an online course again.

> **For the Instructor** Attempts to measure the time/student vary, but for instructor-led (as opposed to instructor-produced) courses, it is clear that class size does affect instructor success (if measured by course evaluations.) In addition there is a great increase in instructor time even when the course includes other staff to help. For the 30+ class, (taught just once because of the time involved) we joked that there is an exponential relation between class size and instructor time and work. Further studies may show it is no joke.

There are many other features for instructors that can be studied, measured, and compared with those for students: collaboration ease, assessments, management of communication tools and course content, to name a few.

Pretest and Posttest Surveys

The information presented here was gathered from one term of a yearly web-based distance-learning course. The information received is consistent with that gathered in previous years, and from larger classes. Not shown are specific statistics taken week by week, and statistics related to course content.

TIME

Distance Learning takes more time for students and instructors. Below is a comparison between the time students *expected* to spend (Figure 1), and the time they actually did spend (Figure 2).

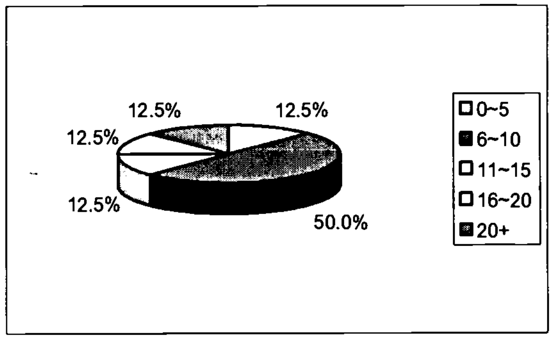

Figure 1 Hours planned to spend/week on course (before course)

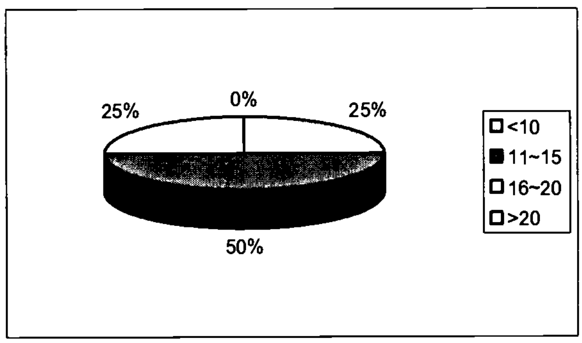

Figure 2 Hours actually spent/week (after course)

Statistics gathered during the course showed that half the class spent 16 or more hours for three of the ten weeks the course was in session, with 25% of the class spending more than 20 hours during two of the busiest weeks.

WEB USE

Students who already use the web to find information might be expected to be more comfortable in a web-based distance learning course. The one student who got a C (the rest of the grades were A's and B's) indicated that he found information best from an instructor.

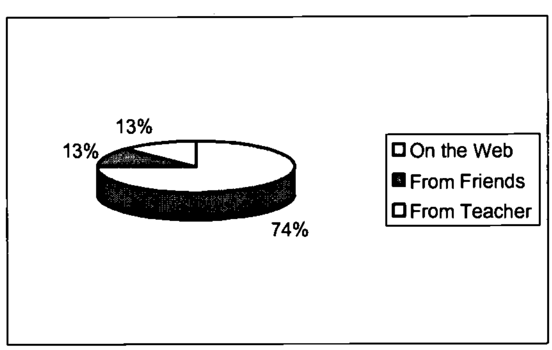

Figure 3 How do you find information?

The amount of time spent on the web also indicates their comfort in this medium. Only one person (the student who received the C) spent fewer than 5 hours per week on the web.

EXPERIENCE IN DISTANCE LEARNING

Students who have taken a distance learning course before might be expected to be more comfortable, and to be better able to gauge their success, but as Figure 4 shows, few have taken distance learning at our university so far.

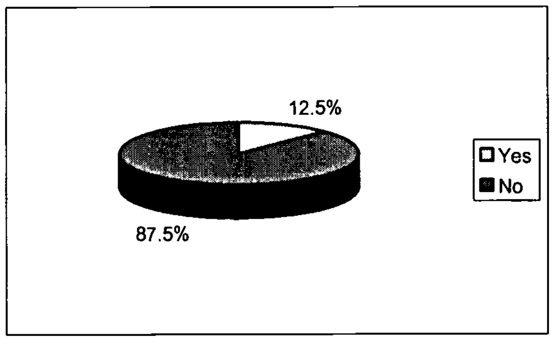

Figure 4 Have you taken a distance Learning Course before?

WEB-BASED AGAIN?

The students were asked if they would take a web-based learning course again. Figure 5 shows that most, but not all of them would like to do so.

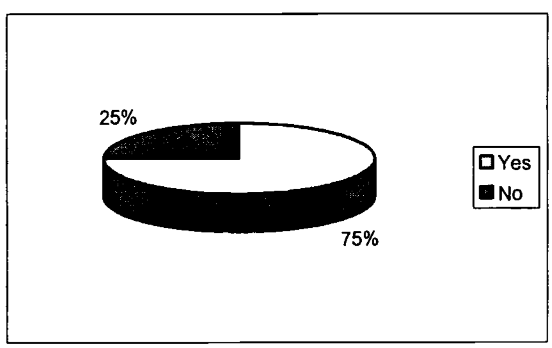

Figure 5 Would you take a web-based online course again?

CAMARARDERIE

It is important for students to feel a sense of connection to both the instructor and to their classmates. For web-based learning courses, this is facilitated both by the instructor and by the use of web-based communication tools. Figure 6 shows that the course could improve in this area.

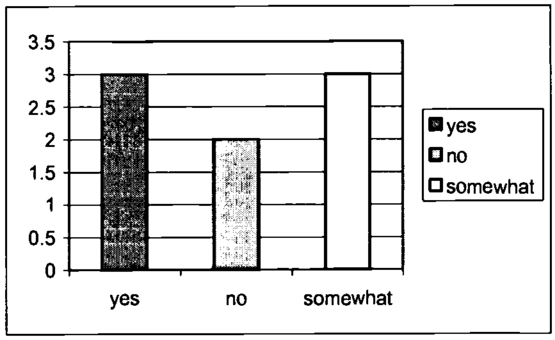

Figure 6 Feel a sense of camaraderie?

The students were also asked questions that allowed free form answers.

STUDENT CHARACTERISTICS

Prior to the course, we publish a list of characteristics found to be predictive of success in web-based distance learning. In an attempt to further refine these, the students were asked after the course for their opinions. They listed many of the same characteristics plus a few of their own: interest in material, self-disciplined, motivated, comfortable learning outside the classroom, comfortable on the web, self-directed (able to search for information), able to keep to a schedule, able to work independently and isolated, be a full-time student (referring to the amount of time the course took), not easily distracted, not needing close attention and one-one attention, not needing physical contact with instructor and classmates, no procrastination, no interfering family responsibilities (for those who work at home),

Students were asked what behaviors enhance web-based learning.

HOW TO ENHANCE WEB-BASED LEARNING

The students mentioned: interacting with other students, being self-disciplined - starting new material early, not to expect spoon-feeding, having a good computer environment, and an easy way to print materials (acknowledging this is hard with hypertext).

What Students Want in a Web-based Distance Learning Instructor

Studies have shown that only those instructors motivated to do distance learning should be encouraged to do so [Institute for Higher Education Policy, 2000]. Those interested and involved in distance learning need to present courses that students can learn in and are comfortable with. The students reported the following characteristics and behaviors needed by such instructors: display correct and concise information, understand that no matter how clear the content appears to be, students will always have questions, respond to questions and requests in a timely manner, respond immediately to bulletin board postings, have good course organization, attend to the course's "portal", have patience (needed more than in-class), be responsive.

While many of these also apply to traditional in-class courses, it is likely they are even more important when the course is entirely web-based.

Analysis, Results and Conclusions

Web-based distance learning courses involve two aspects: 1) course content, and 2) course communication. The World Wide Web itself provides a platform for the content. Course management tools provide the communication, both asynchronous (bulletin boards etc.) and synchronous (chat rooms etc.).

Web-based courses are not an easier way for students to learn, just a convenience in some cases. Clearly, it takes more time to learn in such a course. All students spent more time than they predicted. For the instructors it is also not easier, but also sometimes more convenient. Experience has shown that using the model where the course creator is also the instructor takes the instructor more time than traditional courses, and that the time tends to be more fragmented due to the asynchronous communication features of course bulletin boards. In the statistics, one student requested 24-hour instant response to bulletin board postings. While this may seem unreasonable in a traditional course setting, perhaps it is not unreasonable in a web-based course.

The student characteristics and behaviors, as reported by the students themselves, include some traditional ones: motivation, interest in the subject, avoidance of procrastination etc. But they also include some not needed by traditional students: ability to be physically isolated, no need for one-one interaction etc. While the physical isolation is real, we would question some of the others. Students shouldn't *feel* isolated. Course management techniques and perhaps virtual styles yet to be developed should enable students to feel they are part of the class – a sense of connection. Facilities for one-one interaction need to be further developed: if the written word is too ambiguous in a situation, emerging interactive technologies should be used.

Although the course described here was entirely web-based, we do not necessarily believe this should be the case. Combining technologies via video tapes, video streaming, and other interactive technologies will increase both the learning and comfort of those at a distance. In addition, web-based distance learning need not replicate the classroom. Rather it needs to develop its own pedagogy which enables learning in its own way.

References

Bernt, Frank and Bugbee, Alan (1993) *Study Practices and Attitudes Related to Academic Success in a Distance Learning Programme*, Distance Education, Volume 14, Number 1.

Goodfellow, Robin (1999) *Expert, Assessor, Co-Learner: conflicting roles and expanding workload for the online teacher*, in Proceedings of CAL99.

Institute for Higher Learning Policy, (2000) *Quality on the Line: Benchmarks for Success in Internet-Based Distance Education.*

Lemone, Karen (1999) *Web-based Teaching Tools: Addressing the Paradigm Shift*, presented at Plenary Session of ComCon 7 in Athens, Greece.

Lemone, Karen (1999) *Real Instructors Don't Go to Chat Rooms*, in Proceedings of WebNet 99, Honolulu.

Lemone, Karen (1999) *Experiences in Distance Education: the Authoring Dilemma* in Proceedings of EdMedia '99, Seattle, Washington.

Lemone, Karen (1997) *Experiences in Virtual Teaching*, in proceedings of WebNet '97 in Toronto, Canada.

Lemone, Karen (1997) *Assessment of Tools for Virtual Teaching* in proceedings of Enable '97 in Finland.

Lemone, Karen (1996) *Retargetable Course Generation: A Methodology for Reusability in Distance Education,* in Proceedings of Workshop on Architectures for Intelligent Tutoring Systems, ITS '96, Montreal, Canada.

Mason, Robin (1998) *Models of Online Courses*, ALN Magazine, Volume 2, Issue 2.

VIDEOCONFERENCING IN PRACTICUM OF EDUCATIONAL STUDIES.

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Abstract: This paper presents the use of ISDN-videoconferencing in practicum of teacher training at the University of Oulu in Finland. A special emphasis is given on music education explaining the problems and experiences of teaching music in VC-environment. Music lessons have more complicated difficulties than a normal VC-lesson, because for example a teacher cannot show the pupils from up close the instruments. But the ISDN-technology even helps the teacher in many ways. Experiences of a distance education project at Utsjoki School in Lapland are explained thoroughly and presented with videotaped-material of lessons.

1. The Finnish degree system

The student at a Finnish university studies a Master's degree which can be completed in five years (160 study weeks). Before this he can obtain a Bachelor's degree (120 study weeks). Following the Master's Degree studies there is also an optional pre-doctoral postgraduate degree of licenciate, which can be completed in two years of full-time study. Studies for a doctorate take approximately four years following the Master's degree. [www.oph.fi; www.minedu.fi].

2. The University of Oulu

Oulu is a city of 112.000 inhabitants located in Northern Finland, close to the Arctic Circle [www.ouka.fi]. It is well-known in the field of business and advanced technology. Founded as recently as 1958, the University of Oulu has grown rapidly, establishing itself as one of the leading universities in Finland. About three quarters of the 13 000 students come from the two most northern provinces of Finland: the Provinces of Lapland and Oulu. Approximately 1700 new students enroll at the university every year. The University staff consists of 1400 lecturers and researchers.

2.1. The Faculty of Education

The University of Oulu has five Faculties: Education, Humanities, Medicine, Science and Technology. In addition, the University embraces a number of independent departments, such as the Thule Institute, the Center for Continuing Education, the Computer Services Center and the Language Center. [www.oulu.fi].

The Faculty of Education specializes in Educational Sciences and Teacher Education [wwwedu.oulu.fi]. There is also an international Master's degree program. The disciplines represented by the Faculty are educational sciences, psychology, educational psychology, social sciences and music education. There is a special Unit for Educational Technology [edtech.oulu.fi]. The Faculty of Education has a 10-year tradition and experience in distance learning covering now all of the Northern Finland and Lapland.

The Department of Educational Sciences and Teacher Education offers studies of Kindergarten teacher, Elementary school teacher, Music Teacher and Subject Teacher for comprehensive and secondary schools.

2.2. The Practice of Teacher Training

The Oulu Teacher Training School belongs to the Faculty of Education in the University of Oulu. The school consists of 2-level comprehensive school (primary school and lower secondary level) and upper secondary school with its own school district. The teacher trainees complete their practicum in these Training Schools but also in other schools of the municipality of Oulu and in village schools which often are located far away. Many students choose a part of practical training using videoconferencing in order to have an extended knowledge of telematics-teaching. [norssi.oulu.fi].

The curriculum of teacher training determines the amount of training hours for teachers in the Training School and in the remote schools. The practicum is divided into five modules during the years of studies. Most of the practicum is done at the Teacher Training School, whose aims are also to experiment new methodologies and innovations in education. Because many remote schools have equipment for videoconferencing and also experience of using that, most students have a possibility to practice teaching at distance.

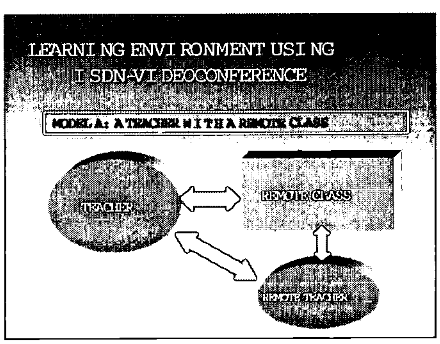
2.3. The Department of Music Education

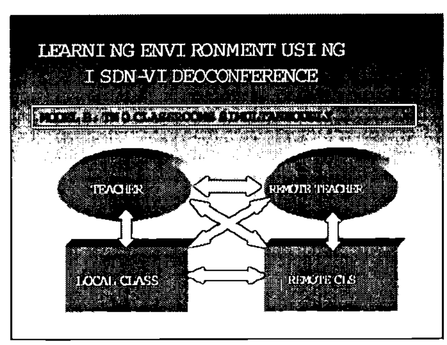
The University of Oulu is one of the three universities in Finland providing subject teacher education in music teachers for comprehensive and secondary schools. The goal of the music education program is to provide the student with skills, information and attitudes required in widely and autonomously taking care of tasks in music education as well as developing the work and scientific aspects. The student is familiarized with the goals, contents and protocols of music education as well as with the application and observation of pedagogic music research. [musicedu.oulu.fi].

Essential points of emphasis in studies are amongst others music and communication technology. All students take part in learning of distance education –methods, lesson planning, using videoconferencing and creating www-material for music lessons.

The Music Department has taken a leading role in developing and integrating the music education in Northern Finland. Cooperation has been done between schools, institutes of music and the Department. Some projects have been done by the members of the staff but mostly in cooperation with the students. Thus all the partners - professors, students, distance teachers and students in institutes and schools - have had important and unique experiences in music education by distance.

3. Models for teaching in ISDN-videoconference environment





A teacher with a remote class. In the first model a local teacher is alone conducting the lesson with the remote class. There might also be a teacher, but in many cases in scarced villages there are no special teachers for all the subjects of the school curriculum. Even the pupils take care of the of the facilities and the classroom discipline. More often there is however a teacher as a technical tutor, but he may not have any knowledge of the teaching subject. The local teacher has the main responsibility of teaching.

Two classrooms simultaneously. In the second model a teacher is conducting the lesson with the local class and the remote class together. There may also be a remote teacher or a tutor. If the remote teacher is familiar with the teaching subject, the responsibility of teaching can be divided between the two teachers. The interaction and communication goes on between all the partners. [musicedu.oulu.fi/koti/jmaki.htm].

4. Utsjoki-project

Utsjoki is a good example of activities that has been done using videoconference in teaching and as part of the practicum of teacher trainees.

Utsjoki is a village with 1500 inhabitants and it is situated in the very North of Finland on the Norwegian border [www.utsjoki.fi]. The municipality has three villages which are located tens of kilometers from each other. Each of them has a school of own but only with few pupils. Without VC-technology the pupils could not receive all the lessons of the comprehensive school program. The main school in Utsjoki has also upper secondary school. Many students of Lower and Upper Secondary School of Utsjoki are brought with taxi from a distance of 50 kilometers or more and some pupils remain every school week in Utsjoki returning home only for the weekends.

4.1. Background to the Project

In the early 90's there were first experiments of distance learning using Tele-X-satellite and later ISDN-lines. There also existed need for distance medical services and so there was interest in different level of municipality. Other villages in Lapland, technological institutions, universities, state and province became partners in the project, too. Because of the long distances from cultural centers and scarce teacher resources, videoconferencing has given new aspects for education.

The Utsjoki-project started in 1995 as preliminary preparation. Experimenting, research and establishing period was implemented in 1996-1999. It had financial support from the Finnish state, European Social Fund and European regional development Fund-project. Because of the excellent results, the Project-application with videoconference was continued until July 2000. [www.utsjoki.fi/~utspoli].

Most of the activities have taken place in the lower and upper secondary school. The main goal of the Utsjoki-project is to create and develop learning methods and networks that increase educational equality and utilize the decreasing resources of the schools. The networking of schools both inside the Utsjoki municipality and with other municipalities in the Lapland region makes it possible to combine the scarce resources of education providing the schools with further possibilities to exist.

4.2. Practicum of distance teaching for teacher trainees

The Teacher Training School of Oulu University [norssi.oulu.fi] started distance education in 1994 first with few villages and later with many schools in Northern Finland. Utsjoki participated as remote school the following year. Lessons were offered in languages (English, German, French, and Swedish), in mathematics and sciences (theoretical physics, chemistry and chemistry laboratories from a distance) and even in astronomy. For instance there were four pupils for the German group in Utsjoki and two in Karigasniemi (100 km). The groups were united and so there was a possibility to start lessons given by teachers and students from Oulu (800 km far away).

In many cases it is far more economical to organize distance lessons rather than to bring pupils with a taxi to the school. And it is far more economical.

Teacher trainees, who participate in teaching from distance, usually also visit the remote schools for the some period. The experiences have been positive, because they can meet the pupils face-to-face. After this the interaction is closer, because the TV-star comes to them live as one pupil expressed. On the other hand, many pupils say that "the teaching is the same whether the teacher is present or not". Often the learning and the results, according to research, are even better in distance learning, because pupils must concentrate more on the instruction and teachers are better prepared for the lessons.

When having a period of face-to-face teaching the teacher trainees became acquainted with the facilities more of the remote school. That's why, according to the experiences, if planning to implement distance teaching it is advised to start with visiting the remote school and meeting the pupils and other teachers.

Some problems have occurred when shy pupils don't want to talk to the camera and so the distant teacher has difficulties to contact them. But there are different reactions, namely many shy pupils have been encouraged more in communication when they can see themselves in the screen. Pupils, who have short attention spans, have naturally problems also in distance lesson.

Research done on distance mathematics studies has shown that it is possible to reach equal results in both distance and actual education. In Utsjoki even distance studying in chemistry class in a laboratory course has been experimented. First the pupils in a chemistry group of the upper secondary schools were taught the basics in laboratory working by their own actual teacher. During the six last lessons of the 38 hours unit pupils had an opportunity to follow instructions in Oulu University's chemistry group, where four students were taking their first year examination in chemistry.

4.3. Teaching music from distance

The Utsjoki School had a music teacher last time 15 years ago and so the pupils had no possibility to have music lessons. The use of ISDN brought a music teacher in the classroom and the pupils were enthusiastic with the instruction. The lessons were instructed from the University of Oulu, the University of Helsinki [www.helsinki.fi], Music University Sibelius Academy in Helsinki [www.siba.fi]and the Institute of Orivesi [www.kvs.fi]. The learning environment was developed to create a similar as a normal classroom face-to-face teaching.

The lessons consisted of teaching history and theory of music, singing and solfege, rhythm instruments, rock band instruments, ensemble playing and pupil presentations.

Teaching with two-way videoconferencing has major problems with the limited possibilities of sound and picture which are more emphatically in teaching music. The main role is the quality of sound and picture. Using one ISDN-line (128 kpbs) a delay of 0.5 seconds occurs. It doesn't sound very much and in normal communication (speaking) it doesn't bother us at all. But that delay is very big when making music with remote class – it's even impossible to sing and play simultaneously. When there are in use two ISDN-lines (256 kpbs) or three (384 kpbs) and the lip synchronization is adjusted, the delay is so minimized that the human mind doesn't even notice it.

There are no differences when teaching theory or history of music from a distance or face-to-face. The teacher is able to use all the written and acoustic material plus the internet and application sharing. Also pupils are able to work in groups, present their exercises and teamwork with the same way as in normal classroom situations. Distance lessons give more possibilities for collaborative and self-directed learning and pupils come more responsible for their own learning, because they must be active participants in the learning process.

Learning to play instruments and ensemble playing meet some problems in teaching. When a pupil is learning guitar, the teacher cannot go next to him and show where to put his fingers. He must explain verbally but he can zoom his camera close to his own hands. This is even better than a classroom situation where a pupil tries to see from the distance of several meters the finger placement. So there comes a question: is distance teaching actually "close-teaching"?

The teacher can always show the rhythms with his own guitar. The same happens with teaching the drums: he shows how to play and pupil imitates. In face-to-face situation the teacher is able to take the hands of a pupil and play together with him. This cannot happen in distance lesson. But again one advantage: quite seldom there are two drum-sets in one classroom – during distance lesson the teacher can play together with pupil and the teaching is more practical.

Because music lesson has always quite high amount of decibels, the teacher and the learning group must agree some practical rules: when and how to start and finish, in which way the teacher interrupts the playing etc. Because the sound is delivered with microphone, the distant teacher might not hear all the details. That's why it's good to use more than one microphone and place and direct them in a proper way.

The modern videoconferencing technology also gives the teacher also the possibility to zoom the remote camera. So he is able to follow closely the performance. Furthermore he is able to play MIDI-instruments together with the remote group. If the teacher also has a classroom with him, they become really versatile jam-sessions between the local and remote pupils. The distance has no borders: one group in Finland and the other group in Australia – making music together!

The critical point in teaching music with ISDN-videoconference is the excellence of planning of the lesson. The teacher must prepare everything very well: the lesson plan, all the music to be listened, to written examples of partitures, transparencies, instruments, VC-equipment – everything must be physically close to him. And he must always be flexible to change his good lesson plan in case of technical problems. A remote music teacher must be a "super-teacher". A good music teacher also uses other means like the internet and email which supplements real-time teaching. Often fax, post and even telephones are useful and necessary ways of communication.

The evaluation of the learning sometimes quite complicated in music lessons. The teacher doesn't always see or hear all the pupils and that's why the participation during lessons is not always well recognized e.g. when they're singing together there might be problems to separate the voices. If there is a tutor or remote teacher, the evaluation is possible to do together. Often the atmosphere during the lessons is not conveyed via ISDN. After every lesson it's good to have a feedback discussion between teachers – and also pupils can tell their thoughts. In the case of the Utsjoki-project it was even more essential, because part of the lessons were instructed by the remote tutor (teacher of physics). Those lessons were however planned by the music teacher and the pupils in turn reported about the lessons to him.

5. The future

The most northern village of Finland, Utsjoki, is creating for its pupils more activities and various learning situations than a normal city-school with the help of videoconferencing. The Utsjoki-project finished, but continues its co-operation with the Povilus project, which is a joint project of 12 Finnish municipalities and the University of Oulu. In September 1999 teachers of those municipalities were given updating training in Oulu and this included 7 teachers from Utsjoki. The future will show what kind of co-operation the network project will create.

In addition to remaining as a remote school for teacher trainees, the Utsjoki school has videoconferencing with other schools, institutes and universities in Finland. One cooperative school is The Ziridis School in Athens, Greece [www.ziridis.gr]. Pupils of both schools have had numerous authentic learning experiences together and they have learnt a lot of culture, history, tradition, way of life etc. of the two countries. And most importantly: the pupils are able to communicate in real-time and learn from each other – although in Utsjoki there might be -40 degrees Celsius and at the same time +40 degrees Celsius in Athens. Both remote ends of Europe.

Links in www

[edtech.oulu.fi] *Research Unit for Educational Technology.* Department of Educational Sciences and Teacher Training. University of Oulu, Finland.
[musicedu.oulu.fi] *Music Education.* Department of Educational Sciences and Teacher Training. University of Oulu, Finland.
[musicedu.oulu.fi/koti/jmaki.htm] *Home page of senior researcher Jukka Mäki.* Music Education. Department of Educational Sciences and Teacher Training. University of Oulu, Finland.
[norssi.oulu.fi] *Teacher Training School.* Department of Educational Sciences and Teacher Training. University of Oulu, Finland.
[www.helsinki.fi] *University of Helsinki,* Finland.
[www.kvs.fi/kvs/orivesi.html] *Institute of Orivesi,* Finland.
[www.minedu.fi] *Ministry of Education,* Finland.
[www.oph.fi] *National Board of Education,* Finland.
[www.ouka.fi] *City of Oulu,* Finland.
[www.oulu.fi] *University of Oulu,* Finland.
[www.siba.fi] *Sibelius Academy,* Helsinki Finland.
[www.ziridis.gr] *The Ziridis Schools,* Athens Greece
[www.utsjoki.fi] *Municipality of Utsjoki,* Finland.
[www.utsjoki.fi/~utspoli] *Telematic distance learning -project in Utsjoki,* Finland.

Desktop Video Conferencing: The Optimum Solution for Synchronous Distance Learning

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Abstract: Technologies for teaching at a distance are expanding rapidly. Though web-based delivery, using the computer and Internet, has attracted substantial interest recently, other technologies, like full motion video compression, continue to provide alternatives to the Internet. Factors such as quality of delivery, cost effectiveness and convenience of operation have shifted the emphasis away from high cost video compression systems. Nonetheless, web-based classed taught at a distance provide significant coverage but lack components such as full frame video that allow students to see the teacher during synchronous delivery. The essence of "real-time" instruction is simulated with DVC, though at a fraction of the cost of video compression systems. Desktop video conferencing synthesizes the best features of all distance learning delivery systems, resulting in a technology that provides a variety of applications for the participating institutions. This paper explores desktop video conferencing as the "next generation" distance learning technology, comparing faculty and student preparation time, initial and maintenance cost, and effectiveness of instruction.

Introduction

The technologies for teaching at a distance continue to proliferate. Though web-based delivery, using the computer and Internet, has attracted substantial interest recently, other technologies, like full motion video compression, continue to provide alternatives to the Internet. Desktop Video Compression provides a middle ground between traditional video compression and text-based Internet. Factors such as quality of delivery, cost effectiveness and convenience of operation have shifted the emphasis away from high cost video compression systems. Nonetheless, web-based classed taught at a distance provide significant coverage but lack components such as full frame video that allow students to see the teacher during synchronous delivery. The essence of "real-time" instruction is simulated with DVC, though at a fraction of the cost of video compression systems. Desktop video conferencing synthesizes the best features of all distance learning delivery systems, resulting in a technology that provides a variety of applications for the participating institutions.

Since this technology is not dedicated for distance learning the way video compression is, facilities serve as a computer lab when the site is not hosting DVC courses. During class time, the technology, by its nature, provides devices that assist the distance-learning teacher with the best opportunity to simulate a face-to-face environment. An essential ancillary benefit of DVC technology is the system accommodates other applications like staff development and certification training for teachers: it works for short-term training in situations where a face-to-face simulation is important. As educators make choices about accessing the world of distance learning, DVC technologies are becoming a clear choice as the vehicle to originate or receive courses from another teaching site. Either way, desktop video conferencing expands possibilities for the participating school to teach or receive classes at a distance and use the facility as a computer lab for traditional applications.

Desktop Video Conferencing as the Next Generation Distance Learning Technology

The evolution of distance learning technologies has included a wide array of delivery systems including but not limited to interactive satellite, audio graphics, audio conferencing, web-based/Internet, video compression and more recently Desktop Video Conferencing (DVC). It has been hailed as a dynamic new technology that operates in a synchronous environment and provides a high degree of interaction between students and their instructors (Mize, 1996). Yet DVC is a relatively new and emerging technology that provides cost-effective instruction under the umbrella of distance learning. Specifically, the cost of delivering instruction via distance learning using computer software and teleconferencing strategies--the profile of desktop video conferencing--creates savings in terms of money, time and resources without a substantial loss of effectiveness of instruction (Castellan, 1993). Desktop video conferencing has created more practical, less network specific distance learning opportunities than systems like video compression that cost considerably more (Ward and Lee, 1995). Furthermore, as a distance learning application it is most appropriate for individual and small-group use (Woodruff & Mosby, 1996, Chute, Thompson & Hancock ,1999). Desktop video conferencing is a technology that allows students, teachers and colleagues to interact with each other from their desks or classrooms via the Internet creating the essence of a phone conversation but with video and graphics (Googin, Finkenberg and Morrow, 1997). The design of the technology maximizes the use of its many applications like document sharing, "which allows participants to see and edit a computer document as they see and hear each other" (Furr, p. 46). Instructors use other applications like a synchronized web-browser to access Internet sites. In addition, DVC includes a "white board" which provides the instructor and student, in control of the system, a utility to write, enhance, draw, highlight and grab images to the board.

The first and most recognizable type of desktop video conferencing system is CU-SeeMe, developed at Cornell University (Fudell, Hardy and Terrell, 1997). CU-SeeMe allows students to send and receive video and audio on a computer to other participants (Todd, 1996). Companies like Vtel and PictureTel have developed desktop video conferencing systems using ProShare operating software (Johnson, 1999). Recent entries into operating software include Ilinc Corporation's Learnlinc Version 3.1 which is the system running the desktop video conferencing network at Northwestern State University, the subject of this paper. Unlike video compression technologies which use significant bandwidth, DVC operates on lesser bandwidth using ISDN or T-1 telephone lines that can be fractured for multiple sections.

There are some disadvantages however, to delivering courses at a distance using desktop video conferencing. Video and audio quality will not be as good as broadcast television or video compression. Video and audio use a great deal of space called bandwidth, which is typically not available with desktop video conferencing technologies (Googin, Finkenberg and Morrow, 1997). Comments such as "This would be great if...the video were better...the audio were better...it could mutli-point...the screen was bigger" (Johnson, 1999, p.1) are typical comments from users of first generation desktop video conferencing technologies. Additionally, users may have difficulty adjusting to live audio and video while trying to manipulate the technology like microphones and cameras to obtain optimal operating quality (Ward and Lee, 1995). Training of users may become the element that eventually neutralizes any disadvantages of using desktop video conferencing for distance learning applications.

Desktop Video Conferencing at Northwestern State University

Northwestern State University of Louisiana, with assistance from a U.S. Department of Agriculture Rural Utilities Service, created a network with 10 sites primarily located at rural schools to pursue a new direction in distance learning that is flexible, accommodates a variety of learning styles, and is synchronous but can have asynchronous applications.

Northwestern provided a good laboratory in which to test desktop video conferencing instruction, for the University had developed and used several distance learning delivery systems over the previous decade, including audio graphics, interactive satellite, web-based Internet and video compression technologies. The selection of DVC as the "next generation" distance learning delivery system was based upon years of evolution, research and practice.

The desktop video conferencing network at Northwestern State University was the answer to several problems facing the university. First, it introduced a new technology to address several challenges unique to teaching at a distance such as the need to see faces of teachers and students. Second, it provided a network where partnerships were established not out of need but necessity. Third, it afforded the opportunity for courses in a variety of disciplines without restrictions or limitations imposed by other technology. Fourth, it provided a location in each parish where students, teachers and citizens can come together and take classes or participate in training sessions. Fifth, it enabled teachers who have skills unique to a discipline to teach classes to other students in the parish and across the state using their expertise. Sixth, it served as a PC lab at the site that can be used for regular computer activities; unlike dedicated video compression classrooms and satellite studios. And seventh, it provided a low-cost alternative to video compression technology, accessible by public schools.

Faculty and Student Preparation for Desktop Video Conferencing

Student and instructors using desktop video conferencing systems typically have little difficulty using the technology. If a teacher is already a computer user, the learning curve for operating a DVC system can be relatively short (Furr, 2000). Nevertheless, as with all distance learning technologies, DVC requires time and effort for training and preparation of course materials (Mize, 1996). Some skills and technical support are needed if students are to interact with instructors using desktop video conferencing (Merisotis and Phipps, 1999).

Introduction and initial training on the system is provided, by faculty members to students during the orientation session or first class. It takes about 10 minutes to prepare students to use DVC a feat unmatched by other prevailing distance learning technologies. Desktop video conferencing systems provide a level of comfort unparalleled in the distance-learning arena. There appear to be two causes for the system's ease of use. First, the technology is a personal computer -- familiar equipment to virtually every student. However, second, the PC, configured for desktop video, is a sophisticated device with applications that enhance teaching and learning at a distance.

Since students tend to feel more comfortable with the technology, they concentrate their efforts on learning in subject areas not struggling with a technology that is difficult to navigate. When the class is not online participants use the lab for class assignments or to perform other tasks. Hence, for the first time user, a desktop video conferencing lab is less intimidating than traditional distance learning technologies and the environment more familiar as well as "user-friendly."

Faculty prepare for DVC classes on their own time. Preparation by faculty as a first time user takes on average about 2 to 3 times longer than that for face-to-face instruction because faculty prepare their lessons using computer applications such as PowerPoint, Word and Excel. In addition, the instructor must prepare a cadre of support resources such as URLs that are presented to students online using the synchronized web browser, a utility available with Northwestern's DVC operating software. Once a course is built, it is easy to modify for subsequent delivery. In fact, most faculty believe that the majority of the effort is in preparation for a first or new class using DVC.

Initial Cost for Desktop Video Conferencing

The cost of delivering instruction via distance learning using computer software and teleconferencing strategies--the profile of desktop video conferencing--creates savings in terms of money, time and resources without a substantial loss of effectiveness of instruction (Castellan, 1993). Desktop video conferencing has created more practical, less network specific distance learning opportunities than systems like video compression that cost $250,000 to $300,000 (Ward and Lee, 1995). It is a technology that allows students, teachers and colleagues to interact with each other from their desks or classrooms via the Internet creating the essence of a phone conversation but with video and graphics (Googin, Finkenberg and Morrow, 1997). Of course, cost may vary, but a typical PC with storage capacity to operate DVC software, the cards, and audio components cost approximately $3500 per unit. Factoring in a network configuration with a server which supports several PCs regardless of their location, add another $12,000. A network with 30 PCs, configured at several sites, has a price tag of under $125,000 without the phone lines. The rates for dedicated telephone lines (ISDN or T-1) vary in cost depending if special rates are available to the institution. Monthly line charges range from $300 to $2,000 for a T-1 line. ISDN with dial-up capabilities are considerably less expensive but may limit the DVC software's performance especially when video is operating on the system.

The initial funding for the desktop video conferencing system at Northwestern State University was supplied from a grant written to the United States Department of Agriculture Rural Utilities Service in August 1997. A second grant was submitted a year later to broaden the scope of the project to include five additional parishes in central Louisiana. The College of Education was awarded a grant in 1998 to parallel the RUS project, which would essentially double the teaching and production capabilities by establishing a second desktop video conferencing laboratory on campus, but in the Teacher Education Center.

The RUS project established a distance learning facility in ten parishes (counties) to address economic and educational challenges for the people of this predominantly rural area. These include: (1) K-12 education--standard, remedial and advanced placement; (2) higher education--undergraduate, graduate, and teacher certification; (3) adult and continuing education--GED, workforce development, and life-long learning; and (4) job searching. College-level courses were planned for the network and made available to those who are time and place bound with specific restrictions that limit their ability to take classes or attend workforce training sessions. Job training and information will also be available for those making transition from welfare to work. Public school administrators will use the system to collaborate on other initiatives by face-to-face conferencing. The match for the project was 60 percent from the partnering institutions and 40 percent from the Department of Agriculture Rural Utilities Service.

The impetus for the grant was to address problems that faced the available user population from demographic data that include a rural population with a high drop-out rate of 50% to the ninth grade, 91% do not have college degrees, a large percentage of the population are classified as disadvantaged, and of those who attend college over 50% need remediation.

A second grant from the Board of Regents Support Fund, State of Louisiana, specifically addressed the need to prepare teachers for the emerging technologies such as desktop video conferencing, centeringk, thereby, the desktop video instructional program in teacher education.. The College of Education at Northwestern State University is a leader and advocate of distance learning. The grant provided the tools for training per-service and in-service teachers and administrators to use these new tools. Area superintendents expressed a concern about the infusion of technology without proper training for teachers on how to use and integrate technology into teaching and learning. They were worried the problem may compound an already desperate situation regarding the attitude of teachers and parents about technology in the classroom. What resulted from these grants was the establishment of a network that accommodates a multitude of educational and work related issues while helping to better prepare teachers for using technology in the classroom.

Effectiveness of Instruction

In addition to its pervasive coverage, desktop video conferencing conforms to instructional strategies where instructional design theories were considered. Adapting instruction to DVC produced a "best fit" atypical to most distance learning delivery systems. First, the best practice of current instruction must be preserved and renewed. Instructional and evaluative strategies that have been successful in face-to-face settings can be adapted to use with DVC to increase salutary effects with students participating from a distance. Second, the technology's instructional enhancements such as application sharing (Microsoft Word, PowerPoint, Excel, etc.), a whiteboard and synchronized web browser can be incorporated in the instructional design of the class in such a way that virtually makes the technology invisible.

Desktop video conferencing is the newest distance learning technology. As a result the amount of research available regarding effectiveness of instruction is somewhat limited. Most studies have generated qualitative regarding the attitude of students toward using DVC. The findings from a study conducted by Bell Canada and Queen's University in 1996-97 were: (1) participants were "excited" about the new technology; (2) participants needed at least a two-week period of adjustment for using the new technology; (3) participants found it difficult to take notes with demonstrations on the monitor; (4) small groups resulted in better sessions and interaction from the participants; and (5) participants found DVC to be an "informal, no pressure" mode of learning.

Cooke (1999) found that DVC instruction increased students' enthusiasm and motivation. Cooke said, "pockets of creative teachers have risen above the obstacles and found new and innovative ways for collaboration and learning through this medium" (p. 8). He noted strengths for using desktop video conferencing. They include: (1) lower costs for development and operation of classes taught using DVC; (2) students are connected from different locations and backgrounds; (3) it provides access to programs for people who might not otherwise have that access; (4) it overcomes the text-based nature of on-line discussion; (5) it enables extends the classroom such that outstanding lecturers can interact with students in their classroom; and (6) it adds a teacher presence on-line. Furr (2000) noted that technical problems, the knowledge needed to operate the system, insufficient training for faculty and participants, the lack of adequate course preparation and the difficulty of soliciting feedback and interaction were obstacles to using DVC.

Since the DVC system at Northwestern State University is in its second semester of operation there is little data to examine the effectiveness of the delivery system. Information from student surveys suggests that 48% of the students taking a DVC class for the first time would take another. Twenty-one percent said it would depend on which course was being offered which was more a function of the class and not the technology. Most of the students were willing to forgive the technical problems because they believed, "the bugs would be fixed." Finally, 90% of those surveyed were positive about the future of distance education and particularly desktop video conferencing.

Conclusion

As distance-learning applications continue to proliferate, new teaching technologies will appear. Desktop video conferencing is perhaps the first distance learning technology to grow out of the most common technology used in education, the personal computer. Network configurations for DVC are less complicated than other technologies and merge with existing systems. Providers of classes at a distance have noted that the availability of compressed video, web-based classes with applications such as video, synchronized web browsers and shared software capabilities alter instructional choices. Yet desktop video conferencing promises to provide these capabilities that were once the exclusive properties of more expensive technologies. Finally, student access to and skill with the new learning environment must be insured. Since learning with technology is predicated on some degree of learning *about* technology, efficient instructional systems strive to provide consistent expectations. Consequently, desktop video conferencing has the potential to replicate traditional face-to-face instruction, can access educational resources such as the web, presentation software, video and CD technologies yet has a "price tag" that is affordable.

References

Castellan, N. (1993). Evaluating information technology in teaching and learning. *Behavior, Research Methods, Instruments, & Computers*, 25, 233-237.

Chute, A.G., Thompson, MM. & Hancock, B.W. (1999). *The McGraw-Hill handbook on distance learning.* New York: McGraw-Hill.

Cooke, G. (1999). Videoconferencing and learning in the primary French immersion classroom. [On-line]. Available: http://www.stemnet.nf.ca/~gcooke/DTVC.html/DTVC1.html

Furr, Paula (2000). The occurrence o f incidental learning in desktop video conferencing courses: an ethnographic study. Unpublished doctoral dissertation. Northwestern State University, Natchitoches, LA.

Fudell, D., Hardy, D., & Terrell, G. (1997, May). *Desktop conferencing for distance education* [On-line]. Available: http://www.utexas.edu/cc/newsletter/may97/confer.htm

Goggin, N., Finkenberg, M., & Morrow, J. (1997, August). Instructional technology in higher education teaching. *Quest*, 49, 278-290.

Johnson, L. (1997) *Converting a desktop video conferencing system to classroom use* [On-line}. Available: http://www.mtsu.edu/~itconf/proceed97/mds097.htm

Merisotis, J.P.& Phipps, R.A. (1999, May/June). What's the difference? *Change*,31(3), 12-18.

Mize, C.D. (1996,November/December). Desktop video communication: A primer. *TechTrends*,41(6), 44-47.

Todd, S. (1996, September). Going global: desktop video conferencing with CU-SeeMe. *Learning and Teaching With Technology.*, 24, 57-61.

Ward, E., & Lee, J. (1995, November). An instructor's guide to distance learning. Training and Development, 49, 40-44.

Woodruff, M., & Mosby, Q. (1996). *Videoconferencing in the classroom and library.* [On-line]. Available: http://kn.pacbell.com/wired/videconf/intro.html

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One Size Does Not Fit All: Designing Distance Education Support

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Abstract: The "One Size Fits All" label is a tantalizing one. It implies that whatever the garment, it is generous enough in intent and design to fit a large individual, yet it is structured so cleverly that it would be useful for the most petite. Like taste and fit in clothing, the need for online support requires different labels that recognize and address shared and unique needs. The purpose of this presentation is to outline a plan for online support that has been implemented at a medium-sized, liberal arts university. When creating a design for this type of support, one begins with all stakeholders' shared needs of communication, servers/computer, and software to make sure that the core of the support system is firmly in place. One then moves outward to address crossover and unique needs of web administration, web faculty, and web students.

The "One Size Fits All" label is a tantalizing one. It implies that whatever the garment, it is generous enough in intent and design to fit a large individual, yet it is structured so cleverly that it would be useful for the most petite. Rarely, however, are the elements of utility and style in apparel really so flexible.

Like taste and fit in clothing, the need for online support requires different labels that recognize and address shared and unique needs. The kind and amount of online coaching that a distance learning student needs certainly varies from X-Small to XX-Large. Typically, however, student needs in distance education reflect an individual's technical knowledge of hardware and software, motivation, identification with his or her social context, personal responsibility for learning, and communication skills.

The purpose of online support is to help students start strong and stay engaged in distance learning situations. If it is successful, online support should positively impact the psychological and physical environment of teaching and learning in an electronic arena and influence the retention rate of students. White and Weight (2000) report the following reasons that students drop out or stop out of an online class: students leave because of isolation; students leave because of the accelerated pace; students leave because of competing responsibilities; students leave because of technical issues. (p. 69)

While these reasons are compelling for students, they also deserve serious consideration from a faculty member's point of view. In addition, Chang (1998) maintains that for faculty "technology must be consistent with their existing values, and there needs to be a real educational value beyond the use of technology for its own sake" (p. 1). From an administrative point of view, online support is a necessary part of doing e-commerce, but tension does exist among competing demands on resources, establishing and maintaining communication, and the strength of an institution's climate for innovation. Support services can also serve the administration of an institution by providing information about student profiles, usage patterns, and evaluation of courses.

The purpose of this presentation is to outline a plan for online support of a web-based, summer program that has been implemented at a medium-sized, liberal arts university where student-involved learning is at the heart of the mission and technology is an important part of the vision of the institution. When creating a design for this type of support, one begins at the center of the Needs for Distance Education Support Diagram (figure1) to make sure that the core of the support system is firmly in place, then moves outward to address all needs. This does not mean that support is only generated as crises occur; support for all shared and unique needs identified should be planned for or in place before the implementation of online instruction. The reality of teaching and learning in any environment, however, is that support is never static. It must continue to evolve to meet new needs.

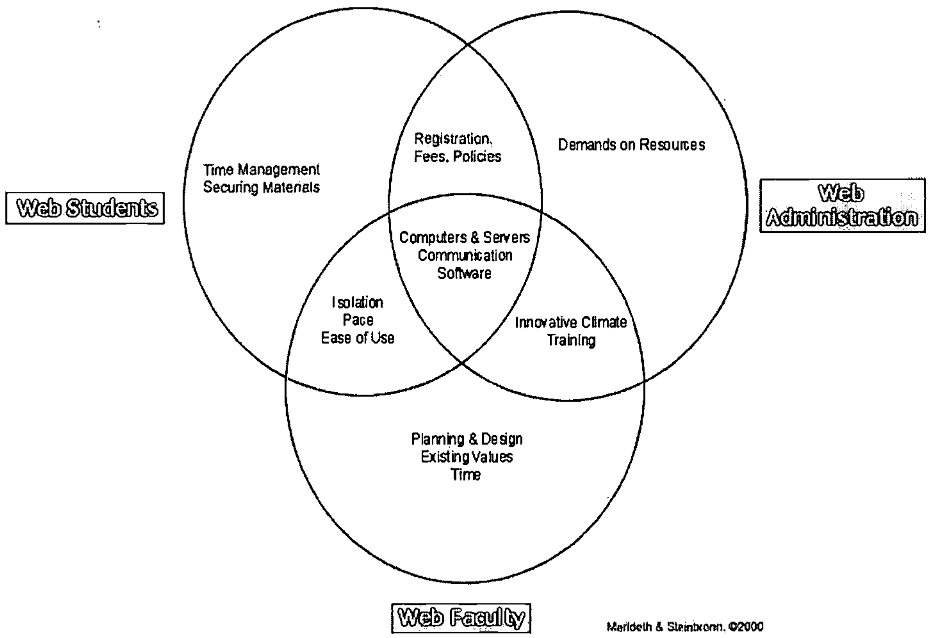

Figure 1: Needs for Distance Education Support Diagram

Shared Needs of All Stakeholders for Distance Education Support

This outward design for online teaching/learning support begins with the shared needs of all stakeholders: communication, computers & servers, and software. Online teaching does not require less communication, but even more communication of specific information that recruits students and then keeps potential students interested. All stakeholders also need server reliability and 24/7 accessibility to be able to function in an anywhere/anytime environment as well as distinct hardware parameters necessary for success. The type of operating system, browser levels, and plug-ins needed to successfully navigate the site and comply with web software should be identified. Web education software defines the look and feel of the courses, so maintaining a balance between power of consistency and flexibility is important.

Serving a variety of stakeholders who have shared needs requires creative strategies to address different levels of need with different measures of support at the same time. Levels of support for shared needs in distance education, like a well-fitting garment, can be categorized by small, medium, and large, depending on how much support is given and the effort incurred in producing and maintaining that support. The following levels of support strategies have been designed to address online stakeholders' shared needs of communication, computer & server information, and software concerns.

Small = Place a promotional communication that is interesting but doesn't overstate the realities of web-based education, a clear description of system, browser, and word processing program requirements on the WWW.

Medium = Create web-based directions with visual aids (screen shots) for setting browser preferences and configurations with directions about how to correct any technical deficiencies. Periodic e-mails to students who have indicated interest also encourage and inform prospective students.

Large = Monitor 24/7 server accessibility and encourage the upgrading and investing in web infrastructure as well as strong hardware/software support for faculty. Electronic mailing of web course offerings and descriptions to other universities and listservs promotes registration on a more global scale.

Shared Needs of Web Administration and Web Faculty for Distance Education Support

Different levels of support are now needed in each crossover areas of need. Web administration and web faculty support needs concern the *creation of the course:* innovative climate and training. A climate of enthusiasm provides the spirit for innovation, but does not sustain it. "Support must be present in terms of funding, time allocation, technical resources, and investing in a well-trained staff" (Hsu et al., 1999, p. 98). Moreover, consistency is improved when the personnel who are training the faculty to use web software are the same personnel who will support it. Differentiated strategies of support in this area include the following:

Small = Create interest and curiosity by sharing innovative online teaching and learning strategies, incite the possibility of web teaching in faculty members' minds, and motivate faculty with evidence of positive experiences and a reward system. Presentation of successful courses and different "looks" to existing courses offer ideas to faculty who are just beginning to explore distance education.

Medium = Host workshops that offer software instruction, create and maintain a help page for faculty, use work-study student help to aid faculty in research and the technical building of the course. Small but important chores such as taking digital photos and scanning materials can be done by students, freeing the faculty to think, plan, and create.

Large = Create and maintain a one-on-one mentoring of faculty new to the web through teams of faculty members headed by an Academic Computing Fellow or a Web Education staff person.

Shared Needs of Web Faculty and Web Students for Distance Education Support

Web faculty members' and Web students' crossover needs include isolation, the pace of the class, and the ease of use--academic and personal factors in *maintaining the course*. These needs are both physiology and psychological, so their impact on teaching and learning is substantial. Hatcher and Craig (1998) acknowledge these needs and warn, "this isolation can lead to a de-humanizing of the learning experience" (p. 4). Obviously, then, special care must be taken to design and support the ease of use of course materials and interactivity between students and faculty in a distance-learning course. Chickering and Ehrmann (2000) find that this is not only possible, but interactive communication strategies can actually empower students: "The World Wide Web increases opportunities for students and faculty to converse and exchange work.... Total communication increases and, for many students, the result seems more intimate, protected, and convenient than the more intimidating demands of face-to-face communication with faculty" (p. 1). Different levels of support to further these worthy goals include the following strategies:

Small = Publish an introduction to the course and a short online syllabus at least two months before the beginning of the class. This preview allows students to understand the workload of the class and to obtain textual materials prior to the first day of the class. The online introduction and syllabus also focuses the faculty member's continuing web course design, so that her/his course is not created ad lib.

Medium = Help faculty members design different types of assignments to create interest and use class management tools to increase efficiency. Assisting faculty in the use of management tools so they may enter grades, post to portfolio files, and provide feedback, contributing to a positive virtual classroom climate for both students and faculty.

Large = Build Instructor-Student and Student-Student communication structures to calm frustration and enhance learning for everyone involved. The technology that allows faculty to specify communication-rich assignments (team projects, required discussions, "guest speakers," peer editing or peer presentations with responses) is available. However, this level of Internet use will call for increased support because it also implies difference avenues for completion of these assignments, and a longer learning curve. These interactive types of assignments are more time-consuming than simple read and response assignments; however, they also lead to better exchanges and greater opportunities for learning, even for the instructor.

Shared Needs of Web Students and Administration for Distance Education Support

Web Students and Web Administration crossover needs center around registration, admission and withdrawal from classes, fees and refunds--matters of *beginning the course*. Like any processes that involve money and credits, these should be as quick and direct as possible. Explicit requirements of online courses may require changes or adjustments in administrative policies that govern traditional courses. On campus and online courses share a concern about the type, sequence, and outcomes of courses needed. Online support in this area requires clear and clever communication that both advertises and informs. "These students expect a high level of customer service. They want their needs to be anticipated, immediately addressed, and courteously handled"(Klor de Alva 2000, p.37). Different strategies seek to reduce confusion and create a positive climate even before the course begins.

Small = Establish registration procedures that ensure a fast turnaround and confirmation of class placement. Once committed to the idea of learning online, students want to know that they are confirmed as a member of a web course.

Medium = Create a library resource launch page that facilitates easy access to electronic resources. This page should facilitate the student's entry into electronic databases and provide hyperlinks to electronic checkout and acquisition of materials.

Large = Publish and maintain an up-to-date web page which clearly states institutional policy about fees, tuition, withdrawal from a course, copyright issues, and plagiarism. Web clients often assume that because the teaching/learning environment is different, that policies are different as well. While maintaining such a page is no small chore, supplying and finding accurate answers before the fact is vital to good public relations.

Unique Needs of Web Faculty, Students, and Administration for Distance Education Support

Unique needs are no less real or less important than shared or crossover needs. These are, however, more difficult to anticipate, so this becomes the creative part of planning for support. For example, Sherry, Billig, Tavaline, and Gibson (2000), maintain that faculty who will be web teachers need to have time for training as well as "demonstrations of promising practices and ongoing professional development by peers" (p. 45). The unique needs of faculty, therefore, include the planning and design of the course, the faculty member's existing values, and the time available to develop the course. Support strategies that address these needs include the following:

Small: Continue discussion about technology integration that encourages a KISAC (Keep It Simple and Creative!) approach. Mounting a faculty help page with frequently asked questions on the web shares information among instructors and provides faculty support that may be accessed multiple times without intimidation or embarrassment.

Medium: Provide in-depth workshops about web pedagogy and the software that supports it, in a number of time slots, to meet a variety of faculty teaching schedules. Faculty members must make connections between web course content and web course goals/expectations with specific directions and published criteria for assessment. In addition, faculty members must know the strengths and limitations of the software they are using so that they can plan interactive activities and assessments that will work.

Large: Offer "hands-on" workshops about page design and image manipulation. With course plans in place, faculty members require support in making their web courses interesting and their classes learning communities. Uploading visual materials that conform to web standards, internal linking to other sites, and creating quizzes/tests online are more sophisticated tasks and need lab time and direction.

White & Weight (2000) assert that "effective online teaching is twofold: the ability to transmit messages clearly and accurately and the ability to maintain positive interpersonal relationships" (p. 10). If faculty members are to be effective teachers, then, they must have the support to develop the knowledge and confidence to show enthusiasm both for their content and distance education.

The fact that the World Wide Web makes it easier to deliver up-to-date teaching material on a global basis is irrelevant if students find the medium difficult to use, or if they are not appropriately supported in their attempts to learn with it (Mason and Kaye, 1990). Students also need information about time and work management of online learning: Does the potential student like to read and write? More than one student has found that electronic communication means a level of typing that he/she had not envisioned.

Students also need assistance to help them use electronically accessed data and process concerns and complaints. Students want convenience, and they want "a curriculum that integrates theory with practice while emphasizing workplace competencies along with teamwork and communication skills" (Klor de Alva, 2000, p37). To accomplish these goals the following strategies need to be in place:

Small: Provide clear information about the dates the class will be held, how to obtain course materials and textbooks, and a hyperlink to an online student guide for the software.

Medium: Post technical support for students on the web through an e-mail contact,page. Other types of assistance would include specific help pages about submitting assignments, accessing grades, and participating in multi-level discussions.

Large: Provide immediate technical help with an 800 number or periodic help through office hours in a real-time chat room. Whatever the media, questions directed to support personnel must be answered accurately and quickly. Establishing an electronic peer mentor network in a web-based environment also allows students to interact online with peers who have taken web courses previously so they might seek academic and technical advice.

As higher-education institutions establish web-based courses and programs, the typical college or university experiences "problematic goals, unclear technology, fluid participation in decision making" (Ehrmann, 2000). Resources of money, time, faculty and staff may need to be reallocated to achieve a web program with high standards and goals. To achieve these goals, the following support strategies must be addressed:

Small: Provide information about student profiles and usage patterns so that administration can make consistent purchases of hardware and software to support a web-based academic program.

Medium: Inform the administration about updates and upgrades of web software as well as minimum standards in hardware/software for successful online teaching/learning. This data is absolutely essential for instituting a consistent plan for keeping both hardware and software current.

Large: Create and distribute an online evaluation of web course experiences to students. Support staff then needs to collect and analyze the data as will as publish results so that decisions about web courses and programs might be data-driven.

Assessment of the Support Design

Any design process needs assessment to test its strength in implementation and provide information for refinement or restructuring. This design is informed by data from student evaluations of web-based courses for the summer of 2000. When asked about their experience with web-based courses, 76% (N=268) of the respondents reported that they had not taken a web course previously. This large number of novice users obviously impacted the amount of support needed.

Of those that responded to specific questions about technical support, 68.4%(N=79) found the technical support pages helpful. When the technical support staff was contacted, over 77%(N=66) found the staff helpful. This contact was most often made through e-mail by 53.5% of the respondents (N=71). Initial contact about Web courses by phone or through the summer 2000 website was favorable in most cases (89.5%) (N=57). Of those that responded, over 91% (N=59) found the information they received from these initial contacts helpful and thought it met their needs. Overall, 61.1% (N=90) respondents registered a satisfied or very satisfied level for the technical support they received.

Future Directions

Teaching and learning through distance education on the Internet currently involves radical changes in our traditional paradigms of academic thinking and acting. Yet online teaching and learning will continue to change as software and hardware evolve to allow easy voice and visual streaming for video conferencing. The following areas will undoubtedly affect online teaching and learning and lead distance education support in new directions:

•Bandwidth and speed of data transfer - The segment of the Internet that brings course material into a student's home or the faculty member's office will continue to increase in capacity and speed.

•Availability of hardware and user-friendly software - The dot-com culture of virtual e-commerce and education is influencing the price of web-based hardware and software, bringing it to a level that is affordable by the average user.

•Synchronous learning systems - The ability to log on and to interact in real time with an instructor and/or other students will moderate the amount of text currently required.

•Consumer demand - students are turning to distance education for convenient anytime, anyplace educational experiences.

•Economic factors - Students may be able to avoid travel, and/or on-campus residency, thus reducing educational expenditures. In addition, students can continue to work as they learn because they are not governed by a university class schedule.

•Sophistication of web faculty - As higher education personnel become familiar with new software, and digital peripheral equipment, they will need more server space, speed, and support maintaining advanced techniques.

A successful design for distance education support does indeed involve different levels, numerous strategies, and its own measure of resources. Without a strong support system for all stakeholders in the online learning process, however, virtual classrooms could be individually spinning in cyberspace, lacking the anchor that solid technology policies and training can provide.

References

Chang, V. (1998). Policy development for distance education. In *ERIC Digest*. [On-line]. Available: http://www.ed.gov/databses/ERIC_Digests/ed423922.html.

Chickering, A. W., & Dhrmann, S. (2000). Implementing the seven principles: Technology as lever. In *American Association for Higher Education Bulletin*. [On-line]. Available: www.aahe.org/technology/ehrmann.htm.

Ehrmann, S.C. (1991). Gauging the educational value of a college's investments in technology. *Educom Review*, 26(30-4), 24-28.

Hatcher, T. & Craig, B. (1998). *Humanizing the technological learning experience: The role of support services as socialization in a human resource development distance education program*. (ERIC ED Publication No. 415-407).

Hsu, S., Marques, O., Hamza, M. K., & Bassem, A. (1999). How to design a virtual classroom: 10 easy steps to follow. *T.H.E. Journal, 27*(2), 96-109.

Klor de Alva, J. (2000). Remaking the academy. *Educause Review*, March/April, 32-40.

Mason, R. D., and Kaye, A. (1990). Towards a new paradigm for distance education. In Harasim, L.M. (ed.), *Online Education: Perspectives on a New Environment*. New York: Praeger.

Sherry, L, Billig, S., Travaline, F., & Gibson, D. (2000). New insights on technology adoption in schools. *T.H.E. Journal, 27*(7), 43-46.

White, K. W., & Weight, B. H. (2000). *The online teaching guide*. Boston: Allyn and Bacon.

Academic Staff Development Course for Coordinators of Distance Education. Russian Experience

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Abstract: Rapid development of the Internet-based distance courses at Russian universities brought out the problem of special in-service training of faculty members. The training should provide future coordinators of distance courses with information about the online educational environment, active methods of teaching (project-based methods, collaborative learning, cooperative learning, etc.), as well as develop their communication skills that could be considered to be the main skills for the teacher working with students on the net in conditions of the distributed teamwork. Within the course learners identify their personal skills and abilities that can influence their work on the net, and develop their own educational trajectories for self-education after graduating from the course. Learners go through various online psychological tests and participate in a series of online exercises and role-plays. The paper gives the overview of the Internet-based training course for coordinators, methodological basis, structure of the course, and first results of its implementation.

Introduction

Today the society states the problem to provide each man with the free open access to education within his life subject to his interests, personal abilities and needs. The other problem is to prepare a man for a life in conditions of rapid change of information flows, for the possible change of profession, for the active independent life, for the communication with people from different societies and cultures, for the quick adaptation in the newly conditions. The urgent necessity of organization of mass in-service training of specialists in today's Russia influenced the increasing development of such form of education as distance education.

We understand distance education as a specific form of education, which formally is used when a teacher and a student are divided by miles, being in fact connected by the New Information Technologies including the wide variety of modem means of communication.

Distance education is very popular in Russia now. According to the latest data that was published in the recent sociological surveys, more than 26% of freshmen at Russian Universities and colleges are ready to study on the Internet. 50% of them want to take the distance learning courses at the leading Moscow universities, and 24% are going to attend the foreign virtual universities. 30% of families in Moscow and St. Petersburg have personal computers at home, and half of them use the Internet.

Considering all above-mentioned the most of the Russian universities have recently opened the distance education faculties and departments. The "National Program of Distance Education Development" is in action since 1995. In accordance with the Program Execution Plan, universities were equipped by the modem computer classes. Many universities organized Internet Open Access Centers for the students. There were also developed hundreds of various Internet-based training courses. But the results of the program could be better because it came across several problems, such as the following:

- most of the distance courses are in practice just the ordinary repetition of traditional correspondence courses with elements of the self-education (no permanent contacts between students and teaches, obligatory internal "face-to-face" meetings at exam sessions, etc.);

- there are no well-trained specialists among the faculty members to provide distance courses (i.e. coordinators who understand what distance education is, what are the effective methods of teaching via Internet, what are the basic rules of E-courses development and management, etc);
- it is very difficult to integrate the existing Russian system of distance education into the world-wide system because there is a lack of specialists who can professionally do it.

So there is an obvious contradiction between the urgent need in accelerated development of Russian system of distance education and the lack of specialists to develop it. At present no Russian academic institution is being busy with the complex training of specialists for distance education in such important subjects as:

- active methods of teaching (cooperative learning, project-based methods, etc.);
- psychology of communication via Internet;
- organization, management, and evaluation of distance courses.

General Idea of the Course

Answering the demands of the academic staff involved in a process of distance education in 2000 a group of scientists from the Russian Academy of Education (Moscow, Russia) and Southern Urals State University (Chelyabinsk, Russia) developed the pilot project – Internet-based course for coordinators of distance education http://courses.urc.ac.ru.

What is the coordinator of distance education?

The word *"coordinator"* is used here as the most general word explaining the role of the "key-persons" in a process of the distance learning and teaching – facilitators, moderators, tutors, coaches, etc. The coordinator influences the educational process at a great extand being responsible for:

- *Facilitating* the course discussions and forums;
- Supporting the group project activities as a *coach*;
- Supporting individuals as a *tutor*;
- Evaluating the assignments;
- Planning and monitoring the course activities;
- *Moderating* the conflicts, and etc.

Being the coordinator of the distance courses means to be:

- competent in the subject area;
- advanced Internet-user,
- skilled communicator;
- efficient in psychological aspects of teaching and learning on the Internet;
- ready to use active methods of teaching related to Internet.

Aims and Objectives of the Course

The main aim of the course was to provide Internet-based training for academic staff and secondary school teachers and prepare them for the work as coordinators of distance courses. The objectives of the course included the following:

- Give the idea of the distance education;
- Train in the field of new methods of active teaching and learning;
- Develop communication skills;
- Identify personal skills and abilities of learners that can influence their work as coordinators within distance learning courses.

Characteristics of the "Pilot Team"

People

Distributed "pilot team" included learners, authors of the course, coordinator, administrator of the course, system administrator, and professional psychologists. Learners were volunteers from the various educational institutions: teachers of secondary schools, faculty members from two universities, instructors from regional departments of teachers' training institutes, and coordinators of educational telecommunication projects.

Equipment

The equipment that learners used was typical for average Russian learner and included IBM-compatible personal computers with Windows 98, or NT, and MS Office 2000 unit (MS Internet Explorer, Outlook Express, Word, FrontPage). The learners had access to the Internet either from home (dial-up access by 28.8 Kbps modems), or from the University Internet Center (direct access, 64 Mbps channels).
Access to the learning tools was possible via Internet, or from home computers (downloaded zipped files with texts, tests, and instructions).

Content and structure of the Course

Within three months of training via Internet the students were involved in a process of active E-learning. They studied the Web-textbook, developed for the purposes of the course. This textbook was enriched by a collection of the links to other Internet-based educational resources and online editions.
The content of the course materials depended upon the main objectives of the course. It included such modules as:

- Introduction into the system of distance education;
- Internet-based technologies and educational environment, used at distance learning;
- Communication via Internet: basic rules and problems;
- New methods of teaching and distance education technologies;
- Psychological aspects of working with students in the Internet environment;
- Monitoring and evaluation of the distance education courses.

Learning Process

Learning process within the course was organized by the three months curriculum, series of control assignments, clearly outlined aims and objectives for each unit, and by ongoing feedback.

Learning tools

Learners had the access to various "learning tools" and "information tools", among those were the following:

- Educational courseware kit, that included: a textbook "Internet Guide (for Educators)" with information about Internet main services, software that would be used within the course, search engines, and numerous examples of the educational resources on the Net;
- Web-textbook;
- Sets of control assignments with detailed description of the task, references to the sources of information, general guidelines on preparing the reports and examples;
- Supplementary materials for individual research projects (on-line tests, questionnaires, etc);
- Collection of the links to the Internet educational resources;
- References on the traditional tools – books, articles, etc.

Modular Structure

The course had a modular structure. Each unit included several activities (steps) that the learners should pass through:

1. Outlining the learning objectives;
2. Readings & "seeings";
3. Experimenting, testing, self-evaluation and inter-evaluation;
4. Doing individual or/and group assignments;
5. Reflecting, discussing, receiving the feedback;
6. Outlining the new learning objectives and problems.

Interactions within the Course

Learners were involved into numerous interactions with the coordinator and other students of the virtual group. The majority of assignments for students were based on active methods of teaching: Internet projects, cooperative learning, science research methods and etc. that motivated learners to work in collaboration with other students of the group, create the permanent "peer-to-peer" connection, and step by step become acquainted with all members of the group as well as the coordinator. They learned how to think globally, to argue and to find compromise within discussion. They developed the critical thinking and abilities to take their own decisions in everyday situations related to distance learning. This process appeared to be rather difficult for many learners that had problems in establishing communication process with other people on the Net. But the series of specially designed online role-plays and individual advises of the coordinator helped them to solve this problem and to develop necessary communication skills.

All interactions among members of the group were organized by:
- e-mail;
- mailing lists (one for learners and coordinator, and the other - for coordinator and supporting team);
- chat-rooms ("Classroom" for formal discussions with protocol recording and "Break" for informal meetings).

Forms of Learning

Different assessments that learners did within the course demanded the use of different forms of learning:
- Individually,
- In pairs,
- In small groups (3-4 learners);
- In larger groups (10-12 learners);
- All the group.

The larger groups were effective within psychological online role-playing and chat sessions. Smaller groups were effective at doing projects, problem solving, and refection. Work in pairs was the best form for inter-evaluation of the existing characteristics of the learners, as well as for the reflection and discussions of the results of the tests within "peer-to-peer" experiments.

Tests

One of the course objectives was to provide learners with the effective tools for self-evaluation that could be used for the development of the personal self-education trajectories of the future coordinators of the distance courses. We came across the problem of unsuitability of famous "classical" psychological tests that could be used to identify motivation, leadership, communication type, and other features of character of the learners, if to place them on the Net directly. It was impossible to transform them in a form of the interactive tests either because of the huge amount of questions that learners should read and answer online, or the evaluation of this answers couldn't be done automatically, by computer program. We developed the list of criteria to select the psychological tests available for online self-evaluation and analysis: no more than 30 questions, no open questions, quick automatic response (feedback), etc.

The Supporting Group of Psychologists

Characteristics of the Internet learning Environment

Developing the conception of this course we realized that the majority of the existing problems of the adults' adaptation to the new learning environment of the Internet are caused by the following reasons (in comparison to traditional "face-to-face" learning experience):

- Domination of the new sensor channel (visual);
- Adult learners working together at a distance course have different learning styles, experiences, characters;
- Some of the learners suffer from information stress and frustration within their first weeks of learning on the Net;
- Internet demands new rules for communication – "democratic Netiquette";
- Not all the adults like to have many new contacts and collaborate with strangers;
- Not all the learners are highly motivated;
- Not all learners are well-organized and could do the self-assessment tasks.

All these questions are the top-interest questions for the researchers working not only in the field of education, but psychology as well. Professional psychologists could contribute the development of some distance courses helping educators to avoid the "reinvention of the wheel". Psychologists could share their methods of evaluation of individual characteristics of the learners, methods of evaluation of the group dynamic processes which are very important for proper evaluation of the effectiveness of the distance learning, and appropriate choose of forms and methods of learning. Practical psychology in Russia and in other countries served for many years in the field of business education, developing the strategies and methods of various in-service trainings in communication, collaboration, team-work, etc. We decided to unite together the efforts of professional psychologists and methodologists, developing and monitoring the effectiveness of the distance course together.

The learners were supported by a group of psychologists who consulted students at their request, and monitored the psychological climate within a group of students. Working together with coordinator of the course, psychologists help students to build their self-development program ("educational trajectory") that would guide them after completing the course.

Objectives of the Online Psychological Service

So, the main aims and objectives of the "psychological service" within the course were outlined as the following:

Aims:

- Creation of the friendly psychological environment;
- Learners support in development of the individual educational trajectory.

Objectives:

- Evaluation of the Course educational environment;
- Study of the personal features of the learners;
- Help in adaptation to the new online environment;
- Popularization of the relevant to the course content psychological issues and theories.

The supporting team of psychologists worked within all stages of the course providing:

- Analytical work and group dynamic's monitoring;
- Instructive support (advices on the We-site design, structuring of the course context, developing of the ongoing system of the feedback, etc.);
- Consultations (individual and group consultations for students, for coordinator, and developers of the course learning materials);
- Methodological support (participated in development of the online tests for self-evaluation and inter-evaluation, etc).

Development of the Learners Online Community

Though the learners were from different educational institutions their group had all "core" attributes of the network community (Whittaker, Issacs, & O'Day, 1997):

- shared goals, interests, needs, and activities;
- engage in repeated, active participation in the course assignments, chats, etc.;
- access to shared course resourses;
- shared social experience, language, netiquette;
- shared support, help, and mutual services.

At the same time (and it's a paradox of the teachers' profession) educators usually suffer from loneliness, they frequently loose the fluency in establishing communication with other adults, are not active, and pretend to be lurkers instead of leaders in a team of the adults (J. Preece, 2000).

Taking into consideration these specific characteristics of the learners and objectives of the course much attention was paid to the development of the system of learners' adaptation to the new communication environment that included:

- Theoretical material to explain the learners the basic rules of Internet environment;
- Online exercises on establishing trust-building and collaboration among peers of the group;
- Psychological role-plays and online tests for self-assessment and self-awareness;
- Project-based assignments.

Much attention was paid to creation of a friendly psychological environment. The objectives for doing this were the following:

- To develop the learners community;
- To help teachers to get acquainted with each other;
- To develop collaboration skills;
- To provide trust-building process;
- To support the on-going interactions among all the members of the group.

The initial educational background and experience of the learners at the course was different. That is why we developed two levels of the specially designed online exercises:
First – for identification of the current status (level) of a learner. At this level exercises are combined with various tests for self-assessment and inter-evaluation as well as group and individual experiments followed by reflection and group discussions of the results.
The second level of the exercises includes exercises which main objective is to put the learner into the new learning conditions and let him use his knowledge in real collaboration with real people on the Net.

Conclusion

The Russian language version of the course was launched in March 2000, and two groups of learners (16 learners in each) from Moscow, Ufa, Novgorod, Chelyabinsk, Irkutsk, and other cities of Russia participated in it. Main achievements of the pilot training:

- Adaptation of new pedagogical technologies and active methods of teaching at online distance courses;
- Effective combination of individual and group activities;
- Permanent contacts and feedback among learners via Internet;
- Development of the system of online exercises and tests for pedagogical and psychological self-assessment and development of necessary skills for communication and collaboration within Internet environment;
- Development of the "Conception of the Psychological Service at Distance Learning"

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Distance Learning: Effective Strategies for the Information Highway

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Abstract: This study was created to fill a void in the knowledge of instructor behaviors, effective instructional strategies, assessment measures and the overall effectiveness of learning in the distance education classroom from the student's perspective. Specifically, this study had graduate students evaluate three professors in three different courses during a fifteen-week semester while teaching in synchronous learning environments. Two of the instructors conducted classes at two sites simultaneously and the third conducted a three site class. At the end of the fifteen weeks, students in all classes were surveyed. All classes were comprised of graduate students who were practitioners in various fields of education. The most used strategies were lecture, group discussion, and cooperative learning. The most effective strategy was noted by students as cooperative learning, followed by group investigation, and presentation. On the open-ended questions, students concurred that a plethora of teaching strategies was employed to engage learners.

Introduction

With an extensive review of the literature and a clear understanding of purported limitations in past research, this study was created to fill a void in the knowledge of instructor behaviors, effective instructional strategies, assessment measures, and the overall effectiveness of learning in the distance education classroom from the student's perspective. Specifically, this study had graduate students evaluate three professors in three different courses during a fifteen-week semester while teaching in synchronous learning environments. Two of the instructors conducted classes at two sites simultaneously and the third conducted a three site class. At the end of the fifteen weeks, students in each class were surveyed. All classes were comprised of graduate students who were practitioners in various fields of education. It was hoped that because of their expertise in education, this pool of students would give insight into appropriate and inappropriate uses of various teaching strategies and techniques.

Theoretical Framework

Distance learning has become a reality in an era when universities are searching for ways to increase student populations and to better serve the needs of their existing students (Charp, 1999). This learning environment encompasses a combination of technologies, including television, videotapes, audiotapes, video-conferencing, email, telephone, fax, Internet, software and print (Merisotis, 1999). It has been speculated that this new form of learning will become a commonplace phenomenon in the next century and has the potential to create a new vision in education (Ben-Jacob, Levin, & Ben-Jacob, 2000). Some have even predicted a new role for teachers; one in which they will act more as social workers or guidance counselors to provide personal one-on-one tutoring and to teach collaboration and interpersonal relationship skills (Schank, 2000).

Should we, as educators, question these technologies and their use in education? Universities continue to add new technologies as they become available. Are we allowing technology to determine the learning experience? And, on a more individual level, what is the significance of teaching strategies in this environment? The future may hold a different role for the teacher, but for now, effective instructional strategies are a large part of effective instruction. Do these change in the distance education classroom?

The literature on distance learning includes numerous studies such as: student perceptions comparing online to traditional lecture class quality (Ryan, 2000), the achievement of students in distance learning and traditional classrooms (Schulman & Sims, 1999; Dominguez & Ridley, 1999), demographics of students taking online courses (Guernsey, 1998), staff training needs (Connell, 1998), support for faculty teaching (Bremner, 1998), and community and team formation in distance education classrooms (Berg, 1999). There is a more limited body of research on the effectiveness of specific strategies using the distance learning platform. Some of these studies discuss the shifts in social relationships (Newson, 1999) and accommodating diverse learning styles (Ross & Schulz, 1999; Diaz & Cartnal, 1999). A few studies suggest the use of specific instructional strategies such as online student portfolios, self-guided online labs, class cybersociety, effective graphics, organized readiness, and the need to adapt instructional materials (Goodman, 1999; Powers, 1999; Grubb & Hines, 1999).

Methods/Results

In this study, two classes consisting primarily of elementary and middle grades' majors were enrolled in core graduate education courses. The first, *Connecting Learners and Subject Matter*, is a course that connects the examination of curriculum foundations and models of the school learner and educational goals with an intense study of research-based, exemplary instructional strategies focused on learning and achievement, and the second course, *Teacher Leadership and School Improvement*, was designed to help teachers develop an understanding of and skill in assuming leadership roles and responsibilities in their schools. In the *Connecting Learners* course, three separate sites were joined with the North Carolina Information Highway. One group of students met in the technology equipped classroom at the university and two groups were approximately 75 miles away at secondary school media centers. Each site had one technician to facilitate the use of cameras and media during instruction. A web site was designed to assist the students with daily assignments and resources. In the event there were delays due to faulty connections, students at the remote sites worked independently using the daily assignments on the web-site to guide them in engaging in class activities. The instructor for this course had no previous experience with distance learning. The second course, *Teacher Leadership*, was taught in a similar manner to the first course except there were only two sites and a web site was not used. The instructor for this course had no previous distance learning experience. The third class was *Telecommunications Technology in Education*, usually the second in a series of educational technology courses that students take for a graduate degree for K-12 licensure in North Carolina. While the major emphasis is the development and use of telecommunications tools in instruction, basic considerations in setting up telecommunications connections, and issues in maintaining telecommunications facilities are discussed. This course was taught to two remote sites from the main campus. Each site had computers for each student and two adjuncts to rotate between the two sites to assist with instruction. A web-based supplement was also developed for the course that included course orientation, daily outline and assignments, resources, and a threaded discussion forum. The instructor for this course had previously taught via distance.

Item Response Survey

Fifty-six students in the three courses completed a survey about student demographics, a general evaluation of the instructor, an evaluation of twenty-one instructional strategies, and five open-ended questions about the effectiveness of the course. Fifty-two students were teaching in the public schools ranging in grades from kindergarten through high school. One student worked in the central office of a school system, one was in ROTC, and three were full time students. The students' number of years teaching in public schools ranged from 0 to 27 years, with an average of 9 years. Thirty-one of the students had previously taken courses via distance learning.

N=56	strongly agree	agree	disagree	strongly disagree
Actively involved students	47	9	0	0
Encouraged participation	49	7	0	0
Respected students' opinions	51	5	0	0
Stimulated critical thinking	47	9	0	0
Gave hands-on experiences	33	23	0	0
Consciously planned for the instruction events	39	17	0	0
Prepared lesson plans based on needs of learners	25	31	0	0
Encouraged the expression of differing viewpoints	50	6	0	0
Used active, interesting audio visual aids	29	25	2	0

Table 1: Evaluation of Instructors

The above table gives an overview of the responses when students were asked to respond to a list of nine instructor behaviors. Students, in each class, either agreed or strongly agreed that all three instructors encouraged participation, actively involved students, etc. Only two students disagreed that active, interesting audio visual aids were used. The results from this portion of the survey suggest that all three instructors were effective in the classrooms engaging students in meaningful collaborative activities.

Instructional Strategy	Use in Class				Effectiveness
N=56	no response	not at all	some of the time	most of the time	strongly agree to strongly disagree (5 to 1)
Cooperative Learning	0	1	24	31	4.49
Group Investigation	0	3	17	36	4.48
Presentation	3	1	28	24	4.48
Reflective Thought	1	0	28	27	4.43
Group Discussion	0	0	39	17	4.40
Question/Answer	0	3	17	36	4.31
Lecture	0	7	20	39	4.22
Direct Instruction	2	4	9	40	4.18

Table 2: Report of Use and Effectiveness of Instructional Strategies

Twenty-one instructional strategies were listed next to a check sheet and a Likert scale in which students were asked to determine whether or not a strategy was used in class and to rate its effectiveness. The eight most effective instructional strategies are listed on Table 2. The most effective strategy was noted by students as cooperative learning, followed by group investigation, and presentation. The most used strategies were lecture, group discussion, and cooperative learning.

Open-ended Survey

On the open-ended portion of the survey, students were asked to briefly describe and comment on the effectiveness of: 1) Teaching strategies in this course, 2) Assessment in this course, 3) The use of technology in this course, 4) Did the professor's on-site visit(s) impact your class? If yes, how?, and 5)Additional comments. They concurred that a plethora of teaching strategies was employed to engage the learners. Though lecture was used, it was not cited as a dominant approach. Cooperative group activities were used predominantly in each class. Discussions occurred frequently at intra and inter site level following presentations made by the cooperative group activities and individual presentations. Students cited the use of videos, power point presentations, and projects as effective. One student commented that when the class size and number of sites increased, the amount of time required to share research also increased. The suggestion was made to have individual sites hear presentations from their colleagues and "turn off the camera". However, it was noted that the downside of this approach is that sites would not benefit from their peers' research. This comment came from a participant in the section where three sites were linked for instruction.

The use of assessments and reactions varied with these participants. In one section, no traditional tests were used. However, students created culminating projects to demonstrate mastery of course objectives. Though traditional quizzes or tests were used, the emphasis on critical thinking, project-based assignments, and group work made it necessary to incorporate a wider variety of assessments. Attendance and class participation were cited as a component of the final grade in each course syllabus. In one section rubrics were used to evaluate student presentations and written projects. One responder noted that rubrics "were very fair" and provided a medium for giving "informative feedback instead of just putting a grade on our work." Such comments as "fair and reasonable," "prompt and beneficial," "appropriate," and "effective" were included. One student noted that the assessments used were "typical of other graduate classes."

The use of technicians on site was cited as an effective means of ensuring quality delivery of the course. "On several occasions, technology presented a problem because of delays in connections," audio problems and CyberClassroom receptions. Students also commented on their use of technology in individual and cooperative group presentations citing numerous presentation, communication, and website development software. E-mail and websites were used to communicate intermittently throughout the semester. Technology was cited as "a must. Without technology there would be no DE." Students' comments clarified that the technology was critical to the effective delivery of the course and also concluded that video and audio problems "were not the instructor's fault."

For each of the three groups who participated in this study, the professor delivered the instruction from the university setting. In two of the sections, students were also enrolled at the university site. Although professors agreed to deliver the course from the university setting, one to four on-site visits were scheduled throughout the semester. When polled to this regard, students were extremely positive about the opportunity for face-to face interactions. Comments were made such as: "It gave me a sense of connectedness I would never have had," "Having the professor there made it more personable," "I enjoyed her visits," "A warm body makes a big difference in attention span," "It provides a personal touch," "I felt more comfortable voicing concerns or issues that I needed to have taken care of," "The professor's visits provided the needed eye-to-eye contact," and "It made us feel more comfortable, but I'm not sure it impacted the learning." Students at the university site unanimously expressed an advantage over the distanced students because of the interpersonal relationships that developed before and after class with the instructor.

Students entered a variety of responses in the category of additional comments ranging from personal comments about the process of distance learning to specific assignments to the value of this university program. One student doubted the value of distance learning initially and concluded that the unique variety of teaching strategies changed his mind about its utility. Another decided not to enroll in another DE course stating "technology is not always the answer." Several of the students concluded that without the distance learning option, they "would have never gotten a Masters Degree." One student commented, "This class would have been worth the tuition even if I weren't pursuing a degree. I learned a lot and I changed my mind about a lot of things I was doing (in a secondary math classroom). Thanks for doing what a teacher is supposed to do."

Educational Importance

Distance learning offers opportunities for students to obtain new skills and achieve graduate degrees from our universities. As professors, we are charged with the task of delivering course content without compromising its rigor. Thus, the strategies employed in these satellite programs must be examined from the perspective of the learner and the instructor. Teaching and guiding learning is no easy task in the most favorable of conditions, notwithstanding one that may not be optimal as an educational environment. Instructors must be given specific guidance based in research. The stakes are too high for teachers to read manuals on distance learning based on practices lacking a theoretical framework. Thus, additional research is needed to investigate the effectiveness of specific instructional strategies.

References

Ben-Jacob, M.G., Levin, D.S., & Ben-Jacob, T.K. (2000). The learning environment of the 21st century, *Educational Technology Review,* 13.

Berg, G.A. (1999). Community in distance learning through virtual teams, *Educational Technology Review,* 12, 23-29.

Bremner, F. (1998). On-line college classes get high marks among students, *USA Today, November 16.*

Charp, S. (2000). The millennial classroom, *T.H.E. Journal*, 27(6), 6.

Connell, G. (1997). Distance holds the key to growth, *Times Higher Education Supplement,* 12.

Diaz, D.P. & Cartnal, R.B. (1999). Students' learning styles in two classes, *College Teaching,* 47(4),130-135.

Dominguez, P.S. & Ridley, D. (1999). Reassessing the assessment of distance education courses, *T.H.E. Journal,* 27(2),70-76.

Goodman, D. (1999). Validating factors that impact on the success of distance learning initiatives, (ERIC Document Reproduction Service No. 429595).

Grubb, A. & Hines, P. (1999). Innovative on-line instructional strategies: Faculty members as distance learners, (ERIC Document Reproduction Service No. 430455).

Guernsey, L. (1998). Distance education for the not-so-distance. *The Chronicle of Higher Education,* 44(29), 29-30.

Merisotis, J.P. (1999). The "what's-the-difference?" debate, *Academe,* 85 (5), 47-51.

Newson, J. (1999). Techno-pedagogy and disappearing context, *Academe,* 85 (5), 52-55.

Powers, K. (1999). A self-fulfilling prophecy: Online distance learning for introductory computing. (ERIC Document Reproduction Service No. 432994).

Ross, J.L. & Schulz, R. A. (1999). Using the world wide web to accommodate diverse learning styles, *College Teaching,* 47(4), 123-129.

Ryan, R.C. (2000). Student assessment comparisons of lecture and online construction equipment and methods classes, *T.H.E. Journal,* 27(6), 78-84.

Shanck, R.C. (2000). A vision of education for the 21st century, *T.H.E. Journal,* 27(6), 42-55.

Schulman, A.H. and Sims, R.L. (1999). Learning in an online format versus an in-class format: An experimental study, *T.H.E. Journal,* 26(11).

Teacher and Developer: A Compromise for the Creation of CSCL Applications

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Abstract: In this paper we present a methodology that reduces the level of complexity when analyzing, designing and evaluating technology-based collaborative learning applications. Its main characteristics are the agreement or compromise reached by teachers and developers in the creation of those applications and the interaction between both roles. The above-mentioned methodology is based on iterative and participative analysis, progressive design and collaborative evaluation. The analysis is performed by means of the presentation of a series of five templates that comprise and model the domain of a collaborative learning situation and Design is supported by a class model. The validation process is attained through usability-based techniques. The methodology is part of the DELFOS project (A Description of tele-Educational Layer Framework Oriented to Learning Situations).

Introduction

The development process of CSCL (Computer Supported Collaborative Learning) (Koschmann, 1996) applications is a complex task, because several factors play an active part, namely: educational process and classroom aspects and those related to the appropriate use of computer network technology. Hence, the aforementioned applications have to be jointly developed by both the teacher and the developer. The teacher-developer relationship triggers a series of mutual understanding problems derived from their communication difficulty; this difficulty is due to the mismatching between the pedagogical and technological vocabulary used by each of them. Besides, the teacher is not familiar with technology; nor is the developer aware of the needs of the classroom.

The search for a possible solution has gone through different Software Engineering strategies in which the teacher is interviewed by the developer on several occasion. Unfortunately, this sort of activity has not allowed the developer to grasp the adequate and precise requirements derived from the classroom needs. A different strategy has been the creation of authoring tools which should be used by the teacher to build his/her own technological developments. The resulting applications present poor robustness. By means of the third strategy teachers have been provided with generic telematic frameworks so that they are able to develop the collaborative application. The applications produced focus on solving communication problems, but do not establish tight links with the collaborative learning process. Therefore, these strategies have produced weak applications regarding the classroom problems and they have, once more, triggered the teacher's uncertainty about the effective use of technology in the classroom. Our strategy is based on the use of a conceptual and technological framework called DELFOS (Osuna, 2000). It proposes an iterative and progressive technique for the analysis and design of systems based on Usability (Mayhew, 1999) and on the use of transdisciplinary techniques (Vilar, 1997); the aim is to stimulate commitment of teacher and developer. The document continues with the methodology description and some conclusions.

DELFOS methodology

DELFOS proposes a four-phase methodology (see Fig. 1). First of all, we can see the *collaborative analysis* phase, in which the teacher describes the scenario and discusses it with the developer. It is here that DELFOS provides a series of templates describing the attributes that constitute a learning situation. Those templates use pedagogical vocabulary and they cover five aspects: Learning Situation, Learning Activity, Roles, Objects and Interactions. The second phase, *collaborative design*, starts in the analysis phase resulting scenario to which a series of class diagrams (also provided by DELFOS) are applied in order to obtain an object-oriented design. Once again, there is an iterative and progressive process that will suppress any design bug. In this phase, both roles dialogue in order to get a joint vision of the design. In the next phase, the design is *implemented* and DELFOS proposes a three-layer structure. Each of the layers takes a different problem into account: the *situational layer* is related to the interface; the *constructivist layer* deals with problems such as scaffolding and social interactions which are related to the knowledge construction process; the *cooperative layer* is in charge of defining the technological requirements needed for interaction and collaboration.

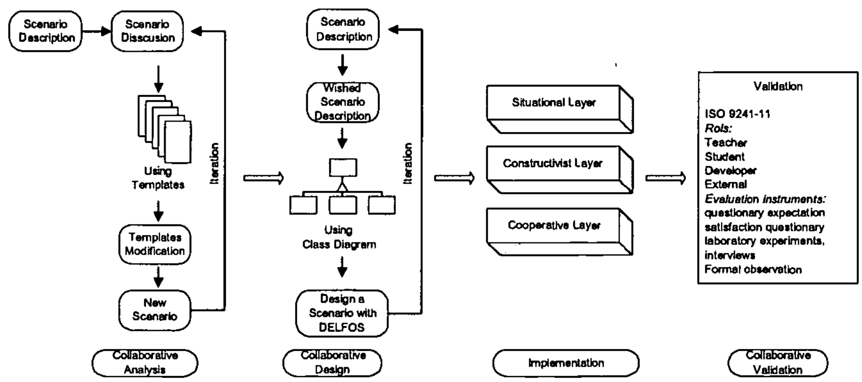

Fig. 1 The DELFOS development methodology

Finally, the validation phase is presented by means of a collaborative evaluation of the resulting application. The roles that participate here are the Teacher, the Developer, the Student and External Evaluators. For this purpose DELFOS has in-built evaluation instruments based on usability principles and on ISO 9241-11. This methodology has been used in the development of three collaborative learning applications; one of them focuses on learning reading-writing skills, the other one on social abilities and the third one on language teaching abilities.

Conclusions

A framework like DELFOS diminishes the CSCL applications development complexity, because it serves as a communication means that reduces the vocabulary differences between the teacher and the technology developer . This allows that two roles work together in all the phases of the development process.

On the other hand, the templates proposed in DELFOS have made the application analysis task easier, since they provide the teacher with a reference framework for the observation of the general properties of collaborative applications. Similarly, having a series of predefined classes accelerates the application design process. The implementation has been possible through the use of Java language, though the use of other type of technology is not discarded. The validation process proposed in DELFOS has enabled us to evaluate not only the applications derived from the framework, but also the framework itself and the performance of each of the roles that take part in the development. DELFOS currently aims at getting a methodology that enables the analysis of the interactions carried out by means of the applications and establishes predetermined relations among the interactions.

References

Koschmann, T. (1996). *CSCL: Theory and Practice of an Emerging Paradigm.* Mahwah, NJ: Lawrence Erlbaum Inc.

Osuna, C. (2000) *DELFOS: A Telematic and Educational Framework based on Layer oriented to Learning Situations.* PhD Dissertation. Valladolid, Spain: Universidad de Valladolid.

Mayhew, D. (1999). *The Usability Engineering Lifecycle.* San Francisco, CA: Morgan Kaufmann Publishers.

Vilar, S. (1999). *The New Rationality.* Barcelona, Spain: Kairós.

Web-based Instruction: What should we know?

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Abstract: Web-based instruction is the latest development of distance education, which has become an extremely important part of instructional technology. Web-based instruction has commonly adopted by universities and schools to deliver courses on line. Challenged by this advanced instructional technology, teachers will ask what we should know about it. The answer is that he or she should be knowledgeable of this advanced delivery method. He or she must be a life-long learner and be willing to face the challenge of being accountable for student's learning achievement. To obtain an effective web-based instruction, specific and clear instructional objectives are critical keys, strategic instructional time management and flexible collaborative learning environment lay down the foundation, and multiple means of evaluation guarantee the high quality of instruction and successful learning.

Web-based instruction is the latest development of distance education, which has become an extremely important part of instructional technology. The university system of Georgia has adopted WebCT as one of the instructional tools to deliver high education on line. Challenged by this advanced instructional technology, teachers are facing the question that what we should know about it. A critical issue is whether this web-based instructional approach can provide acceptable quality of instruction and whether students can receive expected opportunity of learning.

The development of web-based instruction

It does make sense that as society moves to a knowledge-based economy, increasing numbers of people will use communications technologies as a major tool for learning, no matter whether educators choose to encourage this process or not. It is believed that a deliberate transformation that maximizes the strengths and minimizes the weaknesses of the communication tools could greatly improve current educational practice (Elementk, 2000; Didsbury, 1982). The knowledge of the development of web-based instruction will help a teacher understand this advanced tool better and use it more effectively.

Web-based instruction is developed from traditional distance education that can be traced back to a century before (Tiene and Ingram, 2001). In the early 1800, because of reliable national mail service in the United State and Europe, instruction began to be delivered by mail. By the end of the century, a number of distance-learning schools were well established. The Chautauqua Institute in New York was providing adult correspondence education across the nation. The International Correspondence Schools of Pennsylvania combined mail delivery and face-to-face instruction by railroad cars to offer training in a variety of job skills. University of Chicago established the first university "extension division" that offered courses by mail.

In the early of the twentieth century, radio broadcasting was adopted in distance education. Along with providing written study materials for students, the University of Wisconsin became a leader who experimented with educational radio broadcasting. During the years of 1920s and 1930s, a number of universities in the United States practiced with radio broadcasting for their distant students. However, the use of radio broadcasting was declined after the World War II in the United States, partly because of the arrival of television.

Television became widely available in the 1950s. It was considered as a revolutionary development in the field of education, particularly in distance education. The Ford Foundation spent millions of dollars on its "master teacher" project. Lessons were taught by "master teachers" and delivered through television sets in multiple schools. Other teachers remained in their classroom to follow up the television lectures and work directly with their students. It was notable with the project conducted in Hagerstown, Maryland where schools television seemly promoted the education level of that rural school district. However, the conflict interests between master teachers and regular teachers made it nearly impossible for the implementation.

In the 1970s, the British Open University was established and it soon became a model of distance education around the world. The Open University used multiple media to deliver its courses, including mail, radio broadcasting, television programs, audio tapes, video tapes, and so on. Its well-developed curriculum, course materials, and multiple methods of course delivery made the university become successful. In the nineties, with advanced computer technology, the Open University began distributing lessons on computer discs, and has developed its own Web-based online courses.

The advance of computer technology opened an excellent manner of course delivery in distance education. Web-based instruction makes it an excellent education format for those distant students. Curriculum, course materials and class handouts can be posted on the Web. Instructors and students at a distance can chat in the chat rooms, discuss with a bulletin board, and complete projects on line. The increasing popularity of electronic mail and the World Wide Web make Web-based instruction even more possible. At present, many courses already exist on the Web. In fact, Walden University, Nova Southeastern University, The Union Institute and the University of Phoenix have entire degrees offered online.

A tool of Web-based instruction

Like Blackboard and Top class, WebCT (Web Course Tool) is one of the common tools for developing Web-based instruction. WebCT 3.0 provides more sophisticated features for teachers to develop on-line courses. It includes three major blocks: Course utilities, course components and course tools. Course utilities in WebCT are automatically encased in every WebCT course, allow teachers to transfer course files to the WecCT server, manage students' information, and control course layout. Course components are optional features that help teachers organize and structure courses, such as syllabus, course content modules, and course home page. Course tools are also optional features in WebCT. They allow teachers to present information, communicate with students, monitor and evaluate students' completion of the course, and assist students to facilitate learning.

With course utilities, teachers can create or modify courses with course setting management utilities, transfer course files with file management utilities, and maintain class roster and student grades with student management utilities. Course setting management includes identifying instructors, selecting language (at version 3.0, English, French, Dutch, Finnish and Spanish are available), creating course home page, designing course menu, setting course appearance. File management allows teachers zip and unzip, upload and download, link and group files for course instructional needs. After the files are uploaded, the files can be edited, copied, moved, renamed, and deleted. The files can also be regrouped and filed in exiting or newly created folders. Student management initiates lets teachers add students, import student data, list a subset of students, add or modify columns, and change settings and course access. It also let teachers tracking students' learning and managing students' presentation.

Course components can include course home page, syllabus, content modules, and resources links. On the course home page, teachers can have a welcome message describing the course and making the course accessible to the public. Within the syllabus, teachers can provide course description, objectives, textbooks, requirements, assignments, instructional outlines, and contact information, etc. Teachers can create or modify syllabus categories according to his or her instructional needs. Course content modules are structures of delivering. Teachers can present instructional materials, handouts, and test items. With content modules, teachers can also post discussion questions, assign learning activities, and organize the delivery of the course contents. External resources can be linked by URL. Teachers can introduce extensive on-line resources and connect them to the course. The external resources will help students enhance their learning.

WebCT 3.0 is equipped with a sophisticate course tool package. Within this package, there are page management tools, course content module related tools, communication tools and evaluation tools. Page management tools include tools for page organization, page creation, and URL links. Course contents related tools are those for course module creation, modification and organization. Communication tools consist of mail, discussion, chat plus whiteboard that allows teachers and students to share a drawing palette during an online discussion. Teachers and students can use whiteboard to insert text and graphics, choose fonts and colors, upload images from local computer and save images for future use. Evaluation tools are used to administer quizzes and surveys. Learning assignments, project presentations and students' grades can be monitored and tracked for evaluation.

Teachers, however, may experience some frustrations as they use WebCT. WebCT is not likely to deal with large group of files, like a set of PowerPoint presentations. Thoughtfully designed as it is, WebCT cannot handle the transfer of a group of files on the server at the same time. It is suggested that teachers have to zip those files first and then uploaded or downloaded zipped files. While linking sites or organizing the course topics, teachers can only deal with one site or one file at a time. When an attached file is transferred, the file can only be in html format, otherwise it won't be retrieved by the browser and opened with a mouse click. The attachment has to be downloaded for reading.

A practice of Web-based instruction

Web-based instruction helps distant students access to the courses they need, provides teachers with the new vehicle of instructional delivering to meet the individual learner's needs, and brings teachers and students, students and students together without time and space limitations. Students can access course materials at their local computers, practice skills according to the guidelines online and complete course assignments and projects collaboratively. The courses "Teaching mathematics in p-5 "and" Integrating technology in education" have been taught through WebCT for three semesters. Teaching mathematics in P-5 is taught with Web-based instruction as a supplementary practice. Integrating technology is delivered mainly through Web-based instruction. The former has the course materials hosted in presenter's personal Web site, and the later hosts the course materials on the WebCT server.

The course "teaching mathematics in P-5" is designed with 4 major components. They are course materials, course discussion, course resources, and course outcomes. The course materials are grouped into ten topics that are delivered together with traditional classroom-based instruction. Course discussions are conducted at Web-CT's discussion board, through e-mail and in chat rooms. Course resources are collected and linked on-line to support the course. Course outcomes include daily learning journals, curriculum-technology alignment projects that are eventually posted on-line and shared publicly.

The course "integrating technology in education" started from web-based discussion and to web-based instruction. It is at present completely delivered on Web. Its delivering modules currently consist of course instruction, practice, discussion, and project-approach online evaluation. With in course instruction, course materials and instructional objectives are delivered. Practice module includes practice guidelines and project examples. Students can follow the guidelines and refer to the examples while completing assigned individual projects. "Classroom" discussions are conducted through electronic mails, at discussion board and in instant message chat rooms. Students Learning outcomes are evaluated through projects completed with specific technological skills. All completed projects are submitted through e-mail and filed in learning portfolios for evaluation. Based on the experience of teaching online courses, the presenters believe that obtaining an effective web-based instruction, a teacher should have his or her instruction be involved in at least four phases: preparing, performing, following-up and evaluating (Hackbarth, 1998).

At preparing phase, teachers not only need to review course components, examine the facilities and personnel, and practice presentation through web, he or she should also have specific and measurable instructional objectives. The courses delivered on line should have general course objectives, more important is that each course unit or class should have clear and specific instructional objectives which can be assessed with the completion of each lesson. Developing a web-based lesson, the teacher should be fully aware of the difference between web delivery and classroom delivery. Web-based delivery has no face-to-face environment, no on-the-spot explanation, and no students' prompt feedback. Therefore, the instructional objectives for each lesson must be clearly stated before the posting and the delivery of the lesson. An Instructional objective is suggested to include learning goal, learning condition, learning performance and performance criteria. With a specific instructional objective, the learner at the distance can have clear idea what the learning is expected and how learning will be evaluated.

During the performing phase, a teacher need provide orientation of web delivery, elicit students' responses, and facilitate the learning with online delivering strategies. With WebCT, a teacher should realize that it has the features of lesson modules creation, chat room discussion, online test, etc. He or she, however, has to be aware of students' technological knowledge and skills of using computers and the web, their computer and Internet accessibility, and the effectiveness of the course delivery. Orientation will help students get familiar with the delivery tool, assist instructor to know students well, and have both instructor and students get together to make commitment for effective teaching and learning. Communication tools, such as e-mail, discussion board and chat rooms are the strengths of WebCT; however, delivering an effective lesson on the Web, a teacher should be prepared to manage the online instructional "time" and response to students' requests, questions, and/or submissions in a timely manner. A required online chatting and time of posting questions/projects are necessary and a strict deadline for assignment is important. Collaborative learning, sharing and project-oriented problem solving should be strongly encouraged and be highly credited.

Following-up phase plays an important role in Web-based instruction. Lesson modules, assignments, and online time requirement should be an on-going process of refining. For improving students' learning achievement, a teacher should face with the challenge of the rapid development of computer technology, students' increasing needs and bombard online resources. To schedule one or two classroom meetings with students during the period of Web course delivery will be helpful and is necessary. It will help teachers modify the instructional modules, update instructional materials and resources, and facilitate students' learning process.

At evaluating phase, a teacher should understand the purposes of and the means for evaluation in web-based instruction environment. The effectiveness of course delivery and the achievement of students' learning can be the criteria for course evaluation. Teachers have to be aware of the necessity of being prepared for multiple ways of evaluation since students are learning at distant places. The evaluations can be online tests, student activity roll calls, journal posting and sharing, completion of projects, as well as learning portfolios. One of the issues frequently raised about web-based instruction is that how can a teacher know the responses posted or projects submitted through online come from the actual student, not someone else. To pursue a meaningful evaluation on web-based instruction, teachers should realize that online tests are different with tests in the classroom: no on-site supervising. Online quizzes or tests can be used to measure students' learning achievement, however, multiple means of evaluation should be more stressed in web-based instruction.

In conclusion, the answer to the question raised at the beginning of this article-- "what we should know about the web-based instruction" is that he or she should be knowledgeable of this advanced delivery method. He or she must be a life-long learner and be willing to face the challenge of being accountable for student's learning achievement. To obtain an effective web-based instruction, specific and clear instructional objectives are critical keys, strategic instructional time management and flexible collaborative learning environment lay down the foundation, and multiple means of evaluation guarantee the high quality of instruction and successful learning.

References

Elementk. (2000). How to plan, implement, and evaluate a successful online education pilot. Rochester, NY: Elementk. [On-line] www.elementk.com

Dede, C., bowman, J. & Kierstead, F. (1982). Communications technologies and education: The coming teansformation. In Howard F. Didsbury, Jr. (Ed), *Communications and the Future* (pp.181). NY: World Future Society.

Hackbarth, S. (1998). Integrating web-based learning activities into school curriculum. In Catherine Cunningham (Ed). *Perspectives: Instructional technology for teachers* (pp. 141-151). Boulder, CO: Coursewise Publishing, Inc.

Tiene, A. & Ingram, A. (2001). Exploring current issues in educational technology. Boston, MA: McGraw-hill.

Supporting and Evaluating Distance Learning Students' use of an Electronic Discussion Board

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Abstract: This paper deals with the introduction of an electronic discussion board into a paper-based distance learning phase of a post-graduate diploma in Teaching English to Speakers of Other languages (TESOL). It outlines the thinking behind the implementation of learner support through on-line discussion. The students' messages were analysed and a questionnaire used to examine and reflect on their contributions. Findings indicate that positive attitudes do not automatically result in high level of use and that the factors influencing this are varied. It goes on to describe a second, ongoing phase of implementation that is based on the lessons learned.

Introduction

The TESOL Centre has been running distance learning programmes for over 14 years and is experienced in dealing with the support issues that arise from distance learning, paper-based models. These include a sense of isolation from tutors and the institution (Edwards & Hammond, 1998), and problems with self-managed time (Mason, 1998). Other issues are the delays in sending and receiving work and a lack of contact, generally, with peers (McGee & Boyd, 1995). The introduction of online learning environments has had an effect on the distance learning tutor's role. Electronic conferencing provides a new context for learning and interacting, where both tutors and students are creating and shaping the learning environment (Salmon 2000). Computer moderated conferences and web based discussion boards fall into the category of text-based systems (Mason, 1998) that includes electronic mail, computer conferencing, real-time chat, Multi-User Dimensions, fax and many uses of the World Wide Web. *Discus* is a web discussion board software package that can be installed on a Unix, Windows 95/98, or Windows NT web server.

The Study

The Diploma currently has a 40-week paper-based distance learning phase followed by 4 weeks full time direct contact phase at Sheffield Hallam University. The TESOL Diploma students are, typically, experienced native speaker teachers of English, working overseas. Students are asked to submit worksheets by post on a regular basis (as many as 40 items). The subject tutors read these, assess them and give written feedback. This system would appear to be "ripe" for enrichment via ICT.

It was envisaged that the *Discus* discussion board would enable and encourage students to post-up questions/comments on specific modules and talk about specific tasks with other members of the group. A questionnaire was used to identify the students' computer background and canvass them on the tools. This showed all the students to have access to a computer, either at home or at work. While previous experience of ICT, email and the web was high the majority of the group had little experience with other forms of electronic communication. Face-to-face was seen as the most effective form of communication, followed closely by email. Interestingly, in a course that relies heavily on material sent through the post, surface mail was viewed as a relatively less effective method of communication. Electronic conferences and discussion boards were rated least effective.

It was anticipated that the main role of the tutor would be to set the tasks and moderate the responses. The students were given access to the discussion board and asked to use it to read and post up messages concerning the distance learning programme. Tasks were allocated to the students each week and these can be divided into three types: Social, Academic and Technical (Salmon, 2000). These were flexible, allowing tutors to follow students' threads of discussion for proceeding tasks if appropriate but in the main this did not occur.

Findings

Over the 6-week trial period student participation dwindled and there were very few new participants. The majority responded to tasks set in the early weeks where they were asked to comment individually on their work and give an example of their teaching. Responses and comments to each other were minimal, the main contribution being isolated responses to tutor-set tasks. It was found that a good amount of tutor time was spent responding to individual student questions and encouraging interaction.

Efforts by the tutor to raise key points for discussion based on the collated student responses from a previous task met with little or no response. One of the findings of this trial is that if the online tasks are offered as a non-compulsory extra then students tend not to use the online facilities. More active participation may well be evoked through the incentive of assessment.

A second phase of this research has been set up to examine these questions in more detail. A café area is now available for online socialisation to allow students to become familiar with the environment prior to being asked to exchange academic information. The academic tasks are now integral to a specific distance learning module, chosen for the level of student-perceived difficulty. The tasks will run for a specific time in order to focus students' attention and to develop their facility with the course material and the paper-based assessment tasks.

Conclusions

The success of moderation (McGee & Boyd, 1995) is dependent upon a number of factors. In light of this tutor intervention and its effect on the student response needs to be further examined. It is important to clarify what tutors and students are expected to do, and by when, and to be realistic about the amount of time a tutor can give. Students need access to adequate resources and technical competence and the software tools should be robust. The type of task set has a bearing on the perceived relevance and level of difficulty for the student and this can affect the degree of participation and satisfaction.

Tutors need to develop a clear sense of their audience and the composite needs of the group. There are implications arising from this for the training of online tutors. In particular student reticence in contributing, despite expressing enthusiasm for the tools, must be overcome for effective and integral use to be made within a course. Our research will continue to investigate this area.

References

Edwards, C. & Hammond, M. (1998) Introducing Email into a Distance Learning Course – A Case Study . *Innovations in Education and Training International*.35.4 319-327

Mason, R. (1998) *Globalising Education. Trends and Applications*. London: Routledge

McGee, P. & Boyd, V. (1995) *Computer-Mediated Communication: Facilitating Dialogues*
Available at http://www.coe.uh.edu/insite/elec_pub/html1995/173.htm

Salmon, G. (2000) *E-moderating. The key to teaching and learning online.* London: Kogan Page

Access for All: Developing an Online Course about Online Courses

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Abstract: This paper is a report on the results of an online course that focused on online material development that can be used by a diversity of learners. The main focus of the course was on instructional design of web-based materials. An important element of the course was the use of Universal Design for Learning principles to assist designers in creating a course that can be accessed by learners with special needs. The outcomes of the class included feedback on the usefulness of the course, student projects, and discussion on the use of online discussion forums. Individuals planning on creating web-based materials need to be aware of the Universal Design for Learning research.

Introduction

The Internet is growing in use for educational resources. For many educators, the Internet is a tool to find, research, and discover materials and curriculum that can aid students in learning (Richtie & Hoffman, 2000). However, the Internet can also allow teachers to create materials for their students that are useful for learning. The challenge of using technology in these classrooms often is not access, but rather the teachers' development skills in designing instructionally sound curriculum incorporating technology.

Many teachers in this state's educational system are learning technology tools such as creation of webpages. However, just because teachers know how to create webpages it doesn't mean they understand how to create a page that is instructionally sound and universally accessible. Can all students access our materials? We need to design our courses with the awareness that access and usability are key factors in designing successful online courses. This paper discusses the development and delivery of a course that focuses on online instructional design that provides accessibility. The summer course, Web-based Instructional Design, provided learners with the opportunity to design an online unit and materials based on instructional design and Universal Design for Learning principles.

Project Background

The growth in educational use of the Internet for providing materials to learners has been tremendous (Beer, 2000). For the past year, the authors have discussed the idea of weaving the Universal Design for Learning principles used to provide access to individuals with special needs with the concept of instructional design. It was noted that both concepts were closely related and worked well within the framework of putting materials on the Internet. The thought was that if we could teach educators to understand both of these concepts, more web-based curriculum materials could be created to work with diverse learners.

Universal Design for Learning principles were created as a response to those individuals who have a disability that keeps them from accessing information and materials. Universal Design for Learning means the design of instructional materials and activities that allows the learning goals to be achievable by individuals with wide differences in their abilities to see, hear, speak, move, read, write understand English attend, organize, engage and remember (Orkwis & McLane, 1998). The principles for Universal Design for Learning were initially developed by the Center of Applied Special Technologies (CAST) and continue to be revised by CAST and other professionals in the special education communities.

Instructional design is the process of developing plans for instruction through practical application of theoretical principles (Dick & Carey, 1996). Most traditional models of instructional design can be categorized by five processes: needs analysis, designing the instruction, development of instruction, implementing the instruction, and evaluation of the instruction. Instruction is used to close the gap between what the learner should know or be able to do and what the learner currently knows. If there is a gap between the ideal and reality, we use instructional design to bridge that gap.

The decision to use web-based instruction should never be the first decision to make in putting together materials or a course; however, in education, we often decide to offer an internet course without considering whether the internet is the most effective way to provide the materials or the course. Web-based instruction is a media decision that should be made in the design stage of developing a course or materials for learners. The rationale for providing instruction via the web should be made based on instructionally sound reasons. According to Carlson, Down, Repman, and Clark (1998), some of these reasons include providing more convenient access to education, serving a previously underserved population, developing personal skills and expertise, and maximizing the potential for interactivity and linking.

The concepts of Universal Design for Learning and instructional design provided the framework for the course to offered. The main purpose of the course was exposure to these concepts so that educators would create materials that held relevance and be accessible to all learners while using the Internet resources. Designing materials with a purpose from the beginning may aid in increasing the quality of materials in the Internet.

Implementation of the course

Summer was an ideal time to try experimental courses. The authors put together a course called Web-based Instructional Design. The purpose of the course was to focus on using basic principles of instructional design, so that teachers could create web-based lessons that challenge and expand the horizons of the diverse learners in their classrooms. Web-based lessons could include complete lessons or supplemental materials. This course focused on the creation of curriculum materials that were accessible to all learners and provided adaptations to accommodate students with special needs. Students were introduced to topics such as needs assessment, Universal Design for Learning, and curriculum revision for web environments, diverse learning, assistive technology tools, and alternative assessments. This was a two credit hour graduate course meeting through two face-to-face meetings and online resources.

The goal of the course was to introduce web-based materials as a viable way for educators to assure student access to materials. The instructors put together the learning objectives of the course to organize the content. These learning objectives were based on the idea that the course would be a hands-on learning experience. This was important as each unit of study resulted in a project that required students to personalize their newfound knowledge.

The objectives of the course included fell into two categories: applying the principles of Universal Design for Learning and implementing the components of Web-based instructional design. The Universal Design for Learning principles were discussed in unit two where students examined the principles and discussed how these principles could assist the students in designing curriculum materials. The principles of Universal Design for Learning include: creating materials in digital text format; providing relevant captions for audio, images and graphical layouts and video; and providing cognitive supports and activities through the use of several instructional strategies as appropriate to the projects and needs (Orkwis & McLane, Fall 1998).

The components of web-based instructional design composed the rest of the course content. Students were walked through how to complete a needs assessment. Following the needs assessment, students were introduced to writing goals and objectives for their curriculum materials and how to design their instruction including making media decisions. The class also focused on practices that facilitated online learning. Finally students developed various

digital curriculum materials and then assessed the materials. The class also discussed the importance in these steps to the development of an online course that meets the needs of the learners regardless of their diversity.
Both instructors worked together to design the content of the course with the idea that the technology would be introduced at beginning with a face-to-face meeting. One faculty member concentrated on the units dealing with Universal Design for Learning and assessment. The other units were created by the second faculty member including web-based instructional design, needs assessment, instruction design, and material development. Both instructors were available for student consultations as well as responding to online discussions.

The course had four students who participated through the online format. The course was designed to meet initially face-to-face and than continue throughout the summer as an online entity. It was decided that the class would meet for its final presentation face-to-face. The majority of learning would occur through online course materials and through threaded discussions.

The first meeting was on a Saturday from 9:00 a.m. until 3:30 p.m. and offered students the opportunity to learn the online technology that would be used throughout the course. Students were provided a hard copy of the syllabus, which provided the timeline for the projects within the online structure. Students were also given the opportunity to introduce themselves through an activity. A digital camera was used to document some of the proceedings as well as allowing students to post their picture to the course environment. Students logged into the class for the first time and discovered the many features of the online environment by posting a beginning biography. Following, the online activity, students were presented information about Universal Design for Learning as this was definitely a new topic for them and it allowed the class to immediately make use of the online chat feature.

The reminder of the eight week course was conducted through the online course environment. Students were asked to check the site at least once a week, as the units were a week apart. Discussion was relied upon heavily to clear up any confusion or to extend the topic. The final meeting was again a face-to-face meeting where students presented their projects to the class.

The course was set up so that students would look at various resources on web-based curriculum including information on the Center for Applied Special Technology (C.A.S.T.) website about Universal Design for Learning. Once students reviewed the materials, they were asked to read the summary written by the instructors and then comment on the issues and ideas brought up in the instructors' notes. Discussion was used heavily to clarify concepts and to further the ideas as we explored the area of web-based curriculum together. For each "unit" of content, the students were asked to complete an assignment that was part of the discussion on web-based curriculum. The units of study included: an understanding of web-based instructional design, analyzing learner needs, Universal Design for Learning principles, design and development, implementation options for diverse learners, and evaluation. Students were given learning tasks for each unit as well that focused on completing the project through the processes being taught. These hands-on experiences provided an opportunity to question their current practices. For example, during the unit on needs assessments, students were asked to put together a survey that would indicate the needs of the audience they were designing the web-based materials for. Once they would submit their assignments, both instructors would make comments and provide feedback to the students about their use of the instructional design principles and Universal Design for Learning principles.

Assignments ranged from reading assignments to a final project. Students created web-based materials that met universal and instructional design principles during the course. After most units, students were to respond to a discussion question that expanded their thinking about how the unit materials impacted their design processes. Often this called for reflection while practicing these new skills. Also, students were to complete an assignment for each unit that took them through the instructional design process step by step. Students were required to participate in the course discussions online. They also created a unit of study that was built upon the principles of instructional design and incorporated universal design for learning strategies. Finally students orally presented their project to the entire class showcasing the materials they created as well as sharing the process as it applied to them

Results of the class

The instructors learned many things from producing this course. The results offered several items to be considered the next time the course is offered. Many of the outcomes of the class provided both instructors with tools and processes they could use in future courses and training opportunities. Results were measured by the discussion forum, oral presentation and feedback garnered from the learners.

The final meeting gave all the students an opportunity to share their online curriculum projects. The projects were inspiring. One student was a faculty member who was going to begin an online course in the fall. The class gave her an opportunity to prepare the course using some guidelines and ideas that she would not have encountered otherwise. She ended up focusing her efforts on case studies and discussions. Another student developed a cultural course for English as Second Language (ESL) students and really focused on providing her students an opportunity to interact with students from the American culture. Another student developed mini-workshops for his students' parents on how to use things like digital cameras and developing PowerPoint presentations. A fourth student developed a series of sessions focusing on grief therapy complete with a vast array of Internet resources
Bibliography

Discussions were the lifeline of the course. The course started out with the instructors posting a deep thought question at the end of each module to provide opportunity for student reflection. The students would then take over the discussion forum. The students asked and answered many of the questions that helped to clarify and strengthen the content of the course. They also began to build a community amongst themselves. When one student had a problem or concern, other students would submit suggestions or resources that could be used in relation to the problem. All of the students actively participated in the discussion forum.

As the course took shape, we decided to include student-to-student discussions to increase the richness of the online experience. At the first face-to-face meeting, the class was given some guidelines and expectations of what the discussion should encompass. The guidelines were based on some of the suggestions made by Pratt and Paloff (2000), but other guidelines came about because one of the instructors was experienced in group communication and made suggestions based on that experience. Based on that classroom experience, a discussion grading rubric was developed for use in other courses. Currently, the instructor is conducting more research on the use of the rubric and its implications for online environments.

Students also indicated through an oral interview process that they gained much from the course. Several indicated that they had never before considered the Universal Design for Learning principles and through the class had become more aware of accessibility issues. Students encouraged consideration of offering the course again or even providing aspects of the course in faculty training.

Discussion and Summary

Based on student feedback, the course should be offered again. Students felt it helped them understand that online environments are different from the traditional design of materials for educational purposes and need to be planned carefully. The instructors also would like to offer the course again to improve it based on feedback and additional experiences. For example, more in-depth information about assignments was necessary to provide a guide for our students to develop their projects.

There is a growing need on our campus to help faculty understand the nature of putting their course online. The more one understands the guidelines of instructionally sound design, which includes creating materials for all students, the more effective the creation process of an online course seems to be. Through a campus grant, faculty will be offered the chance to take an in-depth training (online) on how to create a course that provides a sound instructional structure. Again the issues of diversity and access for all learners will be addressed as we further the concept of Universal Design for Learning.

The online course we developed was an interesting mix of web-based design exploring the issues of accessibility. The results indicated that we should plan on offering the course in the future and it may wind up on a degree program as an elective. Because of the course, the authors were granted an opportunity to examine first-hand the process of putting a course online which emphasizes good design and accessibility information. The experience was a positive one.

Literature References

Beer, V. (2000). The web learning fieldbook: Using the World Wide Web to build workplace learning environments. San Francisco: Jossey-Bass.

Carlson, R.D., Downs, E., Repman, J., & Clark, K.F. (1998). So you want to develop web-based instruction: Points to ponder. In SITE 98: Society for Information Technology and Teacher Education International Conference Proceedings 9th conference of the society, Washington, DC, March 10-14. (ERIC Document Reproduction Service No. ED 421 097).

Dick, W., & Carey, L. (1996). The systematic design of instruction. New York: HarperCollins.

Orkwis, R., & McLane, K. (Fall 1998). A curriculum every student can use: Design principles for student access. (ERIC-OSEP Topical Brief). Reston, VA: Special Project Council for Exceptional Children.

Palloff, R., & Pratt, K., (1999). Building Learning Communities in Cyberspace. San Francisco: Jossey-Bass.

Richtie, D., & Hoffman, B. (1996). Rationale for Web Based Instruction. Retrieved April 15, 2000 on the World Wide Web: http://edweb.sdsu.edu/clrit/learningtree/DCD/WWWInstrdesign/Rationale.html.

Romereim-Holmes, L. & Peterson, D. (Spring, 2000). *Web-Based Curriculum: An Instructionally Sound Solution for Universal Design for Learning Issues?* San Diego at the Society for Information Technology and Teacher Education 11th International Conference.

Distance Education: An Ultimate Subject for Teachers and Students

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Abstract: In this paper, we use the term "distance education" to refer to the situation where computer-mediated technology is used as the main delivering media of courses of study, and where the teacher and the student are physically in two different locations. Many research papers discuss the reform of high school education and deal with issues such as the new technology and computer mediated curriculums without discussing the role that distance education may play in this reform. Other papers discuss how to improve teachers' knowledge of certain subject areas and only address distance education as a way to make teachers' professional development more flexible in terms of time and space. This paper takes a different approach in claiming and justifying that taking a course at distance should be part of the high school curriculum, and that students need to experience a form of distance education even if they plan to continue their study at traditional institutions. Moreover, this paper also claims and justifies that distance education is a key factor in teachers' good teaching at traditional schools.

Introduction

Distance learning has been mainly characterized as a popular method for adults who need to "upgrade." Typical advantages listed include the flexibility that learners enjoy in terms of time, place and pace of learning. However, the continuous change in computer-related technology have given distance education more credibility by improving accessibility to courses materials on the Web and by improving the availability of electronic equipment that enables students to participate successfully in completing courses at distance. Also, the vast and continually growing Web and the overwhelming increase in the use of the Internet and technology will have an impact on the traditional methods of teaching and learning. We claim that students, after completing their high school education, will most probably have to experience distance education in their ongoing life, either on their way to get a university degree, or to broaden their experience and to qualify for better jobs. Studies show that personal prior experience and acquired knowledge about a certain discipline makes new advances in that discipline easier to grasp, and helps students overcome potential barriers to coping with such new advances. In this context, it can be demonstrated that students taking distance education courses after having some work experience, especially with technology and computer mediated communication, have a better completion rate than those students who take courses at distance without that experience. Recent research suggests that in the new technology-driven economy, a worker may be expected to change her or his career few times before retiring. A worker may need to learn the skills needed for a new job while s/he is working. Distance education may be the most feasible way for learning the new required skills in that situation. In high schools, students learn basic skills that help them learn, but mainly in a face-to-face environment. We claim, and justify in this paper, that students will very likely need to take courses at distance in later life. Hence, they should be well prepared for it. This paper is designed to explore the need for introducing distance education in high school. It begins with an explanation of our view. Secondly, there is a brief presentation of the associated problems, followed by a description of a modified model for high school students to complete such a course at distance. This model will serve as a transitional form of learning between the common models of face-to-face and the distance education. Thirdly, a description of the content of a course that we recommend for high school students to take at distance. Fourthly, the role of teachers in this transitive model is addressed, as well as what teachers need to know to play a successful role as facilitators in our suggested model. The paper concludes by justifying the need for teachers to learn how to use technology through distance education rather than in a traditional environment.

Distance Education is an Ultimate Subject for Students In Schools

The author teach in a leading institute for distance education and are aware of the difficulties that encounter students when taking distance education courses. We believe that students, in high schools, must be well prepared for dealing with distance education courses. Students of high schools may be classified into the following four categories:

1. Those who will join a traditional university. Traditional universities do not offer all courses needed by their students all year round. At certain times it is very likely that a student will need a courses or more to graduate and such courses are not offered in the semester that student needs them in his / her home university. Hence, the only valid option in front of that student is to take that course(s) via distance education.
2. Those who will work and study at the same time. In such a case, distance education is the ideal route for that group of students. So, it is very likely that this category will go for distance education because such category does not have time to attend a traditional university (e.g. have work schedule conflicts).
3. Those who will enter the work force after completing their high school studies, and will not go directly for continuing their higher education. The following argument will also apply for (a) and (b) above as it applies for most workers who may enter the work force at any point. Suresh Dinakaran (Suresh 2000) states that: "the idea of having a single career in one business or industry is long gone. Several papers and articles suggest that, on average, a worker in the new economy will have perhaps as many as seven careers and many more 'jobs' before retiring". We believe that distance education may be the most viable option for those who need to upgrade either to maintain their competence or to qualify for a better / new job due to its well-known advantages such as flexibility in terms of time and space.
4. Those who will neither continue their higher education nor will work. In case a member of this category decides to change his / her situation and join one of the above categories then the relevant argument will apply.

The above classification claims that students will need to experience distance education at sometime of their ongoing life. Students usually face considerable challenges in their distance education in general and in their first course in specific. The first impression they get from their first course can affect their decision whether to continue with this mode of learning or not. Next, we will briefly list few of the challenges that face students while learning at distance. Such listing will help explaining our suggested transitive model.

Challenges Associated with Distance Learning

Some distance education programs use a variety of "real time" technologies such as teleconferencing and videoconferencing. This requires that students gather in one / few locations to be able to use the voice and video equipment to communicate with the instructor for the conference, or at least, students must be available for the conference at the same time. This means imposing some constraints on students who selected distance education primarily for its flexibility. Statistics show that most students who opts for distance education do so because their circumstances prevent them from being committed to a fixed studying schedule. This implies that a distance education program that depends on teleconferencing, videoconferencing, or other real time media may not bc suitable for them. Also, in a typical distance education program students are spread among different geographical areas with different time zones. This makes using any time-bound technology unsuitable. The distance education program we will focus our discussion on is the one that delivers the course material on the Web, accompanied by printed textbooks. In this program, the material on the Web consists of a study guide that explains and compliments the printed textbooks, and of a set of on line assignments and / or quizzes. Students contact tutors primarily via e-mail and get feedback via e-mail. Students have access to courses' conferences where students can read and reply to each other's posted messages at the time suitable for each student. Next, we will briefly identify the main challenges that a distance education learner usually faces, in a similar program to the one described above, in order to come up with a transitive model.

1. Isolation

Student may get the feeling of being isolated from other students and from the instructor because s/he misses the face-to-face contact with the instructor and with the other students. Some educators suggest to students that a technology such as videoconferencing may help overcoming this feeling. We find that real time technologies are not suitable due to the reasons mentioned earlier. Students already know that the nature of distance education differs from that of the traditional education. We do not have to provide an equivalent substitute for face-to-face communication. However, distance education learners may use computer-mediated technology for contact such as e-mails, chat rooms, computer conferences, and MOOs. It is a matter of practice. When students get used to this technology they will overcome that feeling of isolation. Complaints regarding isolation usually come from students taking their first courses at distance. Such complaints usually disappear after completing a second course at distance. An example from real life that may explain the previous argument is buying over the Internet (e-commerce) versus buying from street malls. Buyers over the Internet cannot touch the product, but they know that they have traded touching the product with the convenience of buying at home. As e-commerce is growing tremendously, distance education is also growing tremendously. Distance education learners have traded the face-to-face contact with the convenience of flexibility in time and place of learning.

2. Planning

Some students lack adequate planning that enables them to complete the course of study in time. When student signs for a course s/he is given few months to complete the course (say six months). The student is asked to submit all course work within the specified period without specifying deadlines within that period (e.g. does not have to submit each assignment on a specific date). This is to accommodate for learners' circumstances such as traveling or peak periods of work. Each course offered at distance is usually accompanied with a suggested study plan as a guide for students but it is not enforced. Students need to learn to determine deadlines for themselves and to meet those deadlines.

3. Motivation to complete the course

Some recent studies mention that distance education courses must provide a sort of motivations or incentives for students to encourage them to complete the course of study.

4. Managing technology

Students who use computer-mediated communication for the first time usually encounter this difficulty in their first course taken at distance. Once they acquire the basic computer skills and trouble shooting they proceed with more confidence.

5. Students' collaboration

It is very difficult in distance education courses to

6. Real time feedback from the instructor

Although there is no casual contact between students and teachers in distance education, but students receive feedback promptly from their instructors. Usually in the same day, or in the following day at the most.

7. Students' support Services

Students taking courses at distance, usually need library services and technical support in downloading the course material from the Web, installing new software, logging in to computer conferences, contributing to chat rooms, ... etc. Due to students' lack of the protocols of using or receiving such services, they think that distance education programs lack adequate students' support. However, in reality, technical staff available, in distance education program, to assist students is usually available for extended hours (could be 24 hours a day) and may have greater experience in computer mediated technology than that of traditional programs. Also, libraries in distance education programs, provide students with comprehensive online resources and journals.

In many cases those resources exceed those provided through traditional programs libraries.

A Suggested Transitive Model

The model we will introduce next takes in consideration the challenges discussed in the previous section. This model will be used to deliver the suggested course in an asynchronous mode with some synchronous features.

Features of the transitive model:

1. A self-paced course that uses a printed textbook that discusses, presents, and explains the course contents. The course has an online component used for sending questions, submitting assignments and quizzes to the teacher, and for receiving marks and feedback from the teacher. This is mainly done by e-mail. The course also has a computer conference where messages and news related to the course are posted. Students also download from the Web a study guide and a suggested study plan. This is the current predominant model used for distance education.

Part of the frustration of students taking online courses at distance is that they expect a virtual environment that substitutes all features of the face-to-face environment. Students expect the excessive use of multimedia to substitute teacher's explanation of the material. They expect videoconferencing to substitute the face-to-face interaction, ... etc. Most distance education programs do not use such real-time technology for the reasons explained earlier. However, it makes much difference to students to try a technology themselves and see that it is inadequate rather than just being told that it is not inadequate.

2. The online component here would consist of real-time video / tele conference at scheduled times between the teacher and students to clarify course assignments and other matters related to the course.

3. The online component may consist of animated-based capabilities.

4. The teacher will suggest a study plan with deadlines for completing units of the course and for submitting the assignments. Those deadlines must be enforced in order that student learn how to manage their studying time.

5. Students must be committed to log in to the course's computer conference at least four times a week and to contribute to the course's bulletin at least twice a week. Also, students must be committed to login to newsgroups and / or public chat rooms and to online journals once a week.

6. Students must be committed to meet a minimum number of sending e-mails per week to the teacher.

The goal of 4, 5 and 6 above is to help students to get used to using conferences, bulletins and e-mail. Such features are optional in real distance education programs. Students joining distance education programs for the first time are usually hesitant in using those feature due to their lack of . However, by making using those feature compulsory in this transitive course, students will consider them routine activities when they join a real distance education program.

A Recommended Course

In this section we recommend the contents of the course that to be taken by students at schools within the transitive model.

1. Enabling Technologies

Students must learn about the technology tools used for delivering a course at distance such as browsers, videoconferencing, teleconferencing, computer conferencing and the Internet. Some distance education programs do not use tools such as videoconferencing, because they are time-bound as we mentioned earlier, and do not use excessive animation, since it requires long time to download. Students must experience those difficulties in order to understand why some programs do not use them.

2. Collaborative Technologies

Chat groups, bulletin boards, groupware, message boards and other interactive technologies help students to interact successfully with other students and not to feel isolated.

3. Operating Systems

Popular operating systems such as Microsoft Windows and Unix should be covered in that course. Students who lack the technical skills to manage their computer environment usually spend part of their valuable study time in solving their problems with technology. This causes those students some frustration in their first course and this feeling may affect their enthusiasm to complete their courses at distance.

4. Basic Computer Skills and Trouble-shooting

Learning computers' troubleshooting saves students valuable time, and gives them self-confidence. It will help students to learn how to identify symptoms of problems, possible causes, and what to do, or whom to contact to solve the problems.

Teachers' Role in the Transitive Model

Teachers in on-line classrooms play the role of facilitators rather than educators. While students have course materials and studying guides to read from, teachers need to have tools to stimulate learning by starting and directing dialog in class conference rooms and related chat boards. Experience has proven that teachers should pose themselves as participants in the classrooms rather than authority. By being mere participants classrooms, teachers give students a better chance to get the perfect understanding of the taught idea.

The most important educational instrument a teacher should add in on-line education is the careful design of study guides. Study guides contain general teacher's comments on a chapters, and discussion questions. Careful design of discussion questions is, in fact, the most crucial in crystallizing the objectives of a chapter. Discussion questions should cover all key ideas in the text in a very logical and guiding manner. For example, a discussion question should be designed to lead to another question, and then to a third and so forth, until the idea is fully absorbed by students. While monitoring student's discussion about those questions, a teacher might choose to revise questions for future use, in addition to directing students to grasp the ideas behind.

Teacher's participation in on-line classrooms is an art by itself. We recommend that teachers make their contribution short, precise and to the point. It is obvious that computer-mediated education relies on reading and writing versus listening and writing in conventional classrooms. Students would need to read a lot while studying the textbook. We find that students eventually imitate teachers in the style of contribution to discussion, which we strive to make it short and meaningful.

Among other factors to train teachers for, is to improve social relationship between students. In the on-line classroom, students need to interact more than they do in traditional classrooms. Teachers should be able to maintain the class as a single unit. Cohesiveness in classrooms can be maintained by involving all students in the discussion. For example, a particular student is requested to respond to a certain posting made by another student. Thus, each student is made to talk to every other student in the classroom. Moreover, teachers should encourage individuals' participation, to get the most of this model.

With an active on-line classroom, there is a new set of student problems that a teacher should be prepared to deal with. Some of these problems do exist in traditional classrooms, but they are more serious in on-line classrooms. Examples of these problems are: a student expressing his frustration in the classroom, a student who wants to impose his own learning model, a student who distracts other students by side issues and quarrels, a disrespectful student, and alike. The most important guideline to deal with student misconduct is to reprimand in private and praise in public. Students are ideally reprimanded via electronic mail, till the problem mandates a face-to-face discussion.

Unlike traditional classrooms, on-line classroom is full with distractions for students. A teacher might find his students busy with unrelated material on the computer, instead of concentrating on the class. Teachers should be able to discover, as early as possible, their students as they drift away and bring them back in a reasonable time. Since we are dealing with a transit model of distance education, class monitoring is easy while the teacher is present in the classroom with students.

While discussing a class subject, students might branch to side issues or develop an incorrect understanding of a subject concept. Discussion in on-line classroom takes the form of a thread of message exchanges. A one opinion usually draws several student responses. Naturally, some responses to an idea contain many branched issues. Subsequent responses might carry discussion away from the idea under focus. Therefore, teachers should be vigilant and follow closely so as to discover how students understand the taught subject. (Beaudin, 1999).

Student evaluation is one of the most critical issues in distance education. A teacher should be able to evaluate student's efforts, and produce accurate grades. By being around during discussions, experience has shown that teachers are very well aware of their students' achievements.

Distance Education: an Ideal Route for Teachers to Learn Technology

Teacher's are in dire need to upgrade their computer skills, since computers are increasingly becoming an all-purpose tool in schools. Students are finding more than word processing and report producing in computers these days. Hence, teachers need to cope with the new computerized classrooms. Moreover, computers continue to develop at a fast rate, so are software teaching aids and tools. There are so many software packages designed for education, and much more is still to come. With the advent of computer technology, more sophisticated software packages are expected to emerge. (Harris,1997).

Teachers should also learn paradigms for on-line education. Learning the paradigms enable teachers to know what is available at their disposal and how to make use of it. The major paradigms currently in use are: computer conferencing, on-line material, homework submission and instant grading, interaction with students, and audio and video clips of lectures. Teaching on-line cannot continue to follow the same old model. Therefore, students should be trained to learn the new way, before being seated behind computers. More importantly, teachers themselves should also to be trained to apply these new methods. (Bourne,1997).

To upgrade teachers skills to the level of computerized schools, training should cover two aspects: teacher's technical and methodical development, and development of teacher's ability to handle students in this new environment. Because of time constraints, most teachers cannot afford to join schools and training programs of their choice. Distance education provides an invaluable opportunity for these teachers to upgrade their knowledge while staying at home and following their own schedules. We recommend that teachers complete upgrading course using distance education for two reasons: a) prepares teachers to teach in the new environment, and b) make teachers appreciate the usefulness of this mode of learning.

There is countless number of other benefits that teachers can gain by seeking opportunities provided by distance education. For example, getting to know new colleagues, subscribing to on-line libraries, being up-to-date with new inventions in own fields, and etc.

Conclusion

Computer-mediated distance education is already in wide use today, and we believe that it will play even a greater role in shaping future education. Current learning model used in high schools follows a totally different philosophy than the one used in distance education. To prepare students for the new model, we presented a transitive course that facilitates smooth transition into distance educational learning model. We suggested suitable subjects that have more than one purpose while transforming students into self-learners. Finally, we define a new role for teachers to play in this new environment.

References

Beaudin, Bart P. (1999). Keeping Online Asynchronous Discussion on Topic. *JALN Volume 3*, Issue 2-November 1999

Bourne, John R (1997). Paradigms for On-Line Learning, *JALN Volume 1*, Issue 2-August 1997

Dinakaran, Suresh *Distance Learning: The New Imperative.* Online resource: http://www.educationtimes.com/distance.htm

Harris, Judi. (1997). Teaching Teachers to Use Telecomputing Tools, *North West Educational Technology Consortium*

Haughey, Margaret & Anderson, Terry (1998). *Networked Learning: The Pedagogy of the Internet.* 1st Edition. McGraw-Hill Ryerson Limited

Simonson, Michael & Smaldino, Sharon & Albright, Michael & Zvacek, Sus(2000*). Teaching and Learning at a Distance: Foundations of Distance Education*. 1st Edition, Printice Hall.

Twigg, Carol (1994). "The Need for a National Learning Infrastructure." Educom Review, September-October 1994.

Managing the Dark Side of Online Courses While Enlightening Your Online Students

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Abstract: For every online distance education program launched, there have been five online distance education programs that have either failed outright, or have been deemed unprofitable, because they were launched without benefit of prior research. This is what we term the "dark side" of online education -- for every success, there are numerous failures that provide important strategic learning lessons as we move towards a more technologically enhanced world of education.

Introduction

Nonprofit associations are considering new ways of using educational technology to provide continuing professional development to their memberships. Most association professionals have reported a desire to increase their use of technology to meet continuing education requirements, as necessary to maintain professional certification, but either cannot find the time or the funds (simultaneously) to make this a reality. The more critical problem is that the majority of associations neither have the staff nor the technological expertise to provide online education themselves. While associations understand that online education offers many opportunities to correct this situation; from a managerial aspect, they are unable to work with the variability and continuous change, and the management of "the unexpected" that is online technology at present. This uncertainty is defined as "the dark side" of online education. Much of the uncertainty originates from the association staff and members': lack of experience with online learning; lack of understanding how to migrate a course from traditional to nontraditional platforms; and, lack of understanding how to facilitate a course in the online environment.

These are critical issues, since they impact the association members' persistence in online education. Without a clear understanding of how to develop, manage, and maintain online courses, many association education programs have either failed outright or have been deemed untenable for long-term investment or development. This study attempts to identify those issues that lead to the "dark side" of online education for associations, and provide guidance for associations implementing online education programs. It is in understanding how to best manage the tool of online learning, and how association professionals can be trained to manage online education that can illuminate the dark side, and provide good learning opportunities for adult learners.

The Study

The research examines how educational programs are developed and staffed, starting with the traditional program, and how that program is selected, developed, and maintained for deployment via nontraditional technology. The research also explores how staffing and administration is impacted across the association, since most of these non-profit groups consist of a small staff team (under 50), who are often responsible for performing multiple professional duties simultaneously. The study also explores how associations evaluate online platforms for deploying their online programs, and most importantly, how the associations prepare both the internal staff and the external adult learner-user for online education. Finally, the research explores the impact of new nontraditional learning on existing traditional learning, the motivations to develop association online education as an option, and how online education fits into the overall business strategy of the association. This study is in progress and expected to continue over the next several years as online learning technology evolves into a viable learning platform.

Findings

At present, the findings are inconclusive, because the research is ongoing. However, a overview of current data on the associations reveals the main issues at the heart of the "dark side" with association online education is a lack of understanding: how online education fits into the current business model; how online education requires different and various budget requirements than other departments within associations; and, how online education requires a heightened support team (both from the technical and the educational teams).

Conclusions

While any conclusion is considered early at this stage of the research, it is hoped that the specific findings from this project result in the development of guidelines and an assessment tool for associations to use in creating viable online education opportunities and options for their members.

References

Cuban, Larry. 1986. Teachers and machines: The classroom use of technology since 1920. New York: Teachers College Press.

Harasim, Linda and others. 1997. Learning networks: A field guide to teaching and learning online. 3rd ed. Cambridge, Mass.: The MIT Press.

Knowles, Malcolm. 1990. The adult learner: A negledted species. 4th ed. Houston: Gulf Publishing Co.

Nadler, Leonard and Zeace Nadler. 1994. Designing training programs: The critical events model. Second ed. Houston, TX: Gulf Publishing Co.

Turoff, Murray. Alternative futures for distance learning: The force and the darkside. April 1997. [http://www.rh.cc.ca.us/projects/flashlight/]. September 1998.

Reflections of K-12 Teachers on Graduate Education via Distance Learning

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Abstract: This presentation will describe a recently NCA approved online delivery of a graduate teacher education that has been developed to accommodate the needs and interests of K-12 teachers in the field. The surveyed needs and technological capabilities of these teachers will be discussed along with the reflections of their experiences with receiving professional information in a distance learning delivery system. Also, the structure and functioning of these courses will be highlighted along with how they are used to foster ideas among K-12 teachers for using this approach in their own classroom settings.

University teacher education programs must realize that technology-based education is here and is rapidly changing each day. Our intent is to relate how we have met the challenges of recent trends in education suggesting that the demand for information technology-based teaching will grow in the next decade and this technology will change teaching and learning profoundly. It is imperative that our teacher education programs incorporate technological strategies currently being endorsed in public and private schools. Our presentation will not only show how we are utilizing educational technologies in innovative ways for teacher excellence and improving the delivery of our teacher education system to a wider professional audience, but more specifically the reflections of K-12 teacher involved in an online graduate program.

As an introduction to the reflections of K-12 teachers in our online graduate program, it is important to relate how this online program emerged as delivery system for our graduate teacher education program. The following scenario is a case in point. The authors had developed a new on-campus course for the Division of Health, Physical Education and Recreation (HPER) at Emporia State University entitled, Analysis of Teaching/Coaching, which it was felt would be an "attractive and beneficial" offering to teachers in the field. A disappointing enrollment and its cancellation thereof prompted the authors to investigate the potential of various educational technologies in order to see if a different packaging of the course would increase its future enrollment and better serve our mission as a teacher training institution. It was evident that an alternative approach had to be developed for this course and others in our graduate teacher education program to survive.

Surveying and marketing strategies became an important component to the feasibility and type of distance learning approaches applied to an alternative course delivery plan. Initially, a hard copy and on-line survey assessing the attitudes and opinions of over 200 teachers throughout the state of Kansas was accomplished on the distance learning potential of our graduate and re-certification courses. These results gave us an idea of the types of courses and approaches that teachers would desire. These results have been subsequently reflected in the course evaluations of 40 online courses encompassing the 1996-2000 academic semesters. More recently, the findings of a comprehensive study of online graduate courses in HPER at Emporia State University, Virginia Polytechnic University, and University of Texas – Permian Basin reinforced the above findings. The following reflections are the combined findings of the above surveys.

Reflections

Flexibility of courses. For the most part, teachers liked the concept of "anytime, anywhere" course offerings and course work fitting into their work/personal schedules. One problematic issue some teachers expressed, was recognizing virtual vs. real time in getting work done. In other words, since I don't have to be somewhere at a certain time; then, I will just do it later.

Time/Travel management. With busy professional schedules, the idea of not having to fit in driving time and away time from families was an attractive option for taking classes.

Development of new technology skills. In order to participate in a distance learning class, various technology skills of word processing, class web site navigation, internet searches, emailing, and forum discussions actually had to be learned. Class evaluations not only showed that improvement in technology skills was a by-product of the online class; but these skills were being used by teachers in other professional endeavors.

Well-structured courses. Because of the nature and necessity of distance courses being displayed ahead of time and assignments clearly spelled out, teachers liked the fact that courses were well-structured, many resources were readily available and accessible online. The downside for some teachers with this format was that unclear, confusing instructions and "glitches" in the technology could restrict access to certain resources for completion of assignments.

All allowed to participate. Two dominate issues arose regarding the use of forum discussions and live chats. As a whole, forum discussions received favorable reactions in that they allowed everyone to express an opinion on a topic, not just dominate class members as in many on-site classes. There were some individuals who did desire to have the face-to-face interactions, which is not available in most distance learning classes.

Diverse student populations. The very nature of a distance class allows teachers from literally all over the nation and world to be in class together. This component was an impressive one for teachers. It allowed them to meet not only new professionals, but to become enlightened concerning teaching experiences and educational issues of other professionals.

Writing skills. Since much of an internet-based class utilizes email, forum discussions and other written activities, teachers expressed improvement in writing skills since many others would be viewing their opinions and their correspondences. Obviously, some students expressed stress and anxiety that their written communications would show a lack of skill and knowledge.

Instructor/student relationships. A critical element cited by many teachers was the availability and camaraderie associated with knowing the instructor. Several suggested having a short video clip of the instructor welcoming the class or a portrait picture on a web site as a way of forming an impression of who am I corresponding with or discussion on the forum. Also, virtual office hours and timely email feedback were items that tended to help "personalize" the course and establish that "a real person" was teaching the course. An increase in the number of students per instructor tended to diminish the personal touch student sensed in taking an online class. Any personal activities which highlight and introduce classmates to each other such as student information web pages and/or icebreakers tend to develop stronger intra-class relationships.

Selected Quotes of K-12 Teachers in Distance Classes

The following are actual quotes from teachers enrolled in the online graduate masters degree program at Emporia State University. These quotes reflect much of what has been described in the above summation.

"Living in a small rural area with limited educational opportunities, Emporia State University has given me an opportunity to pursue my masters degree in HPER. The courses I have taken have proven to be practical, challenging, and beneficial to me as a physical educator."

California teacher

"With teaching, coaching, a husband and two small children, I don't have time to sacrifice a night each week to go to classes. This way, I can work from home when its convenient for me. I feel I am getting a quality education."

Virginia Teacher

"These kinds of courses are wonderful. I live far away from big cities, so I have travel two hours to get a class. I would not have had the opportunity to increase my knowledge in ;my profession without the Emporia State University program."

Argentina, South America teacher

"This program allows me to work towards a masters degree while holding down a full-time job half way across the country from the campus. I was surprised how much I could learn through online courses."

Alaska teacher

"The main problem with online instruction is that I don't receive immediate feedback from the student/professors when we talk about an issue. Sometimes meanings can be misconstrued because it's hard to tell "how" somebody is saying something . . ."

Anonymous

"Less interaction with instructors."

Anonymous

"I feel the quality of VA tech's distance learning program makes it a much stronger program than the traditional college program that I took 8 years ago. I feel that I have learned much more appropriate skills to make me a better distance educator.

Anonymous

Conclusions

Innovative teaching techniques must be developed to keep up with the flux of information. Technology is impacting research, classroom teaching, and distance education in all fields of education. Distance learning delivery systems have become a focus of educational programs, not only at the university level but in the K-12 setting as well. We in higher education need continue to explore various distance learning technologies to better serve our mission of teacher training in the "new" millennium.

From "Inches" to "Miles": Web-Enhanced Instruction Using WebCT (Version 3.1)

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Abstract: This paper is a report based on the design, pilot study and teaching of on-line courses, using the WebCT program as a method of course instruction and delivery. The courses involved in the study were freshmen/sophomore computer literacy courses, one being concepts-based, the other more hands-on type involving computer applications. Based on the differences with respect to requirements of the students, desired learning outcomes and delivery method, the study showed more success in one type of on-line course versus the other. Success was measured by comparison of final grades in the on-line courses with those of face-to-face classes being conducted at the same time. Both on-line courses required an alteration in teaching methods to suit the more technology-based environment.

Introduction

"The demand for educators to respond to the needs of diverse students is no longer an issue for the future" (Armstrong, 2000, Timm, 2000). Changes such as our student population (age, ethnicity, country of origin), instructional methodologies and pedagogy and physical location to name a few are issues that need to be addressed. As educators, it is our job to ensure that learning continues to be a positive experience, irrespective of the changes that are at hand. The role of the teacher is also changing to more of a facilitator rather than instructor. There has been an influx of new technologies available to us as educators to act as tools for enhancing learning, and therefore add more to the changes that are already taking place. "Technological advances have given teachers a number of classroom management and instructional tools" (Jones, 2000). In addressing the issue of technology, a part of the title of the paper comes to mind "..from inches to miles". The whole concept of this statement centers on the fact that in embracing any form of technology in the classroom, there are varying degrees to which one can incorporate it into the learning process. Technology should be viewed as a tool, such as a chalkboard and chalk would be looked at, and definitely not a substitute for a teacher. It introduces new methods of teaching rather than teaching new concepts or ideas. Certainly there is additional knowledge involved with learning a new skill, but the content and context of the material should be the same. Due to the influx of these new technologies, some of us as educators have raised our expectations of students with respect to familiarity with computers. Certainly, most institutions today, are requiring certain competency with respect to technology, of our students, by introducing some form of computer literacy course or test before being able to graduate from our schools. There are a vast number of technology tools available for the educator today. Physical hardware which assists in the classroom could start with a simple computer attached to an overhead projector which would take the place of transparencies and an overhead projector, to a "smart classroom", with sophisticated "smart boards", digital video disk players, overhead projectors etc. Software programs could range form a simple word processor, or e-mail program, to web-based educational tools that let you create distance-learning courses to deliver to your students outside of the traditional classroom. The selection of the integration of technology will depend on various factors unique to each individual as an educator, as well as each institution. There are also certain basic methodologies to follow if you will be integrating the technology for the first time, versus approaching the "miles", where you might have been some-what familiar with certain programs and physical hardware. It will take time, effort and a lot of implementation of plans B and C, when technology might just fail us. The most important thing is that these new technologies should in no way change our overall content and objectives of our courses. The material being taught should remain the same irrespective of our methods. Certain methodologies will inevitably change with respect to how our objectives are achieved. We also have to find some way of measuring our outcomes and comparing this with the traditional way of doing things. A process has to go through a series of refinement. The fact that this does not work the first, second or third time doesn't mean that it might not work the fourth time.

Also, there is always room for improvement, so we should strive to improve the process from time to time. "Distance education is first and foremost a movement that sought not so much to challenge or change the structure of higher learning, but to extend the traditional university and to overcome it's inherent problems of scarcity and exclusivity" (Matthews, 2000). There are currently more options available to the student since the idea of distance learning emerged. "Unless you've been asleep for the past five years or so, you are well aware that more and more colleges and universities are turning to the euphemistically-phrased "distance learning," as a way to increase student enrollment and meet the public's demand for convenient access to higher education" (Goodson, 1997).

Preparation

Before efforts could get underway to start developing a distance-learning course for web delivery, an entire summer was dedicated to training and developing the skills necessary to undertake such a job. Participants had to be dedicated and committed from start to end and were given an incentive of a distance education fellowship grant. There were varying degrees of technology experience of the participants, so all courses were broken into at least two levels, basic and advanced, so that all participants were reached irrespective of their skill level. Topics covered varied from e-mail, file management, web authoring to HTML coding and WebCT. At the end of the summer, participants were expected to follow a time-line for the upcoming semester, to start developing their on-line course(s). A part of the timeline involved actually using the on-line course material as a pilot in the face-to-face traditional classroom environment, so that changes could be made and students could contribute to the future learning process of fellow students.

Pilot Study

The software program used to develop these on-line courses was WebCT. The courses that I chose to develop were both computer literacy courses, one being concepts based, the other more hands-on with respect to the computer. I chose to conduct the pilot study using two face-to-face classes that were the same courses as the ones being developed for on-line delivery as well as a business information course, being taught the very same semester. Both computer literacy courses were weighed one credit hour each, and the business course, three semester credit hours. In all three cases, the students had to be instructed as to how to use the program, before they felt comfortable enough to attempt the exercises that were required of them, using this program. Even though we were using this program in addition to having class meetings, students were required to attend the face-to-face class. Students were rated on the discussions and assignments given in class, and also those conducted in the WebCT program. As far as student's reaction to this technology, certain features were more popular than others, such as being able to constantly view your progress. Some students did not see it necessary to go into the on-line portion of the course after a time, as well as some stayed dedicated to the end. The business class however, continued using the program in the absence of their teacher, who went out on maternity leave for six weeks during the semester. On my return at the end of the six weeks, we continued classes as if I had never been away, since they were able to continue with discussions, assignments and communicated constantly with me via e-mail and the bulletin board feature of the program. At the end of the semester, the expected results based on students' grades were within the same numerical ranges when compared with other past courses, for all three pilot courses. There were also changes that were due to errors in data and also refinement of assignments and methodologies that were implemented, at the end of the pilot study.

On-line Implementation

Students were required to attend a face-to-face orientation where students got a chance to meet faculty, and requirements for these courses were highlighted. The distance education program ensured that all students' hardware and software were compatible with the distance-learning environment by requiring them to do a demo course, before actually starting their courses. Teachers in the distance-learning program could choose a separate text from those being used in the equivalent face-to-face classes. I chose to use the same text in both instances, primarily because of me being very familiar with it having taught the courses on several occasions. Each on-line course was conducted separately, one during the first half semester, the other second half. The concepts course was the first to be implemented, followed by the hands-on course. The first course started off with few incidents such as unavailability of textbooks, students not knowing where to begin or what to expect, not unlike the issues of a face-to-face class. The communication with the students was initiated by the students, as another requirement for them is to e-mail their instructor in order to commence the course. However, if a student was listed as enrolled in the course, but did not initiate communication by the end of the first week, then they were contacted via telephone. The students' login information and password was e-mailed back to them so the course could begin.

The kinds of assignments that were conducted in class were timed on-line quizzes and exams, group discussions, textbook assignments and group projects. There were on-line office hours for the students to interact with the instructor, and the hours included late evening and a weekend day to assist students who could not have been able to participate had it been during the week only or during regular business hours. Within the class, there was a wealth of diversity due to age, physical wellness, country and state of residence, which would not be possible had this been a face-to-face course. Students could continue the process of learning uninterrupted, despite certain challenges that they faced. This served as a learning experience not only for me as an instructor, but also for the other students in the class, who had never had such an exposure to the diversity of their fellow classmates. Collaborative work was encouraged and assigned by the instructor, which led to students studying and collaborating outside the realm of the class. The grading scheme on the other hand was weighed differently from that of a face-to-face course. More emphasis was placed on the individual assignments rather than the on-line quizzes and exams, which were weighed, less than in a face-to-face class. Students that excelled in these classes were the ones who handed in assignments in a timely and consistent manner. The outcome measured by the students' performance when compared with those of the face-to-face classes, did not vary much in terms of numerical grades. I am currently tracking the results of the on-line class outcomes versus the face-to-face classes, and there is not enough data collected for me to report any conclusions in this area based on my experiences.

Conclusion

Based on my experience with developing, piloting and teaching of on-line courses, there are certain issues, which I would like to concur with. The initial process of setting up such a course is tedious and requires constant revision of content for errors or simple alterations. However, the pay back is that if you ever decide to teach it again, you spend much less time in preparation of content and design, not unlike a face-to-face class. Such a class requires changes in the way you are used to doing things in the classroom, as on-line students' needs are not all the same as those of a face-to-face class. A regular face-to-face class cannot be simply "made" into an on-line version, if you have certain desired outcomes. Sometimes our expectations and assumptions of our students' knowledge are totally wrong, and then we become suddenly enlightened by either a test or an in-class discussion. Similarly, with an on-line class, I have been wrong in my assumptions of students' technology experience. The pilot was a good experience for me as I did have students input as to how to better this alternate mode of delivery, which made things easier for their peers who were totally on-line. Start with an "inch", in the classroom with your face-to-face students. The journey to the "mile" will be less tedious as your knowledge gained by the "inch" will be priceless.

References

Armstrong, K. B. & Timm, S. A. (2000). *Business Education Forum: Effective Communication in the Diverse Classroom and Beyond* (pp. 16 – 17). VA: NBEA.

Goodson, C. (1997). *The Journal of Library Services for Distance Education: I Have Seen The Future, And It Is Us.* GA: State University of West Georgia.

Jones, K. A. (2000). *Keying In: Incorporating Technology Into Your Teaching Strategies* (pp. 4). VA: NBEA.

Matthews, D. (1999). *Technological Horizons In Education Journal: The Origins of Distance Education and its use in the United States* (pp. 54 – 67). CA: T.H.E.

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Real Concerns on Distance Education When Distance is a Reality

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Abstract: The study from which this report was derived explored concerns of school change facilitators (superintendents, principals, and technology coordinators) as they implemented new curricular requirements for instructional technology. This present report focused on one strand of concerns: distance education. Six informants expressed hesitation over the impending interactive video labs which were to be installed in their school districts, primarily over bad experiences from previous efforts in distance learning. Each informant expressed hope that the new systems would be useful. There appears to be the need for balance as the positive aspects of distance systems (service, teaching) are implemented against the negative aspects of distance systems (teaching changes, impersonalness).

Introduction

Distance education is a reality, continuing to be a growing factor in education, and has become the de facto focus of instructional design programs at the university level. From courses in audio visuals, to BASIC and Logo programming, to applications work, and now to teaching by means of the World Wide Web, the change in what topics need to be considered in instructional technology have morphed over my professional life, and those changes are recognized in the literature. (Becker, 1998; Cuban, 1986) In their ubiquity, distance systems are simply assumed to be the norm.

This writer has visited with many collegiate education departments, each of which believe that they are the true pioneers in distance technology, when, in fact, they are using one of a handful of commercial products which promise ease of course delivery. Noble (1997) suggests ulterior motives in promulgating distance delivery within universities and schools in their collaborations with private industry, resulting in outside control over academics in exchange for providing capital improvements.

At any rate, a cursory look at professional journals from 1998 forward reveal a preponderance of discussions over every "hot" distance topic. Notwithstanding Noble, energetic research is being conducted over instructional design for websites (Coppola & Thomas, 2000; Firdyiwek, 1999; Huang, 2000; Ingram, 2000; Maddux, 1999; Price, 1999; Smaldino, 1999), evaluation of web courses (Kubala, 1998; Kubala, 2000; Rankin, 2000), and practical and administrative concerns (Cornell, 1999; Eastmond & Lawrence, 1998; Harmon & Jones, 1999; Hawkes & Cambre, 2000; Schifter, 2000; Swartz & Biggs, 1999; Wade, 1999; Wynia, 2000; Zhang, 1999).

This writer's earlier study explored concerns of school change facilitators during the implementation of a comprehensive statewide curriculum which included specifics on technology applications. (Wells, 1999) Concerns articulated by the study's informants included several themes, such as student learning, finances, and power, but concerns over distance education, past and future, appeared to be dominant and strong. This present report centers and expands on the concerns over distance education that these informants expressed.

Context for the Study

This study was conducted with those designated as "change facilitators" in a seven-district technology consortium in rural Texas. Two of the districts declined to participate in this research. These districts were rural, but possessed school leaders who were committed to bring their communities up to date with technology.

In general, each of the five school districts were in Texas counties which have declined in population since 1990. The combined population of these districts is 7,306 (Texas Almanac, 1998). Each district's economy was based on agriculture and varying amounts of mineral wealth, resulting in substantial difference in property values.

Telephone interviews were conducted by this writer with three each of school superintendents, building principals, and district technology coordinators scattered among five of the consortium districts. Pseudonyms are given for each of these participants in this present report. Interview data was analyzed and organized to reflect patterns or "themes" which emerged from the data (Bogdan & Biklen, 1992). Bogdan and Biklen further suggest that this method of sorting piles of coded data allows the researcher to make better sense of the data and communicate the results to others.

The Salt Fork Educational Technology Consortium (the Consortium) is comprised of seven independent school districts, all of which have worked together as a special education cooperative. Six of these districts are members of Educational Service Center (ESC) Region J, while one is actually in the territory of ESC Region K. As also with special education cooperatives, a technology consortium is an "interlocal agreement" by Texas law, and has a management board comprised of district superintendents, one district designated as fiscal agent, and a chair, authorized to speak and act for the group.

The Salt Fork Telephone Company (SFTC), headquartered in Dellwood, Texas, provides telephone service for several counties in Texas. All of the school districts in these counties depend on this provider for telephone service and the possibility of Internet connectivity. In 1995, the SFTC invited school leaders from their service area to a demonstration in Dellwood to demonstrate a variety of new technologies that they were excited to announce, particularly their new capability for two-way interactive video. Because these districts had worked together before, had a common telephone carrier, and had common interests, these school leaders concluded it practical to combine together for technology improvement in their schools.

Prior to the Consortium's establishment, member districts were limited to the computers they had in the classroom. Almost all of their computers were stand-alone units. Each district also had a satellite dish for the state network materials, but were using them poorly and inefficiently.

The Consortium keeps operating funds in a bank account separate from general operating funds, administered by the business manager of the fiscal agent. To date, funding has come from grants, and from moneys generated from the two member districts designated as "property-wealthy" under Chapter 41 of the Texas Education Code. These districts recapture a certain percentage of excess property wealth normally surrendered to the State and assign those funds to the Consortium. These districts have voluntarily chosen to redistribute their funds in this manner.

Because these districts have formed this Consortium, they not only have more technology, but also more capabilities. As a whole, there is improved student performance and better trained teachers, with a rise in school accountability scores. Most importantly, these school leaders function as a group. They actively seek ways to collaborate.

A recent example of this improved outlook on technology concerns teachers' use of the Accelerated Reader (AR) program. Heretofore, it had been difficult to get teachers to travel all the way to Center City for training for AR, but with a high-quality technology center in Dellwood, closer to the other Consortium member schools, there was high and enthusiastic turnout for the training sessions.

Informant Concerns

Because the Consortium is implementing a highly sophisticated distance learning center in each of its member schools, each informant eagerly volunteered concerns over its implementation, use, and outcomes. The very concept of "distance," however, is not simply limited to "distance learning," but also to the significant distances Consortium educators have between their schools and sources of school improvement.

These informants perceived improvement for their school districts by being able to bring a greater variety of activities and services to their districts. Charlie Clark, a superintendent, jumps at the chance to use distance learning in his district. He sees benefits in distance learning to both professional and student progress, as well as it being a cost-cutting measure:

> I think it's going to be extremely beneficial, especially to schools out here, like we are, that, you know, we're an hour and a half away from the Service Center, or from Center City, or Tech, or anywhere like that, and it'll be extremely beneficial to our students. You know we can pick up some college classes. We can get them some dual-credit classes. I've got some people here that want to take some classes and want to work on some graduate work, and so forth, that maybe we can pick up. School board training and in-service training through the Service Center will save us lots of dollars and lots of time, because if we don't have to travel all the way to Center City to get our in-service, and even if it's a half-a-day deal, you spend a whole day by the time you drive over there and drive back.

Tim Booth, another superintendent, agrees with Charlie's concern over literal distance from school to service center. When staff have to do as much travel as do these school leaders, distance becomes a significant factor in what they can accomplish:

> We're so isolated. We're a hundred miles from Center City, which is where our Service Center is. . . Instead of travel time, you know, because any teacher who leaves here loses a full day, even if it's an hour workshop.

Denise Stevens, a teacher/technology coordinator, echoes Tim's concerns. She experiences the pressure of the distance crunch as she budgets her time and resources:

> We live a hundred miles from any kind of technical support, and we pay $100.00 an hour for somebody to come out and fix it, so you think twice before you even ask to have (a computer) looked at. Can I work around this?

Nevertheless, there is a sense of concern registered by each informant over distance learning implementation. There is also a fear of technology supplanting the teacher's role. Craig Henry sees distance learning in his professional future, but also makes this prediction:

> My first instinct is to say that probably distance education is going to have effect particularly on rural America. I'm not real sure I'm ready to buy that yet. It may, but I'm not totally yet sold on distance learning as a tool for replacing the teacher in the classroom. There may come a day that that might be the only way that we can deliver some instruction to our students. If and when that day comes, I think that's going to be a shame, and I think that's going to be a step back in education.

Previous efforts with distance learning were frustrating at some informants' schools. Craig registers his experiences:

> And (distance learning) wasn't that well received, either from the students or the parents. And I know that distance learning will be better than that because you'll have two-way interactive audio and video at all times. But I still have reservations, and I'll have to see it work well to change my mind on it. I probably can't stop it from coming.

Arnold Brady, having been a distance learning facilitator, also remembers problems with this teaching format for students and facilitator alike:

> But it was all these schools, even as far away as Kansas that were viewing this at the same time. And it's hard to get through on the telephone line because you had all these people trying to get through to ask a question.

When asked about the net effects of all this, Arnold explained:

> We had a lot of, I guess you'd say, disillusioned parents and kids because they were expecting to get, you know, they thought, "What a wonderful way to be in touch with computers," and what have you. And, you know, if we did work, we had to bundle that work up, send it to San Antonio. Well, by the time the guy got it graded, and got it back, you know, it might be a week or two. . . . And at the same time, we were under "no pass no play" rules. And you had athletes that, you know, at three-week's reporting period, didn't know if they were passing or not. And then some of them would wind up failing at the end, and they didn't even really know why they were failing. And so, you know, we had a bunch of kids that were, like, ineligible.

Frustrations registered by the adult facilitators were received clearly, but students' responses to the distance experience were even worse. Arnold elaborated in detail about the "legwork" done on-site to facilitate distance learning. As is axiomatic in instructional design, inadequate feedback does not promote learning:

> The kids never really knew for sure if what they were doing was what he wanted or what was acceptable, or till he had a chance to mark it, and write notes on it and what have you. And a lot of times, by the time they did get feedback on it, well, it was too late.

Denise also experienced first-hand the details of distance learning. Concerning the possibilities of interactive video, Denise questions:

> I guess the biggest concern has been teachers who are afraid that they will get dumped on. How many students are you going to expect me to teach for this class that I have the same prep time that I had when I had seven kids?. . .And then all of a sudden, I'm teaching an interactive video classroom where I have kids from Woodlake, and from Dellwood, and from Beaverdam, and from Sawtooth, and all of a sudden, I have fifty kids instead of fifteen. I'm given the same amount of prep time, or maybe I'm given a second hour of prep. I still have the logistics of having to be ready for however many my school district decides to contract for. And, I have to be eminently more prepared that I ever thought about having to be prepared in a normal classroom. Because I can't go on the air and expect to freestyle it, you know?

Denise, a technology coordinator, as well as a classroom teacher, brings distance learning down to earth with her practical concerns. Contrasting with the concerns of teachers over the years, distance learning is bringing in new, heretofore unanticipated concerns and challenges. Denise relates:

> You know when we just had textbooks, the worst problem you had to deal with was with the student who showed up in class without their books, or, you ran out of chalk, and you sent somebody down to the office to get chalk. But when you start using these levels of technology where the bugs are not quite as worked out, then you not only run into, you run into problems using the technology that really can crush your class time and crush your prep time.

Charlie Clark concurs adding:

> It's another one of those things that, a new toy, that's going to be helpful, it's going to be beneficial, but it's going to be another one of those things that we've got to learn to USE too. We don't want just the the stuff put in, we want to be able to use it when we get it. We've got to stay on top of it. . . But if we don't stay on top of it, it won't take long to get behind.

As a superintendent, Charlie knows that he has to get the maximum "bang for the buck" as he works with his school board in defending the cost from distance education.

George Richards is adamant in his dislike for distance learning. Suggesting that distance learning might not be a good way to learn, George augments this with more mundane administrative concerns. Since George perceives the teacher role in a traditional manner, he has concern over classroom discipline in a distance learning format:

> Well, I don't think you're going to have any kind of classroom without discipline in the class. And the only person that can do that is the one that is supposedly in charge, the one that's taking care of grades, etc. So that teacher has almost got to see her classroom.

This writer wonders whether George perceives distance education appropriately when he asserts concerning his evaluation of a distance education class:

> You know you have a facilitator. Your class can be strengthened by an excellent facilitator, but there's not any "school" going on. I guess to use the word "waste" of a certified teacher there. Sometimes, it's going to be an aide, somebody that will take care of the business, take care of mailing it off, getting everything in, and kind of keeping the students halfway quite. But it's not like anything like a good teacher would do, and because of this and because of the distance, it's a very slow pace.

Summary and Conclusions

The notion that technology could bring about needed opportunities and services to remote sites by distance learning has been discussed for some time and is now standard for evaluating a school's technology program (Becker, 1998; Texas Association of School Administrators, 1998). Nevertheless, there appears to be a need for a semblance of balance as the positive elements of distance learning (services, teaching, physical distance needs, etc.) are weighed against the pitfalls (teaching method changes, impersonal relationships) of these new technologies (Berg, Benz, Lasley, & Raisch, 1997; Dillon & Walsh, 1997). The apprehensions of Consortium change facilitators toward the impending interactive video system were quite real. They saw potential for some yet unknown distracting factor causing havoc with the learning process as a result of distance learning. At least one informant voiced active disagreement with distance as a viable means of teaching and learning.

Nevertheless, the Salt Fork administrators know that this is necessary for their students. Charlie Clark sums up the attitude of Salt Fork school leaders when he says:

> Our main goal is to make sure that when our kids leave here, they've got just as good an education as someone coming out of Central City or Riverton or Houston or wherever, and that they can just fall right in there, and get with the program, and they don't feel like they're behind in anything. . . . Let's live out in the country, but let's get out of it at the same time and make sure we're on top of the world, here, and we know what's going on.

References

Becker, H. J. (1998). Running to catch a moving train: Schools and information technologies. *Theory Into Practice, 37*(1), 20-30.

Berg, S., Benz, C. R., Lasley, T. J., & Raisch, C. D. (1998). Exemplary technology use in elementary classrooms. *Journal of Research on Computing in Education, 31*(2), 111-122.

Bogdan, R. C., & Biklen, S. K. (1992). *Qualitative research for education: An introduction to theory and methods* (2nd. ed.). Boston: Allyn & Bacon.

Coppola, J. F., & Thomas, B. A. (2000). Beyond "chalk and talk": A model for e-classroom design. *T. H. E. Journal, 27*(6), 30-36.

Cornell, R. (1999). The onrush of technology in education: The professor's new dilemma. *Educational Technology, 39*(3), 60-64.

Cuban, L. (1986). *Teachers and machines: The classroom use of technology since 1920.* New York: Teachers College Press.

Eastmond, D. V., & Lawrence, B. H. (1998). Instructing faculty to develop and deliver distances courses with computer network technology. *Journal of Educational Technology Systems, 26*(4), 315-324.

Firdyiwek, Y. (1999). Web-based courseware tools: Where is the pedagogy? *Educational Technology, 39*(1), 29-34.

Harmon, S. W., & Jones, M. G. (1999). The five levels of web use in education: Factors to consider in planning

online courses. *Educational Technology, 39*(6), 28-32.
Hawkcs, M., & Cambre, M. (2000). The cost factor: When is interactive distance technology justifiable. *T. H. E. Journal, 28*(1), 26-32.
Huang, H. (2000). Instructional technologies facilitating online courses. *Educational Technology, 40*(4), 41-46.
Ingram, A. L. (2000). The four levels of website development expertise. *Educational Technology, 40*(3), 20-28.
Kubala, T. (1998). Addressing student needs: Teaching on the Internet. *T. H. E. Journal, 25*(8), 71-74.
Kubala, T. (2000). Teaching community college faculty members on the Internet. *Community College Journal of Research and Practice, 24*(5), 331-339.
Maddux, C. D. (1999). A university class in web design for teachers: Content and rationale. Paper presented at the Association for the Advancement of Computing in Education Conference, San Antonio, TX.
Noble, D. F. (1997). Digital diploma mills, part I: The automation of higher education. [online] URL: http://www.communication.uscd.edu/dl/
Price, R. V. (1999). Designing a college web-based course using a modified personalized system of instruction (PSI) model. *TechTrends, 43*(5), 23- 28.
Rankin, W. (2000). A survey of course websites and online syllabi. *Educational Technology, 40*(2), 38-42.
Schifter, C. C. (2000). Faculty motivators and inhibitors for participation in distance education. *Educational Technology, 40*(2), 43-46.
Smaldino, S. (1999). Instructional design for distance education. *TechTrends, 43*(5), 9-13.
Swartz, J. D., & Biggs, B. (1999). Technology, time, and space or what does it mean to be present? A study of the culture of a distance education class. *Journal of Educational Computing Research, 20*(1), 71-85.
Texas Association of School Administrators, (1998). *Texas public school technology survey*. [online] URL: http://www.coe.tamu.edu/~texas/techsurvey.
Wade, W. (1999). What do students know and how do we know that they know it? *T. H. E. Journal, 27*(3), 94-100.
Wells, G. G. (1999). *Leadership concerns about the implementation of the Texas Essential Knowledge and Skills (TEKS) for Technology Applications*. Unpublished doctoral dissertation, Texas Tech University, Lubbock, TX.
Wynia, L. (2000). How do students really feel about interactive television? *TechTrends, 44*(4), 39-41.
Zhang, P. (1999). A case study on technology use in distance learning. *Journal of Research on Computing in Education, 30*(4), 398-419.

Does Distance Education Resolve The Current Problems of Education?

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Abstract: Distance education has come of age. Its foundations have become firmer, its applications have grown in number and variety, and its influence has become more visible and more substantive. Yet, one question is still frequently raised: "Does distance education resolve the current problems of education?" This paper aims at giving some answers to this question by investigating the benefits and challenges of distance education. What follows is a thorough discussion of the question. Finally, suggestions are made for further research in the field of distance education to improve the current educational system.

Introduction

Current trends in education reflect an expansion from on-campus education toward distance education. These trends have been evident in the exponential growth of papers published during the 1990s. As Willis (1998) mentioned, distance education, a section that did not exist prior to 1996, is now one of the largest sections in the Society for Information Technology and Teacher Education (SITE) annual conference. A review of the literature, however, found few studies directly addressing the effect of distance education with considerations of the current problems of education. If we understand which aspects of distance education resolve the current problems and which do not, we could then focus our attention to the unsolved problems in forthcoming research efforts to hasten the pace of improvement. Three main problems of current education discussed in this paper are what we regard as the root of many of the key problems facing education today. They are unequal learning opportunities, the change of demographics, and the lack of individualism.

Current Problems of Education

Unequal Learning Opportunities

People in rural or remote locations, as well as those in economically challenged districts, are often at a disadvantage educationally compared with those in well financed urban areas. Resources may be scarce, and, in the worst cases, there may not be enough teachers to reach the students. For example, a small, rural school may not be able to justify the cost of a teacher to provide advanced physics instruction or teach Japanese to a handful of students. Problems of access may be manifested in other ways as well. For example, learners who are homebound due to illness or physical disability may not be located far from an educational institution, but they are effectively isolated. Adults who wish to pursue education may lack the time needed to pursue current coursework at a local school or college. For them, home study may be the only option. Distance education can overcome many of these problems of access and provide educational opportunities (Newby, *et al.*, 2000).

The Change of Demographics

With the disappearance of jobs the workplace is changing, workers require retraining in new jobs that require new skill sets to help revitalize businesses in a competitive marketplace. This resulted in colleges and universities in the United States being faced with tremendous challenges in the 1990s. During this time the traditional 18-21 years old students, who lived on campus while taking courses full time, shifted to students who lived away from campus, had families and jobs and either commuted to campus or looked for distance education alternatives (Hiltz, 1994). A rapidly growing population with increased workplace changes means the traditional methods of on-campus education may leave out many potential students from gaining a full educational experience.

Lack of Individualism

One aspect of education that must be considered is that all students are DIFFERENT, with different backgrounds, knowledge, interests and learning styles. Each student should be treated individually (Bork, 1997). But current modes of learning of instructor-led lecture and textbook provide little individualization. Every student tends to be provided with the same learning experiences. This cookie-cutter approach to learning works for a few students, but many learn only partially without maximizing their potential.

Benefits and Challenges of Distance Education

In order to clearly present the benefits and challenges of distance education, the benefits are classified into eight categories—access, reach, heterogeneous opinions, flexibility, convenience, comfort of learning, quality of learning, and learner focus. Conversely, the challenges are grouped into five categories—the emphasis on the hype and hoopla of technology, feelings of isolation, cost of equipment and technology, low quality of individualization, and inadequate student support systems.

Benefits of Distance Education

a) *Access*—Distance education addresses the problem of unequal learning opportunities in terms of the educational access. It provides service to students who are geographically isolated or who are otherwise place-bound or time-bound, such as people who have physical disabilities and/or working professionals who seek educational opportunities for reasons of career advancement. Distance learning opens up possibilities for non-traditional students who limited on-campus access due to time or distance issues.

b) ***Reach***—The problem of unequal learning opportunities in terms of insufficient funds or resources to open the wanted course for students in a small or rural school can also be solved by distance education. As the example given above, a small, rural school may not be able to justify the cost of a teacher to provide advanced physics instruction or teach foreign languages to a handful of students. Expanding geographic reach through distance education gives an institution a wider pool of students from which to recruit. This could benefit most resident educational institutions, for some of which, this may be a useful tactic to maintain or expand general student enrollments. For others, distance education may be used to recruit students into specialized courses or programs in which a critical mass cannot be maintained on-campus (Smith, 1998).

c) ***Heterogeneous Opinions***—Because distance education gives an institution an opportunity to recruit a wider pool of students, it is expected that students who come from different populations/areas/countries or from different disciplines could provide more heterogeneous perspectives to the topics or problems discussed in class. According to Whitworth (1999), many students felt that the educational experience was enriched by their collaboration with other students from different locations because they have learned just as much material and actually gained more ideas than they would have in a current class setting by listening to and watching the presentations of other students from so many different backgrounds.

d) ***Flexibility***—Smith (1998) pointed out that for faculty, increased flexibility can allow for meeting classes from a distance while traveling, for lecture opportunities, and for maximizing time efficiency in research. For students especially with part-time or full-time jobs, distance education tactics can enhance student efficiency with time shifting within a semester and load leveling within a curriculum, allowing students to take required courses that may only be offered at a certain time of day or in a certain semester. This flexibility may decrease time to graduation and allow students time for extracurricular activities. In business, with a shrinking workforce and the rapid changes in technology, distance education can be employed as a strategy to overcome the internal "content-expert" shortages.

e) ***Convenience***—With the availability of on-line interaction and content support twenty-four hours a day, convenience is another salient aspect of distance education. In today's busy environment, highly mobile learners are requesting equally mobile and time-flexible delivery. The current emphasis on desktop conferencing and asynchronous learning are responses to this need for convenience, so that the learners may take responsibility for the pace of learning, with freedom to start and stop at any time.

According to Smith (1998), distance education technology can provide more detailed needs assessment and more frequent checks and revisions for instructional designers and/or instructors. For example, course delivery through the Web by using WebCT (*http://www.webct.com)*—full-featured packages for on-line courses, allows the instructor to efficiently track students' progress throughout the course and immediately provides the instructor statistical reports of students' performance. These results can supply the instructor useful information in redesigning his/her instruction. In addition, since much of distance education is documented in e-mails, LISTSERVs and chat rooms, it is more convenient for researchers to study the communication and instructional processes of it.

f) ***Comfort of Learning***—Participating in class online allows students and instructors the ease to participate from a computer lab or the comfort of their own home. This is especially beneficial for learners who have illness or physical disability.

g) ***Quality of Learning***—Distance education could maintain or improve instructional quality by providing variety and depth of course offerings within a curriculum, multi-campus graduate seminars, and seminars with industry and government research sponsors. These courses are particularly important in graduate program and can be achieved by using some common techniques, such as videoconferencing and computer communications, as well as audioconferencing.

Educational outcomes of individual courses could also be improved through distance learning. Distance education techniques can support many educational strategies for individual courses to enhance quality. It can allow team teaching with colleagues from other universities. Benchmarking—a frequent quality improvement strategy in education and business—can be facilitated through distance education. Telecommunications technology can connect students with the real world through speakers, experience, and events. These technologies and the Internet can be used to improve contact and access, as well as reduce travel, thus providing new opportunities for students. Examples include supporting interns and residents in field placements, supporting graduate students in industry research placements, and providing contact for industry researchers on campus (Smith, 1998). In addition, in order to take distance courses, students need to learn the required technology skills that will provide them with the everyday information technology skills they will need in their future study, work and life.

h) ***Learner Focus***—Universities have traditionally been teacher-centered rather than learner-centered, with an emphasis on knowledge dissemination through one-way lectures and "chalk-and-talk" methods. Perhaps because teaching is less readily taken for granted when students are separated overtly by time and/or distance from the instructor, the emphasis in distance education programs has been more on the learner and on learning. Moreover, one of the advantages of classroom teaching has supposedly been the interpersonal contact between teacher and student. This has increasingly been lost, as class sizes have grown rapidly, yet there has been little adaptation to the "distance" this introduces. At least in distance education the distance is overt, perhaps necessitating more comprehensive efforts to compensate for it (Tobin, 1995).

Challenges of Distance Education

a) ***Hype and Hoopla of Technology***—Computer technology has been used in learning environments since the late 1950s, with increasing amounts of money going in this direction. Looking nationally and internationally, it is difficult to see that this usage has improved learning performance for most students (Bork, 1997). According to many practitioners in distance learning, it is very easy to get "caught up" in the new technologies, which results in a class that is driven by the technology itself rather than by the use of technology to enhance learning performance. This might be the reason the performance of learning in some distance learning programs has not been improved as expected when technology has been used as an aid for the instruction. Educators should be careful about the "seductive allure" of gee-whiz technology and not lose sight of designing effective instruction.

   Additionally, teaching instructors and students how to use equipment and software packages can often take too much time away from course content. It is recommended by Whitworth (1999) that this problem be alleviated through separate workshops and help sessions focusing solely on the technology that are supported or sponsored by the college or university.

   The problems of the possibility of a technology failure are seldom mentioned. Experience has shown that the likelihood of such an occurrence diminishes with the quality of the equipment. The problems associated with the system in Whitworth's study (1999) mainly occurred at sites that economized by purchasing less expensive microphones, monitors, and cameras. But even with quality equipment, problems can occur. Therefore, it is essential to have a back-up plan and an alternate lesson that site facilitators can deliver to students.

b) ***The Feelings of Isolation***—In a learning situation in which the instructor is not physically present, it is easy for both the students and the instructor to feel isolated from each other. Many students feel that relying on non-personal interaction as a (sole) source is inefficient when compared to human interaction and results in the feelings of isolation. Many instructors feel that it is hard to orchestrate unity among classmates in different distance learning labs. The following entry from the instructor's journal details her impressions after the first encounter with a real distance learning class: "I felt good about the class, but I felt removed from my students. Unless I call on a specific site there is no feedback or response. I felt so alone and the equipment makes a physical barrier between the students and me in the room. This feeling of isolation continued to be a problem for the instruction throughout the semester" (Whitworth, 1999). Therefore, creating a feeling of community to provide a social contact and increase the interactivity between the instructor and students and among students is one of the most important issues that educators should be aware of while teaching at a distance.

c) ***Cost of Equipment and Technology***—According to a study conducted by the U.S. Department of Education in 1995, among the factors frequently reported as keeping instructions from starting or expanding their distance education courses offerings to a "major extent" were program development costs (43%), limited technological infrastructure (31%), and equipment failures and costs of maintaining equipment (23%). It is true that the economies of scale could be achieved once a certain number of students enrolled have been obtained or classes have been taught repeatedly over an extended period of time so that the high fixed cost of equipment and technology can be shared to hundreds of students or over a number of years. However, the setup cost for the required equipment and technology, such as computers, virtual libraries, central servers and networks, ongoing technical support, program development costs, and marketing, for distance learning classrooms can still be substantial. The funding has to be there!

   In many institutions, there is limited technological infrastructure to support distance education (Lewis, *et al.*, 1997). Communication systems used to support distance education can be unreliable (Hall, 1995) and equipment failures numerous (Matthews, 1999). Maintenance and repair bills for distance labs are high. Without proper maintenance, many equipment problems, such as poor reception, busy phone lines, and broken hardware, can result in downtime and canceled classes.

d) ***Low Quality of Individualization***—Although our students are all very different, almost all the curriculum approaches we have now (books and lectures) treat them alike. Thus, it is not too surprising that existing computer learning material does the same. We need learning that is individualized to the needs of each student. The key to achieving effective learning is to use the interactive capabilities of modern computers (Bork, 1997). Unfortunately, current attempts, such as putting courses on the World Wide Web, differ only slightly from books and have not fulfilled the individualized learning that we need.

e) ***Inadequate Student Support Systems***—McInnis-Rankin and Brindley (1986) described that student support services could include orientation and information, administrations and other registry services, advising and counseling, instructional support, and student advocacy. Distance education institutions, such as the Open University in the United Kingdom, have well-developed student support systems to serve the distance student (Koble and Bunker, 1997). However, distance education for Americans was almost synonymous with new technologies and their applications to learning—using computers, interactive video, and even virtual reality (Paul 1995). Paul also mentioned that when compared to the European counterparts, Americans were less interested in course design or student support, and were somewhat indifferent to the linguistic debates about the relative meanings of open learning and distance education, which received considerable attention at that time in Open Learning, the journal of the Open University in Britain. Paul's criticism can be justified by the research conducted by Koble and Bunker. In their journal—Trends in Research and Practice: An Examination of "The American Journal of Distance Education" 1987 to 1995, Koble and Bunker pointed out that only three out of the 129 major refereed articles in American Journal of Distance Education from 1987 to 1995 belonged to student administration and support issue. The dearth of articles on student administration and support is disappointing. Institutions that are now developing distance education programs and new delivery systems must also begin establishing and standardizing admission procedures and support systems to accommodate distance learners. Just as recent articles in the journal indicate an increasing awareness of the role of the instructor in distance education, we would also hope to see an increase in the number of articles addressing student support issues, such as tutoring, counseling, and advising (Koble and Bunker, 1997).

Discussion

Three important problems of the current education—unequal learning opportunities, the change of demographics, and lack of individualism have been selected for the review in this paper. Distance learning is opening doors for populations previously unreachable by current education, such as place-bound or time-bound learners. With the aid of advanced technology, it is believed that the problem of unequal learning opportunities could be resolved by distance learning in the near future. While conventional universities are geared primarily to serving younger full-time students, an emphasis on lifelong learning suggests an increasing interest in older, part-time learners, the primary target group for most distance-based programs. With its relative flexibility and convenience, distance education meets the needs for the changing demographics and, thus, can accommodate the influx of nontraditional learners, such as working professionals who have family obligations, limited free time, and career/civic responsibilities. However, the third problem of the current education—lack of individualism has not yet been achieved by distance education. Research on how to incorporate the technology to design the seamless instruction that meets the individual student needs and maximizes the potential of each student should be further conducted.

Although many of today's education problems can be overcome by distance education, it also brings up some new problems, such as higher dropout rate. The main reason for higher attrition in distance education might be caused by the inadequate student support services. This concern should be set forth and manifested in the development of a wide variety of student support services in American distance teaching institutions to assist students coping with learning difficulties in distance education. In addition, Tobin (1995) claims that, "Research with students...indicates that their successes is closely tied to the provision of these services." Moore (1996) has suggested that, "There is a direct relationship between the instructional effectiveness of a program and the time and money spent on learner support [italics removed]."

Many distance education practitioners noticed that the frenzy of activity relating to the Internet and teleconferencing technologies has produced pressure to rush into distance education without proper planning, which results in overlooking the real purpose of using technology as an aid to enhance learner performance. Thus, the performance of distant learners is not achieved as expected for some distance learning programs. Hence, rather than being "caught up" by the new the technologies, educators should focus their attention back to where it belongs—careful planning, a focused understanding of course requirements and student needs, and the awareness of the limits of distance education, such as the feelings of isolation, which might cause the problem of lacking of student persistence and lower student performance. After all, technology doesn't teach. People do! Only with proper instructional design—planning, implementing, and evaluating (Newby, *et al.*, 2000), and the wise selection of reliable learning methods and appropriate instructional strategies specifically tailored for distance learning to cope with the challenges of it, distance education can provide a convenient and instructionally sound method of course delivery.

Conclusion

With the help of advanced technology, such as the Internet and World Wide Web, which can do many wonderful things for distant learners, distant education provides us a promising solution to cope with the current educational problems, such as unequal learning opportunities and the changing demographics of learners. However, lack of individualism has not yet been achieved by distance education and the solution to it is waiting for us to further explore. To sum up, teaching from a distance is challenging; an effective distance education program does not happen spontaneously. Distance learning requires hard work and commitment on the part of the instructor and students who are willing to give it a chance and a support system from the institution that sponsors it. With a well-organized planning process, distance education will have its rewards—better access, better quality, more flexibility and convenience, and hopefully in the "not-so-distant" days, better individualized education to maximize student performance!

References

Bork, A. (1997). The future of computers and learning. *T.H.E. Journal*, 24 (11), 69-77.

Koble, M. & Bunker, E. (1997). Trends in research and practice: An examination of "The American Journal of Distance Education" 1987 to 1995. *The American Journal of Distance Education*, 11 (2), 19-38.

Hall, J. (1995). The convergence of means. *Educom Review*, 30 (4), 42-45.

Hiltz, S. (1994). *The virtual classroom: Learning without limits via computer network.* Norwood, NJ: Ablex Pub.Corp.

Lewis, L., Farris, E., & Alexander, D. (1997). Distance education in higher education. Statistical Analysis Report. Postsecondary Education (Report No. NCES-98-062). Westat, Inc., Rockville, MD. (ERIC document No. ED 413 829)

Matthews, D. (1999). The origins of distance education and its use in the United States. *T.H.E. Journal*, 27 (2), 54-67.

McInnis-Rankin, E. & Brindley, J. (1986). In *Distance education in Canada*, ed. I. Mugridge & D. Kaufman, 60-80. London: Croom Helm, Limited.

Moore, M. (1996). Tips for the manager setting up a distance education program. *The American Journal of Distance Education*, 10 (1), 1-5.

Newby, T. J., Stepich, D. A., Lehman, J. D., & Russell, J. D. (2000). *Instructional technology for teaching and learning: Designing instruction, integrating computers, and using media.* Columbus, OH: Merrill, an imprint of Prentice-Hall.

Paul, R. (1995). Virtual realities or fantasies? Technology and the future of distance education. In *Why the information highway?* ed. J. M. Roberts and E. M. Keough, 126-145. Toronto: Trifolum Books.

Smith, T. (1998). Distance education is a strategy: What is the objective? *The American Journal of Distance Education*, 12 (2), 63-72.

Tobin, J. (1995). Evaluation and research frontiers: What do we need to know? In *Why the information highway?* ed. J. M. Roberts and E. M. Keough, 201-225. Toronto: Trifolum Books.

U.S. Department of Education. (1995). Survey on distance education courses offered by higher education institutions. National Center for Education Statistics. Postsecondary Education Quick Information System.

Whitworth, J. (1999). Looking at distance learning through both ends of the camera. *The American Journal of Distance Education*, 13 (2), 64-73.

Willis, J. (1998). Distance education. *SITE, 1998*, Association for the Achievement of Computing in Education, Washington, DC. Available URL: http://www.coe.uh.edu/insite/elec_pub/HTML1998/de_edit.htm

(3)

DIVERSITY AND INTERNATIONAL

Section Editor:
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This year's overriding theme for this section is making connections through technology. Technology is connecting teachers to students from universities to public schools, urban areas to farm settings, and countries to countries. The papers demonstrate how projects come alive through technological communication. The diversity in the projects shows that man's desire to connect to others is a basic need. The papers are divided into two basic groupings: connections made by teachers and students in other lands and connections made within the United States.

The first four papers discuss connections from country to country. The writer Greenlaw of Canada at St. Francis Xavier University initiated a Canadian Chinese connection. Canadian students communicate with Chinese students about their understanding of themes, characters, and beliefs in literature selections. This cultural exchange via the Internet provides a powerful vehicle for ESL students to discuss their ideas and develop their language ability. In another experiment, Nel and Wilkinson of South Africa focus on efforts to assist first year students in a developing community with beginning computer classes. This paper focuses on the desire of a whole community to receive direct benefits of its students learning technology. The purpose of learning technology is to help them keep in touch with the rest of the world. The authors discuss the initial problems that can plague novice computer students worldwide. The next paper by Fred Wilkinson and Annette Wilkinson of South Africa discuss how solar energy can be harnessed to develop farm schools in predominately rural areas of South Africa. The project links rural farm schools to the world. Another paper comes from Norway, where Johannesen and Ogrim from Oslo University tell of six universities partnering to offer to its Norway teachers web-based network courses. This seven-year-old Co-operation Network provides seven courses to eighty students in different part of the country. Through these course offerings, teachers receive diversity through co-operation, course content, and communication methods.

The next set of papers shift to interesting research projects in the United States. Here the papers focus on many connections that are being developed from state to state or culture to culture. For example, Knectht of the University of Toledo reported a four-state connection. He discusses attempts to close the digital divide by using the Worldgate Internet School to Home program. His project involves fourth grade elementary students in a program that provides free access to the Internet for a year. Pearson and Swain demonstrate closing the gap within cultures from the University of Florida. They discuss how the computer can be used to close the gap between socioeconomic groups and how to bring equitable learning conditions between groups. The authors discuss three primary areas that influence the digital divide: the areas of frequency of use, the computer experience of students, and technology training. Another paper by McFrazier and Bailey of Prairie View and Texas A&M University identify conditions and teacher practices that have been proven effective in increasing the academic performance of African American students and students in schools with substantial minority populations. The targeted population for the research was reading and math teachers from schools whose Texas Assessment of Academic Skills performance was reported exemplary, recognized, or acceptable. Then the authors Martin and Litton from Loyola Marymount University pilot a study to explore issues surrounding computer technology and social change from the perspective of diverse learners in a university setting. They wanted to find how female students and members of different ethnic groups view the importance of technology for their families.

Cutri from Brigham Young University discusses initial insights gained from integrating technology into a required multicultural education course. She discusses how to critically analyze on-line material if the Internet is to serve as a teaching tool for diversity. Her assignments help students explore other groups from the perspective of three different areas: media, curriculum and policy. The paper by Izat, Hargrave, Brammer, and Williams from West Texas A&M reported the findings of a study conducted in a graduate multicultural course where students send anonymous comments using a web board format. The researchers felt that the students would be more honest with their thoughts and feelings if their comments were sent on web board than a face to face environment.

Meadows from Eastern Illinois discuss the use of technology in the early childhood environment to support the development of cultural competence. The author used four objectives that directed her in identifying specific examples to aid practitioners in developing media presentations suitable for young children. She feels that using technology in a developmentally appropriate manner to facilitate cultural connections with children is a viable way in which to transform current curricula in order to fully integrate, multicultural concepts and develop an understanding of diversity that can last a child a life time. Also, Beyerbach and Russo from State University of New York at Oswego discuss using technology to support social justice in a preservice elementary program. They link foundations and methods issues in teaching social justice.

Connecting urban to suburban students is another way to close the gap. Garcia and Chen from the University of Houston-downtown discuss an online course that presents a unique opportunity for more comprehensive investigation and understanding of urban culture and schools in training future teachers. The online design was to allow students to experience urban complexities resulting from marital, ecological, economic, political, and religious or socio-cultural factors. Thornthwaite from Lipscomb University discuss a study that documented the experiences of a school-university partnership in Nashville Tennessee. The students come from over 100 countries and speak more than 75 different languages. The goal was to promote community instead of isolation in this country.

Finally, evaluating the different methods of communication is important. Furr and Mcbride from Northwestern University discuss how important it is to create a feedback system that would continue to look at the problems that can plague distance learning. It discusses how to effectively incorporate faculty and student feedback into ongoing formative evaluations of distance learning programs.

These papers tell about the new connections that are being made in the 21st century. Technology within the country or abroad presents an interesting perspective.

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USING TECHNOLOGY TO SUPPORT TEACHING FOR SOCIAL JUSTICE IN A PRESERVICE PROGRAM

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Abstract: This article describes how we have attempted to use technology to support teaching for social justice in an educational foundations and in an elementary methods course in our teacher education program. Programs, class activities, and analysis of student work will be shared and implications for practice derived.

Introduction

It is essential that as educators we continue to improve our abilities to develop multicultural, anti-bias, culturally relevant pedagogical practice. The fact that our region, state and country are becoming more culturally diverse is only one reason for this need. If we are committed as teachers, to all of our children, then it is important for us to use curriculum and teaching strategies that reflect the needs and interests of all children. Given that there is increased funding for the enhancement of Math/Science/Technology funding, are there ways this funding can be used to enhance a pedagogy of teaching for social justice?

Recently, we have had opportunity to explore this question, as co-director and participant on a Goals 2000 Preservice Teacher Technology Infusion Project. This paper describes our attempt to infuse computer technology into an undergraduate foundations and an elementary methods course and related field experiences, to support a "teaching for social justice" pedagogy. We will describe the types of learning experiences we sought to craft for preservice teachers and the children they taught, how specific computer technologies had the potential to enhance these with an aim towards teaching for social justice, and where these experiences held promise and fell short of this aim. Implications for technology infusion to support a social justice agenda will be shared.

Significance

How we use computer technology, what technologies and strategies we choose, and whom we engage with them, shapes our pedagogy as well as students' learning experiences. Foundational issues are inherent in any education course, and we have always sought to link foundations and methods issues in our teaching, with an aim towards social justice. Consistent with the Council of Learned Societies in Education's Standards for Academic and Professional Instruction, "The objective of such study is to sharpen students' abilities to examine, understand, and explain educational proposals, arrangements, and practices and to develop a disciplined sense of policy-oriented educational responsibility." (CLSE, 1997, p8). This work articulates a constructivist, social justice pedagogy, describes how computer technology might support such pedagogy, and critically examines preservice teacher learning in the light of these aims. Where the learning falls short (e.g. students' tendency to see computer technology as a cure and great equalizer while at the same time choosing practices that accentuate inequities), strategies for further struggle will be described.

Defining Teaching for Social Justice

The School of Education in which we teach centers "authentic learning for all students towards the aim of social justice" in our conceptual framework. Faculty members are committed to this vision and continuously work to realize it in course and field experiences. The phrase "teaching for social justice" carries with it several key assumptions. First, that there is such a phenomenon as **social justice** and conversely that social **injustice** exists. A claim that we are teaching for social justice positions us at a point of recognizing sites of social injustice and working through our teaching toward a goal of social justice. Given society's dynamic nature and the obscure manifestations of injustice, the work toward social justice is not easily obtainable nor does it have a fixed end. Thus our goal within the School of Education is not necessarily to reach a state of social justice. Rather it is to develop in our candidates the ability to identify social injustice especially within school settings, and the desire and ability to take actions that will cause change leading toward social justice. When we talk about developing ourselves and our students as socially conscious catalysts for change, we acknowledge that we have a responsibility to play an active role in working toward social justice (DeVries & Zan, 1996; Green, 1971; Tom, 1984).

Second, the nature of injustice in our society results in school age students facing "persistent and profound barriers to educational opportunity" (Darling-Hammond, 1995, p. 465). Social injustice means that children are denied opportunities to learn and grow. When we work toward social justice we acknowledge these barriers and make a commitment to transform the educational fabric toward a more fair and inclusive educational setting. "Without acknowledgment that students experience very different educational realities, policies will continue to be based on the presumption that it is the students, not their schools or classroom circumstances, that are the sources of unequal educational attainment" (Darling-Hammond, 1995, p. 465).

According to Bell (1997) "The goal of social justice education is full and equal participation of all groups in a society that is mutually shaped to meet their needs" (P. 3). Teaching for social justice means that in addition to learning about and using "good teaching strategies," we expect our future teachers to learn to use "good" strategies within a context of working toward social justice. Our commitment to social justice has its roots in the efforts of the founder of Oswego State, Edward Austin Sheldon, who prior to establishing this college created a school for poor children in the city of Oswego in 1849, to "teach them that they may become worthy citizens as well as others" (Sheldon in Barnes, 1911, p. 76). A key goal of this school was the "intellectual and moral education and improvement of such poor and orphan children in this city..." (Sheldon in Barnes, 1911, p. 77).

How is the goal of working toward social justice manifested the School of Education? Not only is social justice an end goal of our efforts but it is also an on-going process. This work shows up in our recruitment of faculty and student, our curricula, and in many of our special programs. Given the pervasiveness of social injustice is within our society and schools, the work toward social justice must be equally pervasive in our programs.

Within our curriculum our work toward social justice spans a number of particular approaches ranging from the use of critical reflection and autobiography (Bell, 1997; Ladson-Billings, 1995; Cochran-Smith & Lytle, 1993; Schon, 1983; Noffke & Stevenson, 1995); the development of cultural diversity awareness through many, many levels of multi-cultural education (Banks & Banks, 1993; Sleeter & Grant, 1999; Darling-Hammond, 1998) and anti-bias teaching (Byrnes & Kiger, 1996; Derman Sparks, 1989); examination of issues of oppression including racism, ableism, sexism, classism, and heterosexism, field experiences in culturally diverse settings (Syracuse City Schools, Onondaga Nation Schools, New York City Schools); and requirements that units and lessons in any field experience setting be reflective of cultural diversity and consistent with a social justice framework. We develop a critical perspective within our students and an ability to take action directed toward social change. In developing an awareness and an ability to work for social justice in our students, our own pedagogy must reflect this process (Adams, 1997). Following the pedagogical frameworks described by Adams (1997), we: "balance the emotional and cognitive components of the learning process; acknowledge and support the personal (the individual student's experience) while illuminating the systemic (the interactions among social groups); attend to social relations within the classroom; use reflection and experience as tools for student-centered learning; and value awareness, personal growth, and change as outcomes of the learning process" (p. 30-43).

In the Elementary Education program, the following are some examples of activities which build upon this process and goal of teaching for social justice: In Edo 301 (Foundations of Education) students develop reaction papers where they examine their personal knowledge and attitudes about oppression (race, gender, [dis] ability, class, and sexuality); they trace the flow of forms of oppression throughout the history of education in this country; and they identify issues of gender, race, disability, class, and sexuality in classroom settings in their field placements. In EED 394-396 (Methods of Instruction and practicum) students infuse their unit plans with evidence of anti-bias teaching strategies; they develop single child-study reports in which they collect evidence of a child's social, cultural, intellectual, and emotional background, and develop an instruction plan which can help the child to flourish; and they critically assess their field placement around issues of social justice. We have attempted to extend these experiences through the use of technology-supported learning experiences as follows.

Using Technology to Support Teaching for Social Justice in the Foundations Course

The strategies used in the foundations course to infuse technology to support social justice pedagogy included the following:

1. E-mail discussions between faculty and students to explore social justice issues raised in class and readings.
2. Listservs on multicultural education, educational standards, and children's literature, which students subscribe to and critique.
3. Web searches for links to social justice sites.
4. Interactive desktop videoconferencing between OSU students and students in JH56 in Manhattan, focused on foundational issues in an urban context.

Supporting Teaching for Social Justice in the Methods Course.

The strategies used in the methods course to use computer technology to support teaching for social justice included the following:

1. Helping students explore equity issues with respect to computer use in schools, and in their own learning. We encourage preservice teachers to examine who took leadership roles in what computer related tasks in their work groups as well as in the elementary classrooms in which they were placed. We examine what factors were related to this (particularly class and gender), and how activities could be structured and designed to include all learners.
2. Choosing technologies that are likely (based on the research) to support the learning of diverse students. For example, research indicates girls prefer to use computers to communicate, or accomplish a task, rather than engage in competitive games. Web sites were selected with an eye towards multicultural opportunities, (e.g. Classroom Connect, Global Schoolhouse).
3. Making Teaching for Social Justice the focus, and using computer technology as a strategy to enhance this aim. For example, learning centers on books of choice dealing with diversity issues (Paley's The Girl with the Brown Crayon, Ladson-Billings' The Dream Keepers, Jones and Newman's Our America, Cora Lee Five's Special Voices, and Victoria Purcell Gates' Other Peoples' Words) incorporate relevant software (KidPix, Inspiration, Hyperstudio) into reader response activities.
4. Students in the course participate in a listserv of class members, where they reflect on course readings and experiences, and link these to their readings. Particular questions are posed to the group to expand their understanding of diversity issues, to challenge injustices or narrow perspectives, and to encourage them to view situations from multiple perspectives.
5. Students conduct a group investigation on a topic relating to teaching for social justice, conducting E.R.I.C. and web searches, and share PowerPoint presentations on their learning journeys.
6. Students construct instruction mini-units on topics such as Civil Rights, Women in History etc. using resources on websites linked to the instructor's website that incorporate anti-bias teaching materials.
7. Students have opportunities to explore multimedia authoring software such as Hyperstudio, Inspiration, and PowerPoint, which draw on multiple modalities and centered on learner- constructed knowledge.
8. Students teach technology infusion lessons in their field placements using such resources as Classroom Connect's Galapagos Quest, which potentially expand students' worlds.
9. Preservice teachers also participate in two-way interactive videoconferencing with a fourth grade, team-taught, elementary inclusion class, observing diverse learners and interacting with them and their teacher.

Conclusions

Technology has the potential to support a teaching through social justice pedagogy by

1. Facilitating communication among course members and with the broader educational community, unbounded by geographical distance.
2. Allowing for a shared practicum experience designed to highlight teaching for social justice pedagogy, where issues can be discussed interactively, in real time, across contexts.
3. Empowering more sophisticated research across diverse sources of knowledge via web search engines that make accessing multiple types of information more easy.
4. Positioning students as constructors of knowledge that allows for multimedia representations of that knowledge enhancing communication and learning.

Some of the perils we have noticed in attempting to use computer technology to support teaching for social justice are:

1. Students can be enamored with the glitz of computer technology into a non-critical stance in which they see technology as the great equalizer, meeting needs of students with all learning styles.
2. Students exposed to websites of low quality may take information shared there as truth.
3. Students focus on how to use the technology, diverting attention from issues of substance, for example struggling with the mechanics of signing on to a listserv or using KidPix as opposed to engaging in dialogue, or representing their understanding of scenes from a literature selection.
4. Without adequate processing, students peeking into culturally diverse classrooms may reinforce stereotypes they hold about particular contexts/groups.

Teaming as foundations and methods instructors has allowed us the opportunity to infuse foundational and methodological issues through both courses, in and effort to realize the vision articulated in our School of Education's conceptual framework. We have increasingly come to realize the importance of developing critical literacy in our students, regardless of the educational context or medium, in helping them become reflective, authentic learners who actively support teaching for social justice pedagogy.

References

Adams, M. (1997). Pedagogical frameworks for social justice education. Pp. 30-43. In M. Adams, L.A. Bell & P. Griffin, Eds. *Teaching for social justice: A sourcebook.* New York: Routledge.

Andersen, M. L. and Hill Collins, P. (1995). *Race, class, and gender: An anthology.* Second Edition. Belmont, CA: Wadsworth.

Andersen, M. L. and Hill Collins, P. (1998). *Race, class, and gender: An anthology.* Third Edition. Belmont, CA: Wadsworth.

Banks, J. A. & McGee Banks, C. A. Eds. (1993). *Multicultural education: Issues and perspectives.* Second Edition. Boston: Allyn and Bacon.

Barnes, M. S. (Ed.). (1911). *Autobiography of Edward Austin Sheldon.* New York: Ives-Butler Company.

Bell, L. A. (1997). *Theoretical foundation for social justice education.* Pp. 3-15. In M. Adams, L.A. Bell & P. Griffin, Eds. *Teaching for social justice: A sourcebook.* New York: Routledge.

Byrnes, D. A. & Kiger, G. (Eds.). 1996). *Common bonds: Anti-bias teaching in a diverse society.* Wheaton, MD: Association for Childhood Education International.

Cochran-Smith, M. & Lytle, S. L. (1993). Inside/Outside: Teacher research and knowledge. New York: Teachers College Press.

Council of Learned Societies in Education (1997). Standards for academic and professional instruction in foundations of education, educational studies, and educational policy studies.

Darling-Hammond, L. (1995). Inequality and access to knowledge. Pp. 465-483. In J. A. Banks & C. A. McGee Banks, Eds. Handbook of research on multicultural education. New York: Macmillan Publishing.

Darling-Hammond, L. (1998, February). Teacher learning that supports student learning. Educational Leadership. 55(5). Pp. 6-11.

Derman-Sparks, L. & the ABC Task Force. (1989). Anti-bias curriculum tools for empowering young children. Washington, DC: National Association for the Education of Young Children.

DeVries, R. & Zan, B. (1996) A constructivist perspective on the role of the sociomoral atmosphere in promoting children's development. Pp. 103-119. In Fosnot, C. T. (Ed.) Constructivism: Theory, perspectives, and practice. New York: Teachers College Press.

Grant, C. A. & Sleeter, C. E. (1998). Turning on learning: Five approaches for multicultural teaching plans for race, class, gender, and disability. Second Edition. Upper Saddle River, NJ: Merrill.

Green, T. F. (1971). The activities of teaching. New York: McGraw-Hill Book Company.

Ladson-Billings, G. (1997) Multicultural teacher education: Research, practice, and policy. Pp. 747-759. In J. A. Banks & C. A. McGee Banks, Eds. Handbook of research on multicultural education. New York: Macmillan Publishing.

Noffke, S. E. & Stevenson, R. B. (Eds.). (1995). Educational action research: Becoming practically critical. New York: Teachers College Press.

Schon, D. A. 1983). The reflective practitioner: How professionals think in action. New York: Basic Books, Inc.

Sleeter, C. E. & Grant C. A. (1999). Making choices for multicultural education. Third Edition. Upper Saddle River, NJ: Merrill/Prentice Hall.

Tom, A. R. (1984). Teaching as a moral craft. New York: Longman.

Integrating Technology into a Teacher Education Diversity Course

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Abstract: This paper presents initial insights gained from integrating technology into a required multicultural education course. Students were required to include sources from the Internet in an assignment where they explored how a cultural group other than their own was represented in the media, curriculum, and policy. The range of Internet sources students found included easy to locate sites such as the state department of education site to highly specialized sites focused on a particular cultural group. Students' ability to critically analyze the on-line content they found greatly varied. Some students merely summarized content. Others students applied terms and concepts from multicultural education to identify the messages conveyed through the sites and the potential impact of these messages on students and teachers. Greater attention must be devoted to teaching students how to critically analyze on-line material if the Internet is to serve as a teaching tool for diversity.

Introduction

The push to integrate technology into curriculum and pedagogy is being felt by all level of educators—in-service teachers, pre-service teachers, and teacher educators. The majority of us are novices in this area, but many undergraduate pre-service teachers, because they are from a more computer savy generation, actually have more experience than many teacher educators. I thus decided that the best way to respond to the challenge to integrate technology into my university course was to learn from my students. By modifying one of my existing assignments in a multicultural education course, my students became my guides into how diverse cultural groups were represented on the Internet.

This paper presents initial insights gained from integrating technology into an assignment where students explore how a cultural group other than their own is represented in the three areas of the media, curriculum, and policy. The assignment is called a "Snapshot of a Prominent Cultural Group". The students are asked to choose a cultural group other than their own and create a snapshot of that cultural group by gathering visual and narrative representations of the group from three categories: (1) media—newspapers, magazines, television, the Internet, etc; (2) curriculum—textbooks, videos, posters, chapter and picture books, school brochures, etc.; (3) policy—classroom, school, district, state, or federal guidelines or mandates related to a particular cultural group. Students were required to use the Internet to locate evidence of how a particular cultural group is represented in the area of policy. However, students also chose to use the Internet as a source for evidence in the areas of the media and curriculum.

To date, four students have included a total of 13 Internet web sites in their snapshots. In the following sections, I will discuss the range of Internet sources students located and students' varying abilities to critically analyze Internet content.

Different Levels of Digging

In preparation for the assignment, I provided students with a list of eight web resources as initial points of exploration and informally described each site. The range of Internet sources students included in their assignments greatly varied. Some students simply went to the web sites that I had provided and did not dig any deeper. Other students initially went to the web sites that I provided, and then made connections to other sites through various links. Other students used their own knowledge of exploring the Internet and found sites pertaining to their cultural group of focus that were totally unrelated to the original eight sites that I provided. The latter group of students found web pages specifically devoted to a certain cultural group for instance Native Americans, African Americans, and Middle Easterners. These sites varied from informational resources about the specific cultural group to highly politicized commentary about the status of the cultural group within the U.S. majority culture.

The majority of my students are white, middle class females. Naturally, their cultural backgrounds serve as a lens through which they viewed the politicized material of some of the web sites they found. Many of the web sites were designed to be viewed primarily by members of the specific cultural group with like-minded political opinions. In other words, the materials were aimed at "insiders" to the cultural group rather than designed for "outsiders". Yet, the amazingly easy access provided by the Internet makes it possible for "outsiders" to view "insider" material. Professors must prepare students for experiences such as these. Otherwise, there is a possibility that students will make rash and unfounded judgements about a cultural group based on information that was not designed to be viewed by "outsiders". The consumption of on-line information about diverse cultural groups is influenced not only by students' cultural backgrounds. Additionally, students' varying abilities to critically analyze on-line information also emerged as a finding from this small study.

Analytically Consuming On-line Information

The students' ability to identify and interpret the various messages conveyed by on-line information about diverse cultural groups was greatly impacted by their ability to critically analyze information. Critically analyzing information in my course is defined as applying terms and concepts from multicultural education and social theory to identify the potential impact on students and teachers that societal messages about diverse cultural groups can have. The purpose of such analysis is for my undergraduate students to better understand the experiences and treatment of diverse cultural groups particularly in U.S. settings. Some students, even though they found quite specialized web pages about their cultural group of interest, merely described the on-line content. Other students applied terms and concepts from multicultural education and social theory to systematically identify the messages they perceived from the on-line content. Through the analytic use of the terms and concepts from multicultural education and social theory, these students were able to place the messages that they perceived into a larger social context. This, in turn, allowed the students to do more than just glean information from an on-line source. One student commented, "It seems that there must be some level of awareness about the Native Americans for their culture to be so widely available on the Internet; however, this doesn't seem to translate into tangible powers afforded to them in society." The same student said, "A majority of the lesson plans that I located on the Internet were based on the "food and holidays" approach to multicultural education." (In our course, the "food and holidays" approach to multicultural education is considered a superficial treatment of multicultural issues.) Another student said, "I found they [the Internet sites] were careful to include minority students in their photos. One picture included three white students, a white teacher, and an African American boy. Another featured an African American teacher working on a computer. As trivial as this mere inclusion may seem, it conveys some strong messages. Pictures like these tell the entire classroom that African American students are an integral part of the classroom."

Students who critically analyzed the on-line information evidenced an emergent understanding of the social and political contexts in which information is both created and interpreted. The ability to identify the social and political contexts of information, particularly about diverse cultural groups, is crucial in the education of multicultural students. Teachers must recognize the impact of social and political factors in both the way that multicultural students are schooled and treated in the U.S.

Conclusion

On-line resources offer a great wealth of opportunity for students to learn about how diverse cultural groups are represented in the areas of the media, curriculum, and policy. However, great attention must be devoted to teaching students how to critically analyze on-line material if the Internet is to serve as a teaching tool for diversity.

Is Anybody Listening? Inherent but Typically Ignored Problems in Distance Learning

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Abstract: Desktop Video Conferencing (DVC) is one of newest evolutions indelivering distance learning courses. This paper reports on findings of an ethnographic study conducted in spring 2000 at a mid-sized university thatunderscored the importance of formalized faculty feedback and formative evaluations in planning, implementing, and assessing distance learning programs. The study examined the experiences and perceptions of 163 participants—faculty, students, and support staff—in five DVC teacher education courses offered to undergraduate and graduate students at eight remote sites.

Introduction

During the last two decades, higher education initiatives for distance learning have been accelerating at a rapid pace. Years of research and practice have paved the way for expanding course offerings and, in some cases, degree programs to students at a distance. The dramatic growth can be attributed in part to the collegiate enterprise's ability and desire to modify and broaden its traditional mission to meet the needs of a changing clientele: older students with full-time roles as parents and providers, as adults, and as employees or employers. Colleges are also having to compete with commercial enterprises like Jones International University, which offers its courses entirely over the Internet and became in March 1999 the first such for-profit institution accredited by a regional body, the North Central Association of Colleges and Schools. The Council for Higher Education Accreditation (June 1999) reported an expected 180% increase nationally in distance education students by 2002 with more than two million students as compared to 710,000 in 1998. That figure was matched locally at the researchers' institution, where student enrollment in distance education increased 195% between fall 1998 and spring 2000.

Yet, despite Herculean efforts to implement distance learning courses and entire programs to meet burgeoning enrollments, two vital components to ensure long-term success largely have been ignored by traditional higher education institutions: formalized faculty feedback and ongoing, local, formative evaluations. The intent of this paper is not to enter the "No Significant Difference" debate over traditional classroom versus distance learning. Instead, the focus is to reassert a seemingly ignored obvious: Those who teach using technologies of the trade discover and identify the problems related to teaching students at a distance. They, and not technologists, are in a better position to observe and evaluate the process. A program's success or failure depends in large measure on their experiences while interacting with students, the content, and the technology.

Many distance education programs evolve hastily to meet an observed need or simply to compete with other institutions in a state or service area. What can result is an organizational structure designed to disseminate information, enroll students, and proctor classes but not designed to provide an ongoing, comprehensive support system for faculty teaching at a distance. Worse yet, seldom are formalized systems in place for faculty to report and obtain immediate, corrective action on problems that occur while teaching at a distance. At the semester's end, valuable information for improving the next round of teaching is lost because no after-action reports are compiled, complete with lessons learned and solutions taken or recommended. Why? Is it that many higher education administrations consider distance learning important, but not a priority or simply that too many do not understand the complexity of teaching at a distance and the need for unique instructional design and specially trained faculty?

The Study

In this ethnographic study, designed to examine and describe incidental learning activities, the researchers employed grounded theory to study the experiences and perceptions of 163 participants—faculty, students, and support staff—in five desktop video conferencing courses offered spring 2000 by a mid-sized university in the rural South. Undergraduate and graduate students at eight rural sites were enrolled in teacher education courses delivered via a synchronous audio and video delivery service. Data were triangulated from field observations, interviews, surveys, participants' journals, and course documents. Simple quantitative measures of participant satisfaction and content analysis of journals and course documents also were used.

Because the researcher is the primary instrument in qualitative research, it is highly personal in nature and dependent upon the skill, competence, and rigor of the researcher for its validity and data reliability (Patton, 1990; Wolcott, 1997). Bogdan and Biklen (1998) said that some characterize qualitative research as "a dialogue or interplay between researchers and their subjects" (p. 7). Bogdan and Biklen said that researchers must become critical thinkers about what they have observed, not mere recording machines (p. 161). As they stated, "The worth of a study is the degree to which it generates theory, description, or understanding" (p. 34). Patton (1990) found that the qualitative-naturalistic-formative approach is especially appropriate for developing, innovative, or changing programs where the focus is on exploring a variety of effects on participants.

Two types of evaluation are typical: formative and summative. According to Bogdan and Biklen (1998), formative evaluation is meant to "improve an ongoing program through continuous reporting of the evaluator's findings" (p. 218). Information is shared quickly, informally, and congenially. Summative evaluations, the most common type, are more formal with feedback rarely given during the course of the research. Instead, final reports are issued to a program official. "These reports are used to make decisions concerning reorganization of the program and allocation of resources" (p. 218). Regardless of the evaluation purpose, feedback on the participants' multiple realities they experienced in a particular setting is an essential methodological concern. With its focus on "participant perspectives," qualitative research seeks to study "phenomena or occurrences as seen through the eyes of those experiencing them, rather than through the eyes of outside observers" (Tuckman, 1999, p. 397).

During the 16-week study, the researchers followed a grounded theory approach by spending considerable time collecting data during fieldwork and considerable time later analyzing collected data. More than 800 pages of typed field notes and data were compiled from which to render an accurate and plausible account through thick description of participants' experiences. Data was obtained from observing 35 desktop video conferencing classes; conducting 81 interviews; organizing and studying 35 instructor and 208 student journal entries, 71 e-mail messages, and 2,520 "chat box" entries; and studying official documents related to implementing the desktop video conferencing program. Although the findings of this study can be generalized only within the settings for the particular courses observed, given the cross-section of students and four different education courses observed, administrators and faculty may be able to generalize the findings to other distance learning settings as well.

Findings

Despite a notable level of frustration expressed by faculty, student, and support staff participants with audio and video delays, insufficient technical training, and inadequate administrative support, the majority were forgiving in their assessment of the technology and learning environment provided by desktop video conferencing, acknowledging its newness and future potential. Many students cited the convenience of not having to drive to campus and the opportunity to improve computer skills as the prime motivations for current and future distance learning experiences. However, as one student said: "I believe the glitches in the system will be worked out, but if I took another course like this and had the same experience, it would be my last."

Faculty noted the "hard work" associated with teaching at a distance, compounded by inadequate training, no practice time on the system, technical support not readily available, and no curriculum design support available to assist instructors in converting their classes to a new medium. For instructors delivering real-time interactive courses, "the high potential for confusion, chaos or boredom" accentuates the need for faculty to have a host of well-practiced skills (Kearsley, 1995, p.2). One of the teaching faculty commented:

> The teaching/learning situation is one where focus and concentration for extended periods is required. Add to this the extra focus and intensity required for technology use alone, and the result is fatigue, loss of attention and concentration. This extreme intensity is very underestimated by most technology-oriented people because of their facility in the technology. They seldom deal with a very demanding content-oriented course that also places high demands on learning new technologies.

Additionally, the teaching faculty distinguished between technical training on the system and professional development addressing the pedagogy of teaching at a distance. As one said, "Technologists do not understand teaching and learning. They know one way to do things, and this does not always reflect how teaching and learning take place." One suggested that probably only 5% of the faculty should be designated as distance education faculty. "They are like graduate faculty, and they are special. Not every faculty person is suited to distance education. Poor people can damage the program," the instructor said. In faculty exit interviews, the need for faculty focus groups to share concerns, issues, and teaching strategies and for set procedures for the administration to address faculty concerns was strongly voiced. None of these occurred during the study nor had they since the desktop video conferencing program's inception the previous semester. Moreover, no formalized plans for faculty feedback were in place for future semesters.

As Conley (1993) noted, "problems are our friends" and "natural, expected phenomena. There must be a willingness to confront and resolve problems, rather than to deny, ignore, or repress them" (p. 314). Ehrmann (1999), the director of the Flashlight Program, noted that immediate, local, formative evaluations could help guide administrations in making sound decisions and assessing programs. Indeed, the role of technology, evaluation of process, and support for distance education cannot be understated. Without such local, ongoing evaluations, he noted, institutions cannot know whether good practices are on the increase and problems are on their way to being solved. Chute, Thompson, and Hancock (1999) warned against a one-size-fits-all approach to distance learning because each technology has different characteristics, making it more or less appropriate for a given learning need. For this particular university, the researchers found no documented evidence of plans or procedures for ongoing formative evaluations to assess and improve the program.

Conclusions

If higher education administrators want a smooth transfer to "high tech" from "high touch" (the traditional face-to-face instruction and its traditionally associated "bond" between teachers and students), then distance learning must be more than installing the latest equipment and software and cursory faculty training to meet growing student demands and needs. After all, people are by far the single most important factor in bringing about any kind of change, including the adoption of a distance learning system (Chute et al., 1999, p. 84). Effectively introducing distance learning into any organization requires understanding (1) people's current attitudes and behaviors, (2) desired changes, and (3) the process needed to encourage and support such changes. To be effective, distance education must be viewed as a partnership or an enterprise with many parts working toward a common goal (Schlosser & Anderson, 1994, p. 39), with faculty a key component.

Distance learning is fundamentally an educational issue, not so much a technology issue. Educators must guide and shape the process with support and direction from administrators. Those on the "front line" need instructional design support and they need to learn from those faculty who preceded them.

The purpose of the paper was to enlighten educators who currently provide or plan to offer courses at a distance about probable inherent problems that will arise if institutions do not incorporate faculty feedback into ongoing formative evaluations of distance learning programs. Lateral discussions between faculty and program administrators, shared experiences, and documented "lessons learned" are vital to ensure the success of distance learning initiatives.

References

Bogdan, R.C., & Biklen, S.K. (1998). *Qualitative research for education: An introduction to theory and methods* (3rd ed.). Boston: Allyn and Bacon.

Chute, A.G., Thompson, M.M., & Hancock, B.W. (1999). *The McGraw-Hill handbook of distance learning*. NewYork: McGraw-Hill.

Conley, D.T. (1993). *Roadmap to restructuring*: policies, practices and the emerging vision of schooling. University of Oregon. (ERIC Documentation Service).

Council for Higher Education Accreditation (1999, June). *Distance learning in higher education* [On-line]. Available: http://www.chea.org/Commentary/distance-learning.html

Ehrmann, S. (1999). *Asking the hard questions about technology use and education.* The TLT Group. [On-line]. Available: http://www.tltgroup.org/resources/farticles.html

Kearsley, G. (1995, May). *The nature and value of interaction in distance education.* Paper prepared for the Third Distance Education Research Symposium. [On-line]. Available: http://www.hfni.gsehd.gwu.edu/~etl/interact.html

Patton, M.C. (1990). *Qualitative evaluation and research methods* (2nd ed.). London: Sage.

Schlosser, C.A., & Anderson, M.L. (1994). *Distance education: review of the literature.* Washington, DC: Association for Educational Communications and Technology.

Tuckman, B.W. (1999). *Conducting educational research* (5th ed.). New York: Harcourt Brace.

Wolcott, H.F. (1997). Ethnographic research in education. In R.M. Jaeger (Ed.), *Complementary methods for research in education* (pp. 327-398). Washington, DC: American Educational Research Association.

Integrating Human Impact into a Web-based Multicultural Course for Teacher Education

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Abstract: Social Sciences-Education, SOSE 3306 Culture of the Urban School, is a prerequisite introductory course required of all students in the teacher preparation program at the Department of Urban Education (UE) at University of Houston Downtown (UHD). The course investigates urban culture as the dominant form of community life in contemporary schools. Students explore characteristics, unique properties, and problems of urban schools. The online course presents a unique opportunity for a more comprehensive investigation and understanding of urban culture and urban schools in training future teachers to facilitate the academic achievement of students from diverse racial, cultural, gender, and social-class groups. The purpose of the paper is to share the proposed instructional telecommunication (IT) format that would meet the same standards, prerequisites, and requirements of on-campus sections.

Purpose and Instructional Design

In the Spring 2000, the authors submitted a proposal "Online Course Development for SOSE 3306 Culture of the Urban School" to the CampusNet Instructional Design Collaborative (COW) of the University of Houston System. The proposal was granted and the funding allowed the authors to participate in a two-day workshop on general online course design issues using WebCT.

The primary goals of the online course are to sensitize students to the problems of urban schools, to develop greater self-awareness and increase problem-solving perspectives. The online design will allow students to experience urban complexities resulting from marital, ecological, economic, political, religious or socio-cultural factors. The online format engages students in individual, group, class projects, presentations, discussions or readings on relevant, current and emerging urban issues. Interacting with each other and schools in urban settings, the students will explore the impact of ethnicity and culture and effective teaching strategies in multicultural settings.

In *Distance Education: A Systems View*, Moore and Kearsley (1996) suggest that "because so many skills are needed to design a distance education course, one of the key characteristics of most successful distance education courses is that they are designed by course teams in which many specialists work together" (1996, p. 6). The Garcia-Chen team will heed this recommendation and plan the online course as a team. One author, who has extensive school-related experience and knowledge with multicultural education, will act as the subject matter expert (SME) and pilot user of the initial versions. This faculty member will contact the students taking the traditional version of SOSE 3306 the semester before officially offering online SOSE 3306. During this time, the instructor will gather comments and bring back feedback for course modification. Another author, who is teaching Educational Computing courses for the department, will provide technical support and polish the final product. Both faculty will collaborate on the design and development of the online course and benefit from each other's experience. Once the online SOSE 3306 is developed, the authors will team-teach the course, provide a student orientation where they will meet face-to-face, or in real-time, with students at least once during the semester the course is offered.

The supporters of the constructive approach (Jonassen, Peck, Wilson, 1999) to teaching and learning argue:

> ...technology engages students in meaningful learning, where they are intentionally and actively processing information while pursuing authentic tasks together in order to construct personal and socially shared meaning for the phenomena they are exploring and manipulating. Using technologies to help them articulate and reflect on what they know is the glue that holds personally constructed knowledge together.

Instructional materials, including visual and/or audio materials, will be developed in redesigning the course for web design delivery. It is a University of Houston System decision to deliver web-based course through WebCT. WebCT is a web-based system that combines both one-way and two-way asynchronous and synchronous applications including e-mails, bulletin boards, chat rooms, web pages, calendars, and quizzes/surveys. These activities will be instrumental to students' understanding of the course content. While choosing activities for the online course, the authors reviewed a number of researched designs to support learning communities, both within the classroom and beyond. Harris (1994, 1995) suggested a list of online activities that foster virtual learning communities:

1. Interpersonal exchange, which gives students an opportunity to interact with others from a distance. Examples include keypals, electronic appearances, impersonations, etc.
2. Information collection, which focuses on collaborative, distributed collection, analysis, organization, and presentation of ideas. Examples include information exchange, database collection, electronic publishing, etc.
3. Problem-solving projects, which focuses on individual or group problems. Examples include information searches, social action projects, etc.

The authors will incorporate activities that foster interpersonal exchange, information collection, and problem-solving projects to enhance interactions. It is the intent and hope of the authors that meaningful interaction can be achieved in all categories: learner-content, learner-learner, and learner instructor though careful planning of collaborative course activities.

Course Requirements and Course Units

The proposed course outline is organized into several instructional units. The first unit will be an *Introduction to the Culture of the Urban School.* The students will access the introductory forum on the course bulletin board and become acquainted with key concepts and definitions of Multicultural Education by investigating opposing views of multicultural education and visiting a variety of selected newsgroups and websites. Students are to approach assertions that are made from a skeptic's point of view. They will critically examine the information and compare it to information found in the text used for the course, Banks, J. (2001) Cultural Diversity and Education: Foundations, Curriculum, and Teaching. They are to post to the course bulletin board an evaluation of two of the sites selected.

A second activity will involve students' use of problem-solving skills and multiple perspectives to determine the reasonableness of goals for Multicultural Education (Banks, 2001). Students will submit a proposal for transforming total school environments from centers of stress and anxiety to centers of learning. Students will include an annotated reference list and use the mail function to interact with small groups regarding their proposals. The rationale, goals and need for an understanding of Multicultural Education will be explored. The implications of multicultural training on the human impact that educators have on students, parents, other educators, the community, the classroom, and the world will also be explored.

A second unit will be an *Investigation of Culture and Human Development.* The purpose of the unit is to help students develop greater self-awareness by viewing themselves and their own group(s) from the perspective of other cultures and different mirrors (Takaki, 1993). The activities are intended to lead students to develop a more inclusive multicultural context by exploring the emerging demographic diversity in American culture: Black Voices, Hispanic Voices, Native American Voices, Asian American Voices, and White Ethnic Voices. Sites from the American Civil Liberties Union, The Equity Center, The Freedom Forum, The National Multicultural Institute, and the Smithsonian, as well as others, will be explored. Brief reports will be posted on the bulletin board for ready access to all.

Attitudes and Values Clarification is designed to reduce prejudice, discrimination and conflict so that future teachers are sensitive to problems and conflicts in urban schools. After an initial period of investigation of factual data collection related to racial, ethnic and cultural diversity, the students will investigate their own personal values, beliefs and attitudes. Students will be assigned a number of activities that will heighten their cultural awareness (Noel, J., 2000). The students will share information by identifying a number of positions that can be taken on an issues (e.g., affirmative action, busing to alleviate segregation, interracial dating). A personal perspective will also be attained by student responses to self-awareness surveys. One will be administered at the beginning of the semester and another one will be administered at the end of the semester so that students can ascertain whether their beliefs, values or attitudes have changed during the course of the semester. It is hoped that activities in values clarification will sensitize students to do reflective teaching and to become more aware of the problems of urban schools.

A fourth unit, *Implications for Effective Practice: Teaching and Learning* entails a team project in which students investigate and assess a selected urban school setting. On site visits and data collected from the Academic Excellence Indicator System (AEIS) reports (http://www.tea.state.tx.us/perfreport/aeis/) would be included in the project report. The students would explore a school district's website, and the Texas Education Agency (TEA) school rankings based on student performance. The AEIS reports provide a great deal of performance information about every public school and district in the state. These reports also provide extensive profile information about staff, finances, and programs. Students will determine, as much as possible, indicators of declining academic performance, increases in dropout rates, crime and conflict, or other factors that positively or negatively impact that selected school community. Group discussions through chatboards and online connections would facilitate the group project.

A final unit on *Teaching and Projects* would allow students through a process of inquiry, decision-making, and use of social action skills to suggest curriculum and teaching strategies for a transformative curriculum for empowerment (Banks, 2001) for the selected school setting. The students are required to fully integrate the human impact into this Web-based multi-culture course for teacher education. Additional resources available to the students to complete this final project would include: the reading text, chat board discussions, puzzles and suggestions made on a week-by-week calendar.

In addition to the units of study, the students will be required to complete the assignments and projects that fully integrate the human impact of the course content, discussions, and theoretical frameworks in a Web-based multicultural course for teacher education. A week-by-week calendar will inform the students of the integrated instruction using course texts, links to related sites and Internet activities.

Technical Implementation of Online Resources

The online course will be offered via computer modem, using e-mail, listservs, and the Internet. The course may also be supplemented by videotapes for "homeviewers."

World Wide Web Hyperlinks

The online version of SOSE 3306 Culture of Urban Schools will provide quality World Wide Web Hyperlinks including:

- web pages of research findings published by local researchers in the fields of sociology, anthropology, and education
- major community and historical web sites in the US

- major culture-related web sites hosted in foreign countries
- collections of culturally responsive lesson plan archives
- national cultural awareness events such as Women's Month, Black History Month etc. hosted on the White House homepage

World Wide Web hyperlinks are non-linear and thus flexible in terms of how they can be used. Students can pursue their interests by conducting research on the Internet. The content can be expanded and updated as the core fields change.

Internet Discussion

The electronic mail, chatroom, bulletin board, and listserv functions of the online model provide an environment in which both the diversity of groups and the uniqueness of individuals are recognized and celebrated. Under the instructors' moderation, students can discuss how appropriate instructional methods and resources help students compensate for differences. Students also have an opportunity to explore the implications of recent developments and issues in multicultural education on instruction by engaging in professional conversations with community leaders and experts in the field of multicultural diversity.

Chatrooms allow students to type messages in a virtual room and the message appears on other viewers' screens almost instantaneously. Chatrooms allows for open discussion and instant feedback, which makes it an ideal medium for effective interaction. However, faculty who used the chatroom feature of WebCT have had mixed responses. First of all, it requires an established time for meetings that means that schedule conflicts or equipment malfunction may cause a missed meeting. Another disadvantage is that the answers are instantaneous and may not involve in-depth thought. If the dialog is going on too fast, students can easily lose track and also lose their interest. The authors are taking this input into consideration during the design and development process.

Online Case Studies

The case study approach has been used extensively to conduct research on ethnographic issues and critical pedagogy. The quality and quantity of texts, calendars, timelines, pictures, photos, maps, manuscripts, and case study descriptions that can be scanned and posted onto the on-line version of SOSE 3306 will far surpass what can be done with textbooks, lectures, and hand-outs in the traditional approach.

Other Technologies

Other research also suggest new technologies such as Java/JavaScript, 'half-based software," ActiveX/VBScript, and IRC to make Web pages interactive (Cafolla & Knee, 1999; Box, 1999). Yet, since it may involve more development time, and they may not be fully functional on the WebCT platform, the authors are not currently considering these options.

Summary

The proposed online version of SOSE 3306 Culture of Urban Schools is (1) non-linear and thus flexible in terms of how it can be used, (2) extensive, which means more information can be covered in a typical semester thus allowing instructors and students to select what they want to explore, and (3) expanded and automatically updated through hyperlinks to resources on the Internet that are regularly revised and updated. The authors believe that the course will create a content rich web-delivered course. However, Lai (1997) warns that the web should be more than "an electronic lecture-notes turner" or the self-paced Computer-Assisted Instruction (CAI) of the 70s. We hope that the design of the course can add the interactivity that teachers need in a learning situation.

References

Banks, James A. (2001). *Cultural Diversity and Eduation: Foundations, Curriculum, and Teaching.* Boston: Allyn and Bacon.

Box, Kathrine. (1999). Human Interaction During Teacher Training Courses Delivered Via The Internet. In J. Price, J. W. Willis, & D. Willis (Eds.), (pp. 114-19*). Technology and Teacher Education Manual -- 1999.* Charlottesville, VA: Association for the Advancement of Computing in Education.

Cafolla, R. & Knee, R. (1999). Adding Interactivity to Web Based Distance Learning. In J. Price, J. W. Willis, & D. Willis (Eds.), (pp. 120-25*). Technology and Teacher Education Manual -- 1999.* Charlottesville, VA: Association for the Advancement of Computing in Education.

Harris, J. (1994). *Way of the ferret: Finding educational resources on the Internet.* Eugene, OR: International Society for the Technology in Education.

Harris, J. (1995, February). Organizing and facilitating telecollaborative projects. *The Computing Teacher, 22*(5): 66-9. [Online document: http://www.ed.uiuc.edu/Mining/February95-TCT.html]

Janassen, D. H., Peck, K. L., & Wilson, B. G. (1999). *Learning with technology: A constructivist perspective.* Upper Saddle River, NJ: Merrill.

Lai, K. W. (1997). Some Observations Based on a Web-Based Course about CMS in Education in Collis, B and Knezek, G. (eds) *Teaching and learning in the digital age: Research into practice with telecommunications in educational setting.* Denton, TX: Texas Center for Educational Technology.

Moore, M. & Kearsley, G. (1996). *Distance education: A systems view.* Belmont, CA: Wadsworth.

Noel, Jana. (2000). *Developing Multicultural Educators.* New York: Longman.

Takaki, Ronald. (1993). *A Different Mirror: A History of Multicultural America.* Boston: Little, Brown and Company.

Developing Intercultural Understanding Via the Internet: Canadian Student Teachers and English Students in China Study World Literature Together

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Abstract: In this project English students at a Chinese university and Secondary English Education student teachers at a Canadian University used e-mail to discuss with each other their interpretations of short stories from fifteen different countries. The purpose of this activity was to develop the participants' intercultural understanding and literary critical skills through collaborative responses to world literature. At the same time the Canadian student teachers gained valuable experience at tutoring ESL students. Through the application of postcolonial pedagogical theory, I attempt in this paper to explain what the students have learned from each other.

Introduction: Background to the Project

In 1985, I moved to China for a year to teach English to university students. It was an experience that permanently and profoundly changed the way I viewed my role as an educator and global citizen. Currently, I am an English Education professor in Canada. Some of my student teachers over the past few years have chosen to teach in Asia upon graduating with their Bachelor of Education degrees. When I am asked by aspiring English teachers what it is like to work in China, what are the best books to read and what preparations are necessary in order to cope with the living conditions and culture shock, I have not been able to provide satisfactory answers to these questions. I find conversations about teaching in China to be both exciting and frustrating: exciting because I know that teachers who are going to China will have fascinating experiences, but frustrating because I have not been able to explain to them the significance of my own encounters with Chinese students. Books devoted to preparing Canadians for work in Asia talk about the importance of cultural sensitivity and effective intercultural communication, but they rarely address the significance of how Canada's historic relations with Asian countries may impact upon our lives as teachers in contemporary Asia. Canadian teachers' Eurocentrism is just one aspect of our identities which may undergo a transition as we travel to teach in Asia. When we return home, our transformed identities can cause us to view our roles as educators in Canada with a different awareness. One way to begin to prepare English teachers to work in Asia, and to prepare them to be ESL teachers in Canada, is to introduce them to Asian students via the Internet. During the past decade I have involved Canadian high school students and student teachers in intercultural e-mail exchanges with students in Asia (Greenlaw, 1992, 1997). I have also had the pleasure of taking students on a service learning trip to China, so I realize that cultural exchanges via the Internet are certainly no substitute for actually living and working in countries such as Japan, Korea, and China. Nevertheless, e-mail communication is an important first step in preparing Canadian student teachers to communicate more effectively with Asian students. In the following pages I make use of the postcolonial notion of transnational literacy to describe the kinds of insights that Chinese students of English and Canadian student teachers have gained from each other by sharing their interpretations of short stories from around the world.

In May 1996 and June 2000, as a guest lecturer and researcher in Wuhan City on the Yangtse River in Eastern China, I worked closely with Professor Yuan Xuefen, at the English Department of the South Central University for Ethnic Communities (SCUEC). Most of the students at the SCUEC are members of China's ethnic minorities such as the Tibetans, Hui, Miao, and Tujia. There are approximately one hundred million minority people in China. As Professor Yuan and I considered how we might connect her students in Wuhan with my student teachers in Canada, we decided that a course in short stories from around the world might prove the most effective way to encourage them to share their ideas with each other via e-mail communication about global issues. Thus we decided to provide the students with the opportunity to read together short stories from Trinidad, Japan, Botswana, Brazil, New Zealand, India, Canada, Australia, The USA, Mexico, Ghana, The Philippines, Russia, Singapore, and China. One purpose of this project was to develop the participants' intercultural understanding and literary critical skills through their collaborative responses to the stories. Some of the topics which the students discussed included: Art and Artists, Family Relationships, The Critique of Class, Race Relations, Ethnic Identity, and Social and Cultural Criticism. Another purpose of the project was to provide the Chinese students with an opportunity to develop their writing skills as they composed written responses to world literature with the help of their Canadian partners. At the same time we hoped that the Canadian student teachers would gain useful experience at tutoring ESL students as they guided their Chinese partners through their reading and writing activities.

Transnational Literacy

One of China's leading postcolonial theorists, Wang Ning (1997), believes that there are two views of the West which are held by the Chinese. To some people the West's material civilization and culture are considered superior to Oriental culture, but to other Chinese people the West is perceived as the enemy.

> To these people, the West is in decline, its outward prosperity merely a false mask through which we can see its implied crisis; to them the twenty-first century will surely be the century of China or the Orient, and Oriental culture is superior to Western culture and is bound to dominate the world. In short, the West to these people is nothing but a hell and even an evil spirit. Obviously, the two attitudes show that if we could have dialogue with the West, this kind of dialogue is by no means equal: either Chinese culture dominates or is dominated. Will there be no other way out of these simple modes of thinking characterized by binary opposition? (p. 64)

If both Chinese and Canadian students are to overcome this tendency to see China's relations with the West in the oppositional terms which Wang Ning has identified, then they need to develop a form of literacy that causes them to reflect quite deliberately upon the gradations of difference that exist between Canadian and Chinese perspectives on global issues. Transnational literacy, a term coined by postcolonial theorist Gayatri Spivak (1993), involves the ability both to move beyond simplistic, stereotypical misunderstandings of another person's culture and to begin to view one's own culture through the eyes of that person. Professor Yuan and I observed our students attempts to help each other interpret the short stories by relating the problems of the characters in various countries to similar situations in their own lives and countries. At the same time, my student teachers' experiences as cultural border crossers caused me to consider how potential English teachers can come to know their students not simply as linguistic problems to be solved but as global citizens with complex needs and interests. This project helped them to rethink their own assumptions about global issues with the the help of their Chinese friends.

We organized the students into groups of four so that a pair of Chinese students could work with a pair of Canadian students. According to Marion Crowhurst it is important to use cooperative groups when teaching ESL in heterogeneous and multicultural classrooms. "Classrooms should be organized to facilitate interaction and collaboration in the interests of language learning" (Crowhurst, 1994, p. 279). Thus the two Chinese students in each group shared their ideas with each other before they sent their weekly interpretations of stories to their partners in Canada, and the pair of Canadian students discussed with each other what they should say in reply to the Chinese students. Each week the Chinese students wrote a 300-word essay in response to a story. The stories were grouped according to themes, and the students focussed on each theme for two or three weeks. Professor Yuan and her colleagues in the English Department at SCUEC had warned me that the Chinese students were not interested in conducting detailed literary critical analyses, but that they preferred instead to carry on issues-based discussions. So the questions which my students developed to help initiate discussions were intended to identify themes and issues, and to help the Chinese students to relate the stories to their personal experiences and cultural identities.

The Magic Chalk

The story, "The Magic Chalk," by Japanese writer, Kobo Abe, is a surrealistic tale about an artist named Argon who discovers that the pictures he draws with his magic chalk literally come to life. For example, Argon draws his representation of the perfect woman and calls her Eve. When Eve steps out of the picture and begins to talk, however, it turns out that she is actually Miss Nipon, and that she has strong ideas of her own about her purpose in the world. This Eve has a realistic appreciation of her market value and has no intention of conforming to Argon's fantasies. While the Chinese students were all very perceptive in their interpretations of the relationship between Argon and his artistic creations, they were even more astute in their explanations of the artist's power to change the world. In the following paragraph, we can see how the Chinese students, Shumei and Huifang, have responded personally to a question which my students asked about what kind of world they would create if they possessed Argon's chalk.

> If I had the power of Argon, I would design the world as the following. Firstly, there would be less population in the world, especially in China. Secondly, the world would be just like a carpet of green grass with no pollution and careless littering. In that case, the seas and oceans would be blue, the air would be fresh with fragrance. Lastly, I hope there would be more peace reports and no war abuses at all.

Their Canadian partners, Barb and Melanie, then replied that they particularly enjoyed these ideas of Shumei and Huifang about the world they would design if they had Argon's power. Then they proceeded to point out that Canada, too, has problems such as pollution to confront.

> Pollution is a big problem everywhere these days. Actually, there is a badly polluted area in our hometown of Sydney. Decades of steel making resulted in the pollution of a creek and pond area in which children once played. This area has come to be known as the "Tar Ponds," because the water has turned black, oily and thick.

The theme that the students were considering in this story was the role of art and artists in society, but the students soon moved beyond discussions about the utopian and dystopian imagery in Abe's story and into analyses of the role of artists in their own societies. Kobo Abe's story raises issues about the power of artistic representation. For instance, Huifang and Shumei felt very strongly that while artists and writers cannot directly improve the masses, they can still inspire people to change through various forms of artistic and literary representation.

> Luxun, a famous writer in China, once studied medicine in Japan, because he thought he could make the nation stronger. But later he changed to start a literary career for the minds of the Chinese people were weak at that time. He came back to raise the fighting spirits of the whole nation in the anti-Japanese War.

The postcolonial teaching strategy which was employed in the above exchange involved decentering the classroom. Neither Canadian nor Chinese perspectives dominated the discussion. Instead, a genuine sharing of perspectives helped both sets of students to understand Abe's theme of the role the artist plays in improving society.

The Third Bank of the River

As the students read together the story, "The Third Bank of the River," by Brazil's Joao Guimaraes Rosa, they consider the theme of family relationships. This story is about a father who decides to leave his grown children and wife, and to spend the rest of his life floating in a canoe on the river. The Canadian student teachers, Neil and Wayne, were both committeed to going to China with me for their final practice teaching experience, so they were particularly interested in using their communications with their Chinese partners to learn more about China's cultural context. One of the questions which they asked the Chinese students, therefore, was: " What does the symbol of the canoe mean to you? In what ways does it help you to understand the effect of Father's departure on each of his family members?" In their response, Alice and Helen in China asked a question of their own to Neil and Wayne:

Father was a serious man, and he wouldn't show his affection easily. He just buried it deep in his heart. His sailing, in our opinion, was to fulfill a promise or to chase a dream. There we have a question, "Who is Noah?" It seems to us that Noah and Father have something in common. Can you help us?

In the following answer to Alice and Helen which Neil and Wayne provided, notice how careful they were to choose the right words to communicate what they thought their Chinese partners might want to know about Noah. Notice, as well, that they continued to engage Alice and Helen in a dialogue in order to learn more about Chinese culture.

Noah is one of the best known folk stories in our culture. A long time ago people on the Earth were behaving badly and God was upset with them. He ordered Noah to build an ark, a big boat. God flooded the earth with 40 days and 40 nights of rain. Noah's job was to take two of each animal on the boat to keep each species alive. The flood was like a bath cleaning the filth from the earth. Many cultures have similar stories. Are there any stories that are similar to the tale of Noah in Chinese culture that you are aware of? We would be interested to hear about them.

Another question which the Canadian students raised about the story concerned the problem of homelessness. They explained that there are millions of people around the world who, like Father in this story, end up living alone at the margins of society. In Brazil, for instance, where the story takes place, millions of children live unprotected on the streets of the major cities. They pointed out that in Canada people like Father are called homeless. It is against Canadian law to force these people to live indoors if they do not wish to do so. So some homeless Canadians freeze to death each year on city streets in the winter. Then the Canadian students asked, "What are some of the reasons why people become homeless? Why do you think Father decided to leave his family in this way? What should countries such as Canada, Brazil, and China do for homeless people such as Father?" In another group, a Chinese student proposed the following answer.

The story happened in Brazil, but the same story takes place in every corner of the world. The causes that make people homeless are various, such as a lack of understanding, lack of affection, pessimism, natural disaster and wars. In China, there is a small basic organization called the neighborhood committee whose duty is to assist to solve the family problems. For example, if a couple is quarreling severely, the committee members will act as a mediator to calm them down. If the child drops out of school for poverty, the committee will appeal to the communal residents to donate money for this child. The existence of this organization remarkably reduces the chances of becoming homeless. I think this is the measure that other countries should adopt.

Postcolonial theorists (Said, 1993) have argued that Western intellectuals tend to represent Asian countries such as China in essentialist terms. So, if Europeans and North Americans are industrious and honest, then Chinese people are considered to be the opposite, that is, lazy and deceitful. By comparing homelessness in Brazil, with the situations in China and Canada, the Chinese and Canadian students were able to learn more about their distant partners' societies. Such intercultural communication can help to reduce the essentialist notions of China and Canada that these students may have held before engaging in this sharing process. The insightful social criticisms by both the Chinese and Canadian students in the above messages and in many other communications about the fifteen stories made it impossible for either the Chinese or the Canadians to see their partners in one-dimensional, essentialist terms.

Dhowli

As the students read the story, "Dhowli," by the South Asian writer, Mahasweta Devi, they discussed the problems of class and gender discrimination in India. There are several references to castes throughout this story. The young woman, Dhowli, is an untouchable, a member of a low caste, who must struggle to survive after the Braham boy, Misrilal, fails to marry her when she becomes pregnant with his child. At the beginning of the story old Parashnath questions Dhowli's intentions in wanting to marry Misrilal: "What does she think? An untouchable, Dusad girl can make a Brahman give her home and food?" To determine what the Chinese students thought about Dhowli's predicament the Canadian students asked them to describe the Brahman caste and compare it to Dhowli's untouchable caste. They also wanted to know: "Why do you think Dhowli's own people turn their backs on her?" and "In your opinion, how should society treat unwed mothers?" When Neil and Wayne posed these questions, Helen gave the following reply concerning the plight of unwed mothers in China:

> Most of us almost hold the same opinion as Dhowli's people do. We think that if one is forced to, she is worthy of sympathy; if not, she is not. People will think that if the girl is unwilling, how can the boy have the opportunity. Thus, they always put the blame on the girl. However, the real victim is the girl. If this happens, it will be very difficult for her to face the people and the world. So we should not discard them but help them and encourage them to live a new life again. I remember that, several years ago, I watched a film that talked about unwed mothers. In the film, there was a man who set up a home for them and offered them jobs to kill the time. They lived together just like a big and warm family because they had similar experiences. Gradually, they learned from their life in the unwed mothers' family that they are useful and the society needs them and they need the society. They were encouraged to go on and finally stepped into the society again. Here, I don't mean we should imitate this. I just want to tell those who discriminate against them that they are also human and they also need attention and love as we do.

In this story, Dhowli suffers from multiple oppressions. She is discriminated against both because she is a woman and because she is a member of a lower caste. One of the goals of postcolonial pedagogy is to encourage students to critique for themselves the injustices which result from classism and sexism. Clearly, in the above excerpt from Helen's response, she demonstrates a strong awareness of the unjust treatment both of Dhowli and of unwed mothers in China.

The Loons

In this final story, "The Loons," by Canadian author, Margaret Laurence, the students had the opportunity to discuss the problems of marginalization and racial discrimination that are experienced by hybrid cultures (Bhabha, 1994) such as Canada's Metis people. "The Loons" focusses on the relationship between a Scottish-Canadian girl named Vanessa and her Metis classmate named Piquette. In this tragic tale, Vanessa is puzzled by the fact that Piquette does not enjoy associating with her when Vanessa's family takes Piquette with them to their summer cottage. Piquette suffers from tuberculosis, and Vanessa's father is the doctor who must help her to survive the disease. Vanessa's father takes Piquette with them for the summer so that he can help her to rest and heal. As she tries to coax Piquette to come with her to see the loons, Vanessa remarks: "My Dad says we should listen and try to remember how they sound because in a few years when more cottages are built at Diamond Lake and more people come in, the loons will go away." The Chinese students discussed the ways in which the Metis were suffering from the same plight as the loons. When the Canadian student teacher, Janean, who is herself a member of the Mi'kmaq aboriginal community in Nova Scotia, asked her partner, Xie Si, what she thought would have been different about the story if it had been narrated by Piquette, Xie Si had this to say about the treatment both of Piquette in particular and of minorities in general around the world:

> If this story was written by Piquette, the tone must have been gloomy and full of fear. Piquette felt helpless and sad because of the discrimination and other various difficulties confronting her and she was filled with fear because she wasn't sure of her future or even reluctant to face it, which was doomed to be miserable and hopeless. Not only the Metis people in Canada but also the minority groups around the world are immersed in trouble. Their most serious problem is discrimination from society. The public view them as strange and inferior species. The society does not provide them with sufficient opportunities for the individual and collective development. Their beliefs and traditions are despised and laughed at. Their living conditions are deteriorating and they are badly educated which deprives them of all the chances of

promotion, even survival. They are isolated from the society and are not understood by people.

As this response illustrates, one final strategy of postcolonial pedagogy which proved to be significant during the students' intercultural communications, involved enabling students to perform a critique of racism. Because many of the students in the SCUEC are members of China's ethnic minorities, they possessed a strong appreciation for the plight of other ethnic minorities around the world. Given the opportunity to share their feelings about this issue with students such as Janean in Canada, they were able to express themselves powerfully. Their communications were not simply literary or linguistic exercises, but were opportunities to establish strong positions about their cultural identity.

Conclusion

It is difficult to capture in a few pages the richness of the communications which took place between the Chinese and Canadian students. From these limited examples, however, it should be clear that intercultural communication via the Internet can provide a powerful vehicle for ESL students to develop their abilities to express who they are, and for student teachers to learn more about the thoughts and feelings of English students from various cultural communities. Given the large percentage of ESL students in Canadian schools, and given the fact that many new Canadian teachers are choosing to spend their initial teaching years abroad, it seems prudent to provide student teachers with authentic learning experiences in which cultural differences and global issues can be explored.

References

Abe, K. (1992). The magic chalk. In Solomon, B. (Ed), *Other Voices, Other Vistas: Short Stories from Africa, China, India, Japan, and Latin America* (pp. 315-328). New York: Penguin Books.

Bhabha, H. (1994). *The Location of culture*. London: Routledge.

Crowhurst, M. (1994). *Language and Learning Across the curriculum.* Scarborough, Ontario: Prentice-Hall Canada.

Devi, M. (1992). Dhowli. In Solomon, B. (Ed), *Other Voices, Other Vistas: Short Stories from Africa, China, India, Japan, and Latin America* (pp. 229-257). New York: Penguin Books.

Greenlaw, J. C. (1992). Reading between worlds: Computer-mediated intercultural responses to Asian literature. *Reader: Essays in Reader-Oriented Theory, Criticism, and Pedagogy*, 28, 37-51.

Greenlaw, J. C. & Whittaker, F. (1997). Developing transnational literacy through Asian Pacific email exchanges. *Research and reflection: A journal of educational praxis,* 3(1). http://www.gonzaga.edu/rr/v3n1/greenlaw.html

Laurence, M. (1992). The loons. In Barry, J. & Griffin, J. (Eds.). *The Story Teller: Short Stories from Around the World* (pp. 176-185). Scarborough, Ontario. Nelson Canada.

Rosa, J. G. (1992). The third bank of the river. In Barry, J. & Griffin, J. (Eds.). *The Story Teller: Short Stories from Around the World* (pp. 129-134). Scarborough, Ontario. Nelson Canada.

Said, E. (1993). *Culture and Imperialism*. New York: Knopf.

Spivak, G. C. (1993). *Outside in the teaching machine.* New York: Routledge.

Wang, N. (1997). Orientalism versus occidentalism? *The New Literary History: Cultural Studies: China and the West*, 28, (1), pp. 57-68.

Using Internet Technology to Facilitate Anonymous Communication in World Wide Web Delivered Multiculturalism in Education Courseware

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Abstract: This paper is a report on the findings of a study conducted on a graduate level multiculturalism in education course. Data collected from a world wide web based anonymous comments submission technology were coded and analyzed simultaneously by three researchers. Findings indicate that approximately of the 97.1 percent of students enrolled in three consecutive semesters responding to a statement which sought their perceptions of current efforts toward multiculturalism in education," 56.5 percent of responses were found to be either clearly positive or positive, while 40.5 percent of responses could be considered negative or clearly negative. It is postulated that the provision of a consequence free communication facility has provided students with the opportunity to make authentic comments about sensitive multiculturally related topics.

Introduction and Review of Literature

Education students are increasingly realizing the importance of multiculturalism. In part, because the country's cultural dynamics are rapidly shifting. By the year 2035, the population is projected to be 358 million, with people of color making up about 41 percent. By mid-century the total is projected to be 394 million, with people of color about 48 percent of that total (Tomes, 1998). The resulting changes will affect the general population faster than they will the field of education. Still, there are always some changes apparent. For example, while there is disagreement over how significant an influence Black History Month has had on what students learn, most educators and experts agree it has affected school curricula (Kennedy, 1998).

In order to further test theories of exposure effects, much of the research into prejudices and ideologies have involved group decision support systems (GDSS). In essence GDSS provides a structured process by which information/opinions are collected from the group, analyzed and fed back for final discussion. A typical method of surveying individuals might place participants in a large room with around 40 seats. At each chair there is a microcomputer, which enables every participant to interact with the information discussed simultaneously. After participants submit their ideas regarding the topic of discussion, the computer sorts the ideas, and then the participants will then vote or comment on which ideas they like or they dislike.

The anonymity of the GDSS system was thought to help shy or passive team members to voice their opinions. It was also hoped that the anonymity would increase participants' honesty because it would eliminate negative consequences. However, support for such benefits has proven weak. The use of the anonymous methods of communicating biases does not assure increased honesty. When Postmer and Lea (2000) studied the effect of anonymity, they found that in GDSSs, their meta-analytic found no advantage to anonymous reporting. The only reliable effect of anonymity was to lead to more contributions, especially more critical ones. Even when the role of anonymity is examined in the collection of surveys regarding drug use, it appears that participants in the anonymous survey have none or only slightly higher reporting rates than those taking confidential surveys (Bjarnason & Adalbjarnardottir, 2000); O'Malley, Johnston, Bachman, & Schulenberg, 2000).

It appears, as Postmes, Spears, and Martin (1999) argue, that computer-mediated groups, such as GDSSs, while providing anonymity still involve social influence and social identity. In short, when people are together, even when making comments that cannot be traced to themselves, they will champion ideas common to their observed group. Stereotyping, ingroup favoritism and attachment to the group are not eliminated by GDSSs.

The limitations of GDSSs have led authors such as Clark and Maynard (1998) to advance the use of the internet for sources of analyses. They believe that the Internet is underexploited for its capacity to aid analysis, and advocate making survey data more easily available online to all potential users. Such tactics would be especially useful when surveying sensitive information about which participants might feel uncomfortable regarding their positions.

Method

Participants

The subjects for this study were drawn from three online graduate Multiculturalism in Education courses taught during three consecutive semesters from the Fall, 1999 through Summer, 2000. A total of 105 students were enrolled in these three sections, of which 102 replied to the statement posed yielding a response rate of 97.1%. Of students enrolled in Multiculturalism in Education from Fall 1999 to Summer 2000, 71.4 percent were female (average age 37 years), and 28.6 percent were male (average age 35 years). 1.9 percent of enrolled students reported their race as African American, 2.9 percent Asian American, 92.3 percent Euro-American ancestry, and 2.9 percent Hispanic American.

Data Collection

The online course presentation is organized into instructional units each of which takes as its topic one identified culture in the educational setting (e.g. Students of Color, Gender, Sexual Orientation, etc.). Each unit presents to the student relevant information collected from the World Wide Web, the text and the professional literature and is organized into four web pages (Introduction, Professor's Comments, Activities, and Wrap Up). Once each student has read the introduction and professor's comments pages, and has visited the web sites linked to each unit, they then read and respond to the learning activities on the activities page.

In addition to traditional assignments, students find an "Anonymous Comments Box" at the bottom of each activities page. This box is a standard text submission box wherein students can type in their answers to the question or questions posed in the unit. These questions have been designed to stimulate student's thinking on the multicultural issues covered in the unit of instruction, and to extend their reflections on the material outside their accepted "comfort zone" as concerns multiculturally related issues in the educational environment.

Although this research only focused on the first question regarding students' thoughts concerning the overall concept of multicultural education, the questions posed for all units and the themes of the questions corresponding instructional units are listed below in table one.

The use of the anonymous comment technology is very simple from the student perspective. All the student must do is to type their answer or answers into the text box, and click on the submit button below. The text that the student has written in the box is then sent to the server on which the online courseware is resident. The submitted text is forwarded to the instructor in the form of an email which contains only the number of the unit anonymous comment box from which the comment has been sent, and the students comment. The email message received by the instructor contains a dummy from, and reply to address. There is no information forwarded to the instructor that could identify the sender's identity in any way.

The PHP script code that is used to submit the information from the web page form, and later send the text to email address of the instructor is included below, (see table 1).

```
<?
//prepare email variables
$mailTo="jizat@mail.wtamu.edu";
$mailSubject=$unit." ".$type;
$mailBody = "Comment: " .$comment."\n";
$mailHeaders= "From: student@mail.wtamu.edu";
// send the email
mail($mailTo, $mailSubject, $mailBody, $mailHeaders);
?>
<HTML><HEAD><TITLE>Response</TITLE></HEAD>
<BODY BGCOLOR="#FFFFFF">
<h2><CENTER>Thank you, your information has been sent.</h2>
<BR><a href="#" OnClick="history.go(-1)">Click
here</a> to go back.
<BR><BR></CENTER>
</BODY>
</HTML>
```

Table One: The PHP Script Used to Create the Anonymous Comment Box

During the first and all subsequent semesters in which the Multiculturalism in Education course was offered online to graduate students a general introductory meeting was held with the professor. The purpose of this meeting was to describe the mission and contents of the course. Along with the standard online course delivery technologies required for use by students (email, posting to the discussion forum, attaching documents to email, connecting to university dial up Internet access, accessing web pages etc.) Students were familiarized with the anonymous comment technology they would be using during the semester.

Due to the simplicity of use, the description of how to use the technology was brief, but time was taken to both explain to students the rationale for using the technology, and giving them assurances as to the true anonymity they could expect when submitting their answers in this manner.

Students routinely ask early each semester if copies of their anonymous comments can be sent back to them for inclusion in the portfolio of their work. These requests cannot, however, be honored as there is no way, once a comment has been submitted through the anonymous comment box, to ever identify from whom the comment was submitted.

Analysis of Data

The researchers in this study were particularly interested in the first anonymous response prompt concerning the overall idea of multicultural education and its impact of the treatment of various groups in the classroom. The text of the first prompt was: "*I am very interested in what you as an individual feel about one thing: the overall idea of multicultural education, and the changes it has made in the treatment of the many distinct cultures, races, socio-economic groups, learning abilities, sexual orientations, etc., in the classroom.*"

The researchers examined this question using a constant comparison method for data analysis which consists of simultaneous coding and analysis of data (Taylor & Bogdan, 1984). The data from the first question was analyzed initially by three researchers who examined the anonymous responses independently to identify themes. The three researchers met and developed five consistent themes and definitions that emerged from the responses. Three researchers then examined the anonymous responses from the three semesters independently and coded the comments using these themes and definitions. The researchers finally met to discuss the accumulated data, emerging themes, and reliability of the coding.

Findings

There were a total of 105 students enrolled in the online course, Multiculturalism in Education, over the three semesters from Fall, 1999 to Summer, 2000. Of this total, 102 anonymous responses were given to the first question regarding the impact of multicultural education in the classroom. This represents a 97.1% response rate. As students were aware that, due to the anonymity ensured by the technology used, there was no way for the instructor to know whether or not any individual student had in fact answered each comment prompt the high response rate is remarkable.

Themes and Definitions

Five themes were identified from the anonymous responses by the research team. These themes were discussed in detail and definitions were developed for each theme to aid in the coding of the data. These themes and definitions were as follows:

Applied Positive Statements. The comments reflect positive statements regarding multicultural education and demonstrate some clear experience or application of multicultural education.

Positive Statements. The comments reflect positive statements regarding multicultural education with no contrasting/negative/rebutting statements. While the comments do not reflect experience or application, they may make reference to using the benefits of multicultural education in the future.

Somewhat Negative Statements. The comments reflect some positive content concerning multicultural education, but also includes clear contrasting/negative/rebutting statements about the effect of multicultural education.

Clearly Negative Statements. The comments reflect clearly negative, blaming, or derogatory statements concerning multicultural education with no positive comments.

Neither Negative Nor Positive Statements. The comments reflect content that does not fit the criteria listed in the other definitions.

Interrater Reliability

Three researchers performed the coding of the 102 anonymous responses. Raw data representing the three raters' coding for the 34 responses during the Fall, 1999 semester showed complete agreement on 24 of the 34 ratings representing a 70.6% accuracy. In the Spring, 2000 semester, the coding of the three raters showed complete agreement on 32 of the 42 total ratings representing a 76.1% accuracy. Finally, raw data representing the coding for 26 responses during the Summer, 2000 semester showed complete agreement on 19 of the ratings representing a 73.1% accuracy. Interrater reliability for the total 102 cases was computed at .9019.

Applied Positive Statements

Approximately 17.4% of the anonymous responses were rated as Applied Positive. Statements in this category not only reflected positive content regarding multicultural education, but also suggested that the respondent had made some application of his or her multicultural knowledge or understanding. For example, one respondent said, "Multicultural education is very important because as our classrooms become increasingly diverse, we must rethink our current way of teaching. I have experienced the way that this knowledge has made a difference in my own experience in the education field." Another respondent explained, "Multicultural education has made a positive change. I speak from personal experience. After attending a multicultural workshop, myself and the two other teachers that I attended with, all changed the way we taught, disciplined, and praised."

Positive Statements

Almost 39.1% of the comments reflected Positive Statements regarding multicultural education. These statements were positive with no contrasting/negative/rebutting statements, but did not reflect experience or application. Respondents in this category concentrated on thoughts that education should recognize the importance of multicultural education. For instance, one respondent said, "I think that it is very important to have at least a basic understanding of the diversity of cultures that are present in the classroom. Multiculturalism can impact everything from success in the classroom to discipline, to how the student reacts to different situations." Others made positive statements as to how much multicultural education has already affected the classroom. "l feel that multicultural education has made a tremendous difference in education and has been beneficial to all students," one student responded.

Negative Statements

Nearly 31% of the anonymous responses were somewhat negative. Responses coded "Somewhat Negative" indicate that respondents viewed an awareness of multicultural education as important but felt that too much emphasis is being placed on making curricular changes based on multicultural awareness. Three out of every 10 students who responded made positive statements about multicultural education but presented contrasting, negative, or rebutting statements. One respondent stated, "sometimes in our efforts to address multicultural issues it creates another problem." Others made statements that included concerns with being overwhelmed by change, "it is difficult to address all issues without hindering learning in another area. Some people take advantage of multicultural education. It has taken away from the classroom by the teacher having to focus on individual needs when that time could be used to teach the whole class." The respondents indicated that an awareness of multicultural differences often negatively impacted both class-wide learning and treatment of students from different cultural groups. Many respondents felt that multicultural education had (a) been taken too far, (b) had created an environment where teachers spent more time being politically correct than meeting the needs of the whole, (c) created conflict and fear, (d) been used as an excuse to obtain advantages by minorities.

Clearly Negative Statements

Approximately 11% of the anonymous responses were found to be clearly negative. One out of every 10 students who responded made negative, blaming, or derogatory statements about the effect of multicultural education in the classroom. Examples of such statements include, "Multiculturalism has gone beyond reason. We go above and beyond to make everyone equal. Let's face it, no one is equal. It has lowered the education standards, and "It seems like minorities get all the breaks and help with their education. How can this be fair to the middle class white people?, and finally, "Minority rights have superceded the rights of the majority. It seems that the majority must make sure that the minority is not offended. When we worry more about who may be offended rather than the good of the whole, we are missing the boat.

Conclusions

It has been observed by the researchers that the most significant difference between teaching a multiculturally based course in the traditional classroom and in the online World Wide Web environment is communication in the form of class discussions. Due to the sensitive nature of many of the multiculturalism in education related issues being discussed rarely are more than ten to twenty percent of students willing to make their thoughts and feelings know in an open, face-to-face environment.

This reticence may have two main negative effects upon the learning environment. Students who do not feel free to comment in an open forum course will not be as integrated into the learning experience as they might be. Also, the lack of input on the part of the students will have a negative effect upon the instructor's ability to structure teaching to meet the perceived needs of the particular students in each class taught.

The anonymous comment technology provides a facility for meeting both the needs of students to communicate their thoughts and feelings on difficult issues in a safe communication space, and to allow for these comments to be used by the instructor in tailoring the courses evolution to the needs of the class members as perceived by the instructor through these comments.

References

Bjarnason, T. & Adalbjarnardottir, S. (2000). Anonymity and confidentiality in school surveys on alcohol, tobacco, and cannabis use. *Journal of Drug Issues, 30*(2), 335-343.

Clark, R & Maynard, M. (1998). Using online technology for secondary analysis of survey research data--"Act globally, think locally." *Social Science Computer Review, 16*(1), 58-71.

Kennedy, K (1998). Black History Month Has Left Mark On Curriculum, but to What Extent? *Education Week on the Web.* Retrieved November 29, 2000 from the World Wide Web: http://www.edweek.org/ew/1998/22hist.h17

Nord, W. A & Haynes, C. C. (1998). Taking religion seriously across the curriculum. Nashville, TN: First Amendment Center.

O'Malley, P. M., Johnston, L. D., Bachman, J. G., & Schulenberg, J. (2000). A comparison of confidential versus anonymous survey procedures: Effects on reporting of drug use and related attitudes and beliefs in a national study of students. *Journal of Drug Issues, 30*(1), 35-54.

Postmes, T. & Lea, M. (2000). Social processes and group decision making: Anonymity in group decision support systems. *Ergonomics, 43*(8), 1252-1274.

Postmes, T., Spears, R., & Lea, M. (1999). Social identity, normative content, and "deindividuation" in computer-mediated groups. In N. Ellemers & R. Spears (Eds.), *Social identity: Context, commitment, content.* (pp. 164-183). Oxford: Blackwell Science Ltd..

Richard, A. (2000). Administrators say technology calls for range of skills. *Education Week on the web.* Retrieved November 29, 2000 from the World Wide Web: http://www.edweek.org/ew/ewstory.cfm?slug=03eratemain.h20

Taylor, S.J., & Bogdan, R. (1984). *Introduction to qualitative research methods: The search for meanings.* New York: John Wiley & Sons.

Tomes, H. (1998). Diversity: Psychology's life depends upon it. *APA Monitor, 29.* Retrieved August 22, 2000, from the World Wide Web: http://www.apa.org/monitor/dec98/pubint.html

Diversity through Co-Operation: Creating and Delivering Content in In-service Teacher Education

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Abstract. This paper describes some Norwegian experiences from *the Co-operation Network* project in teacher education. Through the network, students in the study programme "ICT for Teachers", are offered a diversity of web based optional subjects from several university colleges. Different forms of collaboration are applied in the network, and Tony Bates' three categories of inter-organisational co-operation are used to discuss the alternative forms. An organisational and economic model of co-operation is presented and discussed according to diversity.

INTRODUCTION

In accordance with the National Curriculum in "ICT for Teachers", one fifth of the study programme is offered as optional subjects. In Norway, the university colleges are rather small, and the classes for in-service teacher education in ICT typically have 15-30 students. Naturally, optional subjects are thus too expensive for a single college. Instead, six university colleges co-operate on offering a pool of optional subjects to their joint group of students.

Through a web-based network, each participating college provides one or several subjects. Each college is then able to offer their own students a real choice between subjects. Most students are ordinary on-campus students, and all courses are delivered through the web. Each institution is responsible for the content and the quality of the course they offer. When attending a course through the Co-operation Network the student is guaranteed the right quality and level, and that the subject fits into the study programme.

The Co-operation Network provides the basis for open and flexible learning. The project includes co-operation on the development of technology-based distributed learning among public and private university colleges. Both teacher education and computer science departments from several colleges participate as partners, developing electives. In addition, the network has established and formally agreed of a model on running management regarding both administrative and maintenance issues.

The Co-operation Network has been running for a year and a half; six colleges provide 7 courses to approximately 80 students. Systematic evaluation data were collected on the first year of the experiment. The data have been collected through interviews with all participating teachers, evaluation forms from the students, and systematic logging of student activity and final marks, as well as minutes from meetings in the project group, analyses of ideas, solutions and practical experiences from the co-operation (Rekkedal & Johannesen 2000).

The Co-operation Network can be said to be the realisation of the vision of "Technology-based Distributed Learning", as described in (Bates 1995); ICT-based flexible learning both for on-campus and off-campus students. This form of learning – and teaching – is more and more organised independent of time and space. In order to realise flexibility in time and space, information technology is used for communication. The co-operating colleges enrol both ordinary on-campus students, following the fixed progression of a study, and off-campus students starting and ending their studies according to their individual schedule. More students are also in-service students, following the courses beside their paid work and family duties, and are somewhere between on- and off-campus students. Open and flexible studies are thus practical, wanted and necessary.

In the further presentation, we will emphasise how the Co-operation Network leads to diversity in content and thus better quality for the students.

ON CO-OPERATION

Universities try to maintain their own autonomy. Why should they co-operate? In the present economic situation, the universities are not able on their own to fulfil the needs and wishes of their students. The possibilities to gain better quality and fulfil the students' needs are especially mentioned by (Neil 1981) as important motives for co-operation.

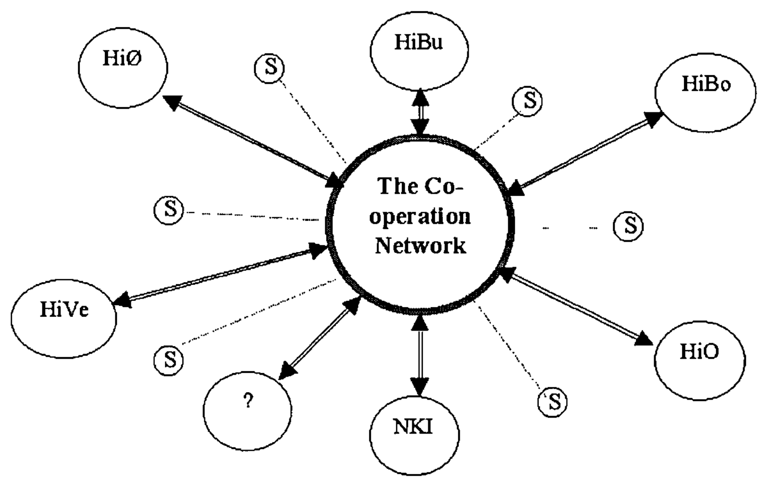

Figure 1 The Co-operation Network

The Co-operation Network is an active working partnership both on academic and administrative issues. One private and five public university colleges are co-operating on development and delivery of credit courses, based on flexible solutions. In (Fig. 1), the large circles placed around the network centre, denote the university colleges. The arrows between the colleges and the network centre denote, from an academic point of view, that each college provides students and courses for the network, at the same time as their local students attend courses delivered by other partners in the network. From the administrative perspective, the arrows denote the information flow of students and courses. And from an economic point of view, the arrows can be said to denote the stream of money between the network partners. The small circles, marked with S, denote typical in-service students, attending separate courses through the same network. The acceptance of individual students in addition to the college on-campus students contributes to the flexibility of the offer, and also to a larger diversity of perspectives between the students on every course.

The Co-operation Network is built on practical co-operation between academics on the development of courses and negotiations and testing of agreements. Also, the colleges co-operate on the development and delivery of exams. All parties deliver and use the same kind of services through the Internet, however related to their different fields of interest. The commitment of every institution is established through formal acceptance of the co-operation model defined by the project group. This kind of co-operation, between private and public university colleges, has never been fulfilled in Norway before.

In his recent book, Tony Bates presents three forms of co-operation between colleges (Bates 2000). He denotes the forms as *franchise*, *transfer of course and credit* and *joint course production*. In the *franchise* model, the course is owned by an institution. The owner institution develops the course and the exam, and may also deliver the course in (parts of) the market. The course may be delivered by one ore more of the partners in co-operation. This is the traditional distance education model. The distance education company buys courses from authors, and then engages teachers. Maintenance and further development is the responsibility of the distance education institution. This model is used only to a small extent in the Co-operation Network. The project aims to test some more dynamic and flexible forms of co-operation.

Co-operation built on *transfer of course and credit*, puts mutual co-operation on development and delivery of courses as the crucial point. Each partner "owns" courses and may sell and buy them mutually. This model is the most frequently used in the Co-operation Network, and is stated as the default model in the network contract. The advantage of this model is that the owner institution holds the responsibility of maintenance and further development of the courses, and is committed to the entire lifecycle of the course. This commitment is also regulated in the economic agreement – the owner institution gets paid from every student attending the course. If the owner institution for some reason is not able to deliver the course, then some other institution in the network may perform the delivery. Still the owner institution is responsible for maintenance, and the student fee is divided between the two.

The last one, *joint course production* may be seen as the most challenging. The partners will develop and own courses together, and find ways of organising the co-operation of delivery. This form of co-operation is however not central in the project, and such agreements are established as bilateral agreements. The Co-operation Network includes elements of all three forms of co-operation, even if the main idea falls in the category of *transfer of course and credit.* When the developers deliver a course, they will feel a strong commitment to the course – the course will be a part of the ordinary educational infrastructure, and not an add-on. Teachers will catch the needs for change while teaching.

INDIVIDUALLY COSTED SERVICES

There is a need for a clear understanding of the connection between costs and benefits, regarding both development and delivery of teaching. The development and negotiation of an organisational and economic contract for the co-operation have been crucial in the project. The project has developed a value chain for the project.

Registration	Development	Delivery	Examination	Accreditation
Local registration 10% Central registration 10%	Development /maintenance 30%	Teaching & tutoring 30% Local tutoring 2%	Development /examination 14% Local examination 2%	Certificate 2%

Figure 2 Value chain for a student in the Co-operation Network (Johannesen & Øgrim 2000)

The basic idea is to divide the costs related to the education of each student into logical pieces. This is illustrated in the value chain shown in (Fig. 2). The model is inspired by Porter's well-known value chain (Porter 1985), and is the basis for the division of costs and benefits between the participants in the network. Standard costs are divided into teaching costs: development, delivery and exam (76%) and administrative costs: subscription, class administration, exam, and accreditation (24 %).

Inst.	Revenues for local administration	Revenues for course d & d	Revenues for central administration	Costs for purchased services	Result
NKI	15 stud.: 12 000	20 stud.: 74 000	61 stud.: 30 500	15 stud.: 75 000	41 500
HiBo	20 stud.: 16 000	18 stud.: 66 600		20 stud.: 100 000	-17 400
HiO	18 stud.: 14 400			18 stud.: 90 000	-75 600
HiVe		7 stud.: 25 900			25 900
HiBu	8 stud.: 6 400	5 stud.: 18 500		8 stud: 40 000	-15 100
HiØ		11 stud.: 40 700			40 700

Figure 3 Economic settlement for 1999/2000

The co-operation model and distance education model easily allow us to scale costs and benefits in relation to the actual student mass. This is expressed in the first year economic settlement, summarised in (Fig. 3). The course costs for the optional topics of the 18 students at Oslo University College (HiO) were only a fraction of the costs of corresponding on-campus courses. The result is more students at each subject, and more offers for the students, that is a broader market.

DIVERSITY

In this section, experiences from the Co-operation Network are presented. We will focus on how the co-operation model has led to diversity in topics offered and pedagogical solutions. To the students, the model means flexibility, access to lifelong learning and more courses. To the institutional partners, the model means cost effective offers, the possibility to fulfil local needs and the needs of special groups of students. Also, they give the basis for customized study programmes (see also Brindley & Paul 1993).

DISTANCE EDUCATION AS A MEANS FOR DIVERSITY

Distance education is a precondition for the whole project. Most students are enrolled as on-campus students in one of the participating university colleges. They make use of the local infrastructure and co-operate with their local fellow students, at the same time as they make use of the distance education facilities of the Co-operation Network. Even if the students generally express scepticism with respect to distance education they are satisfied when the result is more optional subjects. An evaluation of academic and pedagogical aspects of the project is documented in (Rekkedal & Johannesen 2000). Other similar studies may be found in (Rekkedal 1998, Rekkedal 1999, Keegan & Rekkedal 1999).

This form of teaching can also be said to describe modern technology based *on-campus* education: partly independent of time and space and with information technology as a means of communication – technology based distributed learning/e-learning. Using distance education technology as a part of a study programme at universities and colleges is also in line with official educational politics all over the Western World.

Not only do the students choose among different course *content*, but also among different forms of *communication* and different forms of *technical* and *pedagogical* solutions. In *content*, they choose among for instance programming, technical issues of local networks, data modelling, and gender issues in ICT. Regarding *communication*, all courses are web based, and apply asynchronous one-to-many and one-to-one communication (see Paulsen 1998, Fjuk 1998). Other forms of communication, including many-to-many synchronous and asynchronous communication are applied to various degrees. Some of the partners have chosen to purchase communication solutions. With respect to *technical* solutions, there are also differences. The network has agreed on not to standardize neither the technical solutions nor the web design. The reason for this is the idea of courses owned by their developers and that technical- and interface-design is included in the ownership.

Also with respect to *pedagogical* solutions there are differences. Two in principle different teaching models are used. The first one is a flexible model with an individual starting point and progression. The other one has a fixed starting point and group-based progression. There is a tendency that the students who normally study in free progression prefer that model, and those who are attending on-campus studies prefer the other. Group-based progression is often preferred because this model fits best with other courses in their total curriculum. Co-operation with and help from other students are also arguments in favour of group-based progression. The arguments in favour of free progression are mainly based on the need for individual freedom, adapting to working hours, and family duties.

Modern ideas of teaching and learning, including theme organisation, problem-based learning, seminars and project pedagogy are challenging for distance educators (see Fjuk 1998, Fjuk & Øgrim 1997a, Fjuk & Øgrim 1997b). So far, the Co-operation Network project has not dealt with these challenges collectively. Some of the partners, however, have experimented with co-operational pedagogical ideas. Here we will only indicate two examples. One course is based on seminar pedagogy, combined with problem based learning. In this course the communication technology, especially for synchronous communication, is crucial. Another course gives practical training in running a local network – taught via Internet and one week of practical laboratory work.

QUALITY THROUGH DIVERSITY

The potential customers for the Co-operation Network are teachers with a basic knowledge of ICT. This market is relatively small in Norway. By co-ordinating the offer of optional subjects, each course may achieve a critical mass of students and it is profitable to invest the necessary development resources (Moran & Mugridge 1993a). Without co-operation each college will in practice make the choice itself, and the result may be one single offer to the students. (Moran & Mugridge 1993b) describe related problems in their survey of international studies on co-operation in distance education.

Co-operation makes it possible to specialise because each college does not have to develop and deliver all subjects in the National Curriculum. This specialisation makes it possible for each college in the network to concentrate their professional resources on the optional subject they offer, and thus strengthen the academic competence in this field. In the economic model the Co-operation Network differentiates between development and delivery of courses with the following consequences: 1) Both the developing institution and the delivering institution benefit from students attending the course owing to the fact that student fees are divided between these services. 2) The developing institution has the continuous responsibility for course maintenance, expressed by the parts of the student fee that are always related to the development- and maintenance-services. 3) Course delivery may easily be distributed within the network, because the model expresses delivery services as distinguished from the development. The economic model prepares easily for diversity even in co-operation arrangements between the partners.

STUDENTS' EVALUATION: DO THE STUDENTS EXPERIENCE DIVERSITY?

The students' evaluation was collected through a web based questionnaire. The students are mostly positive and express that net based studies can give satisfactory learning results. Most of them can see themselves attending net based studies again, and will recommend such studies to others (Rekkedal & Johannesen 2000). The most important property of the Co-operation Network from the students' point of view is the possibility of choosing among several courses. An other advantage is the possibility to study at a distance and the flexibility of this form of teaching, including gaining experience with information technology. Except from these qualities, their experiences differ. This is expected due to the network idea of diversity.

The students' general experiences, both on the Co-operation Network's web site (Samarbeidsnettverket 2000) and administrative issues, are mostly positive. Negative comments seem trifling. Some of the courses are still characterised by lack of interaction. The poor contact between the teacher and fellow students is mentioned as a disadvantage in distance education. These are obviously conditions that should be improved in the future. The lack of communication is also among the students' proposals for improvement. Both the form (quality) and the amount (quantity) need to be enhanced. The teaching material can be made richer through the use of for instance sound and video. Some more participants in the network would also be desirable in order to offer more optional subjects.

CONCLUSION

The project has through negotiations around practical solutions, the work with the value chain and practical experience managed to establish agreements on economic and administrative relations. The agreements have so far been tested and evaluated for one year of study. They have been renewed, and extended to larger parts of the study programme. The principles from the Co-operation Network, as expressed in the formal agreements, are accepted as the organisational basis of two new projects at Oslo University College; The development of a Master Programme in ICT and learning, and the development of an open and flexible specialisation programme in the combined pre-service and in-service teacher education.

A close relation between the development, delivery and maintenance of the learning environment and course material, also on the Internet, is of importance. Commitment and organisational anchoring is the result From an economic point of view, development is thus not seen as a one time cost before course delivery, but as a running cost of continuous development and maintenance closely related to the delivery of the course. The student fees will in the first placed hopefully cover the investments of first time course development, and then continuously cover the costs of maintenance.

Many colleges and universities wish to deliver open and flexible courses, most of them by themselves. In this project we have experienced that co-operation on the development and delivery of courses is beneficial to all partners. The partners have gained economic advantages along with better and more offers to their students. The result is diversity through co-operation, diversity in course content, combined with structure of the study programme, diversity in communication methods, in technical solutions and in pedagogical approaches.

REFERENCES

Bates, A. W. (1995). *Technology, Open Learning and Distance Education.* Routledge, London

Bates, A. W. (2000). *Managing Technology Change. Strategies for College and Unviversity Leaders.* Jossey-Bass

Brindley, J., & Paul, R. (1993). The way of the future? Transfer credit and credit banking. in Moran, L., & Mugridge, I. (eds): *Collaboration in Distance Education. International Case Studies*. Routledge. London

Fjuk, A. (1998). Computer Support for Distributed Collaborative Learning Thesis for PhD, University of Oslo

Fjuk, A., & Øgrim, L. (1997a). The dichotomy of distributed collaborative learning. Approached through dialectical analysis. in Proceedings of ICDE'97—International Council of Distance Education, Penn. USA

Fjuk, A., & Øgrim, L. (1997b). The tension between tradition and transcendence in designing collaborative learning over distances. in Proceedings of ICDE´97—International Council of Distance Education, Penn. USA

Johannesen, M., & Øgrim, L. (2000). Information Technology for Teachers Experiences from a Web-based Co-Operation Network in *Online Educa 2000*, Berlin

Keegan, D., & Rekkedal, T. (1999): *Achieving excellence in courses on the WWW.* Report from parallel evaluation studies at three institutions carried out as part of the EU Leonardo Project "Multi Media World Wide Kernel for Distance Education"

Moran, L., & Mugridge, I. (1993a). Collaboration in distance education. An introduction in Moran, L. & Mugridge, I. (eds): *Collaboration in Distance Education. International Case Studies*, Routledge, London

Moran, L., & Mugridge, I. (eds) (1993b). *Collaboration in Distance Education. International Case Studies*, Routledge, London

Neil, M. W. (ed) (1981). *Education of Adult at a Distance*, London: Kogan Page

Paulsen, M. F. (1998). *Teaching Techniques for Computer-Mediated Communication.* A PhD Thesis in Adult Education, The Pensylvania State University, The Graduate School

Porter, M. E. (1985). *Competitive Advantage*, New York: Free Press

Rekkedal, T. (1998). *Courses on the WWW - Student Experiences and Attitudes Towards WWW Courses.* En Evaluation Report Written for the Leonardo Online Training Project. http://www.nki.no/eeileo/

Rekkedal, T. (1999). *Courses on the WWW - Student Experiences and Attitudes Towards WWW Courses - II.* Evaluation Report Written for the Leonardo Online Training Project, MMWWW. http://www.nki.no/eeileo/

Rekkedal, T., & Johannesen, M. (2000). *Valgfagsnettverket i "IT for lærere". Evaluering våren 2000,* HiO rapport nr 2000/20 ("The Co-Operation Network 'ICT for Teachers'. Evaluation, Spring 2000" Report no. 20 2000, Oslo University College, in Norwegian)

Samarbeidsnettverket (2000). http://www.nettskolen.com/studium/valgfagsnettverk/ (The Co-operation Network web site)

"WorldGate:" An Attempt to Close the Digital Divide

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Abstract: WorldGate offers the consumer a low-cost, simple-to-use means of connecting to the Internet, and sending and receiving email, without a PC or telephone line. All that WorldGate requires is a TV set, wireless keyboard, and a set-top box connected to a cable TV system.
This fall, fourth grade students from elementary schools in Connecticut, Illinois, Louisiana and Ohio will be among the first to participate in the WorldGate Internet School To Home (WISH TV) Program. WISH TV is a public service initiative provided by WorldGate, local cable operators and participating set-top manufacturers. The program provides participating elementary school children a full school year of free in-home Internet access.
The WISH TV Program ensures that children from all economic levels will have the opportunity to ride the technology tidal wave and not be left behind.
Through WISH TV, students and teachers will be able to integrate the Internet into the curriculum. The program expands existing school curriculum by linking students and parents directly to teachers. Students' Internet access to questionable Web sites will be restricted through current filtering technology. Home Internet access will enable them to do research on their homework, and gain access to school calendars, schedules and class information and extra curricular activities.

Introduction

Invariably, on a day-to-day basis, we hear of the importance or role that the Internet plays and how it has the potential to improve the quality of our lives in the workplace, in our personal setting, and finally, in a global capacity. Much of what the Internet had promised has already been accomplished and is taken for granted in disseminating information to the masses who can afford, have the capability and the knowledge to utilize this technology. However, there are a group of individuals who would be categorized as the "have-nots." It is these citizens who must be encouraged to advance and be given the opportunity to do this. One segment of the population deserving of help are the children who have been ignored. In order to close the gap, which is frequently referred to as the digital divide, "WorldGate" is pioneering a project in Fall, 2000. Its objective is to provide students on all economic levels the ability to gain access to the Internet - from school and from home - via cable TV.

The Study

Through WISHTV, "WorldGate" Internet School-To-Home will be working with local cable operators and school systems to provide a full school year of free - in-home and in-school - Internet access by providing a set-top converter to be placed on a standard television set to all of the students in a single grade. The program provides participating elementary school children a full school year of the free in-home Internet access. Home Internet access will enable them to do research on their homework, and gain access to school calendars, schedules and classroom information, and extra curricular activities. The program expands existing school curriculum by linking students and parents directly to teachers. Students' Internet access to questionable Websites will be restricted through current filtering technology. For Fall, 2000, it is the fourth grade in certain elementary schools in Connecticut, Illinois, Louisiana, Missouri and Ohio. In this pilot project, students who participate will be evaluated by using standardized exams and compared to the control group who are not able to take advantage of the experiment. "WorldGate" has promised to assist school administrators in utilizing national standardized tests and other reputable measures to determine the effectiveness of the program. The plan is that in the program's second year, the number of schools participating would be increased to over one hundred. Although this may seem ambitious, it does have its rewards for both the user and the industry as a whole. As already mentioned, students taking advantage of the system would improve their scores on standardized exams and the manufacturer of the hardware, who receives positive strokes from the campaign, will ultimately have an increase in sales of their product.

Through the combined efforts of Motorola Broadband and Communications and Scientific Atlanta, Inc., have pledged to provide free equipment. This includes the donation of keyboards and set-top boxes in specific markets, which include the eleven schools in the five states already mentioned. The cable operators participating in this launch include Charter Communications, Buckeye CableSystem and Massillon Cable TV. Each of them has promised to provide free connections to those students in the program.

Proposed Findings

The goals of this ambitious project include the following:

1) Provide students with a capability and their own email accounts. This technological service will permit students to collaborate on projects, receive homework assignments, chat with penpals, here and abroad, open lines of communication between parents and teachers, and allow for students to communicate with their teachers and fellow classmates.

2) An enhancement of the school curriculum will enable students to access the Internet in order to complete school assignments. Assignments may be sent home directly, even though they be absent from class, so that they may keep up with their schoolwork.

3) Students would be able to gain the opportunity to become involved interactively and explore new ways of learning directly from home. WISHTV actually extends the school day. It gives homework a whole new meaning.

Conclusion

Unfortunately, due to circumstances beyond the control of the participants, cable companies, WorldGate and the schools involved in the project hit a major obstacle, which meant postponing the launch until the week after Thanksgiving. This would mean it would begin at or about November 27, 2000. According to Theresa Durso, Senior Marketing Representative for WorldGate, the required testing of the system took more time than was expected. To say that WorldGate was apologetic for the delay would be an understatement. There is little consolation to those who were so actively involved in the project up to this point. However, what might be garnered from this is the knowledge that the industry and teaching professionals are dedicated to improving the learning curve on a grand scale. What can be salvaged from the remaining academic year is anyone's guess. Perhaps what can be accomplished is the laying of groundwork, which can be continued next school year. The funds, which were dedicated to this, have not been spent and should be reserved for the future. Ms. Durso feels that the schools that were involved could seek additional funding from some philanthropic source. As educators, we can hope that the WISHTV project is able to make the dreams of those involved a reality.

The proposed presentation, to be given March 5-10, 2001, in Orlando, Florida, will monitor the progress of the project up to the time of the conference and include those results.

Technology and Social Change: Perceptions of Culturally Diverse University Students

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Abstract: This paper is a report on the findings of a pilot study addressing the perceptions of culturally diverse university students and computer technology. A survey instrument was generated to assess differences in attitudes, background and usage of computer technology. Specifically, the study addressed three questions: How do female students and members of different ethnic groups view the importance of computer technology for themselves and for their families? What role do cultural traditions have in creating interest in using computer technology? How do female students and members of ethnic minority groups use computer technology? Results indicate the affects of gender bias in computer technology, and some differences between ethnic minority groups and European American students. Questions for further research on this topic are discussed.

Introduction

Technology has been viewed by society as a powerful tool for social change. As a result of the belief in the power of technology, computers are increasingly being used in educational settings. However, despite all the attention that computer technology is receiving, researchers and educational leaders are realizing that computer technology has done very little to change the lives of people who are female, an ethnic minority, or people who are poor. Thus, there is a growing gap between those who have access to computer technology and those who do not. Students who are female, ethnic minorities or members of low-income groups tend to have less access to computer technology. Members of these groups who do have access to computer technology tend to use it for less cognitively demanding tasks. Societal issues such as poverty, gender and ethnic discrimination have also played a part in determining who has access to computer technology. The gap between those who are able to participate in the technology revolution and those who are not is often referred to as the *digital divide* (Bracey, 2000).

A parallel concern to the question of computer technology access is the issue of who is setting the agenda for the use of computer technology in schools and whose voices are being heard in the discussions. Similar to the academic curriculum, in most institutions in the United States educational technology is controlled by the dominant, European American middle class perspective. This lack of engagement can result in disillusionment and disassociation with technology. If this trend continues, ethnic minorities, women or people who are poor may never be able to reap the benefits of computer technology since members of these groups may feel that computer technology may not be addressing their needs.

The purpose of this pilot study is to explore the issues surrounding computer technology and social change from the perspective of diverse learners in a university setting. In this paper, diverse learners refer to students who are either female, identify themselves a member of an ethnic minority group, or someone who grew up in an economically poor neighborhood. This paper will specifically explore the following questions:

a. How do female students and members of different ethnic groups view the importance of computer technology for themselves and for their families?
b. What role do cultural traditions have in creating interest in using computer technology?
c. How do female students, members of ethnic minority groups and students from low socioeconomic backgrounds use computer technology?

Findings from this pilot study will guide the development of a larger study in the future.

Background

The digital divide is a matter of great importance to educators and policy makers. While computers are being used more frequently in the lives of most people, there is a growing concern that some members of society are not able to participate in the technology revolution. One concern is the lack of access to computer equipment, especially access to computers in the home (McAdoo, 2000). Another concern in discussions on the digital divide also centers on how the equipment is used in communities that have computers. Students in wealthy areas tend to use computers for higher order thinking skills while students in low socioeconomic neighborhoods tend to use computers for drill and practice. There is also a difference in the computer usage of male and female students. Further, the digital divide exists between people who are ethnic minorities and those who are not.

Female students are less likely to see the importance of computers in their lives than male students. Gender inequity in education is nothing new. Sadker and Sadker (1995) showed how schools perpetuate the underachievement of female students, especially in Mathematics and Science. Gollnick and Chinn (1997) explain that the underachievement of females in school is a product of a system that perpetuates the belief that female students are not as academically capable as male students. Teachers expect less of their female students. It is therefore not surprising that female students are less interested in computer technology. Kelly (2000) states, "one of the first indicators of this gender disparity may be the Advanced Placement exam in computer science. Girls accounted for only 17 percent of the test takers on the A exam and 9 percent on the more difficult AB exam" (p. 155). Huber and Schofield (1998) studied the attitudes of male and female elementary school students in Costa Rica. Their study revealed that female students have a less positive attitude towards computers than the male students due to a number of factors: male biased software, the stress on competition in most computer classes, the stereotypical view of computer use as a male activity (even by female computer teachers), less teacher assistance for female students, and less computer use by female students outside of the classroom. As a result of these school experiences, women are less likely to seek a career in the computer industry and are not able to enjoy the same economic prosperity as their male counterparts.

Economics also plays a role in how computers are used in teaching and learning. Access to computers is a major factor that prohibits all students from learning through computers. The high cost of computers continues to prevent many schools from making computers available to students. Schools in affluent neighborhoods are also more likely to have a full-time technology coordinator, and teachers in less affluent districts have less access to technological professional development (McAdoo, 2000). Furthermore, students in poorer communities use computers for drill-and-practice types of activities while students in affluent communities use computers for inquiry-based lessons and collaborative learning (Kleiman, 2000). Thus, in poor communities, the computer leads the student. In more privledged communities the students control the computer for their own purposes. In order to bridge the digital divide, researchers and educators need to come up with ways to make computer usage meaningful for people who are poor.

There is belief that the digital divide will fade due to "market pressures, with decreasing hardware and connectivity costs inevitably leveling the digital playing field" (Carvin, 2000, p. 3). However, some researchers have been able to show that members of ethnic minority communities may not see computer technology as important to their lives even if they have the money to purchase computers. Holmes (1997) notes that many African Americans do not see the Internet as a relevant part of their lives. Hoffman and Novak (1999) show that the absence of relevant multicultural content on the Internet makes surfing the World Wide Web less interesting to ethnic minority communities.

Methodology

As university teachers, we are anecdotally aware that the concerns mentioned in the previous section are true for many of our students, at least in a general way. Because we were not completely sure of what specific research questions to ask, however, we conceived of this study as a pilot study whose purpose would be to help us understand how we need to formulate further research in this area. Our hope was that the tentative results of this study would lead to refining our research questions and methods for a future study.

This study was conducted during the Spring 2000 semester with students attending courses in our university. After an initial review of the literature, we formulated a survey instrument and pre-tested it on three students similar to our target population. One hundred sixty eight students participated in the survey, including 122 female (66.7%) and 50 male (29.8%). Since we wanted to understand the experience of diverse students, we selected university courses in which these students were more likely to enroll and asked professors in these courses to administer the survey and return it to us. Approximately 30 course sections were identified, in the areas of African American Studies, Chicano/a Studies, Asian American Studies, American Cultures and multicultural education courses. We received completed surveys from 12 course sections, a 40% return rate.

The student population included 53 graduate students (31.5%), 34 seniors (20.2%), 40 juniors (23.8%), 24 sophomores (14.3%) and 15 first year students (8.9%). The majority of students self identified as European American (n=68, 40.5%), and the rest self identified as Asian/Asian American (n=38, 22.6%), Latino/Hispanic/Chicano (n=24, 14.3%), African American/Black (n=12, 7.1%) and Pacific Islander/Hawaiian (n=8, 4.8%). We used the Survey Pro software package to create the survey, enter and verify data, and analyze the data using descriptive statistics and cross tabulations.

Findings and Discussion

The findings indicated that the vast majority of students (n=156, 92.9%) owned computers. However, 100% (n=15) of first year students reported owning a computer compared to 85.3% (n=29) of seniors. This could suggest that computer ownership is increasing among newer students. In other survey results there were more commonalties than differences among ethnic groups, with a few exceptions, and differences between gender groups.

In terms of ethnic groups, 41.7% (n=10) of Latinos and 58.3% (n=7) of African American respondents strongly agreed that using computers has improved their lives, compared with 38.2% (n=26) of European American, 34% (n=13) of Asian American and 12.5% (n=1) Pacific Islander/Hawaiian. Students of color respondents were more apt to describe their interest in computer technology as high or very high than European American students. While 48.5% (n=33) of European American students so described their computer interest, 66.7% (n=16) of Latinos, 65.8% (n=25) of Asian Americans, 58.4% (n=7) of African Americans, and 50% (n=4) of Pacific Islander/Hawaiians described their interest as high or very high. The results were reversed, however, when students were asked if their home and/or cultural traditions encouraged them to use computers on a regular basis. Twenty-five percent (n=17) of European Americans strongly agreed with this statement compared to 23.7% (n=9) Asian Americans, 16.7% (n=2) African Americans, 8.3% (n=2) Latinos and no Pacific Islander/Hawaiians.

It was somewhat surprising to us that ethnic minority students indicated higher interest than European American students concerning computers and whether using computers had improved their lives. We were not surprised that ethnic minority students reported less encouragement from their home and/or cultural traditions to use computers on a regular basis. Taken together, these data can be understood by the fact that the majority of students of color at Loyola Marymount University are first generation college students. This could suggest they might have less experience of computer technology at home and are more interested in it as college students.

In terms of gender, the results of this study support literature that suggest women are less inclined toward technology than men. Close to half of the male students (44.0%, n=22) strongly agreed that using computers has improved their lives compared to 34.8% (n=39) of female student respondents. Male respondents were more than twice as likely than female respondents to describe their interest in computer technology as very high, 38% (n=19) compared to 15.2% (n=17). Likewise, male students were more than twice as likely as female students to strongly agree that their home and/or cultural traditions encourage them to use computers on a regular basis, 32% (n=16) compared to 14.3% (n=16).

The above findings support research (Huber & Schofield, 1998) that indicates differences in attitudes concerning computers between female and male students. It is not completely clear as to why these gender difference in technology are present, although the research of Sadker and Sadker (1995) would suggest that this phenomenon is an extension of the gender bias that already exists in schools.

Conclusion

As previously mentioned, this study was conceived as a pilot study. In reviewing the data, we conclude that our sample of university students is not representative of ethnic minority communities in general. Because we want to understand how these communities relate to technology, we need a broader sample that controls for level of education. Further, our data did not allow us to answer our question about socioeconomic status, because there was not enough socioeconomic variance in our sample.

In thinking about new questions that we want to ask in a future study, we are interested in finding out how respondents became interested in computer technology and at what point in their lives did they have access to it. We are also interested in examining the question of gender differences in more detail to understand the source of these differences.

A larger sample size will allow us to analyze variance in socioeconomic status concerning computer technology. We are interested in examining how poor people get access to computers and how they use them. Our overall goal is to understand how the digital divide can be bridged for the various groups that are left out of the technology agenda.

References

Bracey, B. (2000, Spring). A different divide: Teachers and other professionals. Edutopia, 4-5.

Carvin, A. (2000, Spring). Mending the breach: Overcoming the digital divide. Edutopia, 3 and 13.

Gollnick, D. M. & Chinn, P. C. (1998). Multicultural education in a pluralistic society. New York: Merrill.

Huber, B. R. & Schofield, J. W. (1998). "I like computers, but many girls don't": Gender and the sociocultural contexts of computing. In H. Bromley & M. W. Apple (Eds.), Education/Technology/Power (pp. 103-132). Albany, NY: State University of New York Press.

Hoffman, D. L. and Novak, T. P. (1999, November). The growing digital divide: Implications for an Open Research Agenda. http://www.ecommerce.vanderbilt.edu/papers.html

Holmes, T. E. (1997, February 20). Seeing a future with more Blacks exploring the Internet. USA Today.

Jonassen, D. H. (1996). Computers in the classroom: Mindtools for critical thinking. Englewood Cliffs, NJ: Prentice Hall.

Kelly, K. (2000). The gender gap: Why do girls get turned off to technology? In D. T. Gordon (Ed.), The digital classroom (pp. 154-160). Cambridge, MA: Harvard Education Letter

Kleiman, G. M. (2000). Myths and realities about technology in K-12 schools. In D. T. Gordon (Ed.), The digital classroom (pp. 7-18). Cambridge, MA: Harvard Education Letter

McAdoo, M. (2000). The real digital divide: Quality not quantity. In D. T. Gordon (Ed.), The digital classroom (pp. 143-150). Cambridge, MA: Harvard Education Letter

Sadker, M. & Sadker, D. (1995). Failing at fairness: How our schools cheat girls. New York: Touchstone

IDENTIFYING SCHOOL CONDITIONS AND TEACHER PRACTICES THAT HAVE PROVEN EFFECTIVE IN INCREASING MATHEMATICS AND READING ACHIEVEMENT FOR AFRICAN AMERICAN STUDENTS AND STUDENTS IN SCHOOLS WITH SUBSTANTIAL MINORITY STUDENT POPULATIONS.

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Abstract: Reading, Writing and Arithmetic finding ways to make them stick! The focus of this research was to identify those conditions and teacher practices that have been proven effective in increasing the academic performance of African-American students and students in schools with substantial minority populations. The targeted population for this research was reading and math teachers from schools whose Texas Assessment of Academic Skills (TAAS) performance was reportedly Exemplary, Recognized or Acceptable. Research participants must have been teaching in classrooms with at least a 50% minority population. They also must have had at least 70% of their students passing the TAAS exam. Research results indicated that over 90% of the respondents Always exhibited the following strategies in their classrooms in Reading and Mathematics: Believing in their own self efficacy; Projecting a vision of excellence; Believing students can reach their potential; Encouraging students to ask questions; and Teaching students critical thinking strategies for solving math problems.

Introduction

Our nation is becoming ethnically and racially diverse. Several studies indicate that by the year 2005 about 30% of the U.S. population will be racial-ethnic minorities. Moreover, this percentage is projected to increase to 50% by the year 2050 (Reed, 1998). By the turn of the century only 15% of the new entrants into the workforce were native-born white males, compared to 47% in 1987 (Johnston, 1987). Even though the workforce will be more dependent than ever before on women and people of color, a disproportionate number of these individuals are not gaining the skills and knowledge needed to successfully function in the labor force (Johnston, 1987). Currently about 30% of school-age children are minorities, and this number will increase to about 36% by the year 2005. It is predicted that Hispanic American school children will increase from 12.5% to 22.6%, African Americans from 14.7% to 17.7% and Asian Americans from 3% to 9%(Larger, 1995). Florida, Mississippi, New Mexico, California, and Texas already have more than 30% children of color (Allen, Hutchinson, and Johnson, 1995). According to various national and state assessments, minority students, specifically African American students, are in the last or lowest tier of academic achievement (Journal of Negro Education, 1993). Whereas there is no reported emotional, psychological or intellectual reason that fully explains the low academic performance of many minority students, this phenomenon has baffled educators. Signham (1998) states in the article The canary in the mine: the achievement gap between Black and White students, "The educational achievement gap is real and has serious social, economic, and political consequences; however, the situation is by no means hopeless, if we start looking at the problem in new ways and avoid simplistic one-shot solutions." Many minority students are poor, neglected, abused, under housed and/or undernourished. Further exploration of this issue often finds schools that have large minority student populations characterized by discipline problems, heightened security, high absenteeism, dropouts, and few intellectually challenging courses. Also, pervasive in this environment is the attitude that the school's problems are a direct result of the students, their families, and their neighborhoods. Educators must realize that the children themselves, their parents, and the communities from which they come are not solely to blame. The blame for the low achievement of any group of students in an academic institution does not rest solely upon any one entity. It is, however, the responsibility of all (i.e. teachers administrators, community members, parents). Bloomington (1993) suggests that schools, in order to be successful in our rapidly changing society, must cross barriers of language, values and culture. To enhance the academic performance of minority students, we must investigate the conditions and instructional practices that are occurring in our schools and classrooms. We must also analyze the climate of the school as well as the attitudes of teachers. No longer can we point the finger of blame! We must accept responsibility and work to meet the needs of our increasingly diverse student population.

Research Focus

The main focus of this research was to identify those conditions and teacher practices that have been proven effective toward increasing the academic performance of African-American students and students in schools with substantial minority population. Clearly, students from poor and/or challenging family situations can perform as successfully as children from high-income families. According to Singham (1998), there is little evidence for the belief that minority, more specifically African American, students are somehow genetically inferior to whites and that the barriers impeding their academic achievement are insurmountable. Minority students, again and again, have consistently beaten the odds and demonstrated successful performance in schools across the nation. This research sought to identify the techniques and strategies that have proven effective in increasing the math and reading achievement of African American students and students in schools with substantial minority student populations.

Research Questions

The purpose of this research study was to contribute to the knowledge base information that would help in the development of practices to facilitate the academic success of African-American and other minority populations in the areas of Reading and Mathematics. In order to gain a deeper understanding of this insure the following questions were addressed: 1)What characteristics (clear vision,, teacher attitude, strong leadership, knowledge of curriculum, etc.) do teacher view as important to student success? 2) What strategies do teacher who work successfully with minority students (as measured by the Texas Assessment of Academic Skills (TAAS) test scores) in the areas of Reading and Math employ in their classrooms? 3) Are there differences in the strategies teachers believe are successful in working with minority and at-risk students and in those that teachers actually use? 4)Are their certain building practices or conditions that contribute to the success of African-American or minority students? If so what are they? To what extent do successful teachers use these strategies? 5) Which strategies are most successful in helping African-American and minority students improve their performance in Reading and Mathematics on the TAAS test? 6) What can be done to help teachers and schools better meet needs of the minority and low income at risk population? 7) Are teachers using culturally specific pedagogy? If so, what pedagogical strategies are best used and where have teachers received the training for these instructional practices?

Review of the Literature

A review of literature has highlighted numerous factors, which have influenced the success of minority students in schools. Daisy Reed believes that because there is a shortage of minority teachers, whereas Anglos make up 86% of the teaching population, there is a need to educate teachers on teaching minorities (Reed, 1998). Many times teachers, of all races, have extremely different backgrounds, from the student population, and therefore need assistance in understanding the pupils' lifestyles. Some identified aspects that would be helpful in educating minority children were: Have knowledge of the student's background; Have first hand experience working with minority youth; Understand the child's community; Promote desirable learning; Have classroom organization for effective discipline and control; Allow children to see and develop a relationship of similarities with the teacher (Reed, 1998). Educating teachers to teach minorities may not change the student's living conditions, but it can provide a better learning environment (Stephen, 1993). Claudia Steele, of Standford University, says that the low performance of African-Americans on standardized tests, as compared to the Anglo population, is due to a stereotypical "threat". This threat subconsciously demeans their test scores because of the historical fear that is instilled that African-Americans are inferior to Anglos, and especially exhibits this inferiority when their scores will be compared for achievement. The explanation for the low scores could be contributed to the fact that African Americans feel that they will not be the successor of the two groups (Steele, 1995). Researcher John Ogbu says that if the African-American community does not begin to see a reward for their effort given, then visible improvement on their academic performance will be minimized (1991). He suggests that the African-American community does not see a relationship between giving effort and receiving a reward, due to former denials and rebuke of employment and educational opportunities. History has shown that no matter the effort exhibited the rewards did not prevail among the community (Ogbu, 1991). Therefore, self-encouragement for academic achievement, for the youth of today, is minimal. Studies of the achievement related beliefs of African-Americans have focused on the premise that African-American children often do poorly because of their low expectations, lack of interest or giving up in the face of potential failure (Cose, 1998). Children's beliefs about their achievement outcomes are determinants of their behavior and performance in school. Students who perform poorly often feel they do not possess the ability to do well in school and as a result often do not attribute their success to their own efforts. According to research results reported by Dweck (1975), gains in the achievement of African-American students were attributed to intervention procedures that were designed to raise the self-confidence of these students.

Writer Barbara Lerner says the key factors to gaining minority success in school are increased self-esteem of the student and having minimum standards set that enables the student to obtain a high school diploma. In addition, she mentions that the educator must make the student knowledgeable of the student's failure. She says that the acknowledgement of failure is very beneficial to the child's drive to success (Lerner, 1995).

In order to meet the minimum competencies for high school graduation, the candidate must pass the state's objectives in Reading and Math. Teachers advise that the success of minority students can be granted, if the educator learns the culture of the students. She mentions how integrating literature, will inspire enjoyment for the class to discuss different books and stories (Diller, 1999). She mentions that selected literature must not only reflect the role of the educator, but the world of the student. Other key factors mentioned that can assist with educating minority youth are: To have dialogue with the students; To have dialogue with the children; To listen to the children; To have dialogue with the parents; To continue the dialogue (Diller, 1999).

Patty Shafer says that low scores in Math could be in part due to out of date curriculum and curriculum not being aligned with the state's objectives. Therefore, she said in order to gain improvement, schools must: Teach the objectives to be mastered; Use manipulative; Teach problem solving skills; Spend more than 1.5 hours on teaching Math. Over the years several characteristics of "effective schools" have been identified. "Effective schools" are those schools that have been successful in producing high academic performance among minority and/or low-income students. The identified characteristics include: A productive school climate and culture; Focus on student acquisition of central learning skills; Appropriate monitoring of student progress; Practice-oriented staff development; Outstanding leadership; Effective instructional arrangements of low achievers; Active and engaged learning; Salient parental involvement; High operationalized expectations and requirements for students; Multicultural sensitivity (Levine & Lezotte, 1990).

The Center for the Development and Study of Effective Pedagogy for African-``American learners (CPAL) took the Holmes Group characteristics of effective schools and ran a Delphi technique with the principals of ten schools, ranking the Holmes Group characteristics of effective schools as related to Holmes fifteen characteristics of effective schools. Their goal was to determine the most important characteristics as: Clear vision; Knowledge of curriculum; High mutually determined; Demonstrative professionalism; Performance expectations; Teacher attitude; Parent and community involvement ; Administrator attitude Change implementation; School climate and morale; Innovative programs and Technology strategies; Staff development and training. These items were prioritized by effective schools and identified as extremely important and extremely relevant items (CPAL, 1996).

Methodology

Population
The targeted population for this research was teachers from schools whose TAAS performance was reportedly Exemplary, Recognized or Acceptable. These teachers must have been teaching in classrooms with at least a 50% minority population. They also must have had at least 70% of their students passing the TAAS test. These teachers worked in a variety of school districts in the state of Texas.

Procedures
The initial phase of this project was devoted to a review of the literature to determine what strategies and practices have contributed to the increased academic performance of minority students in the areas of math and reading. The Holmes Partnership, research from Haberman, Lewis, Edmonds, Levine and the Charles A. Dana Center provided valuable insight and helped to identify some common characteristics important to student success. These characteristics (e.g. clear vision, teacher's credentials, strong leadership, school climate, etc.) were used to construct the survey instrument. The survey instrument was drafted after much thought over wording and the type of question best suited for this instrument. The respondents were asked to indicate the extent to which factors influenced student success in the areas of reading and math by making choices in categories of Always, Some of the time and Never. Respondents were also asked to provide information about their age, ethnicity, educational background, years of experience, and to indicate the percentage of minority students in their classrooms. The initial instrument was tested for validity. Students enrolled in ADMN 5073 School Curriculum Leadership were administered the survey instrument as asked to make recommendations as to its readability and clarity. From the recommendations several revision were made resulting in an instrument that adequately addressed demographic information, teacher expectations, classroom strategies and practices. TAAS performance was the primary determinant in identifying schools for this research. We requested a listing (i.e. name, location, enrollment, etc.) from the Texas Education Agency's Customer Assistance and Training Department of all school districts within in the State that have a 50% minority population and have made significant gains, 70% or above pass rate, on the TAAS. This request yielded 14 districts that fit the criteria of our study. Additional, we requested Academic Excellence Indicator System (AEIS) reports for the 14 districts previously identified. The AEIS reports allowed us to identify specific schools within the 14 districts to solicit research participants. The survey instrument was administered to teachers from a variety of school districts and schools. Over 150 useable instruments were returned.

Results

Respondents
The majority of the respondents were female (79.9%) between the ages of 26-55, most falling within the 36-45 year old range. 64.9% of these teachers were African American, 24.3% were White and the remainder were Hispanic or Asian. The respondents represented 33 schools in the state of Texas. The majority of these teachers had 1-5 years experience as teachers with 57.3% coming from elementary schools and 40.6% coming from Middle or High Schools. In order to determine the practices and strategies that contribute to the increased probability of academic success for African American and other identified minority students, a survey instrument was distributed to teachers asking them to respond to the research questions.
Question: **To what extent are certain characteristics important to student success?** Teachers were asked to evaluate the extent to which fifteen factors were important to student success by rating them as **Always, Sometimes or Never** important. Over 90% of the respondents felt that the following characteristics or strategies were **Always** important to student success: Teacher Attitude (97.9%); School Climate and Morale (93.6%); Clear Vision (90.8%); Strong Leadership (90.1%). ***Question:*** **To what extent do you exhibit the following characteristics or strategies in your classroom in reading?** Over 90% of the respondents stated that they **Always** exhibited the following strategies in their classrooms in Reading subjects: Believing students can reach their potential (94.3%); Encouraging students to ask questions (93.9%); Encouraging students to take initiative (93.3%); Projecting a vision of excellence (90.4%); Believing in your own efficacy (90.3%). ***Question:*** **To what extent do you exhibit the following characteristics or strategies in your classroom in mathematics?** Over 90% of the respondents stated that they **Always** exhibited the following strategies in their classrooms in Mathematics: Encouraging students to ask questions (96%); Believing in your own efficacy (94.7%); Projecting a vision of excellence (93.7%); Believing students can reach their potential (93.5%); Teaching students strategies

for solving math problems (93%); Teaching problem solving (92.6%). Respondents were also asked to list their responses to four (4) open-ended questions. The following are consistent responses to all questions form teachers who taught Reading, Math, both Reading and Math and other related subjects. These responses were not tailed to fit the researcher's purpose and are in the words of the respondents. ***Reading Question:*** **Do you find certain strategies more successful than other when working with minority students?** Some of the responses included: Strategies that promote independent thinking; One on one teaching; Small groups; Classroom relaxation w/music and snacks; Speaking to Hispanic students w/Spanish phrases raises the level of trust; Relating trends/styles to lesson; Knowing the different "in" topics; Being able to relate to students; Real life material; Hands on manipulatives; Role playing; Scenarios; ESL strategies; Multisensory instruction; Reading aloud at home; More parental assistance/involvement. **Please list any specific Reading/Math programs you have found to be successful in working with minority students. Some of the responses included:** SRA Reading; Direct Instruction; Montessori Instruction; Hooked on Phonics; Oarton-Giliihgham. ***Math Question:*** **Do you find certain strategies more successful than other when working with minority students?** Some of the responses included: One on one help; Hands on activities; Parent involvement; Convincing them that they can do the work; Teaching each other; Team competitions; Individualizing instruction based on weaknesses; Drill and practice; Repetition; One on one; Serve as role model; Give frequent assessments. **Please list any Math programs you have found to be successful in working with minority students.** Some of the responses included: TAAS Classes; Host Math Program; Block Scheduling; Problem Solving Software; Basic Math videos; Hooked on Math; Mountain Math; SRA Math; Computer Assisted Instruction. **Are you using and culturally specific pedagogical strategies? If so, please list these strategies? Where did you receive training?** Some responses included: English as Second Language – School In-Services; Differentiating In Curriculum - Rice University; Gifted and Talented – School In-Services: "Bridging the Gap" Cultural Conversations through Literacy _ Rice University.

Implications and Recommendations

The results of this survey suggest that the strategies that have the most significant influence on the performance of minority students are: Teacher Attitude; School Climate and Morale; Clear Vision; Strong Leadership; Student Expectations; Historical Achievement Related Beliefs; Cultural Awareness.

The teachers stressed the importance of encouraging students to ask questions, believing in their own efficacy, projecting a vision of excellence and believing that students can reach their potential. Learning must be student centered and teachers must understand the needs of their students. Teachers indicated that students must be accountable for their own learning. Students must be taught strategies that will assist them in successful school performance and skill that facilitate academic achievement.

Although the literature review strongly encourages Ahands-on@ activities, having students monitor their own reading and performance behavior, and making them aware of their own unproductive reading and math problem solving styles, teachers to a large degree do not utilize these strategies in their classrooms. Experts also recommend having students read a large number of books, yet these teachers do not utilize this classroom strategy. In Math it has been strongly suggested that strategies such as memorizing, drill and practice should be de-emphasized, yet the teachers surveyed do not de-emphasize this approach.

This research identifies teaching practices used by 150 extraordinary teachers that have proven effective when teaching minority students. The results of this study suggest that effective teachers employ sound research based -strategies that facilitates the academic success of minority populations.

Bibliography

Allen, Hutchinson, and Johnson's Study (as cited in Reed, 1998).

Bay, J. M., Reyes, B. J., Reys, R. E., (1999). The top ten elements that must be in place to implement standards-based mathematics curriculum. Phi Delta Kappan, 80, 503-506.

Bloomington's Study (as cited in Reed, 1998).

Center for the Development and Study of Effective Pedagogy for African-``American learners (CPAL) (1996). Promising Practices Successful Texas school wide programs: Research study results.

Cose, E. (1998). Living with the tests. Newsweek, 65.

Dweck, C. S. (1975). The role of expectations and attributions in the alleviation of learned helplessness. Journal of Personality and Social Psychology,31, 674-685.

Diller, D. (1999). Opening the dialogue using culture as a tool in teaching young African-American children. The Reading Teacher, 52, 820-828.

Johnston, W. Workforce 2000: Work and workers in the twenty-first century. (Indianapolis: Hudson Institute, 1987).

Journal of Negro Education, Vol. 62, No. 3 (1993).

Lerner, B. (1995). Aim higher- recent studies shows that Black students' test scores can be raised- if we aim higher. National Review, 00000047, 54-60.

Levine, D. U. and Lezotte, L. W. (1990). Unusually effective schools: Madison, WI: National Center for Effective Schools Research and Development.

National study says minority students doing better in schools. (1995). Jet, 88, 8.

Ogbu's Study (as cited in Singham, 1998).

Reed, D. F. (1998). Speaking from experience: Anglo-American teachers in African-American schools. ClearingHouse, 71, 224-230.

Singham, M. (1998). The canary in the mine: The achievement gap between black and white students. Phi Delta Kappan, 80, 8-18.

Singham, M. (1995). Race and intelligence: What are the issues. Phi Delta Kappan, 271-278.

Steele's Study (as cited in Singham, 1998).

Stephen, V. P. (1993). Instructional strategies for minority youth. ClearingHouse, 67, 116-121.

Using Technology in Early Childhood Environments to Strengthen Cultural Connections

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Abstract: This application-oriented paper describes the use of technology in the early childhood environment to support the development of cultural competence. Four objectives are identified and specific examples are described to aid practitioners in developing media presentations that serve to reinforce multicultural theory through the integration of technology in a manner that is suitable for young children. All of this information is shared with an eye toward methods of developmentally appropriate practice and the incorporation of technology as deemed valuable in regard to the licensure, certification, and accreditation standards of early childhood professionals.

Introduction

Society is changing. In order to survive and thrive in a new, diverse nation, individuals must adapt. The children who will guide the future must be equipped with skills to navigate on uncharted waters. As stated in the National Association for the Education of Young Children's publication, <u>The Children of 2010</u> (Washington & Andrews 1998), "In a nation where no single race or culture will ultimately be in the majority, the next generation will be called upon to work together - to move beyond the injustice, intolerance, resentment, and anger that has been such weighty baggage in United States history." (p. 14). Children can't achieve this hope alone. They need help cultivating the interpersonal skills that will allow them to accept and appreciate both the commonalties and the differences that exist all around them.

Drawing on the work of James A. Banks (1996) and Stacey York (1991) the following objectives are identified to support developmentally appropriate work with young children in the area of multiculturalism and diversity.

The children will:

- form an awareness of self and explore individuality in relation to their place in the larger group;
- gain knowledge of the traditions, rituals, and practices that combine to form an individual's cultural heritage;
- build a sense of identification with others through the recognition of commonalties and move toward an appreciation of differences; and
- recognize unfair characterizations and begin to understand their roles as agents of change.

Frequently commercial curriculum materials, play props, literature, games and activities are not the most appropriate when attempting to construct an environment for children that will support the growth of cultural competence. Commercially produced materials often contain stereotypical images of costumed children in various geographical regions; the use of the English language is almost exclusive; and alternative family styles, gender roles, ability levels and mixed-age relationships are not often seen. Fortunately, the developmentally appropriate use of technology in early childhood environments is now viable (Haugland 1999) and can aid early childhood professionals in the development of methods and materials that are made in the classroom with a focus on strengthening critical cultural connections for each child.

True multicultural education involves the integration of diversity concepts into every aspect of the curriculum (Banks 1996). Often educators fall into the "tourist" trap and treat multiculturalism as a thematic unit or a specific lesson that must be covered. A month spent studying Mexico, for example, is added to the early childhood curriculum. During the Mexico unit children dine on traditional Mexican foods, listen to Mexican music, wear sombreros and serapes, and learn about Cinco de Mayo celebrations. This practice is called the tourism approach and involves the children looking at groups of people or geographic areas as if they were touring a strange and exotic place. The tourist approach serves to highlight differences, which is not the purpose of multicultural education (Banks 1996). Unfortunately, the media permeating children's lives generally follows the tourism approach as well, often going so far as to exaggerate differences as a comedic device. When children see artwork of adult Mexican males napping against a cactus, watch Speedy Gonzales cartoons, and see Mexican children photographed exclusively in traditional costume, a patronizing caricature of an individual from Mexico begins to form.

All children are harmed by this practice. Those from Mexico or of Mexican decent are clearly marginalized by these images, but other children also are impoverished. Children should not be exposed to material that trivializes others and does not deal with their real, day-to-day living. Children can easily develop a false base of security founded on perceived superiority over others. Unfortunately, they may begin to form pre-bias prejudices if they are not given the opportunity to learn alternative methods of thinking and behaving (Derman-Sparks & A.B.C Task Force 1989).

Instead of resorting to the tourist approach to multiculturalism, educators should highlight commonalties among people and integrate diversity issues into every aspect of daily activity with children. Since commercial materials may not be suitable, technology offers educators the opportunity to integrate multiculturalism in a appropriate manner by developing material specific to the needs of the program.

Objective One: The children will form an awareness of self and explore individuality in relation to their place in the larger group.

From a child's earliest sense of awareness until approximately the age of two the major developmental task in which they engage is identifying themselves as a person separate from others. Young children must gain a clear sense of who they are and where they fit into their family, the community, and their peer group before they can begin to understand others (Derman-Sparks & A.B.C. Task Force 1989). Teachers of very young children set up an environment that is rich in opportunities for the exploration of both the familiar and the unfamiliar. They are primarily in the role of a facilitator of knowledge (Gonzalez-Mena & Eyer 1993).

Activities that label and observe facial features, skin color, and hair color and texture are suitable first steps into the world of diversity. Taking photographs of each child, both individually and within a group helps them examine their own features, compare themselves to one another, and discuss the physical characteristics that make them who they are. Children are capable of all of these tasks. They are not oblivious to differences, but generally have not yet learned to place the value judgements on them that adults often do. An open, honest atmosphere in which to explore is crucial to multicultural education in the early years.

Digital cameras are immediate and therefore are extremely useful in documenting occurrences as they happen. When the need to wait on the developing of film is eliminated children can view high-quality photographs of activities immediately after they take part in them. This immediacy is especially important for young children who are visual learners and are often not yet able to think symbolically.

Group photographs posted in the facility can easily take the place of commercially prepared posters and displays and have the added benefit of allowing the children to build up an appropriate context in which to understand and accept individuality and differences. Commercially produced media generally feature caricatures of ethnic children dressed in native costume while digital or scanned photographs of each child represent the real world and provide fertile ground for the growth of cultural competence.

Photographs of daily activities or special visitors can also be displayed at the end of the day in order to give parents or others who transport a child from school or day care facilities a peek into the day's events. Instead of the generic "What did you do today", parents can be encouraged to ask specific questions of their children, such as "I see that you talked about hair today. On the way home we are visiting Aunt Regina. What color is her hair? Is it the same color as mine? She is my sister." Families can play a greater role in their child's learning when they reinforce and build on multicultural ideas learned at school.

Teachers can expand the use of digital photographs in the classroom. Flashcards can be made by printing the photographs and laminating two cards, one with the child's eyes and the other with a view of the full face. The children use the cards to identify the eyes and faces of each child. This activity would be appropriate for use with children of toddler age. Digital or scanned photographs can be inserted into a Microsoft PowerPoint presentation or a Hyperstudio stack to allow for its continued use in many different capacities. The presentation can document a day in the facility and record each child's arrival, playtime, snacks or meals, and departure time. The presentation can then be used to replace commercial children's software, which may not be considered a viable representation of diversity for use in the early childhood classroom.

Objective Two: The children will gain knowledge of the traditions, rituals, and practices that combine to form an individual's cultural heritage.

It is crucial for early childhood professionals to help young children gain awareness of and appreciation for their own culture. By putting forth every effort to gain a familiarity with each child's family of origin, teachers or caregivers help children through this stage of multicultural education. Families are embedded in their native culture to varying degrees, assumptions about cultural and ethnic association cannot be made (Lane & Signer 1996). One way to find out about a child's family and its unique aspects is through the use of electronic family portfolios. An electronic family portfolio contains information and artifacts that are of import to the child and his or her family members (Dodd & Lilly 1997). A digital camera or scanner and a presentation software package are used to put together this document for each child.

Family portfolios can empower children as decision-makers by enabling them to choose what will be included in their program. Furthermore, as children help select materials for their portfolios, family history and special traditions can be discussed that may never have been addressed with the children in the past. In addition, family members can visit the classroom or facility in order to construct portfolio materials. Family members can also help the child present their finished product to the rest of the group in order to facilitate diversity exploration among peers. Each of these practices aid in cementing the important bond between the child, their family, and the school or care environment.

Conferencing is also a technique that teachers and caregivers use to build relationships with families. Individual technological portfolios can be constructed for each child in order to facilitate positive connections with parents during conference visits. Photographs, artwork, and documentation of each child's development can be displayed on a computer screen. Sound files add an extra dimension to the portfolio and electronic voice recordings would allow the child to narrate sections of the presentation. Personal electronic portfolios can give a visual representation of a child that paper and pencil files cannot. A great deal more data can be incorporated into an electronic portfolio, allowing areas of interest or concern to be easily highlighted. Moreover, the portfolio can easily be updated, daily if necessary. An electronic portfolio can open dialogue in a unique manner in order to support and maintain the open and honest exchange that is an important aspect of a positive association between parents and caregivers or teachers (Newman 1998).

The community in which a child lives also plays a part in shaping individual cultural constructs. It is important that early childhood educators integrate activities that authenticate significant community connections and allow children access to people and events outside of the facility. Customized technological activities can bring the community into the classroom or care facility. Actual photographs of community helpers such as police officers, health care professionals, firefighters, grocers, and postal workers can be matched with photographs of the equipment or supplies that they use in their work. A "virtual field trip" can be conducted by the teacher that tours the community taking photographs of buildings, vehicles, and other points of interest. Presentations, games, and activities that utilize community resources help reinforce relationships already formed between children and their community as well as introduce them to new concepts. An early childhood professional that makes his or her own materials can do so with an eye toward the integration of specific multicultural concepts. Through the use of professionals of both genders, such as a female police officer, or a male nurse or including those of mixed age groups, races, and ability levels children's concepts of what is "normal" can be greatly expanded.

Objective Three: The children will build a sense of identification with others through the recognition of commonalties and move toward an appreciation of differences.

In order to gain an understanding of others, children must first identify with them in some manner. Activities that stress characteristics that groups of children have in common are the first step toward this objective. An activity involving transportation is an example of an activity that builds a sense of unity among children. Every child travels to school; they all might not arrive in the same way, but they all use some type of transportation. A discussion in regard to the various types of transportation used by the children on a daily basis can broaden to incorporate the idea that children in some parts of the world travel to school by bicycle, some travel by boat, some use a bus, and some walk. Photographs of each child arriving at school can be used to graph a chart of various types of transportation. The Internet or a technological encyclopedia can yield photographs of children around the world traveling through the use of various modes of transportation. In addition, presentations can easily be supplemented with high-quality children's literature. Ann Morris' book *On the Go* explores the diversity of transportation with photographs by Ken Heyman and simple text. As children begin to isolate events that are common to all and events that are unique to various cultures or geographic regions, they can develop a deeper understanding of multiculturalism.

Cooking activities are also appropriate to support this objective. Everyone eats, but people eat different types of food, prepare the food in different ways, and use different utensils. Preparing rice for a snack or meal can expose children to many different multicultural concepts. Many families eat rice, but they can get the rice for their meal in different ways. Some families go to the grocery store and buy a bag of rice. Some families grow rice, and still others purchase their rice already cooked. Rice can be prepared and served many different ways; boiling rice in a pot over a flame or frying rice in a wide wok are both options. Some people mix their rice with fish, pork, or vegetables. Some people eat butter and sugar on their rice. Others eat their rice plain. Rice can be served in small, shallow bowls or on wide, flat plates and can be eaten with forks, spoons, chopsticks, or the fingers. Technology compiled during a rice activity can be used to construct either classroom or individual books, games can be made, and posters or collages can be put together. For example, photographs can be printed and laminated so that children can work on sequencing as they put each step of the process in chronological order.

These activities support the young child's development by making learning relevant to their daily lives (Roopnarine & Johnson 1993). When children see a visual representation of themselves involved in activities and hear sound files replicating the events, their ability to remember the occurrence is heightened. As an adult helps guide children through the experience of using the media, their sense of reliving the event can be richly enhanced. Each time children are exposed to a situation they integrate it more fully into existing paradigms and real learning takes place (Roopnarine & Johnson 1993).

Objective Four: The children will recognize unfair characterizations and begin to understand their roles as agents of change.

Young children are capable of empathy, which is the trait that is needed to explore how marginalized groups feel when they are treated with prejudice by majority groups. The Thanksgiving tradition in the United States is an area in which young children can consider unfair representatives of American Indians. Throughout the month of November, children in the United States are constantly exposed to caricatures of Indians involved in the first Thanksgiving dinner. Black-clad pilgrims and near-naked Indians gather together to eat turkey and corn with a complacent contented demeanor. These images are piled on top of other images of American Indians in children's media.

The Disney cartoon "Pocahontas" falsifies the life of a real American Indiana woman for entertainment purposes. The stereotypical picture of an American Indian who communes with nature and can talk to the animals is also reinforced by the cartoon. Classic "Looney Tunes" and other media portray American Indians as savages who scalp and raid with a bow and arrow. In addition, many programs use the "red" man who speaks in monosyllables as a comic foil. When the cumulative effect of these negative images is considered, it is no wonder that children develop unrealistic paradigms in regard to Native Americans.

Technology can help a teacher gather cartoons of American Indians and allow children to compare and contrast those images with both historical and contemporary photographs of American Indians as they live, work, and raise families. A picture of a stereotypical Indian teepee will elicit immediate recognition in children who may not realize that American Indians may live in frame houses, in brick condominiums, and in city apartment buildings at this point in time. It is appropriate to counter the negative media images that permeate a child's life with positive, realistic, and contemporary images that depict American Indians both as they really were in the past and as they are now. Children can consider why it might hurt an American Indian's feelings to be portrayed in cartoons as a savage. They can even begin to make decisions about hanging Thanksgiving decorations on the wall that show American Indians in a negative light, and watching cartoons that are discriminatory in nature. To see children take control of an unfair situation and work to make positive changes is what multicultural education is all about.

Conclusion

Clearly the family is the child's first teacher, but the community in which the child lives and the media to which the child is exposed can be strong determinants of values and beliefs (Hildebrand, Phenice, Gray & Hines 2000). Children generally are not required to learn cultural competence in their homes since the skills are not needed in that environment (Clark, DeWolf & Clark 1992). The preschool classroom or child care setting is often the child's first exposure to diversity and, therefore, is a natural starting point for multicultural awareness (Swick, Bowtle & Van Scoy 1994). Therefore, teachers or caregivers are given an excellent opportunity to integrate the various images that children are exposed to into a workable model of non-bias behaviors and beliefs. Using technology in a developmentally appropriate manner to facilitate cultural connections with children is a viable way in which to transform current curricula in order to fully integrate multicultural concepts and develop an understanding of diversity that can last a child a lifetime.

References

Banks, J. A. (Ed.) (1996). *Multicultural education transformative knowledge and action.* New York: Teachers College Press.

Clark, L., DeWolf, S. & Clark, C. (1992). Teaching teachers to avoid having culturally assaultive classrooms. *Young Children*, 47 (5), 4-9.

Derman-Sparks, L. & ABC Task Force (1989). *Anti-bias curriculum: Tools for empowering young children.* Washington, DC: National Association for the Education of Young Children.

Dodd, E. L. & Lilly, D. H. (1997). Family portfolios: Portraits of children and families. *Preventing School Failure*, 41, 57-62.

Gonzalez-Mena, J. & Eyer, D. W. (1991). *Infants, toddlers, and caregivers* (3rd Ed.). Mountain View, CA: Mayfield Publishing Company.

Haugland, S. (1999). What role should technology play in young children's learning? *Young Children*, 54 (6), 26-34.

Hildebrand, V., Phenice, L. A., Gray, M. M., & Hines, R. P. (2000). *Knowing and serving diverse families* (2nd ed.). Upper Saddle River, New Jersey: Merrill Prentice Hall.

Lane, M. B. & Signer, S. (1996). *Infant and Toddler caregiving: A guide to creating partnerships with parents*. Sacramento: California Department of Education.

Newman, R. (1998). Parent conferences: A conversation between you and your child's teacher. *Childhood Education*, 74 (2), 100-101.

Roopnarine, J. L. & Johnson, J. E. (1993). *Approaches to early childhood education* (2nd ed.). Upper Saddle River, New Jersey: Merrill Prentice Hall.

Swick, K., Boutte, G. & Van Scoy, I. (1994). Family involvement in early multicultural learning. *Dimensions*, 22 (4), 17-21.

Washington, V. & Andrews, J. (Eds.). (1998) *Children of 2010*. Washington, D.C.: National Association for the Education of Young Children.

York, S. (1991). *Roots and Wings: Affirming culture in early childhood programs*. St. Paul: Redleaf Press.

Where is the "Any Key", Sir? Experiences of an African Teacher-To-Be

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Abstract: This presentation focuses on efforts to assist first-year students from developing communities in beginning computer classes at the Technikon Free State (TFS) in South Africa. The research is based on the experiences of Thabo, a student teacher from a rural area who was willing to live in the poorest conditions just to be able to attend a tertiary institution. The compulsory computer literacy classes posed a major problem because he had never touched a computer in his life. On his first day the class mocked him when he indicated that he could not find the "any key"! The pace was just too fast and he also did not have a computer of his own. He ultimately failed the course. After researching the nature of students' problems, lecturers at the TFS drew up a seven-point action plan that might serve to alleviate the initial stress experienced by students like Thabo.

Thabo's Story

Second-year student Thabo Mbokweni lives in a temporary structure (often called a "schack") in the Mandela squatters' camp in the Bloemfontein-Mangaung area, a typical South African settlement with rows and rows of corrugated iron dwellings - the only shelter of many against the harshness of the elements.

Thabo came from a rural area to prepare himself to become a technical teacher. His family is poor, but he fared well at school and they decided that they were willing to sacrifice everything for a good education for their son. Thabo's father is a municipal worker in a small village, while his mother is a domestic worker. They succeeded in saving enough for the fees. The problem, however, was that they could not afford hostel accommodation as well. Thabo then decided to share a shack with a cousin working in the city.

The two young men's dwelling is surrounded by hundreds of shacks – not two similar in construction or size. The only water is available from the tap in the street, but they have an electricity supply where a prepaid card system is used. One electric light, a two-plate stove, a radio and a small television set make up their earthly wealth.

Thabo is an intelligent boy. He has always dreamt of being a teacher and creating a better life for himself and his parents. There was only one major problem – he had never in his life touched a computer and computer literacy is a compulsory subject for student teachers at his institution. His first day in class was a disaster. The whole class burst into laughter and mocked him when he told the lecturer that he could not find the "any key" – not the least the young man from an advantaged community where computer literacy is as commonplace as the traditional biltong and braaivleis.

The pace was just too fast for Thabo, resulting in the fact that he became completely lost somewhere between double click and pull-down menus. Furthermore, because he did not have a computer of his own, he could not get any other practice than during the formal class periods. He ultimately failed the course. He would have to repeat it during his second year. He was not happy, because the fees were high and he did not want to disappoint his family and place an extra burden on them.

Thabo is now in his second year. He is one of the brighter students in the computer literacy class and spends most of the practical classes helping those who cannot find their "any keys". But was it necessary for Thabo to have gone through all the initial trauma? Could other teaching methods and approaches not have given him the opportunity to adapt to the unfamiliar situation more easily?

What Does Our Research Tell?

Accommodation and Transport

In surveys undertaken at the Technikon Free State, it was found that, in some of the classes, up to 40% of the students from rural areas live in less than appropriate conditions in the townships surrounding Bloemfontein. Although some students were not willing to discuss their accommodation problems in detail, it was estimated that 10% of these students live in temporary structures, similar to those of Thabo, as described above. Another 30% rent small, unfurnished rooms in the township. In most cases they share these rooms with at least one other person. Thus it can be understood why the surveys indicated that fewer than 40% of all the students from the developing communities have their own rooms for study purposes. Students also complained about noisy and unsafe conditions. A few remarks on problems experienced in this regard are the following:

- *It was my first time in Bloemfontein and it was difficult for me to go through all the township sections to look for accommodation. Now I don't have money to come to school every day.*
- *I share a room with family members. Each room in the house is rented out. Some of the people are not students, creating an environment not suitable to study.*
- *I rent a room and share it with a friend. It's very noisy. I cannot study well, so I am forced to stay in the library until late in the evening.*
- *There is no table and no chair in my room. A friend I am staying with makes a lot of noise with his radio and TV.*
- *The place where I stay is not safe, and taxis only operate until 19:00 in this area.*
- *I do not have electricity in my room.*

Daily transport poses another major problem to the students. Some live in the Botshabelo and Thaba Nchu areas (about 70 and 90 kilometers respectively from Bloemfontein) because they cannot find or afford accommodation in the city. Almost two hours a day is spent on buses and students complained about exhaustion and not enough time to study or attend extra computer classes ("I have to travel by bus from Thaba Nchu every day, which makes me very tired, so I cannot study when I arrive home"). Others who live in the Mangaung township or surrounding informal settlements said they simply could not afford the daily taxi fare of R6 ($0.75) for travelling to and from the Technikon ("I can't afford R6 a day, so I have to be a pedestrian"). A few students admitted that they walked to the TFS every day ("I travel on foot to school each morning and back, for one hour. Sometimes when it is raining I don't come to classes").

Financial Problems

It seems as if many students make use of loans in order to be able to study at the TFS. The natural and almost casual way in which many treat their financial problems is amazing. They suffer, but they succeed in "coping" and "managing", and that is the most important thing to them, because, in the end, they will have earned a better future for themselves:

- *My parents have to borrow money to see to it that I pay for everything.*
- *I really don't know how I manage, but I do.*
- *If I do not have enough money for transport, I am forced not to eat lunch.*
- *I try to find temporary jobs over weekends.*
- *I'm coping. Try to find bursaries. Money for food is sometimes a problem..*

Possession of Technology

A group of 150 first-year students in a Computer Literacy class in the Faculty of Management at the TFS (many of them teacher education students) was requested to indicate their access to technology at their dwelling places, including computers and related equipment. The findings are represented in Tab. 1. The most promising factor is that more than 93% have access to an electricity supply. Very high percentages also have access to radios and television sets – although it may not always belong to themselves. The possession or access to telephones lies at 55%. The alarming fact, however, is that only 7% of these students have a computer at their disposal after hours - not to mention Internet connections and E-mail. This means that they must be able to fit in time to work in the computer laboratories during scheduled times (which is not always easy, because many of the labs are used throughout the day for lecturing and practical sessions).

Technology	% availability
Electricity	93
Radio	91
Television	82
Satellite TV	5
Telephone	55
Computer	7
Printer	5
E-mail	3
Internet	3
Audio recorder	55

Table 1: % availability of technology to a group of students at the Technikon Free State

The survey was extended to a group of 47 second-year Computer Science students. Very similar results as for the other group were obtained, except for a higher possession of computers (38%), printers (31%), E-mail (10%) and Internet (7%). This is, however, still far from the ideal situation for Computer Science students. The students were also requested to indicate possible solutions to their problem of access to computers. The overall indication was that students need more and longer access to the computer labs. Several asked for 24-hour accessibility and a card system by means of which computers can be operated. There were requests for more student assistants and also for the implementation of a Help Desk in the IT department.

Initial Problems in Computer Classes

The above-mentioned group of first-year students was also asked to indicate their initial problems in the compulsory Computer Literacy course. (The survey was conducted about two months after the classes had commenced). A fairly clear pattern of problems was revealed: Fear of the computer ("Everything was difficult and I was nervous because it was my first time"); uncertainty ("The first time I was just confused at what's going on with this TV-like instrument"); keyboard problems ("First of all I didn't know how to use a keyboard" and "I did not know how to operate and communicate with it"); using the mouse and clicking ("I tried but could not get the whole thing right"); SAVE, OPEN and CLOSE ("I didn't know how to get back the information I had because it didn't show up the next time"); and impatient assistants and lecturers who do not understand that students had never used a computer before ("Lecturers and assistants were not people-oriented. They started as if everyone in the room knew how to use a computer. The way they lecture us is difficult"); difficulties in following instructions in the practical books, etc. The following comments from students on their initial experiences may further reveal the nature and extent of some of these problems:

- *Everything was difficult except pressing the computer, which is what everybody can do.*
- *I did no know how o turn on the computer and type it.*
- *Everything was new for me and I encountered a lot of problems, e.g. why do we use UNDO?*
- *Firstly, the assistant was horrible, unfriendly and acted as if we were supposed to know everything about computers.*
- *The time was not enough to do the practical work.*
- *I did not understand all the multiple-choice questions in the test.*
- *Assistants don't show us what to do. They do it for us.*
- *We were kept in a pool of darkness with nobody to help us.*

For every prospective computer user, the major obstacle is clearly to achieve a basic level of computer literacy. According to Pearn and Down (as cited by Garavan & Mc Cracken 1993 p. 8), a learner has to overcome the following in order to reach this basic level:

- Emotional resistance.
- The lack of availability of tools.

- Limits on the time taken to become computer literate.
- Lack of assistance.
- Fear of interacting with a computer.
- Fear of not being able to cope.
- A desire to hang on to the familiar ways of doing things.

The comments of TFS students show a remarkable resemblance to the above list. Many of the students reported that, after some time, they started to cope and even enjoy the classes. After two months of lecturing, however, about 50% of the respondents were still uneasy about many aspects of the computer lessons. (Fortunately not many students felt as negative about computers as one of the respondents who wrote after two months: "I didn't know a thing about computers and still I don't know".)

In a study undertaken by Callaghan and Smit (2000), also in the South African context, it was found that most students in their investigations took at least one month just to overcome the initial barriers on the road to computer literacy. The authors also mention that only a few of the students had balanced ideas of what they expect of the computer. In accordance with the views of these authors, we also argue that we cannot ignore these facts and should address them in our computer classes.

The following remark also serves to place the problems of TFS students in their South African social context: "When I went to the class of an African lecturer who explained in my mother tongue, I understood much better". It must be understood that almost all the respondents were African students with English as their second language. Their lecturers were mostly Afrikaans-speaking persons teaching through the medium of either English or Afrikaans. (At the TFS a dual medium of instruction is used, Afrikaans and English, two of the eleven official languages in the country.) This fact may have contributed to students' problems with the multiple-choice tests, for example.

Suggestions on the handling of Computer Literacy Classes

Students were asked to explain how they managed to cope with their problems, and also to make suggestions on ways of improving the teaching and learning in beginning computer classes. The following comments more or less summarize the overall trend in the responses:

- *I kept on for asking assistance and going through the work all by myself.*
- *I just concentrated and worked harder.*
- *I started to ask questions where I didn't understand..*
- *Getting help from my classmates.*
- *Tried to learn at my own and ask people who are familiar with the course.*
- *By attending extra classes.*
- *I just attended the open-lab times.*
- *Practice is the solution.*
- *I learnt to teach myself following instructions in the book.*

In considering the above comments, clear signs of growth in students can be recognized. Students started to take responsibility for their own learning on the one hand and, on the other hand, they started to realize the value of seeking for assistance from peers and other knowledgeable individuals. These are important directives when deciding on a more effective approach to use in lecturing.

What about a co-operative learning method?

Some of the suggestions of the students in the previous paragraph show resemblances with co-operative learning methods as well as with self-instruction methods. A literature search gave indications that not many institutions over the world experience problems quite identical to those of our TFS students. It became obvious, however, that much research has gone into researching the effectiveness of specific teaching methods in Computer Science courses. The discussions on co-operative learning methods in particular proved to be very valuable. The notes of Henry Walker (1995) on collaborative learning in computer classes provide a number of very applicable guidelines:

- All students MUST work in groups for the first two weeks of class; thereafter, individual work is allowed but groups still encouraged.
- Groups of not more than two or three students are recommended.
- Formal lectures rarely extend beyond 15 minutes per class.
- Labs at the beginning must be very clear concerning what is to be done and turned in.
- During group work the instructor circulates, regularly asking if there are questions.
- The faculty member needs individual contact with every group every day.
- When common problems arise, the class convenes as a whole to discuss the difficulties.
- While labs are collaborative exercises, programs and tests are to be individual efforts.

Walker feels that by means of the above approach, active learning by students is promoted and a variety of learning styles can be accommodated. Furthermore, oral and written communication skills are developed, the reading of the text is required, and the responsibility for learning is explicitly placed with the students (p. 1).

A jigsaw technique may also be tried out in the computer classroom. Each student in a group of four or five students is assigned a specific task. The groups then break up and all those with identical assignments group together to work on their specific task. When accomplished, each person goes back to his/her original group with the responsibility to teach the other members what has been learnt in the single-task group (see Aronson 2000). Group members now have to work together as a team to reach a common goal and each member depends on all the others. The jigsaw process encourages listening, engagement and empathy by giving each one in the group a very essential part to play in the activity. (In the South African context, the language problem may also be addressed if group members are sharing the same mother tongue.) Salikin and Cummings (1997) give an interesting example of a co-operative learning computer lesson in which the jigsaw method is used.

The Worcester Polytechnic Institute, WPI (1998) provides valuable guidelines on the assessment of peer/cooperative learning in the introductory science curriculum. Although meant for students at a higher level of study, Prey (1995) guides the reader on using a cooperative learning technique in an undergraduate computer science classroom

Callaghan and Smit (2000) noticed that no respondent in their study selected the option of working entirely on his/her own and no student wanted the lecturer to "talk and chalk" only. They found it interesting, however, that a very high percentage of their respondents preferred to work on their own, with only help from the lecturer when needed. Although not specifically investigated, these authors feel that group work would be beneficial, especially if it could be done in the mother tongue.

A Seven-Point Plan for Thabo and His Friends

In considering our research and other views referred to in this discussion, we suggest the following seven-point plan to be implemented and further investigated in the Computer Literacy classes (and other beginning Computer Science classes) at the TFS in 2001:

1. **Awareness:** All IT lecturers must (again) be made aware of the nature and extent of the social, economical and cultural problems many students from developing communities are experiencing, problems that may have a profound influence on their performance in computer science courses as well on their personal well-being. They must also take notice of students' specific problems in the beginning phase of a computer science course, in particular those who have never before worked on a computer. A survey by means of which the prior computer knowledge of students is determined, may prove to be very valuable. If possible, students without any prior computer experience should be grouped together. The careful compilation of student profiles may also help to better understand students and their personal circumstances (and, hopefully, their "any key" problems!). Students may also be encouraged to keep reflective journals in which their specific fears and frustrations can be pinned down.
2. **Orientation:** In the beginning enough time should be spent during a long enough orientation period to acquaint students with the basic elements of a computer keyboard and provide them with basic hands-on experience, in particular in using the mouse and doing the "double-clicking". They should also be shown what the computer can and cannot do. Their fears and expectations need to be discussed in an informal way (see Callaghan & Smit 2000).

3. **Teaching methods:** The possibility of the use of alternative teaching methods such as co-operative learning in theoretical as well as practical classes should be thoroughly investigated and exploited.
4. **Language:** The possible language problems of students need to be acknowledged and addressed, also when referred to instructions in practical guides or manuals. The language used in test and examination questions needs to be considered very carefully. More attention needs to be given to computer terminology in general.
5. **Access**: The effect of the fact that a very large percentage of students do not have computers of their own should be considered in coherence with possible accommodation, transport and financial problems. Appropriate and sufficient open-lab times need to be discussed and negotiated with students.
6. **Assessment:** Assessment techniques need to be revisited; it should be of a continuous nature, with tests in line with what has been done in classes. A co-assessment technique where peer assessment as well as teacher assessment is used, may be considered (to fall in line with co-operative learning methods), as well as the possible introduction of portfolio assessment
7. **Feedback:** Lecturers (and lab assistants) must be willing to listen to their students and not be afraid to ask for feedback on lessons or specific teaching methods.

Conclusion

The researchers are of the opinion that the implementation of the above seven-point plan could bring about a marked difference in the ability of students to cope with problems in beginning computer classes. It is important that the effects of the implementation of such a plan would be carefully monitored and alternative plans developed where necessary. Ultimately, the institution as a whole could benefit from a successful implementation of a plan in which "any key" problems are to be foreseen and avoided.

References

Aronson, E. (2000). Jigsaw Classroom: Overview of the Technique (http://www.jigsaw.org/overview.htm). Read on 22 October 2000.

Callaghan, R. & Smit K. (2000). Pre-knowledge of technology and its effect on promoting computer literacy. Paper delivered at the Conference on Information Technology in Tertiary Education (CITTE2000) at the University of Port Elizabeth, South Africa, 28-30 June 2000 (http://upe.ac.za/citte2000/abstract.asp?ID=7). Read on 20 November 2000.

Garavan, T.N. & McCracken, C. (1993). Introducing end-user computing: the implications for training and development. Accession Number: 00790291. *Industrial & Commercial Training,* 25(7): 8-14.

Johnson, D.W. & Johnson, R.T. (1989). Cooperative learning, values and culturally plural classrooms (http://www.clcrc.com/pages/ClandD.html). Read on 20 October 2000.

Prey, J.C. (1995). Cooperative learning in an undergraduate Computer Science curriculum (http://fie.engrng.pitt.edu/fie95/3c2/3c23/3c23.htm). Read on 15 November 2000.

Salikin, J. & Cummings, H. (1997). Cooperative Learning Computer Lesson (http://www.usask.ca/education/ideas/tplan/complp/westcast.cooperat.htm). Read on 20 October 2000.

Walker, H. (1995). Henry Walker's notes on collaborative learning (http://www.cs.csbsju.edu/~lziegler/Walker.html). Read on 25 November 2000.

Worcester Polytechnic Institute (WPI). (1998). Assessment of peer learning in the introductory Computer Science curriculum (http://www.cs.wpi.edu/~peercs/evaluation.html). Read on 30 October 2000.

The Digital Divide in Schools: We Can Make a Difference

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Abstract: Overcoming the issues surrounding the Digital Divide often appears to be insurmountable. However, in our recent examination of 28 research studies and reports we found the emphasis to frequently be on matters of access and not equity in the learning environment. The studies dealing primarily with access suggest the gap between socioeconomic groups is declining. Yet, access to computers does not provide equitable learning environments. Findings from the literature we examined indicated three primary areas that influence the digital divide in the school system. These areas are frequency of use, the computer experience of students, and technology training for teachers. The encouraging aspect of our review of the literature is that teacher educators can have a positive influence on these areas. We can make a difference in the digital divide in the school systems.

Introduction

The digital divide has been the subject of numerous documentaries, books, and articles (Bolt 1999; Bolt & Crawford, 2000; Harrell, 1998; Schon, Sanyal, & Mitchell, 1999) and continues to gain more attention through the plethora of materials documenting the technological access opportunities for students in U.S. public and private schools. Because the focus of the digital divide is so vast, statements coming from these materials range from "the digital divide is not as serious a problem as it first appeared" (United States Internet Council & ITTA, Inc., 2000, p. 20) to "One can't get around the statistics. There is a 'digital divide' in this country" (Rosenthal, 2000, p. 10). For this article we will define the digital divide as the difference in use of technology by schools based on ethnicity and socioeconomic status. Although strides are being made in giving poor and minority students more access to technology, the ways technology is used with these groups is often left unexplored. There are some exemplary studies (Attewell & Battle, 1999; Coley, Cradler, & Engel, 1998; Wenglinsky, 1998) investigating how digital divide issues and the use of technology influence the academic success of school-aged children, but overall there is scant literature available with strong methodology sections or data that can be generalized beyond the scope of the study. Nevertheless, the studies available do provide valuable insight into the use of computers and the digital divide. This article will examine the digital divide from the perspective of school technology integration for children in the United States using twenty-eight research studies and reports as a foundation.

Background Information

The Effectiveness of Technology on Student Achievement

No matter how one defines it, studying the impact of technology use on student achievement is just beginning. Examining student achievement data with respect to technology is a difficult task because research reports either define student achievement in a variety of ways, or do not define it at all. For example, in Mann, Skaeshaft, Becker, and Kottkamp's study (1999), scores on the Stanford 9 were used to measure the effectiveness of technology use on student achievement. In contrast, in a University of

Michigan study students were assessed using both a standardized test and a performance based biology test (Huebel-Drake, Mouradian, Stern, & Finkel, 1995). Dr. Martha Stone is quoted in *The Impact of Education Technology on Student Achievement* (Schacter, 1999) as saying "one of the enduring difficulties about technology and education is that a lot of people think about the technology first and the education later" (p. 10). It is critical that more studies focus on how educational technologies can enhance the learning process for students.

Higher-order thinking and critical thinking is one area where research of this type has already begun. Reports (Thurow ,1999; U.S. Department of Commerce ,1999; U.S. Department of Labor, 1991) state that workers of tomorrow must be able to think critically and use higher order thinking skills and strategies in a variety of ways. The term "higher order thinking skills" refers to Bloom's Taxonomy of Thinking Skills, which begins with the lowest level, knowledge, progresses to comprehension, application, analysis, and synthesis and concludes with the highest level, evaluation. In today's classrooms, students are often assessed at the knowledge and comprehension level, because assessment is relatively easy to write and grade. However, many items at the lower levels of Bloom's taxonomy (knowledge, comprehension, and application) do not develop and foster the critical thinking strategies in students. By forcing students to dissect and organize information in new ways (analysis), make new connections with existing knowledge (synthesis), and critique the usefulness of many types of information (evaluation), students can gain experience in critical thinking as well as develop a richer and fuller understanding of the content.

Several studies (Berson, 1996; Chessler, Rockman & Walker, 1998; Harel, 1990, 1991; Pogrow, 1996; Scardamalia & Bereiter, 1996; Wenglinsky, 1998) document that students demonstrate stronger higher order thinking skills and problem-solving techniques with computers as compared to students who did not use computers for higher order thinking skills and problem-solving. Findings from other studies suggest that the use of technology can enhance student achievement scores (Cognition and Technology Group at Vanderbilt University, 1994; Coley, Cradler, & Engel, 1998; Kulik, 1994; Mann, et al., 1999; Sivin-Kachala, 1998; Wenglinsky, 1998). Studies such as these imply that student use of educational technologies, specifically computers, can enhance their learning environment. Nevertheless, there are many areas where researchers and educators can work together to improve the educational experience of students through the use of technology. Knowing how technology is used in the schools, in curricular programs, and with various groups of students is a critical component of this issue.

Technology Access in the School

Many states and school districts are making progress toward putting computers into public school classrooms. *Computers and Classrooms: The Status of Technology in U.S. Schools*, a policy information report by Coley, Cradler, & Engel (1998), states that 98% of all schools own a computer with the typical number of computers per school being between 25 and 50 (Coley, et al., 1998, p. 11). This has caused the average ratio of computers to students to drop from 19.2 students to one computer in 1992 to a current ratio of 5.7 students to one computer (Coley, et al. 1998) with Florida and Wyoming having the lowest student to computer ratio (5.9 to 1) and Louisiana having the highest (16 to 1). A 1999(b) report, *Student Computer Use*, from the U.S. Department of Education, expands on these findings showing that there have been dramatic increases in the frequency of computer use by students between 1984 and 1996. In the 4th grade, the percentage of students who stated they used a computer at school once a week rose from 15.5% in 1984 to 36.0% in 1996. It is important to note that schools with a high percentage of minority and Title I students have above average computer to student ratios (Coley et al., 1998, p. 13). Schools containing 90% or more minority students have an average ratio of 17.4 students to one computer, and as the percentage of Title I students increase, so does the ratio of students to computers (Coley, et al., 1998, p.13).

One must also take into consideration that even though most schools have computers, many of those computers are not connected to the Internet. As stated previously, 98% of all schools have computers, however, current statistics (Education Week on the Web, 1999; U.S. Department of Education, 1999a) show that only 89% of schools have Internet access making the average ratio of students to computers 13.6 to one. The disparities that exist in computer access continue regarding Internet access and are actually more pronounced. Schools that have less than 11% of their students receiving free or reduced lunch have a seven to one student to computer ratio (U.S. Department of Education 2000a, p. 2). This increases as the number of disadvantaged students increases peaking at 16 to one in schools where 71% or more of the students receive free or reduced lunch (U.S. Department of Education 2000a, p. 2). The percentage of minority students in a school has disparaging statistics as well, going from 57% of instructional rooms having Internet access in schools that have fewer than 6% minority population, to 37% in schools that have 50% or more minority students (U.S. Department of Education 1999a, p. 1).

These research findings regarding technology access at school provides researchers, educators, and other stakeholders with an abundance of statistics. Yet, these statistics prompt even more questions. For instance, are schools counting all computers in the school (broken ones in storage closets, the administrator's offices, etc.) or are they counting equipment that students have easy access to during the typical school day (classrooms, libraries, and computer labs)? Nevertheless, these statistics provide all stakeholders in the educational system with a starting point. By making connections between technology penetration and the various uses of technology in schools one can begin to explore how this separation can influence students' success in school and in the future.

Making the Connections

Digital divide studies often measure access to the technology; yet, access alone does not ensure equity. Merely counting computers and the number of times a students can use a school computer will not eliminate the digital divide problem in the school systems. There are complex issues associated with the digital divide in the schools. In order to gain insight into these issues we conducted an analysis of twenty-eight studies and looked for areas that dovetailed when examining the use of educational technologies in the schools. We found three areas that appear to impact the digital divide in schools: frequency of use, the differences in students' experiences with respect to computer use, and technology professional development for teachers.

Frequency of Use

Many times the idea is presented that if we equalize the time students can use computers at school this will diminish or completely eliminate the digital divide. If one views the digital divide simply as an issue of access this would be true. However, the frequency of computer use does not necessarily lead to academic gains. In *Teacher Use of Computers and the Internet in Public Schools* (U.S. Department of Education, 2000b) and *Does it Compute?* (Wenglinsky, 1996), the authors state that students in Title I programs and minority groups report more frequent use of computers than those not receiving special services. However, this frequency of use did not lead to a gain in achievement because the computer was used primarily for low-level thinking activities like drill and practice. This does not mean that drill and practice computer experiences are never appropriate; however, using drill and practice as the only computer experience appears to negatively impact student achievement. Wenglinsky's significant research study presents the idea that it is the quality of technology use that can positively impact the achievement of all students—not the frequency of use.

Differing Computer Experiences

The opportunities students have regarding computer use varies widely. *Teacher Use of Computers and the Internet in Public Schools* (U.S. Department of Education, 2000b) is one such report that provides evidence for this idea. Students in high poverty schools (with 71 percent or more of students eligible for free or reduced-price school lunch) used computers for drill and practice 35% of the time as opposed to students in low poverty schools (with a free or reduced lunch population of less than 11 percent) who used computers for drill as practice 26% of the time (U.S. Department of Education 2000b,p. 2). This is in contrast to students in schools with the lowest number living in poverty who were more likely to assign students work involving computers applications, research using CD-ROMs, and research using the Internet than teachers in the highest poverty schools. Minority, poor, and urban students were more likely to use computers for lower-order thinking skills than their white, non-poor, and suburban counterparts.

Wenglinsky's (1998) *Does it Compute?* report provides striking statistics on how computers are being used for students in 4th and 8th grade. In the 4th grade, data was obtained measuring the percentage of students using computers primarily for learning games and activities that involved higher order thinking skills. Asian, Hispanic, and White students used learning games more than 55% of the time as opposed to Black students who used learning games 48% of the time (Wenglinsky, 1998,p. 13). Black students in the 4th grade used the computer primarily for drill and practice activities (Wenglinsky, 1998,p. 13).

The results for 8th graders are even more dramatic. Teachers reported that Asian students used simulations and other higher-order thinking applications for their primary computer use 43% of the time while only 14% of Black students used simulations and higher-order thinking applications as their primary use (Wenglinsky, 1998,p. 13). Whites and Hispanic students used the computer primarily for simulations and higher-order thinking applications 31% and 25% of the time. These findings suggest that students are receiving different learning experiences with computers and these differences can be categorized according to ethnic groups. The reasons for this disparity among computer experiences provided for students needs to be explored. One area that does influence the digital divide in schools is the training provided for educators to use technology in their classrooms.

Teacher Training

Data describing the importance of professional development involving technology for all teachers can be found in digital divide studies examining schools. One of the primary reasons given by several studies (Coley, et al., 1998; U.S. Department of Education, 2000b; Wenglinsky, 1998) of why teachers use technology differently with certain types of students was technology training. For example, Wenglinsky (1998) noted that for 4th and 8th graders in his study, students in urban and rural schools were less likely to have mathematics teachers who had been trained in technology over the past five years than suburban students. He went on to state, "Teacher's professional development in technology and the use of computers to teach higher-order thinking skills were both positively related to academic achievement in mathematics." (Wenglinsky, 1998,p. 4). These findings suggest it is critical for teachers to have ongoing and exemplary professional development with respect to technology use in the classroom. This involves not only learning how to use technology but also how to integrate it into the daily learning environment.

Therefore, in order for teachers to feel comfortable using technology in their classrooms, training must take place in such a way that makes them feel confident in their abilities. In a CEO Forum (2000) report on assessment of technology training, the authors stated, "To achieve sustained technology use, teachers need hands-on learning, time to experiment, easy access to equipment, and ready access to support personnel who can help them understand how to use technology well in their teaching practices" (p. 129). However, many schools do not have this type of technology training and support for their teachers. A 1992 survey of district coordinators found that on average, only 15% of the computer budget is spent on training (CEO Forum 2000, p. 136). This is supported by the study *Technology Support: Its Depth, Breadth and Impact in America's Schools* (Ronnkvist, Dexter,& Anderson 2000) which reported that although 87% of schools have a technology coordinator only 19% of them are full-time (p. 6). The professional development of teachers impacts not only themselves but also their students' potential achievement.

Implications and Suggestions for Future Research

The data on the digital divide available to researchers, educators, and other stakeholders in the educational system strongly indicates students from certain minority groups and economic groups do have different experiences than their White, high-income counterparts. What is encouraging is that teachers and teacher educators can affect and change these experiences. Educators at various levels can improve the preparedness of teachers to effectively use educational technology in their daily teaching. District-level professional development and teacher education programs must get teachers comfortable with using technology and equip them with ideas and strategies to use technology in engaging and meaningful learning environments. Providing all students with challenging computing opportunities is critical. Allowing all students to obtain, organize, and evaluate information, conduct research and other higher-order thinking skills will assist in closing the digital divide in the schools.

There are numerous areas where researchers can document the status of the digital divide in the educational system and lead educators in the direction of improvement. Researchers can examine in detail how computers are used in the schools. This type of study can prompt teachers to closely examine their habits when using computers. It is also important that we examine whether certain academic curricular programs (local, state, and federal) that use computers are enhancing or hindering student achievement. Curricular programs that appeared to be successful in the past may no longer be appropriate for today's students, and may be adversely affecting them. We need to shift from merely examining the number of computers in a classroom or lab to focusing on how the technology is being used to enhance the learning environment. This investigation needs to include the examination of data from various ethnic groups, academic levels, and learning styles.

In summary, there are significant digital divide issues that need to be overcome in the school system. Issues such as frequency of use, students' computer experiences, and professional development using technology for teachers are within the control of stakeholders in the educational system. Only with the assistance of researchers and stakeholders can teachers and administrators make a difference in striving to provide an equitable learning experience with computers for all students.

References

Attewell, P., & Battle, J. (1999). Home computers and school performance. *The Information Society,* 15(1),1-10.

Becker, H. (1994). How exemplary computer-using teachers differ from other teachers: Implications for realizing the potential of computers in schools. *Journal of Research on Computing in Education* 26(3), 291-321.

Berson, M. (1996). Effectiveness of computer technology in the Social Studies: A review of the literature. *Journal of Research on Computing in Education, 28*(4), 486-499.

Bolt, David (Producer), 1999. *The digital divide.* San Francisco: PBS.

Bolt, David, and Ray Crawford, 2000. *Digital divide: Computers and our children's future.* Alexandria, VA: TV Books, Inc.

CEO Forum. (1999). *Professional development: A link to better learning.* Washington, DC: Milken Exchange on Educational Technology.

CEO Forum. (2000). *Teacher preparation star chart: A self-assessment tool for colleges of education.* Washington, DC: Milken Exchange on Educational Technology.

Chessler, M., Rockman, S., and Walker, L. (1998). Powerful tools for schooling: Second year study of the laptop program. ROCKMAN ET AL. San Francisco.

Clark, R. E. (1994). Media will never influence learning. *Educational Technology Research and Development, 42*(2), 21-29.

Cognition and Technology Group at Vanderbilt University. (1994). Multimedia environments for developing literacy in at-risk students. In *Technology and Education Reform*, ed. B. Means. San Francisco: Jossey-Bass.

Coley, R., Cradler, J., & Engel,P. (1996). *Computers and classrooms: The status of technology in U.S. schools.* Princeton, NJ: Educational Testing Service.

Education Week on the Web, 1999. *Technology counts '99.* [On-line]. Available: http://www.edweek.com/sreports/tc99.

Harel, I. (Ed.). (1990). *Constructionist Learning: A 5th anniversary collection of papers reflecting research reports, projects in progress, and essays by the Epistemology and Learning Group.* Cambridge, MA: MIT Media Laboratory.

Harel, I., & Papert, S. (1991). Software design as a learning environment. In *Constructionism*, eds..I. Harel and S. Papert. Norwood, NJ: Ablex.

Harrell, W.. Jr. (1998). Gender and equity issues affecting educational computer use. *Equity & Excellence in Education, 31*(3), 46-53.

Huebel-Drake, M., Mouradian, M., Stern, E., & Finkel, L. (1997). *Foundations of Science: A three year integrated high school science curriculum*, unpublished manuscript, Center for Highly Interactive Computing in Education, University of Michigan.

Kulik, J. (1994). Meta-analytic studies on findings on computer-based instruction. In *Technology assessment in education and training*, ed. E.L. Baker, and H.F. O'Neil, Jr. Hillsdale, NJ: Lawrence Erlbaum.

Mann, D., Skaeshaft, C., Becker, J., & Kottkamp, R. (1999). *West Virginia's basic skills/computer education program: An analysis of student achievement.* Santa Monica, CA: Milken Exchange on Education Technology. (ERIC Document Reproduction Service No. ED 429 575)

NAEP. (2000). *What is NAEP?* [On-line]. Available: http://nces.ed.gov/nationsreportcard/site/whatis.asp

Niederhauser, D., & Stoddart,T. (1994). *Teachers' perspectives on computer-assisted instruction: Transmission versus construction of knowledge.* (ERIC Document Reproduction Service No. ED 374 116)

Pogrow, S. (1996). Using computers and other visual technology to combine process and content. In A. Costa and R. Lieberman (Eds.), *When process is content: Toward renaissance learning*,.eds.. Thousand Oaks, CA: Corwin Press.

Ronnkvist, A., Dexter, S., & Anderson, R. (2000). *Technology Support: Its Depth, Breadth and Impact in America's Schools*. Irvine, CA: Center for Research on Information Technology and Organizations.

Rosenthal, I. (2000). The Clinton-Gore digital divide proposal. *Technology & Learning,* 20(10), 10.

Scardamalia, M., & Bereiter,C. (1996). Computer support for knowledge-building communities. In *CSCL: Theory and practice of an emerging paradigm*, ed. T. Koschmann. Mahwah, NJ: Lawrence Erlbaum.

Schon, D., Sanyal, B., & Mitchell, W. (Eds.). (1999). *High technology and low-income communities: Prospects for the positive use of advanced information technology.* Cambridge, MA: MIT Press.

Schacter, J. (1999). *The impact of education technology on student achievement: What the most current research has to say.* Santa Monica: CA: Milken Exchange on Education Technology. (ERIC Document Reproduction Service No. ED 430 537)

Sivin-Kachala, J. (1998). *Report on the effectiveness of technology in schools, 1990-1997.* Software Publisher's Association.

Stanley, R., Lindauer, P. & Petrie, G. (1998). Factors that increase teachers' use of computer technology. *ERS Spectrum, 16*(3), 42-46.

Thurow, L. (1999). *Building wealth: The new rules for individuals, companies, and nations in a knowledge-based economy.* New York: Harper Collins.

Turow, J. & Nir, L. (2000). *The Internet and the family 2000: The view from parents the view from kids.* Philadelphia, PA: Annenberg Public Policy Center.

U.S. Department of Commerce. (1999). *Falling through the net: Defining the digital divide.* Washington, D.C: U.S. Government Printing Office.

U.S. Department of Education, Office of Educational Research and Improvement. (1999a). *Internet access in public and private schools.* (NCES Publication 2000-002). Washington, D.C.: U.S. Government Printing Office

U.S. Department of Education, Office of Educational Research and Improvement. (2000a). *Internet access in U.S. public schools and classrooms: 1994-99.* (NCES Publication 2000-086). Washington, DC: U.S. Government Printing Office.

U.S. Department of Education, Office of Educational Research and Improvement. (1999b). *Student computer use.* (NCES Publication 1999-011). Washington, D.C.:U.S. Government Printing Office

U.S. Department of Education, Office of Educational Research and Improvement. (1999c). *Teachers' feeling of preparedness.* (NCES Publication 2000-003). Washington, D.C.: U.S. Government Printing Office.

U.S. Department of Education, Office of Educational Research and Improvement. (2000b). *Teacher use of computers and the Internet in public schools* (NCES Publication 2000-090). Washington, D.C.: U.S. Government Printing Office.

U.S. Department of Labor. (1991). *What work requires of schools: A SCANS report for America 2000.* Washington, D.C.: U.S. Government Printing Office.

United States Internet Council and ITTA, Inc. (2000). *State of the Internet 2000.* [On-line]. Available: http://usic.wslogic.com/intro.html

Wenglinsky, Harold. (1998). *Does it compute? The relationship between educational technology and student achievement in mathematics.* Princeton, NJ: (ERIC Document Reproduction Service No. ED 425 191)

Technology Empowers a Diverse Population of Students: Results From a Technology Professional Development School

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Abstract: This study documents the experiences of a school-university partnership initiated in January, 1998, between Lipscomb University and Glencliff High School, both of Nashville, TN. The partnership was established with a focus on the preservice training of university students and the professional development of inservice personnel, with a particular focus on technology. The partnership strove to follow guidelines for professional development schools (PDS) as established in research. Unique characteristics of this PDS developed as a result of the facts that Lipscomb is a small, private university with limited diversity and Glencliff is an inner-city school with tremendous diversity. Annual studies have been conducted using qualitative research methodologies. Although the research indicates success in several areas, the valuing of diversity and community has evolved as the outstanding hallmark of this partnership.

Introduction

The changing nature of schools today often leaves administrators and teachers struggling to adjust to dramatic changes that occur often over short periods of time. In 1988, I began to teach at Glencliff High School, a large urban, public school, located in Nashville, TN. Over a twelve year span to the year 2000, the school as well as the entire school district experienced remarkable change, particularly in two areas: diversity and technology. Although those two areas may appear to be mutually exclusive, the establishment of a Technology Professional Development School at Glencliff has shown that the availability of technology can do much to alleviate the growing pains that result from the remarkable changes in diversity. The purpose of this presentation will be to share the results of research conducted in the spring of 1999, as well as discuss on-going programs.

Concerning the Changes in Diversity & Technology

Today, the Nashville population of over 600,000 residents includes approximately 89,500 immigrants and refugees. These new residents have come to this country from over 100 countries and speak more than 75 different languages. The school age children of those families often know little English and, therefore, must be placed in English as a Second Language (ESL) classrooms. In 1988, Metro school system enrolled 739 ESL students. That number has grown to 4504 students at the beginning of the 2000-2001 school year. In 1995, Glencliff High School became one of two designated ESL high schools in the city. At the time, Glencliff enrolled approximately only 50 ESL students. Today, however, 25% of the student population (approximately 400 students) live in homes where English is not the language of choice. One ESL counselor and eight full-time ESL teachers currently work at Glencliff. The curriculum for the ESL classes was developed to assist the students in acquiring sufficient language skills to be able enroll in the regular classrooms. Unfortunately, since the ESL students are generally separated from the rest of the student population, they often fail to feel a part of the normal school culture. Other students rarely associate with them, primarily because of the language barrier. The ESL students experience a sense of isolation.

In 1988, computers were just beginning to appear on the educational horizon. Very few of the Glencliff teachers showed much interest. Many teachers considered them merely a diversion from the classroom routine. Teachers who accepted computers often only used them to allow students to play computer games when they were finished with their work. Only a few teachers considered that those early computers could be valuable tools for both teachers and their learners. Through the efforts of the administration, Glencliff currently has four computer labs in addition to areas for computers in both the media center and the counseling area. School literature (September, 1999) reports a computer/student ratio of one to six. Despite those numbers, however, most of the faculty fails to use computers as an instructional tool in their classrooms. In fact, only 25% of the teachers have one or more computers in their classrooms. Many teachers now acknowledge the instructional value of computers, but they lack the training to effectively use them.

Role of Technology Professional Development School

In February 1998, Glencliff High School and Lipscomb University agreed to form a Technology Professional Development School (TPDS). Initially the primary purpose of this alliance was to enhance the training of preservice teachers and to facilitate the professional development of inservice teachers with a special focus on technology (Thornthwaite, 1999). Consistent with those goals, the professors at Lipscomb conducted free technology workshops for the Glencliff teachers and would follow-up with individual assistance as needed. The inservice personnel at Glencliff began to mentor the university students who enrolled in the university's secondary methods course.

As part of this symbiotic relationship, the professors and teachers would collaborate on the best approach to address specific needs. One project grew out of the university's concern that their students had limited experience in working with diverse cultures. This project requires that each student in the university's secondary methods course collaborates with a group of ESL students from a single country. Each group is challenged to develop a multimedia presentation about the homeland of the ESL students. The university and high school students meet together on both the high school campus and the college campus to plan and create their presentations. Each semester, the collaborators show their finished product to an audience of high school students in the school auditorium.

Certainly, literature abounds with writings that document a myriad of programs designed to reform educational systems though the activities of Professional Development Schools (Abdal-Haqq, 1998; Clark, 1997; Darling-Hammond, 1994; Demsey, 1997; Hoffman, Reed & Rosenbluth, 1997; Levine & Trachtman, 1997; et al.).

Some PDS research addresses the importance of the empowerment of teachers (Duffy, 1994; Zeichner & Miller, 1997). Indeed, Book (1997) writes, "empowerment is part of the goal to be accomplished" (p. 198). Initial research concerning the accomplishments of the Glencliff-Lipscomb PDS showed that the collaboration was indeed providing a more realistic preservice training for the university students (Thornthwaite, 1999). Additionally the PDS was beginning to provide empowerment for the inservice teachers.

To the delight of both the university and the high school, a serendipitous benefit derived from the ESL project. Dr. Lydon, Glencliff's ESL counselor, first recognized that the project was empowering the ESL students simply because they were being given an opportunity to share information about their homeland. This opportunity allowed them to be the expert and helped to break down their sense of isolation. Additionally, Dr. Lydon maintains that the project has increased the learning skills of her students through the aid of technology. The ESL students are thrilled by the availability of information about their homelands that can be found on the Internet.

With the approach of the third anniversary of the Glencliff-Lipscomb TPDS, plans are underway to continue on-going research. This research has made it apparent that the Glencliff-Lipscomb TPDS has helped both Glencliff and Lipscomb to adjust more smoothly to the dramatic changes in diversity and technology. As a result of this partnership, computers at the high school are being used on a more regular basis and the ESL students are finally breaking down their sense of isolation.

References

Abdal-Haqq, I. (1998). Professional development schools: Weighing the evidence. Thousand Oaks, CA: Corwin Press, Inc.

Book, C. L. (1997). Professional development schools. In J. Sikula, T.J. Buttery & E. Guyton (Eds.), Handbook of research on teacher education (2nd edition, pp. 194-210). New York: Simon & Schuster Macmillan.

Clark, R. W. (1997). Professional development schools: Policy and Financing. Washington, D. C.: AACTE Publications.

Darling-Hammond, L. (1994). Developing professional development schools: Early lessons, challenge and promise. In L. Darling-Hammond (Ed.), Professional development schools: Schools for developing a profession. (pp. 1-27). New York: Teachers College Press.

Demsey, V. (1997). The nature of professionalism in the context of school reform. In N. E. Hoffman, W. M. Reed & G. S. Rosenbluth (Eds.), Lessons from restructuring experiences: Stories of change in professional development schools (pp. 9-31). New York: State University of New York Press.

Duffy, G. G. (1994, April). Professional development schools and the disempowerment of teachers and professors. Phi Delta Kappan, 75 (8), 596-600.

Hoffman, N.E., Reed, W. M. & Rosenbluth, G. S. (Eds.). (1997). Lessons from restructuring experiences: Stories of change in professional development schools. New York: State University of New York Press.

Levine, M. & Trachtman, R. (Ed.) (1997). Making professional development schools work: Politics, practice and policy. New York: Teachers College Press.

Thornthwaite, E. C. H. (1999). The initial year of a university-high school partnership: A case study of a PDS-style program. Unpublished doctoral dissertation, Vanderbilt University, Tennessee.

Zeichner, K. & Miller, M. (1997). Learning to teach in professional development schools. In M. Levine & R. Trachtman (Ed.) (1997). Making professional development schools work: Politics, practice and policy (pp. 15-32). New York: Teachers College Press.

Linking Up Through Solar Energy - The Story of the Gelukwaarts Farm School

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Abstract: This paper highlights the initiatives to develop farm schools in a predominantly rural area in South Africa. Of the 2500 schools in the Free State province, 63% are farm schools. The remoteness of these schools, as well as the absence of basic facilities is stumbling blocks in the delivery of sound education to communities. The lack of infrastructure is also responsible for attracting teachers with low qualifications, resulting in the offering of low quality education. The Gelukwaarts Farm School took the initiative to emerge from the typical farm school set-up by utilizing modern communication technology driven by solar power to get their computers connected to the World-Wide Web. New communication channels have opened, and teachers and learners are no longer confined to the radio and out-of-date newspapers. By utilizing lots of sunshine the school emerged from a half-forgotten farm school to a school with informed teachers, learners and parents.

Orientation

The Free State (FS) province, the third largest province in the Republic of South Africa (RSA), covers 129 480 square km or 10.6 % of the land. Although it is relatively large, it accommodates only 2.6 million people or 6.5% of the total population (Statistics South Africa 1998). The economic activities in the Free State mainly center around agriculture with some mining in the north/north-western areas. A recent study (Statistics South Africa 2000) indicates that the Free State is the province with the highest proportion of households in the lowest expenditure category. Thirty-nine percent of all households spend R600 ($80) or less per month on goods and services. Almost a third (31%) of the population live in the rural areas in small villages and on farms where the infrastructure is not conducive to education. Nevertheless, the Free State has the largest number of farm schools in the RSA.

The existence of farm schools is a very unique characteristic of the African school system. It originated in the 1950s when Government promulgated the so-called Bantu Education Act. This led to the introduction of the category state-aided schools, which were created mainly to accommodate the children of farm workers. The establishment of such schools largely depended on the willingness of the farmer to make land available for the erection of a school building. Farmers had two options in erecting school buildings: they could either carry the entire cost or opt for a state subsidy covering 50 % of the cost with the obligation to make the facilities available for nine years and eleven months for education purposes. The state in turn provided furniture, learner support materials and the salaries of educators. In 1993 the subsidy structure was revised by extending the subsidy amount to 100% of the cost and the period to 20 years. The regulations also allowed for the level of education to be extended to include standard Grade 12 classes. The Department of Education (DoE) also extended the curriculum to include agricultural, hotel keeping and catering subjects in some of the larger farm schools.

Several factors have had a negative impact on the efficiency of the farm school system. Among the problems faced by farm schools are the following:

- The learners at farm schools are mostly the children of the farm laborers and farmers will often expect them to be available for additional labor, resulting in the disruption of the education process.
- Parents' literacy levels are often low, which affect their participation in their children's education.
- Lack of supervision in small schools leads to a lack of educator accountability.
- Educators often have to teach five to six grades per class. Many schools only offer tuition from Grade 1 - 6, all in one classroom.
- Transport problems lead to frequent absenteeism; some learners cover long distances to and from schools (15 km one way on foot in some extreme cases). A lack of hostel facilities in nearby towns and villages as well as the low income of parents prevent many learners from furthering their education after Grade 6.
- District officials often neglect farm schools in their planning and visits to schools.
- Change of farm ownership and worker evictions make farm schools vulnerable.

Furthermore, the number of learners in farm schools is still declining due to the migration of farm workers to urban areas. Drought, the strive towards owning land of their own, as well as the attractions of urban life are the main driving forces behind migration. Since 1995 the farm school population in the Free State declined from 105 000 to a mere 60 000 in 2000 (FS DoE 2000). In this process more than 400 farm schools had to be closed. Similar tendencies occur in other provinces. For example, in the Eastern Cape province the existence of 700 farm schools are threatened, as the DoE cannot make an additional R14 million ($1,87 M) available to meet its contractual obligations to these schools dating back to 1997 (*Teacher* 2000a).

The Conditions at Free State Farm Schools

Infrastructure

In Tab. 1 the infrastructural shortages at farm schools in the province are indicated (FS DoE 2000). It is obvious that the infrastructure and support structures are not conducive to quality education.

Condition	Number of schools	%
Buildings in a state of disrepair	243	16
Schools without water within walking distance	249	16
Schools without electricity	384	25
Schools without telephones	1365	89
Schools with inadequate toilet facilities	172	11
Schools that lack recreational and sporting facilities	1534	100
Schools that lack access to computers	1334	86
Total No. of schools	**1534**	**100**

Table 1: Infrastructural shortages at farm schools in the Free State, 2000

Few schools have access to printed media other than textbooks. The educational TV programmes broadcast by the South African Broadcasting Company (SABC) are not accessible due to lack of electricity and equipment. Some schools utilize the School Radio Service. Periodicals and newspapers are not available in most cases, not even a classroom collection of books. Some farm owners pass on old copies to schools. An investigation by Khulisa Management Services (1998 p.17) revealed a low literacy assessment which is partially ascribed to insufficient learning materials.

Educators

Unfortunately the remoteness of the schools and the lack of infrastructure (including dwellings for teachers) only attracted teachers with low qualifications to farm schools. Even in 2000 a significant number of educators are still regarded as underqualified. As these teachers are deployed at farm schools it implies that their learners cannot reap the full benefit of education. A total of 6142 educators (24.4%) out of 25128 in the Free State fall in this category (FS DoE 2000). Most of these teachers are attached to farm schools. The recent report on Education for All (EFA) for South Africa (DoE 1999) highlights several discrepancies in the education system. It states, among others, that capacity-building of educators and low morale amongst educators and principals need to be addressed. The report specifically stresses the point that excellence in teaching and learning cannot be realized where educators and school managers suffer from low morale and have negative attitudes toward the profession (p.42).

Initiatives to Improve the Quality of Farm School Education

Status of Farm schools

The national DoE has taken the initiative to negotiate with farmers to sign agreements with the provincial departments in order to change the status of farms schools to that of public schools on private property. This would enable the various departments of education to fund education in these schools on the same basis as for ordinary public schools. The agreement also protects the rights of farm owners. The owner must approve matters like school hours, access routes, developments on the school site as well visitors to the school. The National Minister, Professor Kader Asmal, called on all role-players to ensure the speedy signing of agreements as "agreements are entered into for the sake of our children, who deserve the best" (DoE 2000a p.1).

A national conference on farm schools was held on 13 May 2000 at Midrand near Johannesburg to address the needs pertaining to farm school education. In his opening address Prof. Asmal called upon all stakeholders to put aside political considerations and rather put heads together to identify blockages and to seek ways to remedy the blockages (DoE 2000b).

Several provincial departments organized workshops to interact with stakeholders in an attempt to get agreements signed and to pave the way for quality education in farm schools. In the Northern Province special attention is paid to improve learning and teaching in multi-grade farm schools. The Member of the Executive Committee (MEC) for Education, Edgar Mushwana, expressed his appreciation towards farmers who are donating land for the education of rural children (*African Eye News Service* 27 September 2000 p.1).

The Free State Department of Education organized a strategic planning workshop with regard to farm schools on 29 September 2000. The main emphasis was on the following:

- The signing of agreements.
- Learning and teaching effectiveness.
- Physical facilities and resources.
- Role of school governing bodies.

The MEC for Education in the Province, Papi Kganare, announced in the Legislature that schools where no agreement was signed before the end of 2000 will most likely be closed, as they cannot exist outside the framework of the new agreement. However, the department would determine beforehand what the impact would be in terms of learners in those schools (*Volksblad* 14 October 2000). The MEC also announced that schools where agreements had been signed would be eligible to apply for support in the order in which the agreements had been signed (p.1).

Technology-enhanced Education

The outcomes–based model, Curriculum 2005, is in the process of being implemented in South African schools. The ideal is to move away from the stereo-typed teaching methods and passive learning to a learner-centered approach in which the learner is actively engaged in constructing his/her own knowledge and comprehension. The model lends itself toward a resource-based or technology-enhanced approach. A ministerial investigation into technology-enhanced learning (Technology Enhanced Learning Investigation, TELI) has been undertaken parallel to the introduction of Curriculum 2005 since 1995. TELI regards its role against the background, and in complete harmony with the objectives, values and principles of Curriculum 2005. Several reports have already been published and both national and provincial workshops presented.

The private sector as well as non-governmental organizations have also taken the initiative to create education-related Web sites. *The Teacher* (online version of The Mail and Guardian print publication) and *Naspers SkoolNet* *Sunday Times Education Online Siyafunda*, sponsored by the First National Bank (FNB), are examples. These sites typically provide online visibility for existing educational involvement (for example Naspers's *Koerante in die Klaskamer* program) or media coverage of education (Sunday Times Top 100 Schools Survey). Cyberschool Africa as well as The Learning Channel provides excellent on-line access for learners and educations. The Dial-a-Teacher concept, which was introduced in March 2000, literally bring any learner in direct contact which an experienced teacher to solve specific problems. Unfortunately access to these fascinating developments is limited to those who are connected.

The introduction of technology-enhanced learning creates as many problems as it is trying to solve, and may even serve to widen the gap between advantaged and disadvantaged communities even further. The lack of infrastructure and skills in poorer communities; maintenance of equipment in remote areas; as well as lack of funds to acquire hardware and software, are some of the major stumbling-blocks preventing the implementation of technology-enhanced learning on a large scale. In addition to the lack of infrastructure mentioned, the introduction of modern technology in the farm school environment is more than just an ordinary challenge. Therefore alternative ways and means to implement these concepts properly should be looked into. And it is here where the possibility of solar energy has to be looked into.

The utilization of solar power in schools is not a new concept. Several projects are currently running in developed countries, usually driven by environmentalists, where the emphasis is on the beauty of clean renewable solar power as an alternative to electricity generated in the conventional way (see www.ITcorp.com). However, in the rural South Africa, solar power may often be the only way of getting a rural school connected to the outside world. One of the best-known examples of the utilization of solar energy in the country's school system is Myeka High School in the Kwazulu Natal Midlands. This school got solar panels for lighting purposes in 1995, but soon realized that the use of the solar energy should be optimized to bring learners in contact with computer technology as well. This ideal was achieved when twenty computers were donated to the school and three of the educators trained to teach computer skills at the school.

It is against this background, as outlined in the first part of the paper, that the story of Gelukwaarts should be told.

The Gelukwaarts Story of Success

Born out of Sorrow

The Gelukwaarts Agricultural and Hotel School was established in June 1997 when three small farm schools in the South Eastern Free State in the district Vanstadensrus magisterial district amalgamated. The name is derived from the Afrikaans name of the farm on which the school is situated and literally means "towards luck or happiness". As remarked by the present headmaster, Daniel Wilken, the school was born out of sorrow after the cold-blooded murder on the owner of Gelukwaarts, Neels Wilken, and a fellow farmer, Hennie Bekker, on Christmas Eve 1993. The farmers in the particular area, referred to as the "Moot", afterwards had an in-depth discussion with all the role-players in order to stabilize again and to establish the needs of the farming community as far as education was concerned. Eventually it was clear there was a great need for education, especially secondary education in that remote corner of the province.

Although the three amalgamated schools function as a single school, the three educators and learners were still accommodated on three sites as none of the schools could accommodate all the learners. The first step was to negotiate with the Department of Education for the provision of additional classrooms to accommodate everybody on one site. Two new educators were appointed when two storerooms were made available on one of the farms. But even in 2000 the five educators are still teaching 160 learners in ten grades in just four classrooms. As from 2001 two more posts will be provided by the department, which will alleviate the pressure to some extent.

Developments

During October 2000 all the learners and educators moved to the present site. A donation by the National Union of Mineworkers enabled the school to erect three classrooms while the community added a bookstore to the complex. The bookstore is currently utilized as a classroom. The department erected a fence and will shortly start with the erection of two more classrooms. Although still not ideal, the school will be able to perform most of its functions under one roof as from 2001, except for the practical work in Farm Mechanics, Hotel Keeping and Catering which are carried out in the workshops and kitchens of adjacent farms. Extramural activities take place on two afternoons after school while two more afternoons are used for practical work. The land next to the school site is already ploughed and a vegetable garden will soon be established.

Facilities for sports are almost non-existent, however. During a visit to Gelukwaarts, Danie remarked, "We don't have anything, just an incredibly lively spirit". He showed me the athletics track, a dirt road leading to an adjacent farm. The soccer and netball fields are part of a paddock. A patch of well-known Wepener sand (for building purposes) serves as the pit for long jump practice. Despite the meager facilities, the school recently set five athletics records during a competition for farm schools held at Wepener. The local farmers will transport athletes who qualified for the regional competition.

A unique school fee system was also introduced. The monthly school fee is based on what the parents expect from the school. Once a budget has been drawn up to cover the expectations, the parents must indicate how much they can contribute towards the expenses. During the negotiations the staff then would also make a pledge to provide the outstanding amount by means of fund-raising. Thus far the scheme worked very well and school fees are paid regularly. Danie is also negotiating with the Department of Agriculture in the province to secure funds to start pig farming on the school premises. Every grade eight learner will be provided with two pigs and sufficient funds to buy food. When the pigs are sold, one-third of the profit will go to the school fund, one-third to a savings account for the learner and the remainder will be used to pay the school fees of the learner.

Travelling long distances on foot to school was also a problem until Danie solved it by obtaining second-hand bicycles from the Far East. These bicycles are rented at a nominal fee to learners. At the end of each year a competition is held to identify three learners who looked after their bicycles very well. These learners will get their bicycles for free for the following year.

Linking Up

In spite of all his efforts to upgrade and expand the infrastructure and extramural activities at the school, Danie realized that his school was still tucked away in a remote corner of the province. Learners and parents continued their lives in isolation from the rest of the world. Occasional visits to the town of Wepener, some 35 km away, was the furthest trip that could be undertaken by most of them. Much more needed to be done in order to make an impact on the lives of these people. Danie wrote dozens of letters, made presentations and paid visits to a number of institutions and organizations. Ultimately his dedication, perseverance and extraordinary patience were rewarded when some sponsors decided that his school was not an ordinary farm school and should be given the opportunity to cross the Rubicon. A computer company provided a satellite dish, solar panels and a cell phone, while an insurance company donated six computers.

The utilization of modern technology is the greatest achievement of all that happened since 1997 at Gelukwaarts. Contact has not only been established with the Department of Education to receive circulars and survey forms, but learners and their parents now have regular access to the latest news by accessing Web sites like News24.com. The headlines are printed and pinned to notice boards where learners can look at it on a daily basis. There is no further need to collect old newspapers when the information can be obtained directly from the Net!

Teaching and learning are enhanced further by utilizing the excellent material from The Learning Channel and CyberSchool Africa. On-line access to the distance education programs of several institutions is also no longer a dream but a reality. Since the installation of the satellite dish, the school established a wide network of interested parties and supporters of the school by exchanging E-mail messages (gelukwaartslhs@mweb.co.za).

Another exciting development is the utilization of the classrooms for the Adult Basic Education Programme (ABET). In the evenings two of the teachers teach 80 adults basic literacy and numeracy skills. It is envisaged that these learners will eventually also be taught basic computer skills.

Recognition

The success story of a farm school, fired by the enthusiasm and dedication of one man and his wife, made the headlines. All of a sudden the once–forgotten school was in the limelight. Perhaps the greatest honour bestowed upon the school thus far, was Danie being one of 40 educators nationwide who received a National Teacher Award on 26 October from the National Minister, Kader Asmal, in Pretoria (*Teacher* 2000b). This achievement is best described in Danie's own words: "It was a fascinating experience to be one of forty dedicated teachers who have one thing in common - a vision for their schools and their learners spotting a challenge in every problem". In his opening address at the awards ceremony, the Minister highlighted the qualities of the ideal teacher as follows: "The teacher who is able to transport the learners beyond the boundaries of today and into the possibilities of the future is the one we have been looking for in the teacher awards process. The passion, the identification with the learners, and the vision to see beyond the oftendepressing realities of daily life, are the qualities we seek. For as we are, so the learners will learn" (DoE 2000c p.3).

The Future

According to Danie, the success story of Gelukwaarts is not the end but just the beginning of a new era for the provision of education to farm schools in the province. He is in continuous discussion with all role-players like the Government, the Agricultural Union, Tswelopele (a non-governmental organization aimed at the upliftment of farm schools), as well as the private sector. As a result of his deliberations many more farm schools will benefit from a grant of R12 M ($1.6 M) by the National Lottery Trust. Three companies will provide satellite dishes, cell phones, solar panels and computer literacy training to schools and the community in order to promote computer literacy and access to information on the Internet. Even farmers will benefit from these developments, not only to increase communication between the farmer and the school, but also to provide farmers with the latest information regarding prices of their products, as well as information on agricultural matters in general. Danie sees this as a way to acknowledge the willingness and positive attitude of those farmers who have made contributions towards the education of learners on their farms.

References

African Eye News Service. (2000). Province gives special focus to farm schools (http//allafrica.com/stories/printable/200009270304.html). Read on 22 November 2000.

Department of Education (DoE). (1999). Education for all (EFA) assessment (http://education.pwv.gov.za/DoE_Sites/ Quality_ Assurance_Folder/Educ_for_All/EFA_Doc.htm). Read on 23 November 2000.

Department of Education (DoE). (2000a). Farm schools: Mr Asmal urges talks between provinces and farmers to go ahead (http//education.pwv.gov.za/Media_Statements/March2000/Farm_Schools.htm). Read on 22 November 2000.

Department of Education (DoE). (2000b). Address by the Minister of Education, Prof. Kader Asmal, to the National Conference of Farm Schools (http//education.pwv.gov.za/Media_Statements/Speeches00/ May00/Farm-schools.htm2000). Read on 24 November 2000.

Department of Education (DoE). 2000c. Speech by Professor Kader Asmal, MP, Minister of education, at the inauguration of the national teacher awards (http//education.pwv.gov.za/Media_Statements/Speeches00/October00/Teacher_Awards.htm). Read on 19 November 2000.

Free State Department of Education (FS DoE). 2000. Annual school survey 2000. Bloemfontein, South Africa: Free State Department of Education.

Khulisa Management Services. (1998). *Early Childhood Development Pilot Project Baseline Study.* Johannesburg, South Africa: Khulisa Management Services.

Statistics South Africa. (1998). *Statistics in brief. The people of South Africa – Population Census 1996.* Pretoria, South Africa: Statistics South Africa.

Statistics South Africa. (2000). *Measuring poverty in South Africa.* Pretoria, South Africa: Statistics South Africa.

Teacher, The. (2000a). 700 E Cape farm schools to close (http//www.teacher.co.za/letters/200002_farm schools2.html). Read on 22 November 2000.

Teacher, The. (2000b). Top marks for teachers (http//www.teacher.co.za /200001 1best.html). Read on 24 November 2000.

Volksblad, Die. 14 Oktober 2000. Plaasskole gesluit waar grondeienaars nie wou teken nie.

Volksblad, Die. 31 Oktober 2000. Plaasskole in VS word al belangriker, sê LUR.

Volksblad, Die. 10 November 2000. VS plaasskool kry Internetverbinding.

Educational Computing Course

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The educational computing course takes many shapes and forms in the different colleges and universities around the United States and the world, but its basic purpose is universal - prepare the teacher to effectively use and integrate technology in the classroom. This purpose now has more of a structure being imposed upon it with the introduction of the National Educational Technology Standards (NETS) (http://cnets.iste.org) that encourage learning opportunities that will produce technology-capable students. In order for this to happen, the teachers must be prepared. In the National Educational Technology Standards for Teachers (NETS-T) the teacher is called the key individual and teacher preparation is called critical. This document goes on to say, "Being prepared to use technology and knowing how that technology can support student learning must become integral skills in every teacher's professional repertoire. Schools and classrooms, both real and virtual, must have teachers who are equipped with technology resources and skills and who can effectively teach the necessary subject matter content while incorporating technology concepts and skills." All of this preparation does not occur in the educational computing course alone, but it is an important piece of the total process.

The papers for this year reflect these changes, some more than others and some in very different ways. One common strategy for preparing the teacher was a much more extensive use of the World Wide Web. The paper by Bump describes the use of WebQuests with all the instruction presented within them. Murray advocates the use of constructivist, web-based projects for the pre-service teachers that help the teachers think about how they learn as they construct their knowledge and their web pages throughout the semester. Pan presents a working model based on a three-level Delta learning theory that includes self-defined goals, hands-on computer experiences, real-world projects and collaboration.

Another strategy for preparing the teacher was changing the structure of the educational computing course. Chen describes the efforts by her college to change the course from a one-hour to a three-hour course that would conform to the new standards and frameworks. Bump proposes a flexible structure for the course so that the inexperienced students would receive more in-class help and personal interaction than the experienced users who were quite comfortable with more online activities. Another part of the flexibility would be some class days for group work and some for individual work time, if needed. Byrum details varying ways to structure the classes within the course to work with the diversity of skill levels in the students. He includes both individual, as well as group, strategies.

The last strategy for preparing the teacher was apparent in many of the papers. This was the need to make a concerted effort to align the objectives of the classes to the national standards and to integrate technology in all the teacher preparation classes. Nonis discusses her college's efforts to change the learning experienced by their pre-service teachers. She says that teacher education students have a better chance to achieve the NETS if effective uses of technology are implemented and expected to be demonstrated throughout all phases of a teacher education program. Espinoza highlights the experiences of three faculty members as they integrate the standards and the technology-rich activities into the teacher preparation sequence.

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Using a Flexible Format to Create a Constructivist Learning Environment in the Educational Computing Course

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Abstract: This paper describes the restructuring of the Educational Computing Course CUIN 6320 Technology in the Classroom, a graduate class at the University of Houston. The purpose of the restructuring was to model to the students appropriate, constructivist teaching methods and activities used in the integration of technology for instructional purposes. By experiencing a constructivist approach, the students were able to make their own connections between technology and its use in the classroom and reflectively evaluate their progress and growth. It is hoped, since there was much growth and improvement in their knowledge of technology and its applications, that they will use these strategies and activities in their own classrooms.

Introduction

How do you teach a teacher to teach differently? How can you get students totally involved with their own learning? How do you introduce the new technology standards to pre-service teachers? The answer to all three questions is simple – model it for them. The Educational Computing Class was restructured so that teachers and pre-service teachers could participate in a constructivist learning environment. The class was set up with a flexible format that had four features: 1. WebQuests to introduce new concepts and topics and provide practice with several technologies, 2. Collaborative work, 3. Web page creation by each individual student as a means for turning in assignments and learning to upload files, and 4. Discussion lists to discuss topics and readings and respond to class members' responses.

The Need to Restructure

The International Society for Technology in Education (ISTE) in the new National Educational Technology Standards for Teachers (NETS-T) stresses that teaching must be different. "Today's classroom teachers must be prepared to provide technology-supported learning opportunities for their students. Being prepared to use technology and knowing how that technology can support student learning must become integral skills in every teacher's professional repertoire" (ISTE, 2000b, p. 2). Over the last ten years the demands on what teachers should know and what skills they should possess have changed dramatically. It is no longer what they know and what they can do technically – it is what they can apply and integrate into their teaching practices, as well as a complete change in how they teach. If teachers are trained in the traditional, lecture style with the professor dispensing all the knowledge, then it is more likely that they will continue to teach this way. But if the professor will model for them a collaborative, constructivist, interactive environment, then teachers will begin to see the exciting possibilities that exist for them and their students. March (1999) says, "... don't look for the online equivalent of your textbook or handouts (though they may exist), look for the sparks that create insights, the contrasts that promote problem-solving, the bells and whistles that motivate, and the passion that inspires". This change needs to be modeled so that the teachers can experience and understand what will be expected of them as they enter the teaching field.

The Major Components of the Restructured Class

WebQuests

"A WebQuest is an inquiry-oriented activity in which most or all of the information used by learners is drawn from the Web. WebQuests are designed to use learners' time well, to focus on using information rather than looking for it, and to support learners' thinking at the levels of analysis, synthesis and evaluation. The model was developed in early 1995 at San Diego State University by Bernie Dodge with Tom March, and was outlined then in Some Thoughts About WebQuests" (Dodge and March 1995) (http://edweb.sdsu.edu/webquest/overview.htm). WebQuests are designed to utilize the student's time efficiently and to provide a clear purpose for the activity. In order to achieve both clarity and efficiency, WebQuests should include an "introduction that sets the stage and provides some background information, a task that is doable and interesting, a set of information sources needed to complete the task", resources that point to information on the World Wide Web, a "description of the process the learners should go through in accomplishing the task, the process broken out into clearly described steps, and a conclusion that brings closure to the quest, reminds the learners about what they've learned, and perhaps encourages them to extend the experience into other domains."

In the Educational Computing Class, five WebQuests were developed and used throughout the semester to introduce new topics and technologies. Students were able to work through the WebQuests at their own pace and with as much time as was needed. All the WebQuests were online (http://www.geocities.com/cuin6320/) and could be accessed at anytime and from anywhere. Any supplemental material was also available online and could be printed.

These WebQuests introduced an overall topic to the students and the assigned task involved the use of a selection of technologies that would best accomplish the task. In WebQuest 1 the students worked with e-mail and discussion lists since these would be critical for communication throughout the semester. WebQuest 2 introduced the efficient use of the web in both teaching and learning. WebQuest 3 illustrated the use of graphic elements and organizers and the importance of their use in the classroom. In WebQuest 4 the students actually worked through an ISTE learning activity from the new National Educational Technology Standards for Students (NET-S) – Connecting Curriculum and Technology (ISTE 2000a) that explored the practical use of spreadsheets and presentation tools. WebQuest 5 introduced primary sources on the web and combined them with desktop publishing.

An important part of any online work is the evaluation of that work and all its components. The students participated in a "WebQuest about WebQuests" (Dodge 2000) (http://edweb.sdsu.edu/webquest/materials.htm) that helped them to see the differences in the quality (or lack of quality) in several WebQuests that were already online. These WebQuests were on several different grade levels, so each group could evaluate WebQuests that would be appropriate for their particular grade level. After WebQuests 1 and 2, the students evaluated the professor-made WebQuests with the evaluation form created by Dodge (1998) (http://edweb.sdsu.edu/webquest/webquestrubric.html). The students were told that their WebQuest, which they would create with their group, would be evaluated with this same form. Hopefully, being familiar with the evaluation form and actually having to apply it would help the students understand the necessary components of any WebQuest and would help them use this knowledge as they developed their own WebQuests.

Collaborative Work

Students worked in groups as they completed the WebQuests. By doing this, they had a support system to help them and to be another resource besides the teacher. The group also provided help that the teacher might not be able to provide because of differences in learning styles, time conflicts, etc. Each of the five WebQuests included a collaborative piece so that the students could get an idea of how valuable collaborative work could be in their own classrooms one day.

As the semester progressed, the groups met during some of the class periods to begin to develop a group WebQuest. These WebQuests included all the above pieces and students were free to structure their group tasks as necessary. For example, some groups divided the tasks by job descriptions, such as resource gatherer, web page designer, editor, etc, while other groups divided the tasks by the pieces of the WebQuest itself, such as introduction, task, process, resources, and assessment. Near the end of the semester, the groups exchanged URL's, worked through another group's WebQuest and then used the evaluation form to critique their WebQuest. The professor did the same so that the groups would receive multiple and hopefully very useful feedback. The final class day was used to present the updated WebQuests and to provide their URL's.

Online Interaction and Manipulation

Another aspect of the flexible format was the way that students turned in their work that was due. Instead of them having to hand in a disk or a printout, the students would upload their assignments to their own webspace. This webspace was created and maintained by each student and gave them practice with another form of computer-mediated communication. By creating their own website the students experienced many of the possibilities they could offer in their own classroom and in their own students' learning experiences.

Computer-Mediated Communication

The last aspect of the flexible format was the use of computer-mediated communication. One such communication method was use of the discussion list (hypergroup) to discuss topics and readings and respond to class members' responses (http://www.coe.uh.edu/hypergroups/courses/). Every other week there were 2 questions posted on the list to which the students had to respond thoughtfully. Each student also had to read fellow students' responses and then respond to one classmate for each question. Students liked the flexibility of the time involved with the hypergroup since they could read the assigned readings at a convenient time for them and then respond to class members at a different time. If they preferred, both could be done at the same time – post their response to the question and also reply to a fellow class member's response.

Another communication method was the use of e-mail. It was mandatory that students set up an e-mail account and actually use it throughout the entire semester in order to interact with group members and the professor. In prior semesters, the requirement of the use of e-mail was limited since most students were very happy to use e-mail in most of their interactions and no more encouragement was needed from the teacher. But each semester there was always a handful of students who resisted e-mail and were able to complete the course without a thorough, personal knowledge of e-mail's use and advantages.

The Results of the Restructuring

At the beginning of the semester, students evaluated their computer use and knowledge of technology integration using the instrument developed by ISTE, ISTE Recommended Foundations in Technology for All Teachers (http://www.coe.uh.edu/~wren/cuin6320/ISTEself.doc). This instrument has 18 areas in which the students rate themselves with a scale of 0 to 3. If they have never *heard of* the application, they give themselves a zero. If they are *aware of* it, they receive a 1. If they *use* the application, they get a 2 and if they could *integrate* the application into instructional practices, they receive a 3. With the highest score possible being a 54, the beginning scores ranged from 5 to 47. At the end of the semester, the students re-evaluated themselves using the same instrument. On the average, students gained 22 points with the lowest-scoring students making the most significant improvements. A reflective essay, written by each of the students and posted on their personal website, described their growth and experiences throughout the semester.

Here are a few excerpts from their reflective essays: "I discovered that there are many possibilities for the use of basic productivity software to enhance instruction in new and creative ways. I was constantly exposed to valuable resources and encouraged to share my discoveries in the context of classroom activities. From developing a website to creating a PowerPoint presentation to collaborating with others on the creation of a WebQuest, I continually developed skills and applied concepts." "The course has opened my eyes to the possibility of teaching technology skills within the context of real-world problems. Students will benefit from my experience as they learn the skills that I have recently learned and as they strengthen the connections of the skills learned in class with the world outside the classroom. This is timely because I had previously been teaching these skills in isolation and I was looking for strategies to 'break the mold'." "I was continually challenged to think critically about the use of technology in the classroom and to apply the principles of instruction to the acquisition of technology-related skills." "When we began to create the web-based lesson, I had my first opportunity to see how I could use my newfound ability to create web pages for instructional purposes. While doing this, everything came together...the different aspects of using technology in the classroom that had been covered in previous WebQuests and the whole idea of the instructional power of WebQuests." "I have developed a WebQuest that two of my fellow teachers will actually be using next semester!"

The students also wrote a paper about their group experience and their own contributions to the group WebQuest. All of the papers in each group were compared and a part of the students' grades were based upon their ability to work with their group. It was very interesting to see the differences in what the students perceived about their own contributions as compared to how their group members saw their contribution. In most groups the different perspectives corroborated the others, but in a few cases it was very easy to tell who had slacked off in the group work and participation.

Here are a few of the students' comments about working with their group: "There were no problems with our group's ability to engage in the task, work cooperatively, or with the group's dynamics. Our group was comprised of a very diverse collection of individuals with a range of academic skills. Our diversity helped to make our interactions rich, although there were times that we did have some difficulty in reaching consensus on how to proceed. The group's members were mature enough to overcome individual differences in order to produce desirable results. I truly enjoyed working with this group of individuals and I feel fortunate to have been a part of such a dynamic and intelligent group." "One of our group members was going to drop the course. We are the ones who urged her to stay in the course as we needed her help. As a group, we really had to stick together and use each other's individual expertise in order to ensure quality work." "(one student said, in referring to another group member) She was a great asset because she served as a point of reference for me when I felt swamped. She always was encouraging and very helpful when I was lost in the course."

The last result of restructuring that needs to be discussed is the use of the WebQuest in structuring the class periods, as well as the students' intentions to develop and use WebQuests in their own classrooms. Once the students got used to the concept of WebQuests, they were excited about their use and availability online. They enjoyed the variety of activities, as well as the introduction and application of new technologies. But most of all, many of the students could actually see themselves constructing their own knowledge as the semester progressed and developed an ownership of the concepts presented throughout the course. They saw WebQuests as an efficient way to create similar learning experiences for their students. One student observed that the initial time investment by the teacher would be countered by the time saved in class by having all the necessary materials ready for the students to begin working and also to work at their own pace. Another student observed that WebQuests could be revised, after the students completed them, in order to include needed elements, exclude unsuccessful elements and make other changes based upon feedback by the students, thus minimizing preparation time for the next year.

Conclusion

Modeling the use of the four components made a significant difference in the total course and produced the many desirable outcomes illustrated above. Many insights were gained from the students as the professor solicited much feedback and necessary revisions as the semester progressed. Some of the suggestions were incorporated into the present semester while others will be implemented the next semester. Overall, the students were pleased with themselves for their mastery of so many forms of computer-mediated communication and were surprised that they were able to do so many things with technology in an instructional setting. They appreciated the flexibility of the class and the activities, and were glad to be able to construct their own knowledge from this unique experience.

References

Dodge, B. (1998). *A draft rubric for evaluating webquests.* Retrieved December 14, 2000 from the World Wide Web http://edweb.sdsu.edu/webquest/webquestrubric.html.

Dodge, B. (2000). *A webquest about webquests.* Retrieved December 14, 2000 from the World Wide Web http://edweb.sdsu.edu/webquest/materials.htm.

Dodge, B. & March, T. (1995). *Some thoughts about webquests.* Retrieved December 14, 2000 from the World Wide Web http://edweb.sdsu.edu/webquest/overview.htm.

International Society for Technology in Education (2000a). *National educational technology standards for students: Connecting curriculum and technology.* Eugene, OR: International Society for Technology in Education.

International Society for Technology in Education (2000b). *National educational technology standards for teachers.* Eugene, OR: International Society for Technology in Education.

March, T. (1999). *Theory and practice on integrating the web for learning.* Retrieved December 14, 2000, from the World Wide Web http://www.ozline.com/learning/theory.html.

Technological Diversity: Managing Differing Technology Skills in the Edtech Course

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Abstract: Students are coming to Educational Technology courses with extremely diverse technology skills. This presentation/paper will discuss varying ways to structure classes or instruction to work with these varying groups. The author will detail several of the strategies used in past classes, the results, and other methods the instructor may wish to consider depending on the situation

Introduction

Students as never before are coming to Educational Technology with extremely diverse technology skills. Once, when teaching technology skills, you could assume that all students were starting from the same point. Today, however, you must assume all students will be coming to you with a completely different set of skills. In many of our graduate classes, the students often range from the level of computer novice to the student who works in the Austin high-tech corridor and wishes to become certified to teach. The difficult task for any instructor is to find ways to deal with these differing skills in Educational Technology classes and make the class meaningful to all students regardless of prior skills.

This presentation/paper will discuss varying ways to structure classes or instruction to work with these varying groups. The author will detail several of the strategies used in past classes, the results, and other methods the instructor may wish to consider depending on the situation. This paper/presentation will discuss individual strategies and group strategies.

Individual Strategies

Student as Expert Assistant

One method is using the student with superior skills to assist the instructor in classes, often assisting those persons needing extra help with projects. The expert/assistant also learns through one-to-one interactions how to deliver instruction. Overall, I have had much success with this strategy.
•Advantages: The instructor receives much needed help in large lab classes by letting the expert/assistant answer some of the general questions and to help those struggling to keep up. The assistant feels he/she is playing an important part in the class and tends to stay engaged.
•Disadvantages: Some students tend to resent the fact that the expert/assistant is allowed to help and not required to complete the project.

Student as Teacher

Many advanced students find that they only really know the intricacies of a software program when they are given an opportunity to teach it to the class and see the results. When students begin working on projects the student/teacher comes to a greater realization of the many ways instructions can be interpreted.

•Advantages: Practice in developing instruction for training, a chance to work with learners and a deeper understanding of the software.
•Disadvantages: The instructor must closely monitor the instruction being prepared for quality and be ready to step in when things go wrong or are confusing to students. The instruction process could prove to be overwhelming for those with little or no experience in teaching.

Testing out

Testing out allows for students to show work or display skills that prove the class is not needed. Great care must be taken if this option is made available and documentation should be extensive. A portfolio of technology work can allow the instructor to give credit for past work, such as basic word processing, spreadsheets, etc. Portfolios can be used to demonstrate basic competencies as well as show the integration of technology in lesson planning and curriculum.
•Advantages: Students do not need to attend a class in which they already have extensive skills. Student can go on to next level.
•Disadvantages: Often students can pass the technical portion but have no knowledge of educational application of these skills. Testing and documentation can be tricky to determine in project-based courses.

Independent study

An independent study may often be a last resort for a student with superior skills and needing a real challenge. I feel independent studies should only be used in extreme cases, those in which you are sure the student easily meets all prerequisite skills for passing the normal class.
•Advantages: Customized to meet student's needs can provide a real challenge, and projects may benefit the instructor.
•Disadvantage: Students can not make up for time in class interacting with peers and discussing issues and trends. Hard to determine if the student is lacking knowledge in certain areas.

Group Strategies

Multiple path instruction

Multiple path instruction gives the learners varying paths to follow in completing class work. This approach takes students "as they are" and helps them improve skills. For example, the instructor may set up a beginner, intermediate, and advanced path for students to take in completing the course, each level with its own expectations and rigor.
•Advantages: Students can progress at their own pace on their own skill level and is challenging to all students.
•Disadvantages: Students may be working on different projects and end the course with varying skill levels which tends to lead to confusion. Often students will misplace themselves in the beginner, intermediate, and advanced levels and may need to change to a different level.

Differentiating assignments

Somewhat like multiple-path instruction except that all students are on same level and allowed to pick and choose from topics and skills in which they feel help is needed. The instructor may require that certain projects be mandatory and leave student choice to many minor projects. The instructor also needs to set minimum competencies for all students. One danger is many students often overrate themselves in their competencies and skip projects actually needed.
•Advantages: Students are allowed to pick and choose areas they feel they need help or in which they are weak. Students like the feeling of setting their own goals and projects.
•Disadvantages: Students sometimes choose what they perceive as the easier projects and stick with things they know.

Contextual Experiences: The Revision and Implementation Process of an Information Technology Course for Master Teachers

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This paper explores the revision of curriculum within a technology course; the curriculum implementation and outcomes. In similar vein, it explores my reflections of the process, with suggestions of pertinent issues, recommendations, pitfalls, and successes.

Although technology skills are certainly important for teachers to learn, few graduate programs in the State of Utah prime teachers for these demands. The Master of Education Program at Westminster College, a small liberal arts college in Salt Lake City, is one of the few programs in the state that offers the technology specialization, for teachers at a graduate level. As a student in this program, I realized that the present instructional approach lacked the latest instructional tools and resources that would enable teachers to effectively transfer and apply technology skills to classroom situations. From this beginning emerged my effort in a curricular revision of the Information Technology (IT) course; one of three courses offered and required to obtain the technology specialization. My thought was to focus more on a hands-on approach, recent instructional technology tools and resources available for teachers, and their classroom application.

Rationale

The impact of technology in the classroom is promoting changes in the role of teachers. Teacher's roles have shifted from dispensers of knowledge to one of facilitators of the learning process with the attendant need to know how to integrate technology effectively to improve student learning. "Teachers must take time out from an already full schedule to learn new techniques and then incorporate them into daily activities" (Hale & Kieffer, 1995).

This technology trend is sending a clear and widespread message noticeable among people in the education field; teachers should be proficient computer users. "Teachers, administrators, and parents are finding that using technology requires more than adding Internet access or placing computers in a classroom" (Norum, Grabinger, and Duffield, 1999). However, Cradler, and Bridgforth (1999) said, "Many educational leaders have little understanding of or experience in using and managing advanced technologies." This situation implies the need for better technology programs at all educational levels.

Although technology skills are certainly important for teachers to learn, few graduate programs in the State of Utah prime teachers for these demands. The Master of Education program in which I was enrolled, through its technology specialization, attended to this need, but not to my satisfaction. My plan was to persuade students to integrate technology applications in their own teaching practice. By using a hands-on approach, I planned to model teaching strategies from instruction to construction as described by Cradler and Bridgforth (1999),

> It [Technology] can shift instruction from Teacher didactic to learner-centered and interactive, from fact telling to teacher-student collaboration, from memorization to inquiry and invention, from the accumulation of facts to the transformation of facts, and from the use of standardized tests to relevant portfolio and performance-based assessments (http://www.fwl.org/techpolicy/techreform.html).

This approach held much appeal.

The Curriculum Design Process

As a framework to commence the curriculum revision process, I raised the following questions:

- What subject content and topics do I need to include in the curriculum to support the course's objectives and goals?
- What learning activities do I need to include in the curriculum to support the content and topics?
- What resources or materials do I need to use to support the instruction and learning activities?
- What are the learners' interests and characteristics?

To obtain answers to these questions, I compared the previous curriculum with my personal rationale for the course. Ideas acquired through a literature search, prior teaching with technology encounters, and what I believed to be effective educational practice. In addition, I appraised the content and objectives of other IT courses at the graduate level tendered in the state of Utah. I wanted to ensure the topics I sought to include were suitable and comparative with other IT courses.

The new curriculum was developed using the same learning objectives as the previous course, but included topics to elevate discussions applicable to teaching theory and computer knowledge. In addition changes included a shift in focus to a variety of hands-on activities designed to expose students to the classroom application and uses of the most recent instructional technology tools and resources available for teachers.

As a neophyte in the area of curriculum design, I attempted to grasp a constructivist approach, where "...most knowledge is constructed in an active, effortful way by learners who are engaged in experiences that promote an opportunity for reflection and assimilation/accommodation to existing knowledge" (Smith and Ragan, 1999, p. 15). Furthermore, the new curriculum reflected my understanding of how to put into practice Dewey's belief that the purpose of education is to prepare children to live in the world; stu-dents would opt to utilize the technology tools and resources learned in their own teaching practice.

Method

My mentor professor examined and endorsed the curriculum before implementation. The class convened on thirteen occasions from January to April of 2000. The participants in this inquiry were graduate students seeking the Technology Area of Specialization in their graduate studies at Westminster College. All but one of the students who enrolled in the class had teaching experience in K-12 or post secondary education levels. Students ranged in age from 22-54 years, three men and six women. Their technology experience and skills ranged from emergent to proficient.

In the majority of classes, the professor conducted the reading discussion from the text. As the curriculum designer I sought out and chose this text. I wanted a text that would be able to provide a link from computer knowledge to teaching practice. Following a review of available texts, I chose Computers as Tutors: Solving the Crisis in Education by Frederick Bennett, Ph.D. (1999)The professor also conducted the final project assignment. I conducted the demonstrations and hands-on activities which followed the topics stated in the syllabus for each week. The following table displays the topics and activities comprised in my curriculum proposal week by week.

WEEK	TOPIC	ACTIVITY
1	Course Overview	E-mail, Setting up a computer Lab, Price Computer layout, Grant Sources. Educators resources in Utah/UTAP/UEN.
2	Planning for Media Use and Instruction	Trouble Shooting Computers, Install memory, and video card.
3	Creating Non-projected Visual	Practical use of pictures, posters, and other visuals. **Create a non-projected visual.
4	Creating Projected Visual and Audio	Use of overhead, slides, digital images, filmstrips, sound, and other visual. **Create a projected visual.
5	Integrating Computers into the Curriculum	Uses of the Internet in the classroom. Search and **create activities and lesson plans using Filamentality tool.
6	Multimedia Projects and Presentation	Corel Presentations and Power Point. **Create a Presentation.
7	Computers Networks	WAN, LAN, Basic network set-up.
8	EDNET	Distance Learning Education.
9	Distance Learning Education	Search the Web. Online courses **Create a Virtual Tour.
10	Working with Images	Graphics, Editing, Animation using Fireworks.
11	Web Page Editors	Introduction to Composer and Dreamweaver.
12	Online Resume, Portfolio	Show models. Saving on CD.
13	Course Summary	Final Presentations. Choose one of the tools learned and create a lesson. Or use WebCT to put this course online (final project is negotiable).

mini-projects

As the course unfolded, students were encouraged to submit weekly comments or reflections for each topic. Additionally, I kept a journal of personal insights from my teaching experience. The professor and I met regularly to discuss student progress, curriculum adaptation strategies, possibilities, and concerns. At completion of the course students shared their comments about the course.

Reflections

The following are brief transcripts of sample journal notes that highlight the progress of the course and my thoughts as curriculum designer.

Week 1: Course Overview

The class did not go as well as I had hoped. Soon after I began to teach, I had more topics to cover than time. I started to rush through the material. I panicked, looking at the clock, and suddenly nothing was working for me. When I tried to explain one of the options for the final project, developing this course online using WebCT, it didn't succeed the way I had planned. "I am not very familiar with the product, but I practiced before class and created a small course; however, in class it did not work! I could not login and I looked, and felt, foolish." In the middle of all the commotion, I forgot to mention the second option for the final project [select one of the tools learned in class to create a lesson]. Even as I near completion of the class instruction, the anguish of that moment is still with me. I decided, "Next time I will try not to cover so much material." However, I was confused about how to do this. The syllabus was set; so how could I make profound changes this early?

Week 2: Planning for Media use and Instruction

A technician from the information technology department at Westminster came to pull a computer apart to show how they work. Students' feedback suggested that the majority of them appreciated learning about the parts and functions of the computers. One said, "I enjoyed the hands-on approach. It helped me by actually seeing the computers and the slots and how they went together." Unfortunately, the technician did not bring enough computers to allow all the students to use a hands-on approach and monkey around in the guts of the computers. This was a major drawback. Overall, I am not sure what we really gained with this demonstration, other than a general overview of the computer parts. Can the students use this application to actually troubleshoot their classroom computers?

Week 5: Integrating Computers into the Curriculum

One student conveyed, "I think we are extremely involved and so concerned about defining what we are going to do for our final project, that we are distracted from other activities [Integrating Curriculum demonstration]." Students sent a consistent message, however, that while the primary concern of an IT course is to learn educational tools for integration, the time needed to prepare each project and assignment brings stress and frustration.

Throughout the curriculum revision process, it never occurred to me that the intensive amount of topics would provide an avenue for students to disengage from the topics and lose focus on other projects due to the lack of time.

Week 8: EDNET

Today we delivered the class via EDNET, which is the Utah Education Network's interactive system that electronically brings a teacher from one classroom to another. To me this was the biggest event of all because the students had the opportunity to participate in a real life distance learning experience. In education, many courses, degrees, and programs are delivered at a distance. Perhaps ten, fifteen, or twenty years from now, the majority of instruction will by conducted from an EDNET site or another distance learning medium. To facilitate this activity, I encountered many hours of preparation, including training on the system. In addition, some technical difficulties occurred during the event, but that did not diminish the experience.

Although I am in favor of using this type of system as an alternative medium of instruction, it can be a disadvantage. Perhaps it is just a matter of tweaking the way of teaching. The disadvantage comes from the boundaries set by the camera and TV screen. While delivering the instruction, "I felt tight: I could not move, use my hands, or show excitement." My professor could not restrain himself from looking at the monitor to catch a glimpse of the class. The students also felt intimidated by the camera and the microphones. However, the class setting created a meaningful environment that prepared the professor and I to model the use of technology and its practices in a real situation. One student said, "Although I am not entirely sold on EDNET, the chance to participate and learn about it was great!" What does she means by saying, "entirely sold"? Did she mean that distance learning is not effective for teaching and learning? Did the other students feel the same way? What did we gain today?

Week 11: Web Page Editor

I was absent for this class and the professor was going to cover the topic. However, the whole class decided to spend the time to work on the final project. According to the professor, the class was thankful. I do not know how to express my feelings when I found out what happened. As a developer of the curriculum, I would have preferred to follow the plan. Does this make me a behaviorist? On the other hand, as an instructor, I am sure I would have made an adaptation to meet the students' needs allowing them to work on the final project, instead. Does this make me a constructivist? I know that in my personal practice I tend to be flexible and like to negotiate learning and instruction with my students. As an instructor or developer, do I need to stand firm on one or the other approach? Can I mix both: behaviorist and constructivist? Perhaps I need to examine both approaches more closely.

Outcomes

At first, what I tried to do while revising and implementing the Information Technology curriculum was to expose students to the most recent instructional technology tools and resources available for teachers; tools that would be effectively use in a classroom situation. When I asked a student to give me suggestions for a future IT course, the response was, "If the purpose is to offer lots of information about technology, then probably none…[but] I would like the opportunity to become more proficient in some of it [technology tools]. I will have to do that [practice] on my own." Considering this comment and many other issues that arose through the implementation of this curriculum, it is apparent to me that the approach I took to expose the students to a—wide variety—of resources was not effective for some.

This was not an easy personal journey. I began confident in my abilities to envision what an effective Information Technology course should be. I was at time shaken by peers' criticisms and by my professor's concerns about the plethora of topics each week. Many of those emotions are captured through my weekly reflections and questions

As a novice curriculum designer, I emerge from this challenging situation with an understanding that curriculum development means much more than creating a syllabus of neat ideas. I agree with Kemp, Morrison, and Ross (1996) when they said, "The design process includes the activities of analysis, strategy development, evaluation, and revision" (p.11), I have learned this first-hand.

Recommendations

From my experience the fledgling curriculum designer would be wise to consider the following recommendations before beginning the design process:

- Plan each step of the curriculum development with special consideration on the time entailed to accomplish each assignment or task.
- Ensure that all the technology components work appropriately before the launch of the course.
- Be prepared to absorb great quantities of frustrations before and during the implementation of the curriculum.
- Use outside resources when needed.
- Prepare assignments, projects, objectives, and rubrics beforehand. Participants need to have specific guidelines.
- Carefully revise references, books, and other resources used in the class.
  Do not limit the revision to the content, rather examine the validity of the document to avoid unwanted controversies.
- Provide handout material and visuals to reach each individual.
- Allow more computer time to work on projects and assignments.
- Teach fewer topics to allow more in-depth exploration and technology skills development.
- Combine related topics or assignments (e.g. non-projected and projected projects)
- Do not spend too much time on a subject if the students are comfortable with the topic.
- Teach applications that reinforce basic computer skills early in the course (e.g. graphics) to allow students to build their knowledge according to the difficulty of the concept.
- Spend more time on technology integration strategies and applications.
- Consider the possibilities of working in small groups rather than a large group. This will allow each student to become more familiar with different technology applications.
- Be prepared to make adaptations to the topics and activities as the course develops.
- Be available when the students need help.
- Make each activity as close to real world context as possible.
  When choosing the topics and assignments for a course, ask yourself the following questions: How will these topics fit into the scope of the program? What technology skills will the students need to make sense of the topics sufficiently to ensure transfer to their practices?
- Above all, be flexible.

References

Bennett, F., (1999). *Computers as Tutors: Solving the Crisis in Education*. Faben: Florida.

Cobb, P., (1996). Constructivism and learning. In T. Plomp and D.P. Ely (Eds.), International Encyclopedia of Educational Technology (2nd edition). (pp. 56-59) Tarrytown, NY:Elsevier Science.

Cradler, J. & Bridgforth, E., (1999). *Technology as a Catalyst for Education Reform.* http://www.fwl.org/techpolicy/techreform.html

Hale, M.E., & Kieffer, R.D., (1995, April). *Helping Teachers use Multimedia Portfolios for Professional Development*. Paper presented at the Annual Meeting of the American Educational Research Association, San Francisco, CA. Eric Document Reproduction Services No.ED 385-523.

Kemp, J.E., Morrison, G.R., and Ross, S.M., (1996). *Designing Effective Instruction*. Merril:New Jersey

Norum, K.E., Grabinger, R.S., Duffield, J.A., (1999). *Healing the Universe is an Inside Job: Teachers= Views on Integrating Technology*. Journal of Technology and Teacher Education, 7(3), 187-203.

Smith, P.L. and Ragan, T.J., (1999). *Instructional Design* Second Edition. Merrill: New Jersey.

Comparison of Face-to-Face, Semi-Online, and Fully Online Approaches for Introduction to Educational Technology Courses for Educators

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Abstract: An important experience for educators is learning to use computer technology for teaching and learning. In Florida, a course for undergraduates and a graduate class offer that experience. The courses topics include educational hardware, software, multimedia, Internet, and ethical and legal issues. Both courses share primary goals: building technology skills, and helping students to become integrators of technology into teaching. This year, six simultaneous sections of the courses were offered using a range of approaches. Two sections were taught fully face-to-face. Three sections were taught with students meeting in person for 50% of the time, and working in a web-based environment half of the time. One section met only online. Surveys of all students were conducted at the beginning and the end of the course, and student performance on class activities and assessments was tracked. Comparisons were made on student attitudes and self-reported technology abilities, as well as course grades.

Reports from businesses, standards documents from ISTE, and educational accreditation policies from NCATE underscore the importance of technology as a teaching and learning tool. Studies indicate that there are new and veteran educators who do not have the skills for using technology in the teaching and learning process (Barron & Roblyer 1993; Market Data Retrieval 1999; Southeast and Islands Regional Technology Consortium, SERVE, Inc. 1998). An important experience for both preservice and inservice educators is learning to use computer technology effectively as a teaching and learning tool. Higher education programs that prepare professional educators address the need for technology experience in several ways. Educational technology courses may be required, or technology may be integrated throughout other required courses.

In Florida's state university system, students in education programs leading to initial teaching certification take a required educational technology course. Undergraduate programs include the sophomore level Introduction to Educational Technology. Graduate programs include Computers in Education. Both courses have twin goals: building student skills as technology users, and providing background for students to become integrators of technology into teaching. The beginning course in educational technology, mandated by the state of Florida in 1996, is critical in the education of preservice teachers because it is the only required technology course. Web sites and conference presentations confirm that there are multiple approaches to teaching this course.

The courses cover the following topics: educational hardware, application software, multimedia, Internet, and ethical and legal issues. Each course is a three-semester hour class. Traditionally the course has been offered fully face-to-face in a classroom. The class has been web-enhanced with online assignments. This year a group of faculty taught the course using a continuum of approaches ranging from fully classroom-based to fully online. The purposes of employing the continuum of approaches was to determine whether there is a balance of classroom and online learning that is most appropriate for the students in the courses. Six simultaneous sections of the courses were offered: two sections were taught fully face-to-face, three sections were taught with students meeting in person for 50% of the time and working in a web-based environment the rest of the time, while one section met only online. Three instructors were involved with the six sections, teaching a total of 115 students.

In order to evaluate the success of the approaches, several measures were used. At the beginning of the Fall 2000 semester, all students in the courses took online surveys. The surveys and survey methods were identical. The surveys captured baseline information about the students regarding their views of their technology experience, attitudes and skills. The survey items are described in the appendix. The surveys were repeated at the end of the semester. During the course, students participated in similar learning experiences to receive course grades. Students also completed university course evaluation forms at the completion of the course.

Using the surveys, course grades, and course evaluations, results were compared to answer the following questions:

- Do students who opt for an online course initially differ from those who choose a classroom course in their skills and attitudes toward instructional technology?
- Do graduate students initially differ from undergraduate students course in their skills and attitudes toward instructional technology?
- Do students experience a positive change in their skills and attitudes toward instructional technology as a result of participation in a course, and if so, does that change relate to the teaching approach of the course?
- Are changes in skills and attitudes toward instructional technology related to the student's graduate or undergraduate standing?
- Is student class performance related to the teaching approach of the course?
- Is student course evaluation related to the teaching approach of the course?

The results of the comparisons will be used to determine the most effective teaching approach, and to incorporate that knowledge into planning for future semesters. The survey completed at the beginning of the semester provided a baseline of student status, and a comparison of technology experience and attitudes among classes. At the start of the term, the undergraduate students rated their computer skills and experience at a significantly higher level than the graduates students did (p value of 0.001867). Using the 5-point scale, the undergraduates gave themselves a score of 2.15, averaged over the experience questions for all students in the undergraduate classes. The graduate students rated themselves at 1.75 on average. When comparing the students according to the teaching method, the graduate students who chose to take the fully online course rated their skills at a significantly higher level (2.34) than students in both the fully classroom-based (1.67), and hybrid classes (1.63) (p value 0.019356). The skill ratings of undergraduate students in the fully classroom-based classes (2.32) did not differ significantly from those in the hybrid classes (2.06) (p value 0.152215).

References

Barron, A., & Robyler, M. D. (1993). Are Florida universities preparing teachers to use technology? Presentation at the *Florida Educational Technology Conference* (FETC), Tampa, FL.

Market Data Retrieval. (1999). New teachers and technology: Examining perceptions, habits, and professional development experiences. Shelton, CT:

SouthEast and Islands Regional Technology Consortium. SERVE, Inc. (1998). *Integration of technology in preservice teacher education programs: The SouthEast and Islands regional profile.* Orlando, FL: Instructional Technology Resource Center.

Appendix of Survey Questions

The first set of questions asks students to choose from among a set of options to: Identify your course instructor, your gender, your class standing at the university, your age range, and whether you are taking this class as a requirement. The set of questions related to computer experience ask students to rate their level of experience on a scale from 1 indicating no experience to 5 indicating extensive experience. Students rate their experience using operating systems (Unix, Linux, Windows, Macintosh OS), web publishing software, presentation software, digital video, word processing, web browsing, email, animation, search engines, databases, spreadsheets, digital audio, digital graphics, gradebook software, FTP. The set of questions related to computer attitudes ask students to rate their level of agreement with statements on a scale from strongly agree to strongly disagree. The questions relate to students' comfort or anxiety with computer applications, and feelings about the importance and usefulness of computers. Questions ask about student's confidence with email, word processing, and databases.

Redesigning an Educational Computing Course to Meet New National and State Technology Initiatives

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Abstract: The Department of Urban Education (UE) at University of Houston Downtown first began in the fall semester of 1995. It has just started along the technology trail to learn from other institutions that have already addressed some of the issues and found some answers. The shared goal of the faculty in the department is to offer an educational computing course that falls on the end of "teaching with technology across the curriculum". The one credit hour educational computing class CS1105 is in the process of being redesigned by the UE faculty as a 3 credit hours class ETC 3301. The brand new ETC 3301 is proposed to open to all entering pre-service teachers starting spring 2001. Texas Education Agency, State Board for Educator Certification, and several other governing institutes of teacher education programs in Texas are raising standards for computer literacy for new teachers. It was suggested to all computer literacy courses to conform to the current versions of the national and state frameworks and guidelines. On the survey, the students were asked to evaluate their skill levels on using programs such as spreadsheet, database, and philosophy of using technology. This paper will also analyze results from students' self-reports completed on the first day of class for three semesters. The students' input will be implemented into the redesign of the CS1105 to ETC 3301. The paper will discuss the processes of redesigning the educational computing course to meet new state technology application initiatives.

Introduction

In the state of Texas, Texas Education Agency, State Board for Educator Certification (SBEC), and several other governing institutes of teacher education programs in Texas are raising standards for computer literacy for new teachers. For example, it is projected that in 2002-3, the on-line version of the ExCET, the state mandated teacher certification exam, will be piloted, and technology related questions will be embedded across the question sets in the professional development exams for all levels. To meet new state technology application standards, the paper plans to discuss the processes of redesigning the educational computing course ETC3301 at the teacher preparation program at University of Houston Downtown to better prepare the future teachers for the higher expectation on using technology in classrooms. Educational technology in preservice and in-service teacher training organization is a new field that has attracted researchers attention during the last decade of the 20th century. The research findings of the proposed research will also contribute to the study of educational technology and teacher education worldwide.

The Need to Change

The Department of Urban Education (UE) at UHD first began in the fall semester of 1995. It has just started along the technology trail to learn from other institutions that have already addressed some of the issues and found some answers. The teacher education programs across the country may be placed along a continuum in their integration of technology: on one end is teaching about technology while on the other end is teaching with technology across the curriculum (Office of Technology Assessment, 1995). The shared goal of the faculty in the department is to offer an educational computing course that falls on the end of "teaching with technology across the curriculum".

The one credit hour educational computing class CS1105 is in the process of being redesigned by the UE faculty as a 3 credit hours class ETC 3301. The brand new ETC 3301 is proposed to open to all entering pre-service teachers starting Spring 2001. Following several governing agencies' suggestions, the new educational computing class ETC 3301 plans to conform to the most current versions of the following national and state frameworks and guidelines for technology education for beginning teachers:

- NCATE 2000 (http://www.ncate.org/2000/2000stds.pdf)
- StaR CHART from the CEO Forum (http://www.ceoforum.org/)
- SBEC standard (http://www.sbec.state.tx.us/certstand/certstand.htm)
- ISTE NETS*T (National Education Technology Standards for Teachers, ISTE) (http://www.iste.org/standards/index.html)

The purpose of the redesign of ETC 3301 is three-fold: (1) the new course will conform to the national and state frameworks and guidelines for technology education for beginning teachers; (2) to help the students have a better chance of passing the state mandated certification exam ExCET, which, as stated in previous section, in the near future is going to embed more technology related questions across the question sets in the professional development exams for all levels; (3) to help our students to become better teachers for the 21st century.

The Process

Understanding Students' backgrounds

Research has shown that a pre-service teacher's initial attitude toward technology may impact their future use of educational technology in the classroom (Rodriguez, 1996). Instructors should be knowledgeable of the factors that could cause students to exhibit behavioral characteristics.

In order to gain initial knowledge of students' background, since 1999 when first started teaching the computer literacy course, the author has requested students taking CS1105, the predecessor of ETC 3301, to fill out a paper-and-pencil questionnaire when the students take their first professional development course, asking them to answer computer/technology related questions. The author has analyzed results from students' self-reports completed on the first day of class for three semesters. The questionnaire is then followed by e-mail-based homework answering questions such as their teaching strategy, their teaching philosophy, their position in integrating technology into teaching, etc.

On the survey given out during the first class of the computer literacy course, 94% of the population indicated that they were at least fairly competent with word processing and 76% of the population indicated that they were at least fairly competent with Internet. All students agreed that integrating technology into instruction is very important. Yet only 12% of the population indicated that they were at least fairly competent with spreadsheet, 4% of the population indicated that they were at least fairly competent with database, and 15% of the population indicated that they were at least fairly familiar with educational software. The results suggested that database, spreadsheet, and educational software are the areas that need more enrichment activities.

Many researches have been done and many instruments have been developed to investigate prospective teachers' attitudes toward computers in relation to gender, age and academic major (Collis, 1996; Hadley & Sheingold, 1993). However, this is the first time this type of research has been done on the students seeking teaching certification at UHD. It was hoped that the students' inputs could be implemented into the redesign of the CS1105 to ETC 3301.

After teaching CS 1105 for many semesters, the initial impressions of the author were: the students are positive in their attitudes toward using computers; database is one of the weakest areas for the students; many students stated that they are not familiar with Macintosh computers although Macintosh computers have been used widely in K-12 schools; more than half of the students have access to computers at home, office, or the classrooms where they are doing their student teaching.

The variables of the research include: familiarity with Windows computers, familiarity with Macintosh computers, familiarity with word processing, data bases, spread sheet, e-mail, World Wide Web, CD-Rom technology, educational software packages, and anxiety level using technology, computer ownership, access to computer from office/classroom, access to the Internet, philosophy of using technology to enhance learning, opinion about using technology to facilitate teaching, opinion about computers being necessary educational tools, etc.

The author has collected information from approximately 200 subjects from the student pools of Spring 1999, Summer 1999, and Fall 1999. The returned responses are in the formats of paper-based questionnaire and Microsoft Exchange e-mails, and Microsoft Word document. Under the support of the Organized Research Committee fund at UHD, the author has conducted a project "Instructional Implications of UHD Teacher Education Students' Basic Skills, Attitudes, and Anxiety Towards Using Computer Technology" in Fall 2000. The author has conduct analysis to find the reliability coefficients, multiple regression, etc of the variables. This project has reported findings on the archived data of a survey of students in the professional computer literacy course for educators and has related some implications these findings have for teacher educators. The findings of the proposed research will help to identify the weakness of students' computer skills, attitudes, and the anxiety levels of the students in the UHD teacher education program. Based on the findings of the research on students' computer background, special redesigning can therefore be made for the whole class or a special group of students.

Maintaining Student Motivation

To further incorporate the motivational design into lesson planning, a search for a better instrument to assess course motivation has been conducted. The author is considering using John Keller Course Interest Survey, Personal Background Information, and the Instructional Materials Motivation Survey (IMMS). In his online article "How to Integrate Learner Motivation Planning into Lesson Planning: The ARCS Model Approach", John Keller of Florida State University discusses applying the ARCS Model to meet the challenge of stimulating and sustaining learner motivation and the difficulty of finding reliable and valid methods for motivating learners (http://www.netg.com/research/kellerwp.htm). According to Keller, the ARCS model of motivation (Keller, 1999a) provides guidance for analyzing the motivational characteristics of a group of learners and designing motivational strategies based on this analysis. The ARCS model is based on a synthesis of motivational concepts and characteristics into the four categories of attention (A), relevance (R), confidence (C), and satisfaction (S) (Keller, 1999b). These four categories represent sets of conditions that are necessary for a person to be fully motivated (http://www.netg.com/research/kellerwp.htm). If the learners are attentive, interested in the content, and moderately challenged, then they will be motivated to learn. But during the course planning process and when the course is ongoing, the satisfaction criteria will also be constantly monitored to sustain this motivation.

Alignment Analysis

Detailed analysis has been conducted to ensure complete alignment of the curriculum with the standards. The author who is scheduled to teach ETC 3301 has downloaded the national and state frameworks and guidelines from the Internet, formatted them into rubrics, and undergone an item-by-item analysis of the standards with the planned classroom activities. Take the curriculum alignment with the SBEC standard for Technology Application for example, there are eleven Standards in total which provide the general guidelines. Within each Standard there are a section for "Teacher Knowledge: What Teachers Know and Understand" and a section for "Application: What Teachers Can Do" which provide detailed interpretations of the specific Standard.

There are three columns on the rubric used as a template for the faculty in the Department: (1) detailed description of "Teacher Knowledge: What Teachers Know and Understand" and "Application: What Teachers Can Do", followed by (2) textbook chapters that correlate with the knowledge and application, and (3) finally the activities that can be conducted during class. If unmet standards were identified, either original activity could be modified or new activities could be added around the unmet standards. The alignment analysis has been turned in for the departmental curriculum alignment committee to review. A copy of the alignment analysis is kept in an open area for the faculty member to add more ideas and facilitate information sharing with each other.

Textbook Selection

In addition, as the second step, from a pool of 5 pre-selected potential textbooks on the topic, one new textbook has been singled out for adoption for Spring 2000 by a departmental curriculum committee made up of faculty members teaching a variety of subjects within the Department, including but not limited to science education, bilingual education, language arts and social studies.

Conclusion

In the initial planning stage, the topics chosen are as follows: Operating System, Desktop publishing, Database, Spreadsheet, E-mail, Web search, Multimedia/hypermedia, and Software evaluation. Depending on individual needs, students will be allowed to pick up a few subjects from the above list and complete small projects assigned by the instructors. The students will also have the flexibility to do work for different subject content and grade levels. Throughout the whole semester, students are required to conduct at least two mini-lessons or micro-teaching which demonstrate their proficiency in integrating technology into curriculum. Mini-lessons or micro-teaching also offer a chance for students to observe and learn from each other. In general, student-centered teaching and learning approach will be encouraged.

Reference

Collis, B. A. (1996). Technology in Teacher Education. In T. Plomp & D. P. Ely (Eds.),. *International Encyclopedia of Educational Technology*, 2nd edition. (pp. 534-538). Oxford, U.K.: Pergamon Press.

Hadley, M., & Sheingold, K. (1993). Commonalities and distinctive patterns in teachers' integration of computers. *American Journal of Education, 101*(3), 261-301.

Keller, J. M. (1999a). Motivational systems. In H. D. Stolovitch, & E. J. Keeps (Eds.), *Handbook of human performance technology*, 2nd Edition. San Francisco: Jossey-Bass Inc., Publisher.

Keller, J. M. (1999b). Using the ARCS motivational process in computer-based instruction and distance education. In M. Theall (ed.), *New Directions for Teaching and Learning: Motivation from Within: Approaches for Encouraging Faculty and Students to Excel.* San Francisco: Jossey-Bass, (#78).

Rodriguez, S. (1996). Preparing preservice teachers to use technology: Issues and strategies. *Tech Trends, 41*(4), 18-22.

U. S. Congress, Office of Technology Assessment (1995). *Teachers and technology: Making the connection.* (OTA Publication No. OTA-HER-616). Washington, DC: U.S. Government Printing Office.

Technology -- Stand Alone or Integrated?

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Abstract: What technology should be included in teacher preparation programs, and where should it be taught and/or practiced? As states (and other entities) establish technology standards to be addressed in teacher education, programs are looking for the best way to integrate these standards into existing (or new) courses. Three faculty members share their recent experiences, from their examination of the Texas Technology Applications Standards, to a determination of where each is addressed in the professional development sequence of courses as well as in the technology courses, to the development of activities to assure that all students address all of the proficiencies that are included in the standards. Included are the standards, the procedures used to determine and/or add needed technologies, and student activities.

Technology and Teacher Education -- two items that are becoming increasingly intertwined. Much money and talk have been devoted to the duo, with a growing awareness that just putting the technology out in the schools is not enough. Teachers must be trained to use that technology to enhance student learning, and a natural place to start is with preservice teacher preparation programs. This comes at a time when universities are evaluating and expanding or otherwise enhancing technologies (and related infrastructures), some of which are to be used for alternate methods of course delivery (Internet based, videoconferencing, etc.) by faculty members who may or may not have had any training in such techniques. Even 'traditional' classes are changing, as instructors (and/or their students) expect to have computers, projectors, and Internet connections in the classroom for use as an integral part of instruction and presentations. Teacher education faculty are hearing how important it is to learn the technology, to model its use for their students (future teachers), and to help those students learn to integrate it into their (the students') teaching fields. So how did we get to this point, and how are we addressing the issue?

Technology and Teacher Education

Teacher education programs have been charged with preparing teachers for the classrooms of today and tomorrow. Many of these k-12 classrooms are changing, and some have changed drastically from the days when the current teacher education faculty were students in elementary and secondary schools. Some of the students in these programs, especially the growing numbers of non-traditional students entering the teaching field, may also find that the classrooms in which they will teach are not like the ones in which they received their education. The challenge is to prepare both faculty and students to work with students in these new environments.

One of the most visible changes in the classroom and school of today is the presence of computers and related technologies. Although technology has come to be recognized as an essential component of education, much of that recognition in both k-12 and higher education has been demonstrated by the acquisition of computer hardware and software. This technology was often under-used because the teachers either did not have the appropriate software to use with their students, did not have access to enough computers for all class members, or just didn't have the time. A basic reason, though, was a lack of knowledge about how to use the computers and what those computers could help them and their students. Teachers needed to learn how to use the computers, but they also needed to learn to integrate computers and computer-related technologies into classroom activities and to develop a vision of the role of technology in education.

Technology Standards and Teacher Education

The importance of technology in education, and the need to prepare teachers to use it as an educational tool, is highlighted by the prominence of technology goals and standards for education and educators. At the national level, four goals (Educational Technology Goals, 2000) have provided a general framework addressing technology in the classroom in terms of accessibility, connectivity, integration, and teacher preparation. More detailed are the ISTE/NCATE National Standards for Technology in Teacher Preparation (ISTE, 1998), which have been used by many institutions to guide the integration of technology into their teacher education programs. As part of their National Educational Technology Standards (NETS) for Teachers (ISTE, 2000) ISTE has revised and expanded the earlier standards, to accompany the standards that they had developed for students. Many states also have been developing technology standards. Texas has just approved a set of Technology Applications Standards (SBEC, 2000) for which all educators will be accountable – and education programs are currently working on ways to assure their graduates will have the prescribed knowledge and skills to enable them to pass certification exams which will cover these standards. (Although there are eleven standards, only the first five are for all teachers. The others are for teachers of the high school computer science and technology applications courses such as web mastering, desktop publishing, etc.)

While standards suggest *what* skills and knowledge must be acquired, there is still the question of *how* and *where*. And that brings us to the often debated issue of the best way to 'teach' technology in teacher education programs. This on-going debate has two (often opposing) forces – those who believe a separate technology course is essential, and those who consider it better to integrate technology throughout the curriculum. There are advantages and disadvantages to each. The integration approach will require coordination of content in different courses and different disciplines, to assure that all students received appropriate (and required?) technology experiences. On the other hand, a student taking a technology course may not consider using the technology skills and knowledge outside that class. A third option is to combine these two approaches, having students take a technology class, but also having technology integrated throughout the other courses in the teacher education program.

The Dual Approach

At Texas A&M University-Commerce, students in the preservice secondary education program complete introductory education courses and all or most of their out-of-education courses before their final two semesters, when they will have a year-long field experience. The first semester they will be interns, and then during the second, they will be residents – with increasing responsibilities for classroom activities ending with full student-teaching. One of the program goals is that the students use technology in their teaching (and other school-related) activities in a way that enhances student learning. Shortly after we instituted the intern/resident year, we introduced a technology integration course into the final semester, feeling that this would give students an opportunity to apply what they were learning in their university class when they were in their k-12 classrooms. We quickly found, though, that this was not adequate. Currently we use a dual approach, as described below.

Before entering the secondary education program, students must take an introductory computer course (ETEC 224) to provide them with basic computer skills to prepare them for the computer integration course as well as for computer-related activities in their other classes. Then, before their internship and residency semesters, they take ETEC 424 (Integrating Technology into Curriculum). Meanwhile, in their professional development sequence courses, technology experiences are integrated into the various courses. Although originally (as mentioned above) ETEC 424 was taught during the residency semester, it was determined that the students needed these technology skills in place before they began their classroom activities. Now, they acquire and practice skills and knowledge in ETEC 424, and then are expected to use these in their classrooms during semesters after they complete the course.

Key to the integration of technology throughout the program is the involvement of faculty, and we have used the May, 2000 release of the Texas Technology Applications for all teachers (SBEC, 2000) as a way to find out what technologies are being used what students are expected to know before getting to specific courses, and what training faculty want and need.

Technology Skills

As we began our integration and alignment efforts in terms of technology in all courses, faculty members from the technology classes and the secondary professional development courses each reviewed the Texas Technology Applications Standards and indicated which they addressed in their classes and how. This provided us with a base, from which we could be sure that prerequisite skills were included in the appropriate computer course, and that all of the standards, including the 17 knowledge and the 66 applications statements, were addressed in one or more courses. Then, to get a better idea of what skills students came in with, and what they left with, we interviewed the faculty members who taught the first and last secondary professional development courses that students took. Information from those interviews is presented below, and is followed by a discussion of the technology classes and how the Technology Applications standards fit in with all of this.

The First Semester

The first professional development course students take is SHED 300 – a basic introduction to the teaching profession, which includes a field-based component where students go into the schools for 30-hours. Before taking this course, students must have completed a basic introductory computer course (either ETEC 224 or a similar course in another college). Therefore we looked at this course to see what technology experiences these students had in class, and whether all prerequisite skills were included in ETEC 224. The SHED 300 instructor submitted the following information.

Students entering the teacher education program possess a wide range of computer skills – from computer programmers and repair technicians to the computer challenged. Some students have completed the required educational technology courses, others are simultaneously enrolled in the introductory teacher education preparation course and the educational technology courses, while others are planning on taking the educational technology courses in a future semester. this wide range of knowledge and abilities poses a challenge for the college instructors.

On the first day of class in SHED 300, students are required to submit their Early Field Experience applications to the Certification office by using a newly-developed on-line system. Using this application method within the first week of the semester greatly reduces the time to place students in the schools where they will be observing. It also gives them an initial experience in the use and value of technology.

Other uses of technology in the teacher education program include PowerPoint for class presentations, sending and receiving e-mail, submitting assignments over the Internet using attachments, searching web sites for lesson plans and other teacher topics, downloading TEKS (Texas Essential Knowledge and Skills – curriculum information) and ExCET (Texas certification examinations) information, and word processing programs.

The Last Semester

During the final semester of their certification courses, students are in the schools everyday, but come back to class for seminars several times throughout the semesters. University supervisors visit them in their classrooms each week, observing and conferencing with them. The instructor for the seminars, who also visited some of the students as supervisor, provided the following the technology uses in her classes, and in the students' teaching activities in the schools:

When students come into the second half of student teaching they must know how to use the computer. They do extensive online searches for lesson plans at different sites to improve their lessons; they write journals each week about classroom experiences and send these to me via e-mail; they use WebBoard (posting messages and chatting) as an electronic forum to communicate with each other and their peers; and they practice testing skills online at state and university web sites..

They are expected to integrate technology into their lessons, providing interactive learning activities for their students. For example, one student used the computer to allow students to trace the steps to the Presidency. Students gathered information on the candidates as well as looked at the issues, as they progressed through the sites suggested by their teacher. Immediate vocabulary assistance was available – a student who did not know the meaning of a word needed only to click on the word for an explanation. Student had fun while gaining information, and various learning levels were addressed.

In another unit a math student created a PowerPoint presentation on Scuba Diving to use with his students. First, though, he had his students create and present to the class their own PowerPoint presentations about famous mathematicians and other math related topics.. This activity helped prepare these students for their instructor's presentation about how to use a profile in scuba diving.

Another math teacher used PowerPoint to show students how to take notes on math theorems. The students would later collect these, make note cards, and have a small math book of their own at the end of the year.

An ongoing use of technology for the residents is posting on WebBoard, where their comments can be read throughout the semester. This is a closed environment, open only to class members, so it is basically their online classroom, where they feel free to discuss issues openly with each other.. At the start of the semester, each student's first posting includes answers to the following::

- Who are you?
- What district are you teaching in?
- What was you first lesson?
- Why do you want to teach?
- Discuss one thing that has surprised you most about teaching.

This helps students get to know each other, and also provides a place where the information may be found later when it is needed. Students also post reflections – over assigned topics or as 'free-writing.' This interaction helps student to overcome the isolation that some of them feel. One teacher said that it gave him a chance to know what his peers do in their classes – since his classroom was on the other side of the school. Away from most of the other classrooms, he felt alone. Students were also asked to share information about what they were doing in their classes, especially examples of how they were using technology. As they posted and read, they began to use each other's ideas, and when they came to the university for seminars they discussed what they had learned from their WebBoard exchanges. They were learning from each other, and it was not restricted to time in class. Technology (WebBoard) was enabling them to have this on-going forum that they could access from anywhere (provided they had Internet access) at anytime.

The Technology Courses

In the secondary teacher preparation program, students major in other areas, and only come to us for their professional development courses. When they come to us as juniors, they have already completed an introductory computer course – this is what some people refer to as 'basic computer literacy.' Course content includes how to operate a computer and to use basic computer applications – and includes all of the skills that students will need to perform the SHED 300 activities, described above. Because of the wide variety of skills possessed by the students, activities are often personalized – to encourage all students to go beyond their comfort level.

Before students enter their internship and residency year, they take ETEC 424, the technology integration course. There, they build upon the skills from their introductory course, with an emphasis on the relationship between learning and technology, and on ways to integrate technology into the curriculum. These are the skills that lead to the classroom activities observed by the instructor during students' resident semester. WebBoard, which was introduced briefly in the previous course, is used more extensively here, and the chat mode is introduced. The classroom/lab environment provides students with the opportunity to share and to learn from each other. Many students take this at the same time that they are taking SHED 300, and the observation hours for the SHED class prove helpful here, too, as they look specifically for technology use in the classroom (which is one of the required SHED observation topics).

The Standards

So how and where do the Texas Technology Applications Standards fit in? The activities listed by the instructors of the first and last SHED classes fall under several of the five standards that are for *all* beginning teachers. Those five basic Technology Applications Standards (SBEC, 2000) are:

Standard I. All teachers use technology-related terms, concepts, data input strategies, and ethical practices to make informed decisions about current technologies and their applications.

Standard II. All teachers identify task requirements, apply search strategies, and use current technology to efficiently acquire, analyze, and evaluate a variety of electronic information.

Standard III. All teachers use task-appropriate tools to synthesize knowledge, create and modify solutions, and evaluate results in a way that supports the work of individuals and groups in problem-solving situations.

Standard IV. All teachers communicate information in different formats and for diverse audiences.

Standard V. All teachers know how to plan, organize, deliver, and evaluate instruction for all students that incorporates the effective use of current technology for teaching and integrating the Technology Applications Texas Essential Knowledge and Skills (TEKS) into the curriculum.

Under each Standard there are 3-5 knowledge statements, and 8-18 applications statements, for a total of 83 proficiencies. The challenge to our program is to provide every student with experiences related to each. Some of the content areas do a good job of integrating technology into their classes, but others do not, so we are addressing all of the standards (and their components) in the ETEC and/or SHED courses. To determine where we stand, a form listing the proficiencies and asking faculty to indicate which they addressed and how they did so was distributed. Input from those forms has been reviewed, and ETEC courses have been modified so that all students will have the skills needed for SHED classroom activities. Examples of the proficiencies and responses, demonstrating the differences between the two technology classes include:

1.3 Select and use software for a defined task according to quality, appropriateness, effectiveness, and efficiency.
ETEC 224: Students will work in groups to evaluate basic categories of computer applications programs (word processor, spreadsheet, database, etc.); and to analyze advantages and disadvantages of each
ETEC424. Students make software selections based on appropriateness/effectiveness for the task. They choose between word processing, database, presentation, scanning, and spreadsheet software.

2.6 Determine and employ methods to evaluate electronic information for accuracy and validity
ETEC 224: Provide students with real life problems to research and have them work in groups to evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias of their accumulated information, and to prepare a report of their findings
ETEC 424: Students learn to evaluate the information they retrieve from the Internet and electronic database for accuracy and validity. They learn basic rules to follow and to use with their students when they are teaching.

3.2 Plan, create, and edit spreadsheet documents using all data types, formulas, functions, and chart information
ETEC 224: Have students create a budget spreadsheet that would reflect their individual yearly, monthly, and daily real-life expenditures
ETEC424: Spreadsheet – create a gradebook including intermediate formulas, charting, and data comparison.

4.8 Use telecommunication tools, such as Internet browsers, video conferencing, and distance learning, for publishing learning.
ETEC 424: Students develop a web portfolio that is published on the Internet and also present their PowerPoint presentations via distance learning system on campus.

5.6 Identify and use resources to keep current with technology information
ETEC224: Discuss as a group the sources of current information on new technology concepts and devices, and have students explore for and show examples to the class
ETEC424: Students develop a list of resources to use as links on their web portfolio.

5.7 Create project-based teaming activities that integrate Technology Applications TEKS into the curriculum and meet the Technology Applications TEKS benchmarks.
ETEC 424: Students locate the discipline-appropriate TEKS on the Internet and incorporate them into their collaborative WebQuest assignment.

The Future

Our initial examination of the standards and how they are addressed in our program, indicates that we are already addressing most of the standards and proficiencies in one way or another. Questions arise about what we need to add, and what we need to reinforce. Of utmost importance is the determination of what benefits students are deriving (and retaining) from these experiences. Classroom observations, as described above provide documentation that some students are taking what they learn and implementing those ideas.

An added bonus resulting from the Technology Applications Standards is that they may have a tendency to help encourage non-technology faculty to learn and then model use of technology in their classes. The more people use computers, the more comfortable they become, and the more comfortable they are, the more they learn, and the more they learn, the more they will undoubtedly want to use computers. The next question will be whether we can eliminate the computer literacy class, because people are coming in with such greater knowledge and skills in the computer arena. With the nature of technology, though, we may want to keep the course and update its content!

Conclusion

Technology is helping us to improve some things we have done in the past, but it is also helping us do things we never dreamed of. The various technology standards at all levels provide guidance for us in the ways that technology can be used to enhance instruction. This is definitely an exciting time to be teaching.

References

Educational Technology Goals. (2000). [Online]. United States Department of Education, Office of Educational Technology. <http://www.ed.gov/technology/goals.html> [2000, November 29].

ISTE Accreditation and Standards Committee. (1998). National Standards for Technology in Teacher Preparation. [Online] <http://www.iste.org/standards/ncate/intro.html> [2000, November 29]

ISTE Technology Standards and Performance Indicators for Teachers. (2000). [Online]. <http://cnets.iste.org/teachstandintro.html> [2000, November 29].

State Board for Educator Certification [SBEC]. (2000). Approved educator certification standards. [Online]. Texas State Board for Educator Certification (SBEC). <http://www.sbec.state.tx.us/certstand/certstand.htm> [2000, November 29].

The Anatomy of an Educational Technology Seminar

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Abstract: In this case study, a group of advanced educational technology students "invent" methods that infuse technology into a dry, research based history course. In the process, the students develop several products, and create educational software for other students to use.

Recent research we have been conducting at the University of Florida suggests that educational technology courses have a high degree of cross-grade similarity from the elementary grades through graduate school. Educational Technology instructors seem to focus on what is *hot* (everyone is making web pages), rather than clarifying a vision of the discipline. One could make the case that the field changes so rapidly that instructors are simply trying to "keep up", or that in times of rapid change practice precedes theory, but most current educational technology programs, including ours, have serious deficiencies.

Our students, for example, have very little knowledge of historical figures in education, and in educational technology. Although our program includes the study of innovation diffusion and change theory, students have an extreme lack of interest in historical change agents. As a response to this state of affairs, I recently decided to offer an Educational Technology seminar to investigate historical figures in education. I intended to make the course a pure research course, and foresaw no need to schedule computer lab time. My students, however, had other ideas. What follows is a description of how a group of self actualized students can integrate technology into a course in meaningful ways, apply collaborative methods, and develop sophisticated, content specific media for a larger learning community.

In the summer of 2000, at the first meeting of my seminar, I distributed a list of seventy-two famous educators, including about 25 contemporary educators to my class of eight students. I gave each student two weeks to write a one-page biography of each educator, meaning that each student would produce 72 pages of biographical information during the first two weeks of class. During the second session, we discussed some of the radical thinkers involved with education, and the passion of their beliefs. After a lively discussion, one student asked, "What are we going to do with all of our research?" Since the students in the seminar were all Masters and doctoral students that had been with me for a few semesters, they were comfortable with computers. "Let's synthesize our individual pages into a biography for each educator and create a book for every member of the class", said one student. Another said "No, let's put it online so other students can study these people." "Let's do both! said another. So they set up committees, divided up the list, and met to synthesize the pages and pages of information they had gathered.

At the next session, a student suggested that we create a database and enter the data about each person into this "Master" file so that we could generate web pages and the book from the same file, thus optimizing our error correction work. Another suggested putting the database online so that the class editors could work on the database from home. Then, someone had an idea. It started with "Hey, you know what would be really neat?" "What if we could make a game, kind of like the Millionaire game, and put it on the web, so that all the students could learn who these people are..." Another student said "Yeah, and people could use the game to study for their quals..."

During the weeks that followed, the students set up an online database for questions, answers, and hints, entered about 150 questions, designed the game (and redesigned it several times), programmed the game, posted it to the web, and continued to work on the other projects they had initiated. The fact that the magnitude of the project was so great that it would take longer than the seminar lasted didn't seem to matter. They would keep working on it until they finished it.

The class finished some projects before the class ended; others took until October (the seminar lasted until August). Seminar time was filled with discussions, watching videos about history, and making decisions about the products.... hundreds of decisions about every aspect of the game, the databases, the web site for reference - and everyone was involved.

What is the goal of an educational technology class? How do 21st Century learners differ from their predecessors? How is it that educational technology students are often more interested in problem solving than in "how to get an A"?

I have come to believe that educational technology leaders need to have gumption. Once they decide not to give up, they have to become problem solvers. In order to do that they have to be able to make decisions...many, many decisions related to human-computer interaction, instructional design, screen design, and pedagogy. They must realize that a response or solution to a problem may be extremely complex and involve many layers of decision making. They must always have an eye on community - is there a way my work can benefit others - we are smarter and more prolific collectively than we are individually. Somehow, they must develop vision, and must be able to communicate that vision. It is cause for celebration that somehow, often in spite of us, our students seem to be doing these things, and learning these truths.

I couldn't have designed a course that achieved the standards the seminar students set and achieved for themselves, but I believe that as we develop curricula, we must be concerned about more than topics. We must be concerned with developing leaders with vision and decision making ability, with gumption and a sense of community. It seems to be less about learning rules and more about enjoying a good, ill-structured challenge. Can we teach students to have fun being perplexed?

Come play the game: *"So you want to be an Edugator?"*

http://www.coe.ufl.edu/webtech/edugator/edugator.htm

(You'll need a very recent version of Shockwave)

Technology education and integration: A position paper on attitude, perspective and commitment

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Abstract: You cannot get a generation of non-computer-users to integrate classroom technology for children. Instead, enable teachers to BE technology-users and classroom implementation will follow. This author suggests a relational link between (a) teachers' educational expectations, (b) computer educators' notions of how teachers learn computing, (c) what administrators believe teachers need, and (d) teachers' personal commitments to computing. It is suggested that this relationship accounts for the 25 year failure of technology integration.

The full expanded version of this paper is available on-line at:
http://jerrygalloway.com/papers.htm

Based on a recent survey of parents and children (National School Boards Foundation, 2000) by the time children are teenagers, nearly three out of four are online using the internet. Our society is clearly becoming a nation online, a technological world, especially among children. While computers have been in our schools for more than a generation (since before the middle 70's), educators are still concerned with how to integrate technology into instruction. Why has this issue or goal not been successfully addressed among educators over the past 25 years?

Teachers in our society are expected to lead rather than follow children to mastery of the world in which they must live and work. If teachers are not leading, then children will inevitably learn on their own. As the rock-n-roll generation grew to adulthood, whose music was originally considered renegade, subversive or rebellious, that same music is now integrated into established adult society. Even elevators today play themes originally found on the 45 rpm records of adolescents. Young people from generations past, without guiding classroom leadership, brought with them elements of a culture exclusively their own and simply by virtue of growing to adulthood replaced established society with their own. The same is becoming true of the computer generation. Young people, learning technology without significant leadership from educators, are learning on their own. They have grown - are growing – to adulthood to establish a new cyber-society as a new standard. Unfortunately, educators are following instead of leading.

For a full generation educators have presumably been about the business of integrating technology. The tech-limitation of the novice teacher is as important today as 25 years ago. Being a total beginner to computing today is the same as 25 years ago. Certainly there is a kind of societal "tech-awareness" that is different today but not knowing is not knowing. Beginners are beginners. Society's cyber-development does little to provide an education for interested teachers who know nothing of technology. And, contrary to the mission of today's teacher trainers, you cannot get a generation of non-computer-users to integrate classroom technology for children. Instead, enable teachers to be technology-users and classroom implementation will follow.

However, teachers' perspectives skew their expectations and attitudes about computing experiences and limit if not preclude the achievement and acquisition of computing knowledge and problem solving skills. This author suggests a relational link between (a) teachers' educational expectations, (b) computer educators' notions of how teachers learn computing, (c) what administrators believe teachers need, and (d) teachers' personal commitments to computing. It is suggested that this relationship accounts for the 25 year failure of technology integration.

Quite common today, teachers expect recipes for using technology. Simply stated, they want to be shown how to do something with computers without actually learning to use them. Teachers invariably seek to be given procedures to follow, packaged lesson plans to implement, imaginative and representative applications of technology that they can carry back to the classroom and put into practice in teaching. This is a popular notion among many teacher and technology educators and seems on the surface to make sense. This idea as a goal for empowering teachers with technology for the benefit of school children seems quite appropriate at first glance and is thought to withstand any criticism as noble and obviously beneficial for the target group.

The problem of course is simply that this does not constitute learning anything. That is, the teacher (the technology user) never actually learns to be a competent user. This misconception about what it takes to successfully bring technology into teaching precludes experiencing concept-building and other valuable competence-building activities. That is, teachers resist those experiences that have no obvious classroom applications.

The intuition, problem-solving and critical thinking abilities consistent with learning and mastery are not commonly recognized as vital for classroom integration of technology. Such elements of education require one to change. To risk over dramatizing, becoming a competent user of technology involves a transformation as one acquires an education – a mastery. Teachers don't want to change and prefer instead to merely pickup copies of their recipes and thus their mindset precludes being educated at all.

Empower Teachers: A Prerequisite to Integration

Leading the call for a focus on computer integration is a recent study that accounts for the current status of teacher technology-training programs across the United States (Moursund & Bielefeldt, 1999). Available equipment and beginner-level courses are thought to be sufficient for the purpose they serve but teachers still need more. The report recommends that computing instruction for teachers be integrated throughout the curriculum rather than isolated classes.

Educators should emphasize the importance of a personal commitment from teachers who are learning to use computers or who intend to use computers in teaching. Integration has failed to the extent that teachers have failed to personally adopt the computer in their personal and professional lives. This must change for integration to succeed.

Most commonly today, efforts at integration focus on helping teachers to use computers with and for classroom children. This might be fine for non-beginners and teachers well established in using technology but does not work for limited users or beginners. Empower teachers with technical skills, computing knowledge and intuition, and critical thinking skills in using computer technology. This is a prerequisite to focusing on technology integration into classroom teaching.

Summary

The goal is integration. The ultimate end is of course providing a state-of-the-art technological presence (instruction, resources, guidance, support, etc.) for school children. That's the purpose of education and why teachers exist. There are funds available for staff development, equipment, education or training programs. In any event, those resources are typically directed to using computers with or for classroom children to the detriment of the teachers. This approach has failed for over 25 years. The point is simply that you cannot get a generation of non-computer-users to integrate classroom technology for children. Instead, enable teachers to become technology-users and classroom implementation will follow.

Training and education are not the same thing. Other disciplines find a more appropriate balance of skills, knowledge, understanding, and intuition. Science, for example, clearly involves training and skill development in order to successfully conduct experiments of various sorts. Yet, in Science such skills and training are clearly a means to a different end. Such skills are not the end in themselves. They support and make possible the development of a conceptual understanding, critical thinking and problem-solving skills. This must be true in educational computing and instructional technology as well if teachers are to continue to adapt to the quickly changing world.

Full expanded version of this paper available on-line: **http://jerrygalloway.com/papers.htm**

References

Moursund, D., & Bielefeldt, T. (1999). *Will new teachers be prepared to teach in a digital age? A national survey on information technology in teacher education.* Research study by the International Society for Technology in Education (ISTE), Eugene, OR.

National School Boards Foundation (2000). Safe and smart: Research and guidelines for children's use of the Internet. *Report from National School Boards Foundation, Alexandria, VA.* Available on-line at: http://www.nsbf.org/safe-smart/full-report.htm

Traeger Technology Target: Completing the Circle of Community

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Abstract: The goal of the Traeger Technology Target project is to provide the opportunity for pre-service educators, K-12 faculty, and university faculty to form a learning community. The project facilitates the following objectives: university undergraduates will begin to bridge theory and practice through the authentic learning experiences afforded only through classroom practice; K-12 faculty will share their expertise in the areas of curriculum development, instructional strategies, and classroom management with pre-service teachers; and, university faculty will facilitate the interactions between the pre-service and in-service educators while providing appropriate technology skills in a just-in-time setting for both groups. The theoretical framework for this project is profoundly constructivist and supports the notion of service learning.

Introduction

The traditional instructional technology course of many preservice teachers' experience is undergoing a fundamental change. Just as K-12 educators have come to reconsider the traditional placement of computer technology in central lab facilities, so also are colleges of education beginning to question the wisdom of isolating digital technology as if it were a separate subject area rather than a rich tool for facilitating student learning. Current NCATE standards focus on the need for university faculty to model the use of technology throughout the undergraduate education student's coursework. However, many university faculty are in much the same position as their secondary counterparts. Faculty at both the secondary and higher education levels face both intrinsic and extrinsic barriers to implementing the use of technology in their classrooms. Brickner (Ertmer & Hruskocy 1999) proposes that extrinsic barriers include lack of access to computers and software, insufficient time to plan instruction, and inadequate technical and administrative support while intrinsic barriers may include beliefs about teaching, beliefs about computers, established classroom practices and unwillingness to change.

While university faculty struggle to learn technology skills as well as the means for integrating curriculum with technology, the stand-alone course, properly conceived, may continue to serve as a vital area of focus on the application of technology to curriculum. The challenge for the instructor of that course then becomes to consider how linkages can be created between the university students, the course concepts, robust content, and the K-12 classroom. This experience can be significantly enriched when genuine efforts are made at creating a learning community consisting of university undergraduates, university faculty, K-12 faculty and their students. University undergraduates can assist K-12 teachers in the design of instructional materials, student instruction, and web resources while the K-12 teachers assist the undergraduate students in creating units of study that include logical use of available technology resources and real-world application of technology skills.

The Traeger Technology Target (TTT) project engages a University of Wisconsin Oshkosh instructional technology class of 24 undergraduate students in a collaborative project with four educators teaching multiage fourth-fifth grade classrooms at Carl Traeger Elementary School. The project spans two semesters - fall 2000 and spring 2001 - and thus two different groups of undergraduate students. The project provides an authentic opportunity for university students to apply technology knowledge and skills acquired during their university class in an environment that fosters the connection of theory and practice. In turn, the practicing educators at the elementary school develop an increased awareness of the technology resources available at the site, their application, and have the time to consider how to integrate that technology with their curriculum. Elementary students benefit from the continual assistance of the undergraduate students in their portfolio development, literature circles, and the use of the World Wide Web as a learning tool. University faculty remain available to all Traeger teachers in the consideration of curriculum-technology integration. A balance is sought whereby undergraduate scholars, university scholars, and teacher scholars may begin to truly address the four components of scholarship at all levels: teaching, discovery, integration and application (Boyer 1990).

This collaboration benefits all participating groups in a manner consistent with the notion of *service learning* whose relevance at all levels of education has been affirmed (Lynton 1995). The literature on service learning supports the view that educational institutions from elementary school through higher education must develop formal relationships with one another that mutually benefit all concerned. It is envisioned that this project may serve as consideration by other instructional technology courses as it seeks to build a learning community with the shared purpose of improving education for all students.

Additionally, the ISTE National Educational Technology Standards for preservice teachers repeatedly stress the critical need to provide the opportunity to link theory with concrete field experiences. Specifically, this is found in the essential conditions of the document within the shared vision, skilled educators, professional development, student-centered teaching, and community support areas.

Background

The University Instructional Technology Course

The junior-level, three-credit instructional technology course in the College of Education at the University of Wisconsin Oshkosh has been in a state of transformation over the last five years consistent with the prevalent view of technology as a powerful learning tool for students. Originally conceived as a stand alone, skills acquisition course, it has been afforded the opportunity to evolve into a course focusing on the integration of curriculum and technology. This change in focus has been made possible (and necessary) because of the implementation of a prerequisite requirement to the course that focuses entirely on computer skills, by the increasing sophistication of the undergraduate students themselves, and by the needs expressed by surrounding school districts. Various strategies have been implemented with one of the most successful being the linking of one section of instructional technology course with a corresponding secondary level methods course (i.e. social studies, science, math, etc.). Students are co-enrolled in both course sections, usually in back-to-back time periods which affords ample opportunities for interaction between both the methods and technology course objectives and professors. However, such a structure for the elementary pre-service teachers has not been found to be suitable given the parameters of the program structure.

The instructional technology section that participated in this project during the fall 2000 semester consisted of 24 junior level students. Fifteen of these students were pursuing elementary licensure exclusively, 5 were pursuing dual licensure in special education and elementary education, while the remaining four represented combined elementary and secondary licensure in music, physical education and Spanish or ESL. Students were not notified of the intensive off-campus component of this course section prior to enrollment and were given the option of transferring to other sections after the first class meeting. Of the original 27 students enrolled, three transferred with the remaining 24 students enthusiastically opting to stay with the project. They were cautioned that this project represented an untried formula for both the college and the elementary teachers and that the design would be evaluated at iterations by all parties and modified based on most current feedback.

Carl Traeger Elementary School

Carl Traeger Elementary opened in 1997 and serves almost 600 students in kindergarten through fifth grades. It was originally designated as a technology-intensive school and has a large computer lab as well as small minilabs located in each of the learning pods throughout the school. The principal is very supportive of technology as one of the many hands-on experiences afforded students. Teachers at the school are acknowledged within the district as innovative and creative and are proud of their use of a variety of instructional strategies aimed at encouraging student excellence according to individual abilities. The elementary school is physically attached to Carl Traeger Middle School and benefits from both enhanced facilities and placement opportunities for students. Unique to the school is the availability of both multi-age and grade level classroom configurations.

Four teachers at Carl Traeger elected to participate in the TTT project. These teachers team-teach in pairs; each pair has 48 fourth and fifth grade students in a classroom consisting of two large instructional spaces joined by a common student area and a common teacher office. Thus the entire project dealt with four teachers and 96 fourth and fifth grade students.

Project Design

The impetus for the Traeger Technology Target project came from the Preparing Tomorrow's Teachers to Use Technology Capacity Building Grant received in 1999 by the College of Education and Human Services. Part of that grant specified the need to design means for undergraduate students to observe and practice curriculum-technology integration throughout their years at the university. Thus funding was available to pay stipends to the teacher participants and to support transportation between the two sites. Cooperating teachers were recruited through another grant initiative, Wisconsin Regional Instructional Technology Support, that affords districts the opportunity to provide constructivist technology workshops given by outstanding area teachers.

University faculty and Traeger faculty met at intervals during the summer to discuss the direction of the collaborative effort. Central to these discussions was the expression of the needs of the various project constituents. University faculty desired an authentic context for the work done by their undergraduate students with content that was directly from the field and applicable to a real classroom setting. Traeger faculty wanted assistance in designing published background materials for parents of their students, ideas on how the World Wide Web could assist their own teaching and their students' learning, and assistance on instructing students on various software applications. They also expressed the need for planning time to develop units of practice that made use of technology tools and a curiosity about electronic student portfolios. As these needs emerged the context and content evolved for the university undergraduates.

Based on stated needs, an ambitious project was developed with the full understanding of all faculty involved, and eventually undergraduate students in both the fall and spring semesters, that various components would be distributed over the two semesters. That is, the second semester would build upon the experiences of the first, independent of the fact that the university class composition would significantly change.

The university undergraduate students were initially divided into four production teams. Each team was assigned to one of the four mentor teachers. This facilitated e-mail communication while providing the structure that enabled development of brochures, literature circle journal partners, and a unit of practice. At various times throughout the semester, the students were rearranged into pairs to develop webpages and HyperStudio stacks. Students also worked one-on-one with 4/5 students in development of PowerPoint student portfolios.

To be respectful of the travel time required between the university and the elementary school, every effort was made to keep elementary site visits confined within the time period of the university course. While the instructional technology course meets twice weekly for an hour and a half, there are twenty-minute breaks on either side of the course. Most students found this to be ample time to get to the elementary school. Teams were not scheduled to visit the school all at the same time; that is, work teams one and two might be working at the elementary school while teams three and four remained at the university working in the lab. This minimized the confusion and influx of numbers at Carl Traeger School. The only time that all teams visited the elementary school at the same time was on the last day of class in the university semester that served as a time for community sharing and celebration.

Project Components

The following tables outline the artifacts originally proposed for the collaboration, the process involved in those projects, and correlates the product with both the university class need and the 4/5 classroom need.

Artifact 1: Introduction WebPage			
IT Focus	4/5 need	Product	Process
• Rudimentary web publishing skills	4/5 grade students needed	Simple web page	1. UW Oshkosh students divided into work teams

• WWW as virtual community • Use of digital camera	introduction to the university students		2. Each team constructed webpage using Netscape Composer, individual pictures, and table design

Artifact 2: Tri-fold Brochures on philosophy and instructional strategies relevant to classroom program			
IT Focus	4/5 need	Product	Process
• Authentic assessment • Multiage classrooms • Continuous quality improvement • Brain research • Design basics • Desktop Publishing	Detailed program information for parent community	Tri-fold brochures	1. Traeger teachers provided background materials 2. UW Oshkosh students met with Traeger teachers for clarification and discussion of content 3. UW Oshkosh students developed brochures within work teams 4. Traeger teachers provided feedback and input 5. Brochures distributed to parent community

Artifact 3: Use of Telecommunications to facilitate student discussions on WWW			
IT Focus	4/5 need	Product	Process
• Telecommunications • Collaboration on WWW	Discussion partners for literature circles	Threaded discussions with groups on selected topics for trade books read in literature circles	1. Traeger teachers provided trade books selected for literature circles for UW Oshkosh students 2. UW Oshkosh students assigned to different literature circles 3. UW Oshkosh develop discussion questions in collaboration with Traeger teachers 4. UW Oshkosh students led discussions in literature circles via WWW

Artifact 4: Use of Hypermedia software with elementary students			
IT Focus	4/5 need	Product	Process
• Understanding of brain research • Application of new knowledge to HyperStudio program • Introduction to storyboarding as a pre-project strategy	Introduction of fourth grade students to HyperStudio software and final project for science unit	HyperStudio stacks on weather created by 4/5 grade students working in pairs	1. Traeger teachers provided 4/5 grade students with ample background information, research and collaboration opportunities, and detailed rubric for project. 2. UW Oshkosh students worked with student pairs at elementary school to storyboard HyperStudio project. 3. Traeger 4/5 grade students traveled to university computer lab to begin project 4. After 3 weeks of working on project back at elementary school, students again returned to university to finish project and demonstrate it to their undergraduate student partner

Artifact 5: Use of Presentation software as an electronic portfolio medium			
IT Focus	4/5 need	Product	Process
• Use of presentation software for electronic portfolio • Knowledge of PowerPoint • Scanning, PDF files	Cohesive means of presenting portfolio progress and achievements during first quarter	PowerPoint portfolio presentation for each student	1. Traeger teachers set portfolio assessment requirements at beginning of school year, had students document and collect artifacts, graph progress etc. 2. 4/5 students used digital camera throughout quarter to record science experiments, dinner theatres, etc. 3. Traeger 4/5 grade students traveled to university computer lab to begin

			electronic portfolio project 4. After 3 weeks of working on project back at elementary school, students again returned to university to finish project and demonstrate it to their undergraduate student partner

Artifact 6: WebPages Developed as Student/Teacher Resource			
IT Focus	4/5 need	Product	Process
• WWW as an instructional tool • Resource gathering on WWW • Evaluation of appropriateness of material on web • WebPage production using Claris HomePage	Web resources to support literature circles	Webpage supporting tradebooks used in literature circles	1. Traeger teachers provided list of all available tradebooks for literature circles 2. Undergraduate students, working in pairs, selected one book 3. Traeger teachers provided copies of selected books for undergraduates 4. UW Oshkosh students read books and developed webpages providing a brief introduction to the book, reference material about the author, other pertinent websites, suggested projects, and links for educators

Artifact 7: Unit of Study integrating subjects, curriculum and technology			
IT Focus	4/5 need	Product	Process
• How a teaching unit is conceived • Steps in development of unit • Software evaluation • Strategies for integration of subject matter and technology • Telecommunications for professional collaboration	Social studies resource materials	Unit of study demonstrating integration of curricular subjects as well as integration of curriculum and technology	1. UW Oshkosh work teams and Traeger teachers met to decide on focus of unit of study 2. Traeger teachers supported undergraduate students with materials, suggestions, feedback and guidance 3. UW Oshkosh work teams developed four-week committee cycle and whole group activities to support colonial America unit.

Discussion

As of the submission of this paper for publication, the first semester of the Traeger Technology Target is just two weeks away. Six out of the seven artifacts detailed above were accomplished during the semester. Given lab size constraints at the university, it was decided to implement the PowerPoint electronic portfolio during the first semester with 48 of the elementary students and to implement the HyperStudio project in the spring semester with the remaining elementary students.

Feedback obtained throughout the semester from the undergraduate participants has been overwhelmingly positive. One student, when reflecting upon the opportunity to work with the elementary students in the college computer lab, said, "This is the first time I've ever seen kids in this building. This is the way it should always be... we can learn so much from them - more than they could ever learn from us!" Another stated, "I was so scared because I wasn't that sure of myself with PowerPoint...but my student and the kid next to him were both familiar with it so they taught me some things. I can see from this that technology is an area that I must be willing to become the learner in, which is all right. Since I didn't have to teach them to do the program, I could spend lots of time talking with them about their accomplishments during the nine week period." One young woman summed up her experience, "My students did not know how to do anything with the program [PowerPoint] but they did come with their portfolio information up-to-date and their experiment photos on disk. It was difficult for me to keep my hands off of the keyboard - to allow them to make their own mistakes and learn on their own. Ultimately, however, this was for the best because they learned from one another rapidly and we could spend a lot of time sharing what they had learned from the experiences they chose to illustrate in their portfolio."

The elementary aged students were proud to have been associated with the university undergraduates and were particularly thrilled with the opportunity to "come to school with the big kids". In viewing one of the web pages created as a resource for Jean Craighead George's book *My Side of the Mountain* one elementary student remarked, "This website is really easy to read...it has some ideas that I think I'll use for my final project." One student, while presenting her portfolio to her undergraduate partner, stated, "I would never have been able to finish this without your help....My dad was so impressed and didn't really believe that I knew how to do all that stuff until I sat down at home and showed him!" Another added, "I haven't shown my parents yet but I'm glad I'll get the chance to practice here - it's fun to see all the stuff I've done this year in one place - the year's just beginning and I already have a whole lot!"

The teachers at Carl Traeger Elementary are pleased with what has been accomplished this semester with their fourth and fifth grade students. They feel the collaboration has been beneficial to them as well. One educator enthusiastically endorsed the project saying, "As a new teacher, I remember desperately wishing that I'd had more opportunities to work with students while I was an undergraduate. I think that we have a responsibility to mentor these students and provide for them the experiences so necessary prior to entering a classroom." Another noted that undergraduate students have so little experience on which to apply theory and mused that perhaps an apprenticeship approach would better serve the profession rather than the traditional student teaching model.

Conclusion

It would hardly be possible to offer an informed conclusion to this project as only twelve weeks of the expected twenty-eight week project life have been completed. However, at this juncture, the project has been successful in engaging undergraduate students with authentic content and experiences within four elementary multiage classrooms. The fourth and fifth grade students in those classrooms have benefited from the presence of the undergraduate preservice teachers. The faculty participants at Carl Traeger Elementary are pleased with the informational materials published by the students, the provision of an authentic context for World Wide Web and telecommunication usage by their students in their literature circle discussions, the affordance of instruction in software programs by the undergraduate students, and the opportunity to share their expertise and experiences with the next generation of teachers. Preservice undergraduate students, university faculty, practicing educators, parents, and students: the Traeger Technology Target is beginning to foster a learning community.

References

Boyer, E. (1990). *Scholarship reconsidered: Priorities of the professorate.* Princeton, NJ: Carnegie Foundation for the Advancement of Teaching.

Ertmer, P.A. & Hruskocy, C. (1999). Impacts of a University-Elementary School Partnership Designed to Support Technology Integration. *Educational Technology Research and Development,* 47(1), 81-97.

Lynton, E. (1995). *Making the case for professional service.* Washington, DC: American Association for Higher Education.

On-line Exams: Design, Development and Implementation

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Abstract: This paper is intended to provide educators with a basic understanding of the creation, development, and implementation phases of on-line exams. The content includes an overview of on-line exams to explain the specific features and the advantages and limitations of this medium. Design and development are also presented to explain the different test development tools. The implementation phase covers areas of administration and distribution based upon personal experiences.

As the impact of Internet grows in education, more educators have turned toward computers as an instructional vehicle for delivering courses and course materials. There are three categories concerning the use of Internet in teaching and learning: (1) utilizing specific attributes of the Internet in creating supplemental on-line materials, (2) developing inclusive courses in which students take on-line, and (3) offering complete degree programs on-line. Regardless of the category in which these educators fall under, the Internet will be a major factor for delivering instructional materials to learners.

The use of computers in teaching and assessment already has a considerable history within education and training. However, the rise of the Internet presents new opportunities for many aspects of education, particularly assessment. With the Web technology, it is possible to construct on-line tests that are: (a) available beyond the walls of the classroom, (b) independent of paper or other physical resources (apart from a computer and access to the Web), (c) immediately graded with assurance of objectivity, and (d) used for formative or summative purposes (Dalziel & Gazzard, 1998).

The purpose of this paper is to provide educators with basic information and resources concerning the development and implementation of on-line exams. The paper is organized into five areas of discussion. First, an overview of on-line exams will be provided to assist readers in understanding what it can provide and the features pertinent to on-line exams. Second, a review of advantages and limitations of on-line testing will be given. Design issues such as layout, flow, and planning will be the third area. The fourth area touches upon the development phase that includes a discussion of related software and on-line course authoring tools. Finally, the implementation phase will cover areas of administration and distribution based upon the authors' personal experiences.

Introduction

Interactivity on the Internet is one component that educators have been drawn to recently. On-line assessment has been growing in popularity and educators have been exploring different ways in which exams could be delivered to students on-line.

On-line exams are simply defined as a mode of delivering tests, quizzes, and surveys via computer in a synchronous or asynchronous mode. An example of a synchronous environment would consist of students taking the on-line exam during class time where the teacher can monitor students' behavior. An asynchronous environment is where students are taking the exam at their own chosen time and at their own pace either in a monitored (e.g., testing center, library, school computer lab) or unmonitored (e.g., home, work) situation.

Web-based assessment provides a way to administer, grade, and record a test via the Internet. Students can easily take the test by accessing the Web site. They enter their names and other information like an ID number and password. They are then presented with the test. When students have completed the test, they click on a "submit" button. Immediately, the test is graded and the results are shown. Questions answered incorrectly are shown with the option to reveal the correct answer in company with a brief explanation supporting the correct answer.

The types of on-line exam questions vary and are dependent upon the purpose of the exam itself. Most commonly used types are the true-false, multiple-choice, and fill-in question objects. Most on-line test development tools provide educators with a way to create questions and assign answers with individual scores. These question types can be graded automatically. Another question type is the short-essay. Short-essay questions cannot be graded by the computer, and thus, requires the instructor to grade the question individually. However, scores obtained from the short-essays can be added automatically to the scores from the computer-graded exam questions. Thus, writing for an exam to be delivered on-line do not vary much from the paper tests except that now the student and teacher both need access to a computer with Internet connection.

Strengths and Weaknesses

On-line testing has several advantages. For one, on-line testing is not restricted to time and place. On-line testing has the ability to deliver tests efficiently and effectively in asynchronous mode. Thus, timeliness is an advantage that educators have been drawn to as a result of on-line testing. Convenience and access are added benefits to non-traditional students.

Immediate feedback is an area of importance for many educators who have adopted the Internet as an assessment vehicle (Kibby, 1999). Allowing students to view how well they performed on exams is an excellent way to reinforce learning, a feature found with most on-line assessment tools. Once students complete the on-line exam they can immediately examine their performance by viewing their overall score and discern which questions they answered wrong and find what answers were correct. In addition, instructors can add personal feedback to on-line questions to help the learning process. For instance, if instructors not only want their students to view the correct answer but explain why that answer is the right one, on-line assessment tools can provide that extended, immediate feedback. This way, students will remember the question more if the feedback occurs directly after completing the exam as compared to reviewing the exam a week later (Jonassen, 1988).

Interactive multimedia is another advantage of on-line testing. The primary strength of on-line testing in this area is to allow educators to create test items that incorporate other types of media besides text. On-line exams can incorporate visual, aural and interactive components. Multimedia elements such as charts, graphs, photos, animation, audio, and video can all be incorporated into the on-line exam.

Student tracking is a feature of on-line exams that can be of an asset to teachers (Juchnowski & Atkins, 1999). For teachers, on-line student tracking can provide them with information such as date and time in which students accessed the test site. It can also tell teachers whether students have made several attempts at taking the exam. Finally, student tracking provides teachers with information such as the length in which the students took the test. This could be beneficial in assessing whether an extended time-length could be a result of the student not understanding the material, especially when other students completed the exam in half the time.

On-line testing also provides statistical analysis that has been traditionally done by hand or calculator. Many test development tools provide instructors with the option to calculate the test scores for each student and provide an electronic grade book for all the students. On-line testing programs also provide instructors with other statistical analyses such as means, modes, medians, standard deviations, and item analysis on each test item.

In short, on-line testing can provide students and teachers with timeliness and convenience, the opportunity to increase retention through feedback, provide interactive multimedia to maintain interest, track and manage test scores, and obtain computerized statistical analyses. For these reasons, the use of on-line testing has experienced a significant increase and will continue to flourish in years to come.

On-line testing does have several limitations worth mentioning. Time is a major factor in developing on-line exams. It requires a large pool of test items to be effective. Not only do instructors have to learn the test development tool, but they also have to develop the exams and upload them to the Internet. Network and server complications can cause a student to end the test prematurely and the educator can loose all of the student's scores. This can double-up the management responsibilities of the instructor, and thus, take time away from the workday. However, once the exams are placed on-line, developing and implementing the exams are no longer a concern because the instructor can always modify the exam later.

On-line exams can also be impersonal (Juchnowski & Atkins, 1999). Often times, students take the on-line exams alone. If students are in a monitored situation (e.g., a librarian monitoring the exam period) with other students, the feeling of isolation will not be as overwhelming. In addition, students often do not get the chance to ask for clarification on puzzling questions as they would in a classroom environment. This can lead to student isolation and disenchantment that will hinder the student's academic performance and success.

Student integrity and cheating are other concerns for on-line testing (Juchnowski & Atkins, 1999). The common question that educators ask with on-line testing is, "How do I know whether the student sitting behind the computer is who she/he says they are?" The bottom line is that you will not know. Cheating is something that cannot be resolved either in an on-line environment or in a classroom. Although no one can guarantee that students taking on-line exams are not cheating, this should not sway educators away from using the medium because of the other advantages that on-line exams do provide.

Overall, although on-line assessment tools do have its limitations such as time consumption, remoteness, and student dishonesty, on-line assessment tools should not be disregarded. Depending upon the instructional situation, on-line exams can increase teacher productivity with better accuracy. For students, convenience and interactivity are major factors toward academic success.

Design

Creating and designing on-line exams are quite simple. In the past, educators had to know programming to create on-line exams. However, with the proliferation of the Web, there are many tools available to assist educators with various degrees of technical abilities to create on-line exams. Traditional instructional design models work well in terms of designing and developing on-line exams. The ADDIE and ASSURE (Heinich, Molenda, & Russell, 1993) models are the most popular and are similar in the way they present the steps toward designing and developing instructional materials, lesson plans, and in this case, on-line exams. In short, the steps toward designing on-line exams should include (a) assessing the learner, task, and learning environment, (b) generating objectives and goal, (c) designing the on-line exam and how it should be presented and delivered, (d) creating the actual on-line exam by writing test questions and developing the testing program, (e) implementing and delivering the on-line exam, and finally, (f) assessing the effectiveness of the on-line exam.

In the design phase, things such as layout, flow, and feedback should be considered. Depending upon the tool being used to develop the exam, the educator can have either some or an abundant amount of freedom in how he/she wants the on-line exam to look like, the types of questions to be included, and how the program will respond to students' answers. The following are design guidelines for those who are designing on-line exams:

- Keep the background design consistent for the entire exam and use a background that is not too busy such as textured patterns and those having more than two colors.
- If different types of questions (e.g., multiple choice) are used, keep the types grouped together and reserve the fill-in's and short answers toward the end.
- If feedback is provided to the student (e.g., telling students which is the correct answer and explaining why), the feedback should be presented at the end of the exam to prevent disruption.
- Use uniform placement of questions and answer choices (e.g., if answers are given on the right side of the first slide, then answers should always be presented on the right side),
- When working with fonts, keep the font style and typeface consistent, avoid double emphasis such as simultaneously bolding and underlining a word, keep colors to a minimum, and use the largest size of font for readability considerations.

These are considerations that one must observe when designing on-line exams. A few others are worth mentioning such as limiting the number of questions to be asked at one time to avoid student fatigue aand writing questions that are succinct and to the point. The later point is important because students who take on-line exams do not have the luxury of asking for clarification on confusing questions or unknown terms. Hence, the design of on-line exams is critical to the success of the student, and thus, need to be taken seriously.

Development

Though there has been a growing array of software tools being developed for creating computer-based tests, many tools have been developed recently to facilitate the teachers in authoring, delivering, grading, and analyzing the tests on the Web. The selection of the software determines the placement of the question and answers, how the feedback will be provided, whether the score is shown to the student, the type of background design used, the style of fonts, and whether any multimedia or graphics is used. In general, there are five categories of tools that can assist with the development and delivery of on-line exams: (1) CGI (Common Gateway Interface) programs, (2) JavaScripts, (3) commercial testing programs, (4) authoring software, and (5) on-line course authoring tools.

CGI is a server-based method that can be used to implement on-line testing. There are a great number of CGI programs available on the Web and many of them are free. Exam Mail [www.oyston.com/ExamMail/home.html], Simple On-line Interactive Test-generator (SOIT) [www.cals.ncsu.edu:8050/soit/], Web Test [fpg.uwaterloo.ca/WEBTEST/], and Web Exam [www.admin.northpark.edu/lmartin/WWWAssign/] are some examples of the CGI programs for creating on-line exams. The advantages of CGI programs are: (a) the scripts will work with virtually any browser, (b) permit interactivity between a client and a host operating system through the Web, and (c) the scripts allow the creation of a test report or a follow-up messages to the learner. The primary disadvantage of CGI scripts is that the teacher must be more knowledgeable about computers and be able to edit the CGI scripts to get them to work. Often, some technical assistance will be needed to identify sever paths, etc. or install the scripts to the server. Some institutions also have strict rules for installing CGI scripts for security reasons. In addition, CGI programs are well suited only for presenting basic types of tests. More advanced and interactive types of tests (e.g., tests which involve drag-and-drop activities) cannot be implemented with CGI programs (Brusilovsky & Miller, 1999).

JavaScript is an interpreted scripting language that is embedded with HTML code to develop interactive Web pages. JavaScript processes information on the client side and works with all browsers. Most of the processing such as checking the correct answers takes place on the users' browser. It is most suitable for creating tests with multiple-choice, fill-in-the-blank, and true-false type questions. The main advantage of JavaScript is that form validation can be built in to provide immediate feedback to the students. However, the major disadvantage is that the source code cannot be hidden (Hazari, 1998). A learner can easily find answers from viewing the source code of the page. In addition, there is no way for recording the test results. Thus, the JavaScript-based exams are more appropriate for self-assessment than for assessments used in grading (Brusilovsky & Miller, 1999). There are many pre-designed JavaScripts that are made freely available for educators to use and customize. Examples of these include CASTLE [www.le.ac.uk/castle], Hot Potatoes Web Authoring Tools [web.uvic.ca/hrd/halfbaked/], Quiz Maker [www.attotron.com/pub/QuizMaker.html], and On-line Exercises System [math.uc.edu/onex/demo.html].

Besides using CGI and JavaScripts, commercial testing programs are also used to create and deliver on-line exams. These software are designed specifically for developing on-line exams. Generally, they are user-friendly and provide manuals and technical support. Some examples of commercial testing programs are Question Mark [www.questionmark.com], Interactive Test [www.interactivetest.com], Quiz Factory [www.learningware.com/quizfactory/], and Quiz Maker [www.mrtc.org/~twright/quizzes/quizcenter/].

A few authoring software that have the capability of providing on-line exams are ToolBook [www.click2learn.com] and Authorware [www.macromedia.com]. There are others, but ToolBook will be discussed in more detail because of our personal experiences with this. Advantages of using ToolBook include easy uploading of files to the server and the freedom to personalize the exam. Though the software is mainly intended for creating training modules or lessons, computer-based exams can be created and uploaded to the server, and thus, become on-line exams.

When creating exams in ToolBook, educators have the choice to select (a) the types of questions to use, (b) how the exam will be graded (e.g., point over a percentage value, grade each question individually as the student progress or wait to tabulate scores at the end), (c) how many points will be allocated to correct responses or subtracted for wrong answers, (d) whether feedback is given at all, and (e) randomization of questions so a student will not see the same order of questions more than once.

Uploading of the exam to the Web server is quite simple. ToolBook has its own Distribution Wizard that allows an educator with three choices: save as an .exe program, convert files to HTML and DHTML pages on the hard drive, and upload all pages directly to the server. ToolBook has a lot of dynamic HTML options in its program and has made it easy for the educator to upload files by automatically converting the files and including extension programs that are required for DHTML to work properly on the server. However, authoring software like ToolBook is expensive and requires a steep learning curve.

Examples of on-line course authoring tools include WebCT [www.webct.com] and Blackboard [www.blackboard.com]. These tools are provided on-line and educators have to be connected to the Internet to gain access to these sites. WebCT and Blackboard have their own design layout and instructors do have the options to change certain features such as the style of buttons and what buttons provide. However, the layout is consistent for all course sites. One major advantage of using these tools is the template. The on-line course tools contain primarily of templates that educators fill in with either typing the test items or uploading documents and files from the hard drive. No HTML programming is necessary. It is merely just filling in the blanks.

The only drawback of using on-line course authoring tools to create exams is inflexibility. The layout of the on-line exams is the same. Multiple-choice, true-false, fill-in, and short answer questions can all be used, but the appearance will be the same no matter which course Web site you are accessing. Feedback is possible, but it can only be given at the end of the exam. In addition, students have to scroll down to answer questions that may not appear in the window. This can be distracting and cumbersome. Thus, limiting the amount of questions for each exam needs to be done. Nonetheless, ease of use and economic convenience are reasons why educators should investigate on-line course authoring tools as an option for developing and delivering on-line exams.

Implementation

Administration and distribution are critical for successful implementation of on-line exams. Certain factors need to be addressed ahead of time before making the final leap to offer exams on-line. Based upon personal experiences, these are just a few of the areas that need to be investigated before deciding to deliver exams on-line.

Network capability is the first area of consideration. There are several aspects that instructors must examine. First, one must find out whether the server he/she is uploading the files to is software-friendly. In other words, will the server be compatible with the chosen test development tool. For instance, many school servers have strict firewalls that do not allow certain scripts or Applets to be used because of security reasons. Second, one must consider the computers that the students will be using. Assessing whether students have access to the proper equipment, and even the proper browser and plug-ins, is important. If students cannot gain access to the on-line exam, then the whole purpose of offering on-line exams in the first place is defeated.

Staffing is another important issue concerning the implementation of on-line exams. The instructor may not be the only one responsible for administering and delivering on-line exams. Others may include teaching assistants, administrative assistants, and test monitors (e.g., testing coordinator, librarians) who need to be trained. If students are required to attend a facility in which their exams are to be monitored, then the other individuals will come into play. In short, when on-line exams become a heavy part of the curriculum, others will eventually become involved.

Support is vital toward the success of delivering and administering on-line exams. When situations arise that require troubleshooting, a supportive and competent technical staff is important. Often the companies that provide the software or on-line course authoring tool provide support, but that support is not always immediate or even effective. Thus, instructors need someplace else to turn for assistance. In addition, not only do instructors need assistance, but students. If students are taking the exam in a monitored situation, it is important that the test facilitator or librarian knows how to use the program (Kibby, 1999). Problems will arise if the monitor does not know anything about the program students are using. No matter who is the monitor, students will consider that person as the instructor and expect the same. Therefore, the support structure must be considered before implementing on-line exams.

Student integrity is the final area of consideration. Issues surrounding cheating and plagiarism exists with on-line exams as they do for in-class exams (Juchnowski & Atkins, 1999). No one will ever circumvent cheating, and thus, should not be used as an excuse to denounce on-line exams overall.

However, student integrity is an issue and needs to be approached carefully. One suggestion is to develop the on-line exam with the intention that it will be offered as an open-book or take-home test. Although the exam may not be open-book, one must consider the fact that students will be taking these exams on their own, even in a monitored situation, and will have the opportunity to cheat. Thus, one might even consider on-line exams as take-home tests, thus eliminating instructor's concern of deception. In short, if the assessment requires strictly controlled conditions and requires a high degree of security, then delivering exams on-line should not be performed (Kibby, 1999).

There are many more issues that involve the implementation of on-line exams. However, network capacity, staffing, technical assistance, and student honesty are major concerns that have been brought up repeatedly. For these reasons, educators must have a contingency plan to deal with unforeseen technical difficulties such as the server being down and for handling disciplinary issues. As long as the educator is aware of these problem areas and anticipates such obstacles ahead of time, then the implementation process will be much more successful.

Conclusion

Testing has always been an important part of the instructional process for traditional classroom courses as well as Web-based courses. The goal of testing is to determine if learning objectives have been accomplished by providing feedback to the instructor of what students are understanding and the areas that need further explanation or clarification (Hazari, 1998). Assessment is also a powerful motivator of student learning. With the rise of the Internet, Web-based assessment has also grown considerably in education. Appropriate use of Web-based assessment can play an important role in student learning while at the same time reducing teacher workload. Many authoring tools are now available to facilitate educators in authoring, delivering, grading, and analyzing tests on the Web. Web-based assessment has demonstrated its ability to deliver exams efficiently and effectively at anytime and anywhere. Thus, on-line assessment will continue to grow in years to come.

References

Brusilovsky, P., & Miller, P. (1999, October). *Web-based testing for distance education.* Paper presented at the WebNet 1999 World Conference on the WWW and Internet, Honolulu, Hawaii.

Dalziel, J. R., & Gazzard, S. (1998, December). *Assisting student learning using web-based assessment: An overview of the WebMCQ system.* Poster session presented at the meeting of the Annual Conference of the Australasian Society for Computers in Learning In Tertiary Education, New South Whales, Australia.

Hazari, S. Home page. [Online]. University of Maryland, School of Business. <http://linus.umd.edu/documents/assmnt/onlinetest.htm> [Accessed 2000, July 28].

Heinich, R., Molenda, M., & Russell, J. (1993). *Instructional media and the new technologies of instruction.* New York: MacMillan Publishing.

Jonassen, D. (1998). *Instructional designs for microcomputer courseware.* Lawrence Erlbaum: Hillsdale, New Jersey.

Juchnowski, M., & Atkins, P. (1999, Aug.). Home page. [Online]. Swinburne University of Technology. <http://www.swin.edu.au/tafe/eis/indsci/assess/theory.htm> [Accessed 2000, Aug. 8].

Kibby, M. (1999, April). Home page. [Online]. The University of Newcastle. <http://linus.umd.edu/documents/assmnt/onlinetest.htm> [Accessed 2000, Nov. 3].

Using Anchored Instruction to Teach Preservice Teachers to Integrate Technology in the Curriculum

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Abstract: Twenty-two preservice teachers involved in a cohort group were enrolled in both an educational computing class and a curriculum development class in the same academic quarter. The instructors for both courses collaborated their teaching efforts whereby the preservice teachers used the educational computing class to research, record, and document their experiences in the curriculum development course. The theme of the curriculum class was therefore used as an anchor for the educational computing class. This paper describes how the technology instructor structured the educational computing class around this anchor. It also describes the lessons learned from this collaborative experience. The paper includes some reflections from the preservice teachers that highlight some advantages of this collaborative process from the preservice teachers' perspective. The paper concludes with suggestions for implementation of similar teaching designs to allow other technology instructors to take advantage of the benefits of anchored instruction in teaching technology to preservice teachers.

Introduction

The infusion of information technology into the teaching and learning process is challenging to preservice teacher preparation programs. Yet these programs are viewed as the most direct and cost-effective way to prepare the approximately 2 million new teachers who will be teaching in the next decade (National Council for Accreditation of Teacher Education [NCATE], 1997).

Although institutions of higher education vary in their specific responses to this challenge, most institutions require at least one educational computing course as a core component of their teacher preparation programs (Leh, 1998). Such courses play a critical role in introducing preservice teachers to fundamental information technology components and skills (Kim and Peterson, 1992).

In a recent study, Leh (1998) studied design and structure of educational computing courses in teacher preparation programs. The study indicated that each university has its own way of preparing their students for the use of information technology in educational settings. The structure and content of the courses also vary from one university to another. One approach to the design of such course involves using a theme or anchor around which various learning activities take place. This approach has been referred to as "anchored instruction" (Bransford, Sherwood, Hasselbring, Kinzer, & Williams, 1990). This model provides learners with a "situated, authentic and social learning environment" which encourages problem solving (Shih, 1997).

Anchored instruction has been suggested as a model of instruction that "can be used to show preservice teachers how to integrate appropriate technologies in their teaching..." (Bauer, 1998). This paper describes the experiences of a cohort group of preservice teachers who used their curriculum development course activities as an anchor in their educational computing class.

Using Coal Project as an Anchor

Twenty-two preservice teachers involved in a cohort group were enrolled in an educational computing class and a curriculum development class in the same academic quarter. In the curriculum development class the preservice teachers worked with a class of eighth graders in a local Junior high school. The eighth graders were involved in an expeditionary research project in the local community. In the project the Junior high school students, together with their teacher, researched the question of whether a local controversial coal mine should have been reopened. The students gathered different perspectives from the local community. One way was by visiting and interviewing different groups of individuals in the community. In the end the students presented a readers theater depicting the different voices represented in the coal mining controversy.

The preservice teachers accompanied the eighth graders in this coal project expedition to learn along, and from, the experiences of the eighth graders. They worked together with the eighth graders (as learning teachers) to plan the field trips involved, prepare interview scripts, and to prepare scripts for the readers theater. In the educational computing class the preservice teachers were involved in hands-on sessions where they learned how to use various technology applications for personal and professional use as teachers. These applications included Word processing, KidPix, PowerPoint, Database, Spreadsheets, and HyperStudio.

The technology course and the curriculum course instructors collaborated their teaching efforts whereby the preservice teachers used the educational computing class to research, record, and document their experiences in the expeditionary learning process. The theme of the curriculum class was therefore used as an anchor for the educational computing class. This paper describes how the technology instructor structured the educational computing class around this anchor. It also records the lessons learned from this collaborative experience. The paper includes some reflections from the preservice teachers that highlight some advantages of this collaborative process from the preservice teachers' perspective. The paper concludes with suggestions that other technology instructors can draw from to implement similar teaching designs that would allow them to take advantage of the benefits of anchored instruction in teaching technology to preservice teachers.

The two instructors involved in this teaching experience conducted a study of their collaborative teaching activity for the purpose of improving instruction in their respective areas. A qualitative inquiry was used to gather data. The instructors kept daily journals of their experiences. At the end of the quarter, each preservice teacher wrote a reflection paper based on the collaborative learning experience. The journal and the reflective papers were the main sources of data.

Structuring the Technology Course Around the Anchor

The goals of the educational computing were based on the ISTE standards which aim at preparing teachers to use technology for acquisition of basic computer/technology operations and concepts, personal and professional use of technology, and integration of technology in instruction. The preservice teachers spent some time learning the skills involved in using various applications. This was followed by activities that gave them opportunities to practice the use of these application within the setting of the anchor. The following is a description of how the activities around each technology application emerged from the theme, content, and activities of the curriculum development course.

Word Processing. On the first meeting of the educational computing class, each preservice teacher used word processing to write an introductory story to the eighth grade partner that he or she would be working with. They also used a digital camera to take personal pictures. They inserted these pictures in their stories. The preservice teachers later shared these stories with the eighth graders.

Web searching. The first meeting of the curriculum class involved a brainstorming lesson around the questions "what do we know about coal mining, and what do we want to know?" After listing down several questions, the next task at hand was "how are we going to find out what we do not know." This became an opportune time to introduce web searching. In the following educational computing class the preservice teachers used different search engines to search the Internet for information about the topic of coal and coal mining. The preservice teachers created annotated bookmarks of resourceful sites, and saved them on floppy disks. They shared this bookmarked resources with the eighth grader on the next meeting.

PowerPoint. One curriculum class involved a discussion of the principles of expeditionary learning. The next technology class involved reviewing the expeditionary learning web site (ELOB) for further information. The preservice teachers then created a PowerPoint presentation around the topic of expeditionary learning based on materials covered in the curriculum development class and information gathered from the web.

Spreadsheet. The eighth grade class and the preservice teachers spent one session planning a field trip to the coal mining area in question. In this session the eighth grade teacher involved the students in an activity aimed at figuring out what they needed for the trip, how much money they would need, and how to raise the funds. In the next educational computing class spreadsheets were introduced to spreadsheet as a possible trip planning application.

HyperStudio. The eighth graders and the preservice teachers engaged in several research-oriented activities aimed at providing information around the questions on coal mining. These activities involved interviewing different players, visiting coal-mining areas, and searching materials and information from the library. The preservice teachers used HyperStudio to document this entire experience. During the fieldtrips digital cameras were used to capture different scenes. These graphics were woven into the HyperStudio multimedia presentations.

Database. To help them keep track of the different components of the learning experience, the preservice teachers used a database. Some preservice teachers were able to use the screen capture option of Macintosh computers to use these weekly database presentations as part of their HyperStudio stacks.

Inspiration. One session of the curriculum class involved concept mapping. The eighth grade class mapped out, on a chalkboard the different aspects of coal mining that they would explore in the expedition. This became an opportune moment to introduce inspiration as a concept mapping application. The preservice teachers later used these maps as part of their multimedia stacks.

KidPix. In the culminating project in the curriculum class, the eight graders worked with the preservice teachers to set up a readers theater. KidPix was introduced as a possible readers theater presentation application. Some of the preservice teachers used KidPix slide shows depicting some of the perspectives represented in the readers theater.

Reflections and Discussions

Flexibility. In this study, the content for the anchor was open-ended and evolutionary in nature in the sense that no one could determine ahead of time either what the eighth grade class was going to find out during the expedition or the sequence of activities they would need to take to complete their task. As the learners (eighth graders) explored the task ahead of them, they identified their own questions and these questions became the basis for formulating goals and designing the activities that would lead to the realization of these goals. One of the goals of immersing the preservice teachers in this collaborative teaching/learning experience was to emphasize relevance of technology in teaching and learning by allowing the preservice teachers to use technology in a real life setting. To achieve this goal, it was important for the activities of the technology class to relate closely to those of the anchor.

One of the challenges of anchored instruction is for the instructor to know "how and where to fit anchored instruction into the existing curricula ..." (Baumbach, Brewer & Bird, 1995). The existing curriculum in this case was for the preservice teachers to learn the use and application of various technology applications for teaching/learning environments. Relating the activities of the technology class to the anchor, and fitting these activities within the curriculum of the technology course necessitated planning the technology activities as the content of the curriculum class evolved. It therefore became necessary for the technology instructor to attend the curriculum course class sessions. This created a great demand on her time, but as she reflected, "this was the only way I could make the assignments and class activities meaningful. I had to know what they are doing in the other class in order for me to create corresponding and complementary activities for them." This suggests the need for flexibility on the part of the instructors involved in anchored instruction and confirms the suggestion by Baumbach, Brewer & Bird, (1995), that "with anchored instruction, the teacher can no longer follow a fully scripted lesson plan."

Providing on-demand learning. "On-demand learning allows the individual to learn the topics they need when they need" (Duke, 2000). It has been suggested that "people learn best when they can learn exactly what they need at exactly the moment they need it…" (Skillsoft, 2000). In this study the technology instructor provided on-demand learning on several occasions. An example was in the case of Inspirations as described above. At the beginning of the course, the technology instructor had not planned to use the Inspiration software. Upon attending the curriculum class sessions and watching the concept mapping session (using a chalkboard), she quickly recognized this as a very timely opportunity to introduce Inspiration as a concept mapping software. The preservice teachers then used inspiration to create an electronic version of the concept map which they had tried to create on the chalkboard earlier on in that day. Inspiration became the exact topic they needed to learn at this particular moment. Providing this on-demand learning helped the preservice teachers appreciate the use of Inspiration. As the ease of forming concept maps using Inspiration unfolded to them, the class was full of "aahhs" and "oohs" in appreciation.

One of the advantages of providing individuals with on-demand learning is that it allows "them to immediately apply their newly gained knowledge… Immediate application cements the knowledge gain and makes it far more likely that the knowledge will be retained and used in future" (Skillsoft, 2000). A number of preservice teachers in this study reported that they started using some of the applications such as Inspiration, PowerPoint, and KidPix for other courses as well.

Recognizing teachable moments. Closely related to the concept of providing on-demand learning is the need for instructors to recognize and seize teachable moments. Teachable moments refer to a time when individuals are ready to learn. In using this approach "the teacher may appropriately decide that the current discussion or situation may offer a prime opportunity to meet current or anticipated learning goals better than the planned instructional activities" (MentorNet domain, 2000). In this study, some time the technology instructor had to change a planned course of action in order to seize a teachable moment. The case of Inspiration above was one example. The prior plan for that particular class session was for the preservice teachers to work on completing previous assignments. The introduction of spreadsheet as a possible trip planning software, as described earlier, was another example. "Suitable recognition and capitalization of teachable moments can increase instructional efficiency, despite deviation from planned activities" (MentorNet domain, 2000).

Cohort group. Cohort instructional programs, where students are required to take all or nearly all courses together toward a degree, have been associated with some benefits. An example of these benefits includes higher levels of cohesiveness and group interaction among the students (Reynolds, 1993). These interactions in turn result in, enhanced professional confidence and life long learning relationships. This study reveals an additional advantage of cohort instructional programs, namely that cohort instructional programs present an excellent setting for educators to implement anchored instruction. The collaborative teaching experience in this study was made possible by the fact that the preservice teachers were involved in a cohort instructional program based on a partnership between the university and the local Junior high school.

Motivation. One major difference between this class and other similar classes that the technology instructor had taught before (based on same technological applications) was the level of enthusiasm and motivation in the preservice teachers. As she indicated "on average, for example, I spend considerable time just trying to get the students to think of a topic of interest to use when practicing web searching. In contrast, it seemed like this class could hardly wait to *lay their hands on the WWW*, because they were very eager to see how much information about coal and coal mining was available on the web".

The preservice teachers' perspective. At the end of the technology class the preservice teachers shared some of their reflections on the anchored instruction experience. These reflections highlight some of the benefits of this anchored instruction in their learning experience including: increased motivation to work on and complete tasks, a sense of pride and accomplishment, understanding of integration of technology in the curriculum, and developing a vision for integrating technology in their own classrooms. Some of these benefits are captured in the following excerpts from the students' reflection papers.

> *"It was because I was involved in this unique integrated curriculum that makes it easy or me to envision technology in my own classroom."*

> *"This integrated experience has made learning to use technology effectively all the more meaningful."*

> *"I found myself practically bragging to other technology student [not involved in the anchored instruction partnership] throughout the quarter about how our class made so much more sense because we were connecting our classes together."*

> *"The integration of these two classes really helped me to be a reflective educator."*

Summary, conclusions and suggestions

A cohort group of preservice teachers was immersed in a hand-on experience where the preservice teachers learned the use of technology applications within a real life setting. The theme, content, and activities of a curriculum development class were used as an anchor for the preservice teachers to learn the use and integration of technology applications in teaching and learning. Planning the activities around the anchor in such a way as to fit the activities within the curriculum called for flexibility in the part of the instructor. By recognizing and seizing teachable moments the instructor provided on demand learning which led to transfer of skills to other areas. Anchored instruction was found to be an effective way of training preservice teachers to develop a vision for integrating technology in the curriculum. It also resulted in increased motivation to work on and complete tasks, a sense of pride and accomplishment, and understanding of integration of technology in the curriculum.

One of the unique situations that made this collaborative partnership possible was the fact that the preservice teachers were in a cohort group. Cohort groups of preservice teachers therefore present an excellent opportunity for implementing anchored instruction. Where cohort groups of preservice teachers can be organized, technology instructors should take advantage of such a setting and create collaborative partnerships that would allow the activities of an educational computing course to be anchored around the theme, content, and activities of another course.

References

Bauer, J.W. (1998). Anchored Instruction in preservice educational computing classes: A research project. *Technology and teacher education annual-1998* (pp 241-245); Charlottesville, VA: Association for the Advancement of Computing in Education.

Bransford, J., Sherwood, R., Hasselbirg, T., Kinzer, C., & Williams, S. (1990). Anchored instruction: Why we need it and how technology can help. In D. Nix & R. Spiro (Eds.), *Cognition education and multimedia: Exploring ideas in high technology* (pp. 115-141). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Duke, A. (2000). *Real time and on-demand learning*. [Online]. Available: http: //www.spring.com/interactive/intlearn.asp

Leh, A. S. C. (1998). Design of a computer literacy course in teacher education. In S. McNeil, J. D. Price, S. Boger-Mehall, B. Robin, & J. Willis (Eds.), *Technology and teacher education annual-1998*. Washington, DC: Association for the Advancement of Computing in Education. [On-line]. Available: http://www.coe.uh.edu/insite/elec_pub/HTML1998/ec_leh.htm

Kim, C. S., & Peterson, D. (1992). The introductory computer course: Business majors perceived importance of topics. *Journal of Education for Business, 6*(6), 361-365.

MentorNet domain, (2000). *Teaching for student learning*. [Online]. Available: http://www.bgsu.edu/colleges/edhd/programs/MentorNet/glossary/glossary_c.html.

Mclarty, K., Goodman, J.R., Risko, V.J., Kinzer, C.K., Vye, N.J., Rowe, D.W., & Carson, J.L. (1989). *Implementing anchored instruction: Guiding principles for curriculum development.* (Paper presented at the 39th annual meeting of the National Reading Conference December 2, 1989, Austin TX).

National Council for Accreditation of Teacher Education. (1997). *Technology and the new professional teacher: 21st century classroom.* Washington, D. C.: National Council for Accreditation of Teacher Education. [Online]. Available: http://www.ncate.org/specfoc/oct97

Reynolds, K. (1993). *Students in cohort programs and intensive schedule classes: Does familiarity breed differences?* Paper presented at the 18th Annual Meeting of the Association for the Study of Higher Education, Pittsburgh, PA, November 4-7. (ERIC Document reproduction Service No. ED 365 175).

Shih, Y. (1997). *Effects of knowledge with anchored instruction on learning transfer*. In: Proceedings of selected research and development presentations at the 1997 National Convention of the Association for Educational Communications and Technology (19th Albuquerque NM February 14-18, 1997).

Skillsoft, (2000). *Learning on demand*. [Online]. Available: http://www.skillsoft.com/products/concepts/learning_on_demand/learning_on_demand_index.html.

Challenges to Currency in the Educational Computing Course

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Abstract: This short paper is an initial report on the challenges facing the instructor of the educational computing course as colleges and universities strive to prepare technology-capable teachers who in turn can produce technology-capable students. These challenges include the changes in entry-level computing skills for preservice teachers, along with the many new innovations in hardware, software, and course delivery tools. These dramatic changes pose wonderful opportunities and demanding challenges for the instructor of the educational computing course and for teacher education programs.

Introduction

A major goal of teacher education is to prepare teachers to play a vital role in preparing students to function in a technology-rich environment. The International Society for Technology in Education document, *National Educational Technology Standards for Teachers,* states that "Our educational system must produce technology-capable kids." Colleges and universities have the responsibility for producing technology-capable teachers. A major challenge to the instructor of the educational computing course and to teacher education programs is maintaining currency, and even innovation, in a course that must constantly change. This is not an easy challenge. Pre-service teachers' entry-level computing skills have improved substantially over the past few years, hardware as well as software is being updated and replaced at a rapid rate, instructional delivery tools are constantly being developed and modified, and the expected skill-level for teachers is approaching higher standards. These dramatic changes pose wonderful opportunities and demanding challenges for the educational computing course and for teacher education programs.

Entry-Level Computing Skills

Information collected from a survey of students entering an educational computing class in 1995, and a comparable survey in 2000, demonstrates the change in skills of incoming students. Less than five years ago, most students entered college with few computing skills. These skills were mostly restricted to the use of word-processing or spreadsheet applications. Today's students arrive in the college classroom with an array of computing skills and some savvy experience in using technology. These same students usually carry cellular phones, must have an e-mail fix every few hours, and have access to a computer outside of the university lab or classroom. Before students arrive on campus, many have listened to music via the web, played with an array of interactive game software, downloaded plug-ins, and participated in chat-rooms. These students also bring an expectation to the computing classroom for more than a sampling of presentation software, database applications, and web development. As teacher educators, we must continually assess the skill-level and knowledge of our incoming students and strive to update course curriculum and activities to meet the needs of our pre-service teachers and the students whom they will teach. With computers in most homes and students arriving at college with more experience in computer use (*Digest of Educational Statistics*, 1999), it is vital that the educational computing course take into account these significant improvements in students' entry-level skills. As a result, the instructor of the educational computing course must continually examine the curriculum, throw out the obsolete and replace it with new applications and skills. These skills must be blended with the appropriate focus on activities which will allow pre-service teachers to gain the design and delivery experiences needed for classrooms which will produce "technology-capable kids."

Changes in Hardware and Software

In early 1995 there was no need to assess student skills in using the web or to teach students about web design. Although the Internet was in existence in the late 1960's (Shelly, Cashman, & Gunter), prolific creation of web sites and use of the web for education have only exploded during the past few years. Today's entry-level students are adept at searching for information on the web and are beginning to be much more experienced in creating web pages. Yesterday's web creation lessons for the educational computing class, which included some basic activities using HTML or Netscape Composer, are not sufficient for today's students. Students can now expect to use a variety of packages, such as Macromedia's Dreamweaver 3.0 or Microsoft's FrontPage 2000, to develop professional web sites and web pages. It is a major challenge for an instructor to maintain currency in the various web-development and graphics-applications packages and provide appropriate learning experiences for our students. Presentation software has also moved from simple screen designs with text and clip art to complex learning kiosks with interactive buttons, digital video and audio, and complex designs that allow the user to view only certain portions of the materials and not just a sequential show. It is no longer a question of which button to add but rather how does one design an on-line learning module which encourages higher-order thinking skills. The teacher educator must possess skills in using digital cameras, digital video cameras, scanners, and know how to use appropriate software to capture and edit the products of these peripherals into viable electronic objects for learning. Computers must constantly be replaced with those having faster processors, more memory, and special cards for all of these powerful new tools. The average life expectancy of a computer in a college lab or in a public school classroom is less than two years and the average life expectancy of a course syllabus for the instructional computing course is barely one semester. Curricular revision, combined with changes in hardware and software, adds to the challenges facing the instructor of the educational computing course and these are not the only elements of change. Perhaps the greatest element of change comes from the challenges placed on new methods of course delivery.

Changing Delivery Methods

Classroom face-to-face interaction is sometimes being replaced, or at least challenged, by courses which are totally or partially on-line. Pre-service teachers may be experiencing these new learning environments in classes as well as studying appropriate ways for using these new tools. The instructor of the educational computing course must learn this new technology and also learn how to use this new technology to create dynamic learning environments that are very different from the four walls and blackboards used a few years ago. By the time an instructor masters the basic skills of a new package, such as WEBCT or Blackboard, the instructor finds that there is an updated version on the market--one that has more bells and whistles and holds the promise of a more effective learning environment with a shorter learning curve.

Future

How does the instructor of the educational computing course address these challenges posed by new entry-level computing skills of students, modifications of hardware and software, and new delivery techniques? The instructor of the educational computing course is also a learner. Consequently this learner heads back to the classroom in whatever form that classroom currently exists, either face-to-face, on-line, or wireless, to learn new applications or upgrades that will hopefully make the classroom of the future a better place to learn and the teacher a more effective facilitator of learning. If a major goal of education is to produce lifelong learners, then the instructor in the educational computing course makes an excellent model. This instructor probably learns something new regarding educational technology every day and enjoys almost every challenging minute of the experience.

References

International Society for Technology in Education (2000). *National Educational Technology Standards for Teachers*, Eugene, OR: ISTE.

National Center for Educational Statistics (2000). *The Digest of Educational Statistics*,1999, Education Publications Center, U.S. Department of Education.

Shelley, G., Cashman, T., Gunter, R., & Gunter, G. (1999). *Teachers Discovering Computers, A Link to the Future*, Cambridge, MA: Course Technology.

Architecture of a Cooperative Hypermedia

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Abstract: Cooperation is one of the most important human activities. Several researchers over the world showed that cooperation enhance learning. Cooperative learning is very imoprtant because it produces greater student achievement.In this paper, we present the architecture of an environment based hypermedia that supports cooperation between learners. We present also its implementation.

1. Introduction :

The application of cooperation principles in hypermedia environment is not a new idea. Many researchers had prouved that providing cooperation opportunities to learners can reduce the problems of hypermedia, i.e. the lost in the hyperespace and the cognitive overloading.
In this paper, we present a architecture of an hypremedia that offers cooperation opportunities to learners.

2. Architecture of the system:

This hypermedia is composed of a set of human-machine interfaces, a tutor and some others modules.

2.1. Student interface:

It is through this interface that the learner navigates, request advices from the tutor or cooperate with their peers. Learners can exchange ideas, some points of view, suggestions, ... a.s.o. A dialogue model is under construction in order to facilitate the negociation beteween learners.

2.2. Author interface:

The author creates the hypermedia (nodes, links, ...). The matter to be learned is divided into a set of educational objectives. So, the hypermedia contain a set of educational objectives related by «prerequest» relation. Each educational objective is represented by a set of nodes, so, two objectives can have the same node. For each objective, the author creates:

- the nodes of this objective,
- the « prerequest » objectives,
- the difficulty level.

For evaluate the student's knowledge, the author creates exercices with their solutions and the score to add or to substract.

2.3. Tutor:

It is used in order to propose an educational objective to the learner following the student's knowledge state. It can give advices to learners or informations about the cooperation opportunities (Lafifi &

Bensebaa 2000). It uses a set of pedagogic strategies which are constituted by a set of pedagogic rules. Theses rules have the shape of a production rule:

If Condition Then Action.

3. Implementation and conclusion:

For implementing this architecture, we had used a Server/Client architecture. In the Server slide, we have the hypermedia, the tutor and the author interface.
In other hand, in the client side, we have a student interface, the student model of each student and its historic. For accessing in each interface, a passoword is used.

We presented the main features of the architecture of an hypermedia system that can offer cooperation possibilities to learners. Now, we try to implement this architecture in the Web.

References:

Lafifi Y & Bensebaa T (2000). Hypermedia and cooperative learning. Accepted to be presented in EDMEDIA'2000. Montréal , Canada, 2000.

Freeing the Monkeys:
Making the EdTech Course More than Learning to Push Buttons

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Abstract: Since 1995, the School of Education at American University has offered a course called Educational Uses of Technology. The aim of the class has been to teach the metaskills necessary to empower students to become self-directed learners capable of mastering new computer skills on their own. The course attempts to accomplish this through the use of tutorials and limited group projects. This study solicited feedback from former students who successfully completed the course. Most of the respondents reported that they had become more comfortable with learning new computer applications as a result of taking the course. The authors feel these results provide support for the teaching methods used.

Introduction

Several years ago I got a hair cut at one of the big franchised haircutting establishments. When I went to pay, the stylist had a problem with the computer that served as a register. The screen locked up, and she did not know what to do. After watching her stare timidly at the screen for several minutes, I offered to help. A quick reboot later I was able to pay for my haircut. The very next day I was buying a cup of coffee in a college cafeteria when the same sort of computer problem confronted the woman working the register. Instead of staring helplessly at her machine, this woman prodded a number of keys before shrugging and rebooting the computer. The moral of this tale is not that I could have gotten out of paying for a haircut if I had just kept my mouth shut. What really struck me was the difference between the ways these two women dealt with their computers. The first woman was clearly apprehensive about the machine and too nervous to try anything when it stopped working. The second woman was much more comfortable with her machine and thought nothing of doing a little experimenting to get it to work.

Semester after semester we see students in educational technology classes who approach computers with the same trepidation as the hair stylist in this story (Kay, 1989). If we are really going to give them what they need out of an educational technology course, we need to be able to help them become more like the second woman in the story. They have to be willing and able to try things for themselves.

If you stand outside any software training class and listen, you are most likely to hear the instructor walking students step-by-step through the procedure of some operation of whatever application is being taught. "Click the File Menu. Scroll down to Page Setup and click it. Choose the Paper Size tab. Click the Landscape option in the Orientation section." Voila! You have instructed the printer to print down the length instead of across the width of the page. But did anyone learn anything from the process? In today's climate of appreciation for learning by doing and degradation of simple memorization, this type of rote drill is to be discouraged (Bird, 1993).

In 1991, I had a job travelling around the country teaching seminars on how to repair and upgrade computers. One day the own of the company really lost his patience with me because I complained that I did not understand some aspects of the new course well enough to teach them after sitting in on the course twice. In a fit of anger he yelled, "a trained monkey could have learned it by now." Needless to say, I was not working for the same company the next day. But the expression stuck with me and it has come to be the way I think of courses that focus on memorizing which buttons to push. If our educational technology courses are not doing more than teaching which buttons to push, we might just as well be working with trained monkeys. We believe that would both waste our time and annoy the monkeys. So we are trying to free the monkeys and make our educational technology courses more than just button pushing seminar.

A major element of our approach has been the use of tutorials. Instead of walking students through a new application step by step, we encourage them to read and follow a tutorial. This guides student away from passive learning and toward self-paced, active learning (Zemelman and Daniels, 1998). When they encounter trouble, we help them get back on track, but mostly the instructor serves as reassurance. Students with problems are gently urged to try to solve their own problems while the instructor guides their problem solving effort. This is a form of Piaget's (1995) scaffolding. The student without enough experience to come up with the solution immediately is helped to reach a solution they can call their own. The sense of personal accomplishment in this system is much higher than in a system based on pushing buttons on cue. So is the level of frustration along the way. Instructors must be prepared to deal with that frustration and hold on to the belief that student satisfaction with their own accomplishments will be all the higher for it.

The Study

What we have been seeking to do is foster the metaskills necessary to empower our students to become independent, self-guided learners in the area of educational technology. While we use a variety of active learning techniques to foster this in our education technology classes, we have had little feedback concerning the success of our efforts. To change that, we assembled a database of all of the students who have completed the Educational Uses of Technology course offered by American University's School of Education since 1995. Because the course is offer both to undergraduate and graduate students, many of those who completed it in its early history have left the university. We were not able to contact all of the former students. Of the 312 students who have completed the course, we were only able to successfully contact 205. Most of this group was recruited to participate in an email survey for this study. Twenty-one others were contacted and agreed to participate either through conventional mail, telephone or (in two cases) personal interviews. Of the 205 students agreeing to participate, only 93 had actually responded by the writing of this paper.

All participants were asked to respond to a questionnaire containing ten queries. Because we have a number of records giving individuals self-reported attitudes and experiences concerning educational uses of technology from their time in class, we chose not to make this an anonymous process. We also asked the participants to report in which semester and with which instructor they took the course so that we might compare responses to the questionnaire to past student evaluations.

The questions addressed to the participants fell into two main categories. Four questions solicited the former students' impressions of the usefulness of the material they learned while taking the Educational Uses of Technology course. Four questions asked about the former students' experiences with computers since completing the course. The remaining two questions asked for recommendations to improve the quality of the course. All of the questions were open-ended, and participants were encouraged to make their responses as detailed and lengthy as they wished.

Findings

Of those who responded, 85 said they felt that the Educational Uses of Technology course had been beneficial. Seven of the remaining eight respondents said they did not learn anything new in the class while the eighth felt "*the class was a stupid waste of time.*" This former student went on to say that he thought, "*the class shouldn't be required for people who already know how to use computers.*" Of those with more positive assessments, many mentioned that the course helped them *feel "more comfortable about using computers.*"

Twenty-three percent of respondents reported learning to use new software or peripheral devices since taking the course. Of those who were more explicit in their answers, twelve wrote that they had learned to use at least one new software application. Four participants said they had used more than one new package. Two reported learning to use a scanner on their own (as opposed to with the assistance of a lab assistant while taking the course). One excited former student was the proud owner of a new web cam and wrote that it was "*really cool.*"

Most (86%) of the participants reported that they had used specific skills that had been taught in the Educational Uses of Technology class since completing the course. Forty-two said they had created or presented power point presentations. Twenty respondents wrote that they had created web pages for themselves or for groups or projects with which they were associated. Eighteen said they had used specific skills learned in class but failed to mention which skills those were. No respondents reported designing their own learning labs since completing the final class project. Two students volunteered that the course helped them make decisions when buying a new computer.

Interestingly, only 38% of respondents reported remembering having felt any anxiety related to computers before they took the course. Yet on average, slightly more than half of the students who take the Educational Uses of Technology course report some level of anxiety about using computers in the beginning of the class. Of those who reported remembering having felt anxiety, all said that the course lessened the level of tension they felt when dealing with computers. Most seemed to indicate that they now felt little or no apprehension, but twelve (13%) reported that they still felt some such anxiety. It was unclear from the responses how many meant they constantly felt apprehensive as opposed to periodically experiencing tension. One respondent wrote, "*I usually am okay with the computer now. But some days everything seems to go wrong and I get so I just want to throw it out the window.*" Since this student responded to the survey via email, we assume she has not yet given into that urge.

When asked about confidence in their ability to use skills specifically learned in class, 84% of participants said they could currently use or relearn those skills on their own. Several respondents made comments similar to one former student who wrote, "*I guess I could make a web page on my own if I had to, but it would be easier if you were there. I'd be more confident just knowing I could ask for help if I had to.*"

When asked about confidence in their ability to learn new computer based skills on their own, 61% of respondents reported that they either had done so or thought they could do so. It is worth noting that of the 57 participants, who answered in the affirmative, nearly half went on to mention having someone they could turn to for help or advice. We are divided on the issue of whether or not this counts as being able to learn new software "*on your own.*"

Eighteen participants said they felt more courses on the educational uses of technology ought to be required or at least available though American University's School of Education. One student specifically stated that the current course should not be required of education majors and graduate students.

A disappointingly small number of former students are currently teaching using any form of computer technology. Of the twenty-eight respondents who are currently teaching, only twelve reported having working computers available to them in school. Of those twelve, none reported having more than a handful of computers in their classrooms. One particularly passionate student wrote, "*It's not fair. I learned how to do all this neat stuff getting my degree, but I can't use any of it. I only have four computers in my classroom and they are so old they won't run anything I can buy today. If they were even working.*" Two respondents did report having class web pages where they posted scanned copies of students' work for parents to see online. Several participants reported using email to communicate with parents. By and large, however, most did not seem to have access to the computing resources the course prepared them to use.

Conclusions

There is a natural tension between the desires of students to develop specific and explicit skills in a class such as Educational Uses of Technology and the instructional goal of helping students develop the metaskills discussed above. The majority of students taking such a class are pre-service teachers. According to Fullers (1974) Teacher Concerns Model they are primarily focussed on developing basic skills. As the dreaded "*will this be on the test*" question indicates, many students feel they only have time to master skills and knowledge on which they will be graded. The metaskills for independent mastery of new computer skills are not easily tested for in a single semester. It is natural, therefore, for students to want to be taught new computing skills in the traditional rote button-pressing manner that we have called monkey work. Despite that urge, almost two-thirds of our former students indirectly reported having developed the ability to teach themselves new computer applications. Given that more than half of all students starting the course indicate that they would have difficulty doing so, we find reason to believe that we have been at least partially successful in our goal of fostering the desired metaskills.

Lewis (1988) made a number of recommendations for easing anxieties about computers in education classes. Among them were relating personal experiences as a beginning computer user to relax students and make them more comfortable in the early stages of their technical skill development. We recommend creating a classroom environment that is relaxed, comfortable and informal. For many students there will be considerable tension when trying to do new things on a computer. The instructor needs to do everything possible to minimize other sources of tension. Ideally students need to develop a sort of fearless willingness to try new things. They need to know that it is okay to fail and make mistakes when learning new skills. Piaget (1995) suggested that each time humans try to learn a new set of skills that are essentially going through the stages of mental development on a micro scale. To individuals used to working in familiar areas this can be a very daunting experience. A number of participants remarked that the casual classroom atmosphere of the Educational Uses of Technology course made the experience much more pleasant.

To help minimize frustration, Konar, Kraut and Wong (1986) recommended starting with simple tasks early and working up to more difficult tasks later in the semester. This may seem obvious when it is mentioned, but many instructors do not seem to take it into consideration when laying out educational technology courses. We start off at the simplest level of sending email, web browsing and using a search engine. Mastery of these simple tasks helps to build confidence and starts students with a foundation of success. By the end of the semester, students are able to plan and design their own computer based learning labs complete with promotional web pages and explanatory power point presentations.

We cannot emphasize enough the need for this type of class to be a hands-on, active learning environment. It is not enough just to have students sitting at computers. The monkey work approach does that. Students need to be active participants in the learning process. We foster this with the use of tutorials and several group projects. The instructor needs to step back to a support role and resist the urge to explain every step in detail. A good overview of what needs to be done and how the tutorial will guide the process is enough. After that, answering individual questions while everyone is working is the best approach. The instructor should encourage exploration and problem solving by the students. Giving a prompt answer to every question may be tempting, but students will get more out of the process if they are encouraged to work through difficulties.

This study was originally intended as a way to get feedback from former students beyond the traditional end of semester student evaluation. Overall, most of our former students seemed pleased with both the content and the structure of the course. A few suggestions were made about changing the order or assignments and a couple of students even suggested adding more assignments. We will be experiment with these ideas in coming semesters. We find support for our pedagogical approach in the survey responses. We intend to continue soliciting feedback from students from current and future classes. We also intend to carry on freeing the monkeys.

References

Bird, T, Anderson L. & Swidler S. (1993). Pedagogical balancing acts: Attempts to influence prospective teachers' beliefs. Teaching and Teacher Education, 9, 253-267

Fuller, F. (1974). A Teacher Concerns-Self Confrontation Model of Teacher Education. Paper presented at the American Educational Research Association.

Kay, R. H. (1989). A practical and theoretical approach to assessing computer attitudes. Journal of Research on Computing in Education, 21, 456-461

Konar, E., Kraut, A. and Wong, W. (1986). Computer literacy: With ASK you shall receive. Personnel Journal, 7, 83-86

Lewis, L. H. (1988). Adults and computer anxiety: Fact of fiction? Lifelong Learning, 11, 5-12

Piaget, J (1995). The Essential Paiget. NY: Basic Books

Zemelman, S., Daniels, H. and Hyde, A. (1998). Best practice: New standards for teaching and learning in America's schools. NY: Heinneman

"Surfing Safely with Social Navigation"

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This proposal relates to the use of instructional technology in undergraduate and graduate teacher education. It fits the topics of: The Educational Computing Course; Graduate & Inservice Education; Instructional Design; Preservice Teacher Education; Technology Diffusion; and Telecommunications.

Many parents and teachers are concerned about the growing proliferation of published material on the World Wide Web, some of it being unfit for small children's eyes and minds. Thousands of new websites are being added every month to the Internet with a wide range of HTML styles and structures. Navigating this vast sea of information safely becomes a nightmarish adventure for the uninformed and/or uninitiated.

Dieberger (1997) proposes that when Internet users help each other with this navigational task, they are using "Social Navigation." Often users will e-mail each other URLs with descriptions of the websites and recommendations. Or they might create a webpage with pointers to their favorite and/or most helpful sites. When the recipients and readers use these resources, whether via e-mail or the webpage, they are engaging in a social activity while surfing the web.

Dieberger (1997) recommends direct social navigation where a group of individuals with common interests agree to share ideas, resources, and evaluations. These recommendations become a point of discussion as others view the selected Internet resource, evaluate the site for themselves, and compare and contrast their own evaluations of the site.

Undergraduate and graduate education students at the author's current university have been involved in Social Navigation for the past few semesters in an organized manner. This has lead to more and varied integration of educational technology into the School of Education's courses and into the actual teaching of the courses by the established faculty. It has also encouraged the faculty to experiment with new technology and explore the multiplicity of offerings on the WWW.

For example. Education Strategies students, under the direction of their instructors, are now required to do web-based research on available on-line resources for their discipline as part of a lesson plan. With the technical guidance and instruction of the author, each student researches a minimum of four websites and composes an HTML document containing the name of each site, its URL, and an annotation of the webpage. The web-based lesson plan is then edited, as necessary, by the webmaster and uploaded onto the School of Education's server for viewing through the World Wide Web at http://teach.fhu.edu/technology/.

Other undergraduate and graduate courses are also involved in web research and webpage design, although to a lesser extent than the Education Strategies classes. For example, some of the introductory Special Education classes have created webpages featuring specific learning disabilities and handicapping conditions. These are hosted on the School of Education's website, as well.

The author's graduate students in EDU 506, Computer Applications in Education, have not only created webpages with Internet resources, but have also been involved in e-mailing their instructor and fellow class members. They are providing thoroughly reviewed and evaluated, hand-picked lists of URLs to other websites of interest to K-12 teachers. Dieberger (1997) argues that the locations of social navigation are important and therefore our class provides a supportive atmosphere to both explore the web and share found resources in a collaborative environment. Creating e-mail discussions that represent different interpretations reinforces an advanced state of cognitive functioning.

Collaborative Communities Think About Technology in Education: a Web-based Constructivist Course Model for Pre-service Teachers.

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Abstract: A need exists for beginning teachers to be aware of ways in which technology can be integrated into classroom instruction. This paper is a reflection on a course model that was developed to address this need. The course is available to students in a one-year post-degree education program. It focuses on the use of technology in education and is designed in a manner that encourages reflection and engagement. The students collaborate in theoretical and practical readings, field experiences and instructional design. Students in the course actively engage in the construction of their knowledge as part of a community of learners.

Introduction

That all pre-service teachers acknowledge and become familiar with the use of technology in public school classrooms is widely accepted. Acknowledging this need, pre-service teachers in our university's intensive one-year post degree program are required to take an introduction to technology and instructional design course in the first term. In the second term they may also take an optional course, *Technology in Education*. The model for this course has evolved over the past few years. It focuses on the process of technology use in education. This focus on process requires of the pre-service teachers theoretical investigation and the sharing of thoughts on readings, experiences, and on the rationales that have been generated for the use of technology in schools as well as in the broader community.

The course model is one structured around collaborative investigation and constructivist pedagogy. Most of the course time is spent reading in the library, working on collaborative projects, conducting field investigations and discussing and reacting to what is being read, experienced, observed and/or discovered. The pre-service teachers are active group participants in helping to shape each other's understandings of technology. They also are members of focused discussion and research groups. As part of a learning community they collaborate by sharing thoughts and engaging in a dialogue through written texts and oral communication. This dialogue of engagement both oral and textual is often at a level of sophistication and deep understanding that I have not experienced through a more traditional course structure. The course consists of a study of three distinct areas: theory and practice surrounding technology use, learning from and through experience, and the design of a web-based project that could be used in the public school system.

Course Structure

The course structure requires the pre-service teacher to have a series of linked web pages on which they share what they have come to believe about technology use in education and to which class members react and respond. Students read about issues that are related to visions and rationales for the use of technology in education and respond to these readings on web-based Read Log pages. Students in the course are involved at the same time in reacting to their classmates writing and responding on the Read Log pages. This external dialogue enables shared understandings of the place of technology in public school education.

The second phase of the course is allocated for the actual process of learning about technology use in schools. The pre-service teachers spend one-third of the course in a school based technology setting. This engages students in a process that, like all learning, involves *doing* as well as *getting*. The objective of this component of the course is to use a community or public service experience to enhance and impact the learning of traditional course content. This component of the course provides an opportunity to *test* or *demonstrate* abstract theory in the real world. The pre-service teachers share the knowledge they have gained from their visits to schools through a reflective web page.

The development of a web-based design for instruction is the final component of the course. The instructional design reflects the pre-service teacher's previous course work giving them a sense of the theoretical as well as the practical implications for the use of technology. The creation of the instructional design is completed as part of a team. The team often focuses on a topic within a discipline but in some cases the designs are interdisciplinary in approach. The instructional design topic is most often developed around particular areas of interest and has ranged from a study of environmental biology to the study of fairy tales in elementary language arts. Teams of pre-service teachers collaborate on the web-based instructional design package by working together— teaching and learning together.

Findings

In the first phase of the course model discussions around theoretical and practical readings are not instructor focused or directed. The opportunity exists for all students to express their views through their web pages. In traditional fifty-minute classes discussion usually occurs among a small group of vocal students; others are reluctant to enter the debate/discussion and they often remain silent. Through interactive web pages all class members have the opportunity to express their views and when the class meets as a whole everyone is familiar with each other's perspective and a more focused dialogue occurs.

The degree of engagement in a textual dialogue are sampled here in some responses from a Read Log page, "I am very interested in examining this article in full, ...I am uncertain of the direction K—[female] is aiming for in her response? Is she suggesting that the role of the public school teachers should move in the direction of caretaker, not educator? ...Granted widespread computer use will help in sharing of knowledge as well as accessing knowledge, but who will be there to filter this new knowledge?" Responding to this, "E—[male]: You have some valid questions, ... First of all I do advocate the use of computers in the schools. I see technology 'know how' as a marketable skill in the workforce and feel those who do not have any ultimately reduce their options." The opportunities for students to share their views in a public forum enhances the understandings of the class as a whole and serves to extend the dialogue beyond the privacy of student essays and teacher responses.

Field placement experiences occur in public schools that have been identified as exemplary users of technology. The pre-service teachers are encouraged to think of themselves as active participants who may be called upon to share their knowledge. They were often impressed by what they saw, "It's amazing to think that grade five and six students were producing this work!" while others were positively reinforced by the teaching experience, "They asked lots of questions that I knew the answers to and that made me feel important." Coming to an understanding of theoretical views and then experiencing the practical realities of the public school classrooms serves as vital information and experience for the final stage of the course which is the design of a web-based instructional learning package.

Conclusion

This course model focuses on helping pre-service teachers think about how they learn and how they can improve learning as well as how they can learn from one another. The course tasks have a *real* educational purpose and are not usually done for the sake of completing an assignment. Students construct activities or representations of their understanding; particularly in their electronic course web pages, which reflect their experiences and thought developments as well as a finished product. The course design supports a constructivist model of instruction, which creates an environment that has learners construct understandings of the use of technology in public education.

Revising an educational computing course to meet the National Educational Technology Standards: A process of reflective teaching.

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Abstract: In our attempt to address National Educational Technology Standards (NETS) set forth by the International Society for Technology in Education (ISTE), we have faced issues impacting the conditions of learning experienced by our students. As reflective practitioners, we have revisited the curriculum to make improvements based on our experiences and our students' experiences in the required educational computing course in our college of education. Our reflections have included conversations about the scope and sequence of the curriculum, pedagogical knowledge, instructional strategies, and procedures for assessment. This paper will highlight key points of our discussions and describe interventions and their resulting consequences for our preservice teachers.

Introduction

Teacher preparation is a key factor to consider when determining beginning teachers' use of technology for instructional purposes. Most colleges of education offer a required educational computing course for all preservice teachers. This introductory course generally covers basic skills and computer operations, and attempts to provide students with familiarity with a range of technological applications such as word processing, databases, spreadsheets, telecommunications, multimedia/hypermedia and content related software. Until appropriate uses of technology are fully integrated throughout the entire teacher preparation program, a separate instructional technology course will continue to be a necessary core requirement.

At the College of Education at the University of Tennessee (UT), *ITCE 486: Introduction to Instructional Computing* fulfills this basic computer requirement for all teacher education students. Admission to the teacher education program is the only requirement, although this has not been strictly enforced in past semesters. Eighty students enrolled in one of six sections during the Fall '00 semester. Three Instructional Technology (IT) faculty members taught four of the sections while the remaining sections were taught by graduate teaching associates. While two of the IT faculty members were beginning their first semester at UT, both had previously taught similar courses at other universities.

Dewey's contributions to reflective teaching have provided an avenue for thinking about and discussing revisions to create a positive impact on students' learning about and with technology. According to Dewey, "the process of reflection for teachers begins when they experience a difficulty, troublesome event, or experience that cannot be immediately resolved" (Zeichner & Liston, 1996). Throughout the course of the semester, while we experienced success stories in various sections, we also faced numerous challenges encouraging us to engage in this process of reflection. We (course instructors) met on a regular basis during the semester to discuss issues, concerns, instructional strategies, and plans for future improvements. These conversations enhanced understanding of how the history and purpose of the course had an impact on the current situation. Using information gathered from the overall situation, reflective practitioners construct the problem and use their knowledge of experiences to make changes grounded in a contextual understanding of the problem. Our attempts to act as reflective practitioners and were carried beyond formal meetings as we continued to discuss course related issues and the larger role of technology in the College of Education in numerous informal meetings throughout the semester.

Using this framework as a guide, we have reflected on our experiences and the experiences of our students with an educational computing course, and revisited the curriculum to make improvements based on what we have learned. Our reflections have included conversations about the scope and sequence of the curriculum, pedagogical knowledge, instructional strategies, and procedures for assessment.

Areas for Consideration

Scope and Sequence of the Curriculum

One of our major course changes focused on aligning our course goals to the National Educational Technology Standards (NETS). The International Society for Technology in Education (ISTE) NETS for Teachers Project has put together a series of Performance Profiles for teacher preparation, describing what teachers should know about and be able to do with technology. The Performance Profiles address four phases that a typical teacher education student might experience: General Preparation, Professional Preparation, Student Teaching/Internship, and First-Year Teaching (ISTE, 2000). Based on our class composition, we focused on the profile targeting the professional preparation experience. To further support our emphasis on these standards, we adopted a resource book from the NETS project[1] which provided students with examples and lessons based on the standards.

Our biggest challenge in this area was the sheer number of topics we felt compelled to introduce, given the fact that this course served as the only exposure to instructional technology for the majority of students. The curriculum included topics from a variety of general areas including word processing, databases, spreadsheets, telecommunications, multimedia/hypermedia and content related software. At the beginning of the semester, course instructors agreed on basic areas, but depth of coverage, timing of topics, and required assignments varied from section to section. While consistency in major course topics was necessary, we maintained the need for flexibility in implementation. This provided instructors with opportunities to target instruction based on their teaching styles and the needs of their unique sections. For example, although all sections were to learn to create instructional Web pages, one section might have created WebQuests while another section might have been asked to create online portfolios. The differences in skills and assignments were enough to warrant a lengthy discussion about the need for greater consistency within topics. We wanted to bring about some level of consistency and accountability among sections so that *all* students learn a common body of knowledge regardless of the section in which they are enrolled. Dividing up core topics, each instructor compiled a list of basic and advanced competencies that were modified by the group until consensus was reached. These competencies will be included in future student course packets. With this in place, other courses in the teacher preparation program can build on the foundation this course provides.

Pedagogical Knowledge

Most of the course instructors shared the philosophy that technology should not be taught in isolation, but should be tied into the curriculum. Since the majority of our students were just entering the teacher preparation program and had not taken any methods courses, they were unfamiliar with the profession of teaching aside from their own personal experiences from their perspective as a student in a K-12 classroom. As a group, we made a decision to introduce them to the state content standards—the Tennessee Curriculum Frameworks—and the national educational technology standards. We also felt it necessary to introduce the components of a basic lesson plan so students could begin to make connections in planning and designing an instructionally sound, technology-rich lesson or series of lessons. We sacrificed the time consumed by these activities that would otherwise have been spent on regular course topics, but we felt it provided students with a critical foundation to help them focus on technology as a tool to support teaching and learning in a K-12 classroom. Students were expected to connect the competencies they were learning to a curricular area and grade level of their choice.

Students' lack of pedagogical knowledge at this point of their program was evident in the initial lessons produced. Many struggled with trying to learn a new technology skill as well as address issues such as assessment,

[1] National Educational Technology Standards for Students: Connecting Curriculum and Technology. Published by the International Society for Technology in Education, 2000

lesson planning, unit organization, and creating developmentally appropriate classroom activities. Midway into the semester, a faculty member created a structured, yet simplified electronic lesson plan for students to use as an initial template. This provided an important level of scaffolding as it helped students focus on the basic components of a lesson plan and articulate their thoughts in an organized and concise manner. We plan to provide students with this electronic template at the beginning of the semester along with examples of clearly written lesson plans that include meaningful uses of technology. Due to the time constraints, we have found it necessary to reduce the number of formal lesson plans needed for each technology competency area so students can concentrate on the quality and not the quantity of their written assignments.

Instructional Strategies

The strong emphasis on curriculum connections created special challenges in finding examples that were relevant to students within each section. Overall, 43% of the students were majoring in elementary education, 29% in secondary education (history, english, math, science, foreign language, agricultural education), 10% in special education, 10% in music education, and the remaining 8% came from deaf education, early childhood, and recreation studies). Each section was comprised of students from different areas, making it difficult to find examples of content-based technology applications relevant to all students. Similarly, all students used the same software, regardless of whether or not it was most appropriate for their grade level or subject are. For example, Kid Pix would have been a better choice for demonstrating how one might use slideshows with very young children, yet PowerPoint was selected as we felt that this tool would be relevant to the majority of the students. While our course packet consisted of practical articles that described uses of technology, it would have been costly to include examples representative of every grade level and content area. To address this need, we plan to build an organized resource file from which individual instructors can pull out articles based on specific student interests in addition to linking to online lesson databases or activities. These resources will provide students with opportunities to examine models in order to get ideas for adapting existing activities or developing their own ideas.

Archives of student projects provide another rich source for learning about applying technology to achieve sound instructional objectives. Students' course packets include an authorization form they can voluntarily complete if they would like course instructors to share their work with a wider audience. We feel that student examples provide a realistic picture of what others, who share similar experiences, are able to accomplish. By showing a variety of well-executed projects created by novice to advanced users, students get a sense of what can be done without feeling overwhelmed by perceptions of unrealistic expectations. By combining and organizing student projects among sections, we plan to build a growing archive containing projects and lesson plans demonstrating technology applications across a wide range of areas.

Another major area for improvement focuses on *modeling* instructional strategies that effective teachers themselves may use in a classroom. While the basic format of each class consists of direct instruction, demonstrations and hands-on lab time for project development, we feel that various models of teaching need to be implemented and articulated so that students begin to recognize, understand, and therefore use these strategies in their own classrooms. For example, instead of lecturing about Copyright and Fair Use Guidelines, we can embed case scenarios for analysis by small groups, thereby modeling the use of teaching cases and the need to make connections to real world events. Time, once again, hinders our ambition to accomplish everything in one class, but much can be done to change the manner in which we model effective and varied teaching strategies with our students.

Procedures for Assessment

The fourth standard in the NETS document addresses the ability for teachers to "apply technology to facilitate a variety of effective assessment and evaluation strategies" (ISTE, 2000). Since many students were just beginning their teacher preparation program, they had not taken any assessment classes. As a result, many were unfamiliar with this area and struggled to identify appropriate assessment strategies. In many cases, preservice teachers were asked to create samples of K-12 student products as an example of how their students might demonstrate knowledge about a subject. The projects had to tie in to instructional objectives as specified in their lesson plans. As a result of this project-based approach, we introduced the notion of using rubrics as a performance-based assessment to our students.

We modeled the use of rubrics by assessing most of our students' projects with various rubrics that we had designed. In the beginning, different section instructors created their own rubrics. This became a topic of discussion among the course instructors and an important decision was made to use a standards set of rubrics. One point of discussion about the initial rubric was the concern that students might have a tendency to use the guide as a checklist for quality. If the rubric was too vague though, then students might not apply all of the necessary project elements. If the rubric was too specific, however, we realized that students might be fulfill all of the individual areas, yet not achieve a quality project as a whole. Eventually, we found a way to combine elements of both the checklist and the holistic evaluation, allowing us to evaluate the entire project in a way that allowed us flexibility and provided students with adequate feedback about specific parts of the project that were well done or that needed improvement.

We are aware of the "law of the hammer" and are wary that students may use rubrics as an assessment tool for all tasks without considering alternatives that may be more appropriate. One of our goals for the future is to embed various types of assessment options at different points throughout the semester so students develop an awareness for connecting a task to an appropriate assessment strategy.

Currently, we require students to complete a paper-based technology portfolio of instructional applications of educational technologies based on the competencies completed as part of the course. An important part of the portfolio process is to document the development of skills and knowledge through a process of self-reflection. We are considering the possibility of offering an option to develop an online electronic portfolio and we are currently piloting this activity in one section to evaluate the feasibility of this option for the wider group.

Conclusions

While the separate introductory course model for preservice teachers is widespread, numerous problems are inherent with the structure of this type of course, especially when it serves as the only exposure to the use of technology as a learning and teaching tool in a teacher preparation program. Oftentimes, more than a year might pass between the introductory course offering and a student's field placement. Unless preservice teachers have a reason to use and practice technology related skills throughout their program, many will not feel comfortable using technology in their classrooms. Teacher education students have a better chance to achieve the National Educational Technology Standards if effective uses of technology are implemented and expected to be demonstrated throughout all phases of a teacher education program.

The possibilities are encouraging. One student, who concurrently enrolled in the introductory course during his internship year, reported that he was applying what he was learning and using the projects he developed in his middle school classroom placement. While he reported that it was not the ideal time for such an experience as he struggled to learn new technologies, complete class projects, and teach, his experiences demonstrate that timing and exposure are essential considerations. We believe that the introductory course can serve to provide a solid foundation addressing the National Educational Technology Standards, but these efforts will need to be supported by a collaborative and integrated teacher education program.

References

Zeichner, K.M. and Liston, D.P, (1996). *Reflective Teaching: An Introduction.* N.J.: Lawrence Erlbaum Associates, Publishers.

International Society for Technology in Education. (2000). NETS for Teachers Project. Eugene, OR. Retrieved November 1, 2000, from the World Wide Web: http://cnets.iste.org/index3.html

ENHANCING EDUCATORS' COMPUTER LEARNING WITH THE EMERGING TECHNOLOGY

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Abstract:
With the emerging technology highlighting hypermedia and the Internet, educators are finding ways to modify the traditional ways of teaching and learning. The need of infusing the Web in education is evident in two surveys of our college students and faculty members as well as a result of a national survey of teachers. To fully maximize the power of the Web to enhance instruction, this paper presents a working model detailing related issues and experiences in a few computer courses, based on a three-level Delta learning theory, containing: (a) technology used as originally intended; (b) technology applied in new ways; and (c) technology as a necessary component of any application. This paper also discusses the various ways in which technology can contribute to better instruction, inspiring students to learn through working cooperatively and collaboratively.

Introduction

Currently, the emerging computer technology which includes hypermedia and the Internet, is drastically changing education. Hypermedia is the combination of both hypertext and multimedia which have a great potential to offer education (e.g., Boyle, 1997; Bagui, 1998; Stoney & Oliver, 1998). Abstract concepts may be presented with concrete examples. The hypertext-based, multimedia applications, or the so-called hypermedia applications, can be made highly interactive in the formats of tutorial, drills and practice, simulations, and entertainment games. Students can explore the hypermedia-based virtual reality as presented in the multimedia software and learn to take control over their own learning and construct new knowledge through such exploratory experiences. High quality course contents may be organized, developed, and disseminated in cost-effective manner for either formal instruction, distance learning, or remedial training purposes..

Hypermedia and the Internet have become an indispensable means to realize such a mission. Hypermedia-based applications can provide a highly interactive learning environment where students build up their own knowledge. With exciting audio and visual elements in the programs, students can master abstract concepts with concrete examples and illustrations. The introduction of the Web has resulted in teaching methods, and teaching and learning styles being changed from the traditional lecture-discussion modality to that of the student-centered learning (Roblyer, Edwards, & Harviluk, 1997). The teachers' and professors' role has also been changed from that of a traditional figure, dispensing knowledge and information to that of a facilitator of learning. As the popularity of the Web increases, so does the number of potential uses in higher education. With both faculty and students, the Web is becoming a very significant component in education at all levels. As Powell (1998) pointed out, the Internet can support lifelong learning because its usefulness does not terminate with graduation.

By its nature of inter-connectivity and huge amount of resources, the Internet and the Web can promote research. Pan (1999) indicated that technology-based research has a great potential to improve the quality of teachers' performance and suggested that higher education teacher preparation programs should engage preservice and inservice teachers in action research with the new technology. Ackermann and Hartman (1998) indicated that the Web has profound effects on the way we find information and conduct research. Using the Web for better education has become an ultimate mission and for this reason, a Web-enhanced instructional model is highlighted in this paper.

Technology, especially the Web-based application with the advantage of hypermedia and the Internet, is not just for science and business anymore; it is for our everyday life. The Web has, in reality, become a new fashion in education. With widely available resources, students, teachers, and college professors are learning how to use it and explore ways to maximize the learning outcome with the Web-based activities. Technology integration is deemed as an ultimate goal in most education reform plans. Morton (1996) suggested that technology should be integrated when it is used in a seamless manner to support and extend curriculum objectives and to engage student in meaningful learning.

The Reality of Computer Use in Education

To address the needs of school computer use and to prepare new teachers to know how to integrate computers in their work, it is important to know the reality of how computers are being used at various levels. In a recent survey of all the faculty members in the School of Education at our institution, the results showed that most of those who responded to the survey were aware of the importance of the emerging computer technology in education and they were interested in integrating computers in their curricula. These respondents also indicated that the computer lab resources were inadequate for their instructional needs that are very high. Also, more and easier access from anywhere and anytime was requested. Hypermedia-enhanced materials and the Web has definitely become the more desirable resource to meet their instructional needs.

In another survey of 60 preservice teachers in the School of Education, the results showed that 90% of these teachers had easy access to a computer and the Internet. Nearly everyone, 97%, has used one of the word processing programs to prepare written documents, knew how to send e-mail messages, and had some experience using the Web to surf or to search for resources. However, even if they used the Internet and the Web everyday, most did not know how to find material that is relevant to the lesson they are teaching or how to use the materials wisely for instruction or administrative tasks. These students expressed their interest in learning how to integrate the Web into teaching and to engage their future students in tasks that will help them master the content and further their accomplishments. Currently, many studies and reports show that the utilization of the Web has become a major force in teacher preparation programs. (Robin & Miller, 1998; Ivers & Barron, 1998).

In the schools, teachers are adopting the Web for their instruction and finding it an essential tool. In the Education Week's 1999 National Survey of Teachers' Use of Digital Content (Fatemi, 1999), the results showed that 9% of teachers surveyed use Web sites as their primary resources for instruction; 88% use it as a supplementary resource; and 3% use it as a "quiet time" or "bonus time" activities for students. These studies indicate that the use of the Web for instruction is expected to grow continuously in the near future. Likewise, the hypermedia-enhanced applications, very often the equivalent component to the Web, have gained significant importance in education.

The Potential of the Emerging Technology for Better Teaching and Learning

- It presents a new way of learning via inquiry and exploration. Students with all sorts of learning styles can benefit from using it. It promotes student-centered learning activities in which students take control of their own learning and build their own skills and knowledge with meaningful processes and tasks.
- It offers a new partnership between teachers and students in exploring the learning tasks together.
- It provides access to a vast volume of information anywhere and at anytime it may become available.
- It help teachers as well as students to stay current with the newest resources.

- Communication all over the world has made possible learning from people with different cultural backgrounds.
- It allows and encourages cooperation and collaboration between students.
- It makes available hyper links, a major part of the Web, so those teachers may easily direct their students to explore and learn.

Concerns and Issues

The following issues are the primary concerns when developing an effective model for teaching and learning with the emerging technology.

- How much should they learn?
- How can we help students get started and engage them in dynamic learning?
- What should we do to maximize the power of the Web and hypermedia for instruction?

Although the emerging technology provides a great potential for education, it contains many critical issues concerning its usefulness and effectiveness for education. Zehr (1999) indicated that educators have a lot of digital content to choose from, but not all is worth using in the classroom. Simply having students use the Web or hypermedia-based applications for resources does not guarantee successful learning. How to motivate students and how to guide them to explore the huge realm of resources and make sense out of the information becomes a more critical task.

There are a few misconceptions and inadequate practices in using emerging computer technology in education. Often, students are spending too much time on technical aspects of learning about computers, instead of concentrating on the content. Technology should be a tool to enhance learning, not its goal. Sometimes, we find that some students try to learn about computer tasks by memorizing facts and non-essential information in order to pass a quiz. In fact, the most important aspect of learning with and about computers is to learn how to learn in order that they will be able to adapt in the future as new technologies emerge.

Throughout many years of experience, we found that the best way to integrate computers into curriculum is to support learning with relevant materials and to engage students in active hands-on experience. We also found that students tend to accomplish more when they are inspired to pursue their self-defined learning goals and when they are supported by each other through working or connecting with real people and real projects.

To make a profound impact on education with computer technology, a Web-enhanced instructional model was developed based on Schwartz and Beichner's (1999) Delta Principle, which contains three levels: (a) technology used as originally intended; (b) technology applied in new ways; and (c) technology as a necessary component of any application. The Delta principle actually advocates an implementing approach, with which technology will become an integral part of education, and both teachers and students will unconsciously depend on the power and convenience that technology can provide. Teachers especially will find great value in technology and consequently change their way of working.

This model was implemented in several computer courses, including Computer Literacy, Computer Applications for Educators, and Computer Applications for Administrators. These courses have the potential to play a more significant role in our teacher education program. These courses can also provide an authentic context for both preservice and inservice educators to examine instructional practice and reflect on their learning as they acquire new skills and content. Course activities are designed with a scenario, and within this scenario, teachers will utilize the given technology in an exemplary manner, thus providing a positive model for their students and other teachers. The characteristics of this model include the following features.

- A new partnership between faculty and students
- Setting up a learning goal.

- Conducting a meaningful study based on individual experiences and goals.
- Presenting and contributing to the entire group learning accomplishment.
- A new student-leadership through collaboration and cooperation

In this model, students started developing basic experiences with the Web as in a Delta Level I and II where they developed good strategies of searching and using the Web. They then gradually developed concerns about how to bring this technology into their work and teaching in helpful ways. With increased communication among themselves, they relied upon the Web even more than before and used the Web as an essential part of their work.

Prior to taking the courses, most students had limited computer experience. Additional experience that stresses Internet related applications can assist them in the mastering of the skills necessary to meet the challenges of a Web-enhanced learning environment. After learning the required general applications, students were asked to apply their knowledge and skills to some integrative tasks. Appropriate examples might be a written report on information found on the Web, creating a desktop publishing document or generating an on-line presentation.

Students started the course with a great diversity in terms of their computer backgrounds, personal experiences, and individual interests. It is impossible to provide one definite course outline to meet the needs of every one. Therefore, an innovative approach is offered to provide a comprehensive and flexible course outline to address individual students' needs. As shown in Table 1, both the general computer literacy skills and the Web-enhanced learning tasks were emphasized simultaneously to go along with the three levels of the Delta principals. This approach engages everyone in the class in activities that they will be able to grow with and to better contribute to the dynamic learning experience. Access and platform preferences are also a vital issue that affects their learning. Students tend to accomplish more if they can have easy access to computers and preferably if they can do work on a computer platform that's compatible with those used in the class. The Web can help with all of these issues.

Students are taking full advantage of the Internet for their own studies. They find resources, seek answers, and develop connections and communication with others. They are amazed by the rapidity of answers to questions. They are also encouraged by other students contributing to their learning through sharing a great variety of resources, ideas, and experiences. They particularly recognized the role of the Internet in the formulation of new learning strategies and practices. The most evident result was enhanced student collaboration and the interpersonal exchange of knowledge.

Computer Literacy Skills	Technology-enhanced Learning Tasks
• Students build their computer skills with various tasks. • Students extend their applications in both Delta Level I and level II. • Students adopt computers as an essential part of their work and learning. This is equivalent to the Level III tasks.	• Student projects. • Cooperative learning and collaboration. • Contribution to the class via presentations and sharing. • Students develop the Web-based activities as the further applications to realize the Level III tasks.

Table 1: Technology-enhanced learning skills and computer literacy tasks

Courses based upon this model also entail the following exercises:

- Students reflect their own learning process as enhanced by the Web.
- Students can associate teaching and learning practice with learning theories.
- Students are engaged in serious research efforts.
- Students learn from each other by critiquing and discussing the teaching and learning-based experience.
- Students make adequate and reasonable modifications about their learning goals or administrative plans for implementation or reform.

- Students can acquire authentic experience by working with real people for projects or conducting interviews with the personnel in the school.

Educational Implications of the Web

The Web which best represents the emerging technology has made a tremendous impact on today's education on several counts.

Firstly, the Web presents information in the hypermedia format using the combination of the hypertext and multimedia. The hypertext allows the information being accessed through a non-linear sequence so that users may click a button or a hot word to go to a different page/screen on a computer or can retrieve a piece of information or an image. The multimedia can enhance the information display dynamically with sounds, graphics, animation, audio clips, and video clips.

Secondly, the Web can reach students far and near. With an access to the Internet from home or work, students can easily gather information and resources and participate in discussion and communications. In the past, our student had to go to libraries to check out information or had to visit the campus computer lab to work on specific assignments. Presently, they can get on-line from home and conduct even more sophisticated projects than ever.

Thirdly, the Web provides a wide array of information and topics to suit individual needs. The Web allows a great variety of activities where students can browse, search, research, ask and discuss questions or issues, and contribute to the building of new information via Web page construction.

Lastly, the Web promotes communication between people. Students tend to learn more from each other or from real people in the field through cooperation and collaboration.

Examples of Assignments and Exercises

- To identify and discuss how computer technology and the Internet affects the culture of the school and the relationships among administrators, teachers, students and parents.
- To list and describe some of the many programs located on the Internet that are available and valuable to administrators, teachers and students.
- After learning how to develop Web pages, databases and spreadsheets through available tutorials on the Web, develop real or hypothetical applications that could increase financial support and improve teaching and learning in a school or school district.
- Interview school administrators, teachers and other appropriate individuals and determine the criteria, process and the rationale used in the school or district to select computer hardware and software, to initiate a staff development and support program
- Develop a power point presentation such as "Harnessing the Power of the Internet" and present the same to classes and/or other appropriate groups.
- Develop a **"School Internet Use Policy"** based upon legal and ethical principles, as well as the wealth of experience gained in the recent past.
- Explore how electronic communication and collaboration with other individuals, groups and institutions such as libraries, museums and schools can result in sharing knowledge, skills, values and cultures.

Minimize the Obstacles and Maximize the Learning Outcomes

- Differentiate surfing from searching and researching. Students may start with some Web surfing and experience. They should be encouraged to conduct more significant research tasks and develop powerful search skills using electronic tools.
- Increase efficiency with proper management of time and stay focused with the intended topics.
- To avoid being overwhelmed by too much irrelevant information, help students develop strategies to screen information. For security purposes, teachers should go through most of the possible Web sites before they send students to do it.
- Address important issues, such as ethics, copyright, and plagiarism.
- Maximizing the Web by making the Web more interactive by adding components such as Web-based discussion, e-mailing, and so on.
- When creating on-line publication on the Web, keep users in mind. Avoid loading too many big graphics or multimedia elements.

Summary

The emerging technology has provided a tremendous potential to enhance instruction. In order to integrate hypermedia-enhanced applications and the Web technology into instruction, an instructional model was developed. When implementing this model in various computer courses, students improved their computer literacy skills while they learn how to maximize the power of hypermedia and the Web for better instructional needs. This model can be characterized by various elements, including self-defined goals, hands-on computer experiences, real-world projects, and sharing through cooperation and collaboration. As indicated in the Delta principles, students made progress as they gradually acquired their computers skills and contributed to the Web-based information development. They learned strategies through the completion of various projects and eventually used the computer and the Web as an essential part of their life.

References

Ackermann, E., & Hartman, K. (1998). *Searching and Researching on the Internet and the World Wide Web.* Wilsonville, OR: Franklin, Beedle & Associates.

Bagui, S. (1998). Reasons for increased learning in multimedia. Journal of Educational Multimedia and Hypermedia, 7(1), 3-18.

Boyle, T. (1997). Design for Multimedia Learning. Englewood Cliffs, NJ: Prentice Hall.

Fatemi, E. (September 23, 1999). Building the digital curriculum. *Education Week*, 5-8.

Ivers, K. S., & Barron, A. E. (1998). Using paired learning conditions with computer-based instruction to teach preservice teachers about telecommunications. *Technology and Teacher Education, 6*(2/3), 183-191.

Morton, C. (1996). The modern land of Laputa. *Phi Delta Kappan, 77*(6), 416-419.

Pan, A. (1999). Using technology to promote teacher action research. *Computers in the School, 15*(3/4), 81-99.

Powell, C. C. (1998). *A Student's Guide to the Internet.* Upper Saddle River, NJ: Prentice Hall.

Robin, B., & Miller, R. (1998). Developing and electronic infrastructure to support multimedia telecomputing resources. *Technology and Teacher Education, 6*(2/3), 151-167.

Roblyer, M. D., Edwards, J., & Harviluk, M. A. (1997). *Integrating Educational Technology into Teaching*. Upper Saddle River, NJ: Prentice Hall.

Schwartz, J.E., & Beichner, R. J. (1999). *Essentials of Educational Technology*. Needham Heights, MA: Allyn & Bacon.

Stoney, S., & Oliver, R. (1998). Interactive multimedia for adult learners: Can learning be fun? Journal of Interactive Learning Resaerch 9(1), 55-81.

Zehr, M. A. (September 23, 1999). Screen for the best. *Education Week*, 13-22.

A Collaborative Course Portfolio: The Core Curriculum of a Core Course

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Abstract: Core courses are those which are deemed to be essential to a major, whether in Teacher Education, History or English. Typically there are several sections of core courses, not all taught by the same persons. How do we engage faculty in the process of ensuring equality across faculty and sections of core courses? Indeed, how do we ensure equality across sections of core courses? This paper presents a model to ensure coherence and continuity across sections of a core course on the infusion of technology in education through a case study of one technology course at one large urban university.

Core courses are essential to any major. Typically there are many sections taught by many people, including full time faculty, graduate assistants, and adjunct faculty. With the diversity of people teaching these courses, how do we ensure equity across sections? Clearly teaching styles vary across faculty, but core courses are by nature intended to teach basic knowledge for the discipline, upon which higher level courses expand. This means that core courses cannot vary in basic information taught or learned, but must have common basic outcomes across sections. However, how do we ensure this?

This paper presents a case study of an ongoing project for faculty teaching a newly revised core course on technology in education. A teaching circle was formed where faculty discuss, collaborate and compare across sections, with the end product to be a Collaborative Course Portfolio. The faculty participating in this teaching circle include 3 full time faculty, 4 adjunct faculty, and 1 graduate student, out of the total of 11 faculty teaching the course during the fall 2000 semester. The other 3 instructors were unable to participate due to work schedules. This process will continue during the spring 2001 semester, with a core of 2 full time and 3 adjunct participating. While it would be nice to have continuity in all faculty teaching core courses, scheduling does not always permit this outcome.

This group met bi-weekly since mid-August 2000 to discuss issues of lesson sequencing, selecting a textbook that better fits the revised curriculum, and assuring each section meets the four themes of the undergraduate teacher education curriculum. These four themes are: inclusion and diversity of students, authenticity of learning experiences, reflective learning, and infusion of technology. Clearly, this course addresses the last theme by virtue of the nature of the course itself; however, the other three themes are not as easy to ensure. To help in keeping track of the activities of the teaching circle, a graduate assistant took notes and began the process of developing the collaborative course portfolio.

It should be pointed out that the teaching circle developed this year is the outcome of two processes. During the 1999-2000 academic year, four of the eight teaching circle faculty met bi-weekly to develop a mutually acceptable set of core course guidelines, which provided a common set of learning objectives and student projects for all sections of the course. This group collaboration provided the foundation for the discussions this year. Secondly, this author applied for and was awarded a Carnegie Scholarship, which focuses on the process of developing the teaching circle, expanding that circle to include faculty who teach specific subject matter, and developing an overall course portfolio to chronicle the collaborative efforts of the group and provide guidance to faculty who teach this course in the future.

One challenge to the teaching circle has been to avoid focusing on technical issues rather than on substantive issues of the course. Given the fact that we teach a course that is about technology, it is quite easy to discuss the technology issues (e.g., problems with lab equipment, student problems with equipment, scheduling) rather share experiences and materials. This group has on occasion fallen into this trap, but the group facilitator has managed to bring the discussion back to issues of substance for the course by relating the technology issues back to the course. Students can learn from technology glitches they may face in their own classrooms, and how we as faculty handle these problems within the course.

In addition to the faculty who teach the technology course, faculty who teach specific subjects that education majors take were invited to participate in the teaching circle. The reason for this expansion of the teaching circle is that the technology course is a core course; therefore, the teaching methods courses should expand upon what is taught and learned. However, if the teaching methods faculty are unaware of what is taught and learned in the technology course, how can they make use of the skills and knowledge in their courses? Likewise, if the faculty who teach the technology course are unaware of technology skills required in the teaching methods courses, they cannot ensure the students are prepared appropriately. Hence, the discussions have begun with someone from Math Education and Social Studies Education. This discussion has been quite fruitful for many reasons. One example is that the revised course focuses on infusing technology into teaching through lesson plans, not merely learning how to use educational software. This is not the course responsible for teaching students how to write lesson plans, but it should not contradict those courses that do. In sharing course outcomes and materials with the faculty member from Math Education, we discovered we were indeed supporting the process taught through their courses. At the same time, the faculty in Math Education discovered that the students are expected to write lesson plans in the technology course specifically focusing on the infusion of technology into the teaching and learning enterprise, rather than on specific knowledge.

The Collaborative Course Portfolio follows one model discussed by Lee Shulman (1998). This model is one of chronicling the process of the course teaching circle, with an analysis of the outcome after the end of the semester. The analysis is a reflective analysis looking back at the discussion and contribution by members of the teaching circle. This information will be shared back to the group the next semester to help determine the direction of discussion. The course portfolio will be available through this author's web site: http://nimbus.temple.edu/~schifter

How can this process be applied to other subject areas or disciplines? The concept would be the same in developing a teaching circle. Getting core faculty to get together on a regular basis to discuss substantive issues common to their courses begins the processes. Chronicling these discussions so they provide guidance to future teachers of the core course is key to making these discussions truly fruitful. The course portfolio provides an opportunity to discuss publicly the similarities and differences across and between sections, and to invite comment and critique from colleagues. The collaborative course portfolio contributes to knowledge about engaging faculty in new teaching practices that highlight the scholarship of teaching and collaboration of colleagues.

References:

Mennis, B. (1999). 1999 conference for chairs' sessions examines faculty evaluation. *For the Chair: A Newsletter of the American Political Science Association*. 13:1-3.

Shulman, L.S. (1998). Course anatomy: The disection and analysis of knowledge through teaching. In Hutchings, P. (1998). *The Course Portfolio: How Faculty Can Examine Their Teaching to Advance practice and Improve Student Learning*. Washington: AAHE.

EDUCATIONAL LEADERSHIP

Section Editor:
John R. Tollett, *Northwestern State University of Louisiana*

Twenty-four articles in this section are summarized according to the following topics: (a) Utilizing Technology for Curriculum Management, (b) Utilizing Technology Resources for Leadership Development, and (c) Research and Recommendations for Improving the Utilization of Technology. Summaries are provided in alphabetical order within each topic.

Utilizing Technology for Curriculum Management section focuses on efforts of school districts to incorporate technology in tracking accountability progress. These selections would be excellent articles for K-12 curriculum coordinators and administrators as they consider efforts to improve instruction and assessment.

Anderson and Anderson, National Louis University, provide a chronology of transferring a school district's paper-based curriculum notebook to electronic form. Filemaker Pro database was utilized to manage the curriculum, assessment procedures, and reporting systems. Descriptions of other software are provided to assist teachers with lesson planning and grading.

Cafolle and Schoon, Florida Atlantic University, assisted Palm Beach County, Florida, with the implementation of the Instructional Management System to align the state's required standards to the curriculum, instruction, and assessment. The IMS Series provides teachers with data to measure the students' progress towards achieving state benchmarks and standards.

Cassidy, Adelphi University, questions administrative control over the use of technology by teachers. Effective leadership requires principals to have additional responsibilities as they make decisions in the use of school computers. Pitfalls and recommendations are provided by the author.

Floyd, Moore, Bailey, and Reed provide an interesting blend of perspectives from the state, district, university and corporate worlds in the use of technology to meet accountability requirements. South Dakota provided the technology infrastructure to districts, mandated accountability standards, and provided 2-way audio-video systems to deliver certain subjects on-line. Meanwhile, districts outlined steps in their initiatives to provide electronic tools to aid in curricular planning and student assessment. Ball State University prepares its education majors to use the state adopted software prior to graduation. The corporate perspective encourages teachers, schools, and districts to solicit private funding to implement technology rich accountability software.

Lang promotes software agents as the next evolution following the infosphere of internet, intranet, and the world wide web. Specifically, Lang asserts that the thoughtful application of pedagogical agents can support teachers with the application of pedagogical theory. Adele, an animated pedagogical agent developed at USC, has been used in medical education in the areas of family medicine and geriatric dentistry. This type of technology can address institutional goals using a minimum of resources.

Piper and Yan, Indiana University of Pennsylvania, presents the results of a study of 160 teachers and their use of technology in the classroom. Factor analysis was used for data reduction. Teacher behaviors for predicting the amount of computer use are presented.

Swiderski, Education Service Center Region XI, Texas, presents an innovative approach to staff development. "Move to the top of the class" is a series of on-campus and on-line mini-courses to provide technology skills to teachers. The program description, methods of interaction, methods of instruction, methods of evaluation and implementation are described.

Generally speaking, the **Utilizing Technology Resources for Leadership Development** section would be of particular interest to any higher education instructor or administrator that utilizes or wishes to use technology to improve skills of future school administrators.

Kaufman, Indiana University of Pennsylvania, directs a Principal Certification Program that utilizes individual web pages for students to document internship experiences matching the program objectives. Student experiences in six performance areas are posted on web pages and follow a common template. Web pages are accessible to other students, and provide opportunities for collaborative learning, technology competences, and cohort support.

Kim, California State University, Los Angeles, creates webfolios in the first preparation class for the prospective educational leaders. Portfolios used in this project are authentic assessments of leadership skills. The webfolios document school leader training throughout the program. Students and faculty become active partners in the teaching and learning process. Kim summarizes the results of the project and provides recommendations.

Saleh and Weber, Florida Atlantic University, report the use a variety of multimedia produced, simulation modules in their leadership training program. Developed with Authorware, content is delivered via interactive simulations in an educational organization course dealing with administrative theory.

Shoffner, Georgia State University, presents the results from an exploratory national survey on the presence of instructional technology professionals in school settings. State licensure requirements for instructional technology certification are explored with explicit licensure rules the focus of the study. Pros and cons of licensure are also provided.

Sobehart, Tomei, and Armstrong, Duquesne University, founded the Leadership Institute and Interdisciplinary Doctoral Program, to train future superintendents and other school executives. Cohorts of 30 students are admitted every three years. Each student is assigned a practitioner mentor. Systematic use of technology skills, electronic portfolios, distance learning, and electronic curricula are cornerstones of the program.

Walker, University of the West of England, UK, portrays the leadership role in higher education institutions as an "entrepreneurial activity" linked to the e-learning revolution. Lessons learned and issues still to be resolved are stated.

Waterhouse, Embry-Riddle Aeronautic University, profiles needed careers in instructional technology. Also presented are new principal duties and responsibilities to facilitate instructional technology.

The final section groups articles with a common theme of **Research and Recommendations for Improving the Utilization of Technology**. These articles would appeal to those in higher education as well K-12 education interested in the future technology initiatives.

Bork, University of California-Irvine, provides a critique of the failure of teacher inservice efforts and makes two recommendations for alternatives to inservice education.

Braswell, Auburn University-Montgomery, and Childress, Emporia State University, present findings from a study of technology use by university administrators. The perceived use and support of technology at these universities were also provided.

Carlsen, Mathies, Hawley, and Veres, Wright State University, evaluate the development of an on-line course delivered through the WebCT, WebBoard, and Tegrity while both synchronous and asynchronous methods of delivery were used. Social and cultural needs of students were considered in this development.

Chandra-Handa, Knox Grammar School, Australia, suggests a 2-level paradigm shift for leading academic change. One level is in learning and the second is in educational leadership. Learner-centered education for both students and teachers are recommended.

Gibson and McLaughlin, National Interagency Civil-Military Institute, and others provide in an interactive panel discussion addressing the needs for further development of SITE's web sites. Session goals are provided.

Gibson, Wichita State University, examines the role of administrators as instructional leaders in their integration of technology into the learning environment. The author used focus groups to collect qualitative data on the importance of administrative support in utilization of technology.

Kavanagh, University of Queensland, Australia, challenges instructors in universities using internet delivery for courses. The author describes a learning model "reflective of the needs of its learning community." The author touts flexible teaching and learning systems, shifts in university policy relative to the development and delivery of courses, and the process to bring on-line such courses.

Davis, Project Story Teller, and Engelhart and Korth, DIAL Corporation, support inquiry through the co-delivery of ideas by design teams and models the process. WebMaster Institute teams build technical skill, and other design teams combine content and technology into course modules. The program outcome is longevity and sustainability of technology.

Nelson, University of Wisconsin, focuses on the planning effort of the University of Wisconsin System to integrate technology within their teacher preparation programs. Change strategies are explained within the context of the University organization.

Szabo, University of Alberta, presents a set of guidelines to prepare educators for the Instructional Technology revolution. Recommendations are based on a review of current technological and sociological developments with an eye towards the future.

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Electronic Curriculum Development and Assessment

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Abstract: This poster demonstration by Kenosha (WI) Schools will show screen shots from a *Filemaker Pro* curriculum database representing the official academic curriculum of the district, provide samples of grade reporting formats using *Easy Grade Pro*, and demonstrate hands-on use of the programs through the use of two laptop computers. Visitors will be able to examine the formats and offer suggestions about future improvements to the system. The intent of this session is to provide K-12 schools and teacher education institutions with a look at how one public school district is developing electronic methods for developing curricula, assessing student performance, and reporting out on standards to parents and the community.

The Kenosha (WI) Unified School District has been working for the past several years to develop a paper-based curriculum notebook for use by teachers in all subject areas. These notebooks contain the standards and benchmarks that are the basis for instruction in the district, a 20, 000 student school system about 30 miles south of Milwaukee, Wisconsin. In addition, the notebooks contain lifelong learning standards, examples of exemplary units, and other supplemental information. These notebooks have now become the official curriculum guides for the district and are available in each classroom and school library for teacher, student, and parent use.

Due to recent advances in the availability of technology for all teachers, over 6,000 computers are now in use by over 1,700 teachers and 20,000 students in the district. The majority of these computers are now connected to the web through T-1 lines, enabling easy and fast access to networked programs and Internet sites. Because of this new accessibility, efforts are underway to produce electronic versions of the curriculum notebook, including assessment procedures and reporting systems to check on progress toward meeting student academic standards. This poster demonstration presents the current work on these electronic curriculum development and reporting programs.

The Kenosha Schools have contracted with the TIES company of Roseville, Minnesota to produce an electronic curriculum notebook using the *Filemaker Pro* database. While the design of the notebook is not completely finished, the potential of using such an electronic curriculum notebook is readily visible. Current plans call for producing both a web-based version of the notebook and a CD-ROM version. These two versions will allow teachers to access the database in their classrooms either on-line or without an Internet hookup. As they design lessons and units, teachers will be able to quickly search for benchmarks, activities, vocabulary words, sample assessments, and suggestions for teaching about the particular skill. The, they will be able to "drag and drop" information from the database into a lesson plan template and create their own customized plans. It is planned to include scanned pictures of required lesson materials, audio clips, and *QuickTime* movies for use by teachers in their lessons.

Figures 1 and 2 below show screenshot of a standard page and a benchmark page in the curriculum database. It should be noted that the vocabulary and content specific notes sections are still blank in this version. These fields are currently being completed by teams of district teachers.

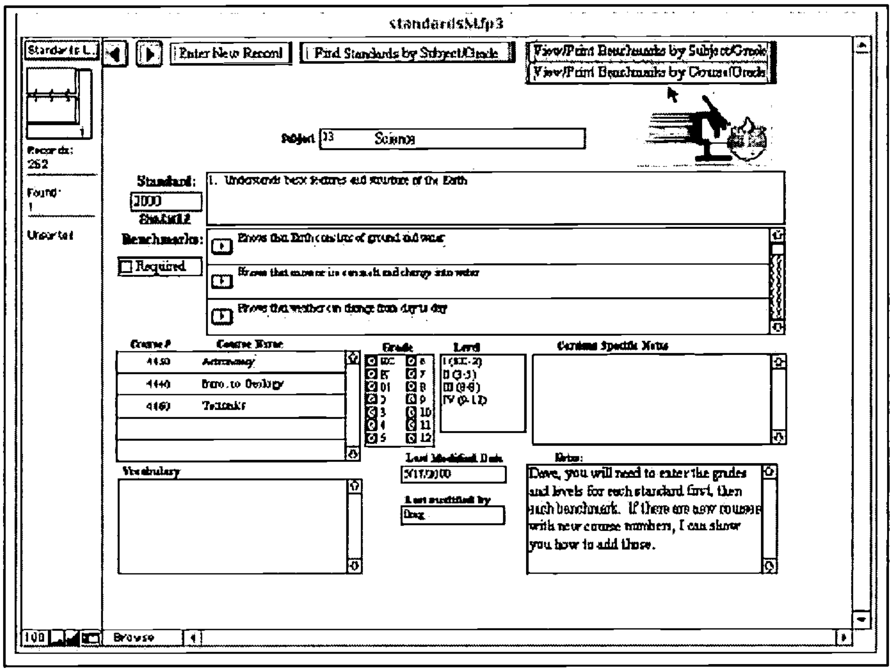


Figure 1: Screenshot of a standards page in *Filemaker Pro*

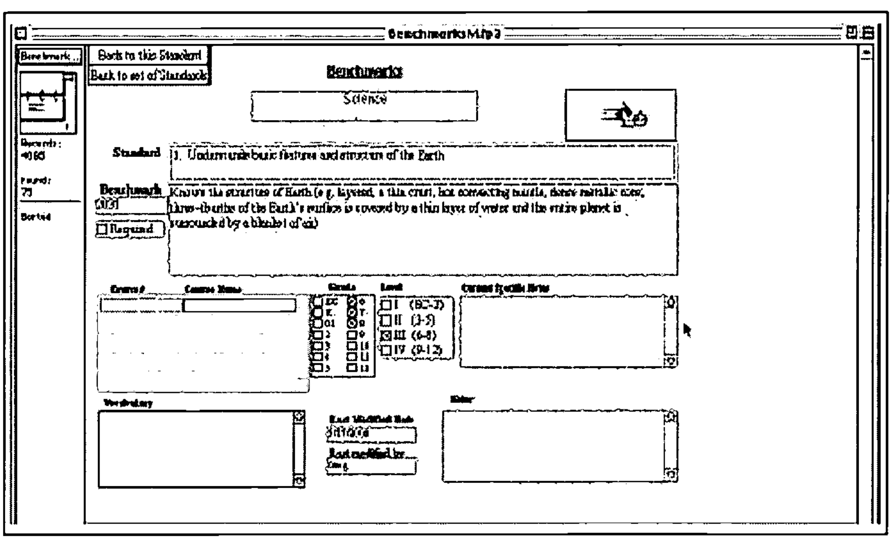


Figure 2: Screenshot of a benchmark page in *Filemaker Pro*

In order to maintain a consistent and accurate database, teachers will only be able to access and use the information without being able to make changes to the database. While entering information will be the responsibility of one or two teacher-consultants or their secretaries in the district's central office, teams of teachers will work together to develop the information about each subject standard and benchmark. In addition, changes to the database will primarily occur when a subject is due for review under the district's curriculum review cycle (Figure 3). This means that major information will be entered for all subjects during the first year, followed by revisions for individual subjects at regularly specified intervals. Plans are to make the CD-ROMs available to subject-area teachers each August with the newly updated benchmarks and materials for their areas. Due to the cost, it will still need to be determined whether to give each teacher an individual copy or to give grade level teams one copy. Teachers having Internet access at school or at home could also work with the database by downloading information and using it for lesson development.

Curriculum Evaluation and Renewal Cycle

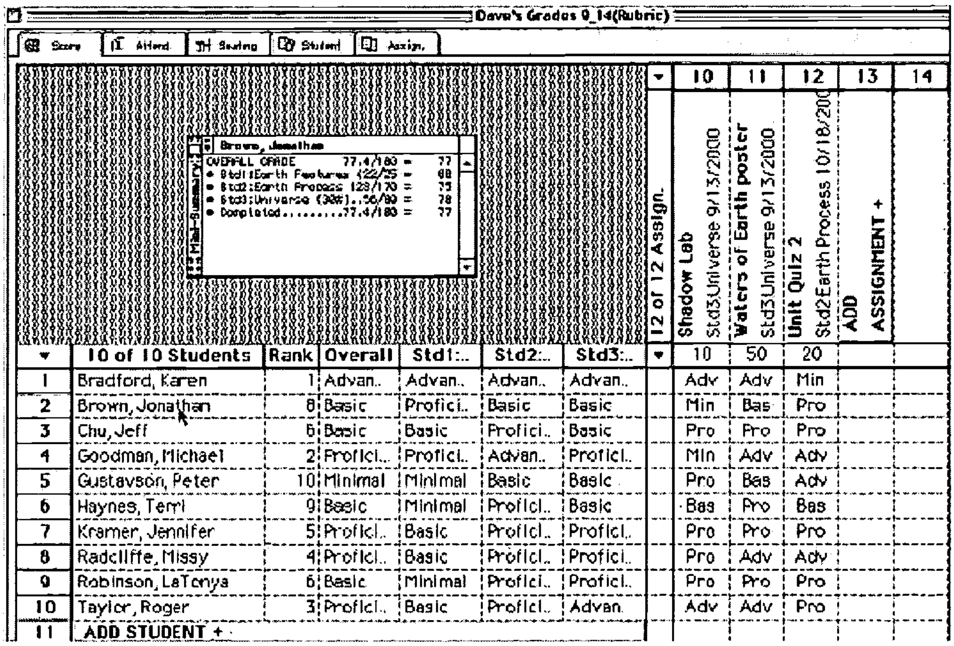
	99-00	00-01	01-02	02-03	03-04	04-05	05-06	06-07
Study and Review of Programs	Rdg/LA K-5	Soc. St. K-12	School to Career K-12	Rdg/LA 6-12 Music K-12	For.Lang. 6-12 Health K-5* Art K-12	Math K-12	Science K-12	Rdg/LA K-5
Pilot/Purchase Materials (Major Budget Year)	Science K-12 (1.0)	Rdg/LA K-5 (1.0)	Soc. St. K-12 (1.0)	School to Career K-12 (1.0)	Rdg/LA 6-12 (.75) Music K-12 (.25)	For. Lang. 6-12(.4) Health K-5*(.4) Art K-12 (.2)	Math K-12 (1.0)	Science K-12 (1.0)
Implement Program (Staff Development and Formative Assess.)								
Use and Review (Staff Development and Formative Assess.)								
Use and Review (Staff Development and Formative Assess.)								
Use and Review (Staff Development and Formative Assess.)								
Use and Review (Summative Assessment)								

Figure 3: Curriculum Development and Renewal Cycle

In conjunction with the development of the electronic curriculum is the piloting of an electronic gradebook for reporting out on student success with subject standards. The district has made the purchase of *Easy Grade Pro* for all teachers in the district based on earlier pilot studies conducted last year. Previously, some of the teaching staff had used various grading programs for doing grade reporting, but various limitations forced the district to look for a more complete reporting program. *Easy Grade Pro* appears to meet this need. Teams of subject consultants and classroom teachers have been testing the use of this grading program with the district's standards and benchmarks and have found a great deal of support from the users. Figure 4 shows a reporting screen with fictional student scores.

Easy Grade Pro allows teachers to input class lists from several other electronic sources. This facilitates the switchover from the other grading program currently being utilized in the district. Also, grading schemes may be set up as letter grades, pass-fail, rubric scores, and percentages to give several different views of student proficiency. In fact, each student in a class may have a different grading notation or approach to meet the individual needs of diverse learners. Numerous reports and graphs may be generated from these student scores, providing teachers with a myriad of ways to show students and parents about academic progress.

This poster presentation will show screenshots from the various programs, provide samples of reporting formats, and demonstrate hands-on use of the programs. Suggestions will be welcomed about future improvements to the system. The intent of this session is to provide K-12 schools personnel and teacher education faculty with the opportunity to see how one district is developing electronic methods for developing curricula and assessing student performance.


Dave's Grades 9_14(Rubric)

Score | Attend. | Seating | Student | Assign.

▾	10 of 10 Students	Rank	Overall	Std1:..	Std2:..	Std3:..	12 of 12 Assign.	10 Shadow Lab Std3Universe 9/13/2000	11 Waters of Earth poster Std3Universe 9/13/2000	12 Unit Quiz 2 Std2Earth Process 10/18/200	13 ADD ASSIGNMENT +	14
							▾	10	50	20		
1	Bradford, Karen	1	Advan..	Advan..	Advan..	Advan..		Adv	Adv	Min		
2	Brown, Jonathan	8	Basic	Profici..	Basic	Basic		Min	Bas	Pro		
3	Chu, Jeff	6	Basic	Basic	Profici..	Basic		Pro	Pro	Pro		
4	Goodman, Michael	2	Profici..	Profici..	Advan..	Profici..		Min	Adv	Adv		
5	Gustavson, Peter	10	Minimal	Minimal	Basic	Basic		Pro	Bas	Adv		
6	Haynes, Terri	9	Basic	Minimal	Profici..	Basic		Bas	Pro	Bas		
7	Kramer, Jennifer	5	Profici..	Basic	Profici..	Profici..		Pro	Pro	Pro		
8	Radcliffe, Missy	4	Profici..	Basic	Profici..	Profici..		Pro	Adv	Adv		
9	Robinson, LaTonya	6	Basic	Minimal	Profici..	Profici..		Pro	Pro	Pro		
10	Taylor, Roger	3	Profici..	Basic	Profici..	Advan.		Adv	Adv	Pro		
11	ADD STUDENT +											

Figure 4: Screenshot of a standards-based class score sheet in *Easy Grade Pro*

Easy Grade Pro 3.5. (2001) Orbis Software, Puyallup,WA.

Filemaker Pro 4.0. (1997) Claris Corp., Santa Clara, CA.

QuickTime. (1991-99) Apple Computer, Inc., Cupertino, CA

THE DILEMMA OF TEACHER TRANING

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Introduction

In 1957 the Soviets put up the first earth satellite, Sputnik I. For education in the United States this was a traumatic event. Until that time, many (but not all) people, including the popular press commonly denounced Soviet science as ineffective. The fact that it achieved this major technological development, visible in many parts of the country, before we did led to much trauma about the quality of science education in the United States.

One reaction was a major organized curriculum effort in American education, the major such event in our history, mostly funded by the United States government, It lasted about 15 years. Many of the courses developed cost millions of dollars to produce, so the curriculum efforts were well funded. I would estimate that close to one hundred million dollars were spent in these extensive efforts, more by today's prices. Major individuals participated in their development, including major figures in science and education. The concentration was on the east coast, but it was a nationwide efforts. Books were the most common product, with some production of films and other items.

Some initial efforts were in elementary science, including such major products as the Science Curriculum Improvement Project (often called SCIS) at the University of Califomia, Berkeley, directed by Robert Karplus. A similar project was the Elementary Science Study at MIT. These courses were very different than existing practice at the elementary level, with much more emphasis on the processes of science, and much less emphasis on memory. Mathematics courses followed, also with new approaches.

High school courses were developed, and even a few university courses. I was involved in one of these, the Harvard Project Physics course for secondary school. One project, Man a Course of Study, a fifth grade sociology course, brought this period to an abrupt end, for political reasons. This was a very interesting story, but not relevant to this paper.

Although many of the resulting courses were widely praised by scientists and educators, most of the products were not successful in practical usage. Only the biology courses, produced by the Biological Sciences Curriculum Study group are in common use today.

This well-funded failure led to much agonizing about what went wrong. Some of this thinking appeared earlier, but we are still hearing the reasons for lack of success. Probably everyone, including me, 'knows' why failure happened.

One such reason commonly given for this failure was of considerable importance at the time, and is the primary concern of this paper. Since these new courses were different than older courses, it was believed that teacher training was essential to prepare teachers for this new task. Not only the content was different, but with many of the courses the entire philosophy of what the student and teacher were supposed to do was strange to many teachers, different than their previous training.

A major effort in training teachers in these new courses took place. It is difficult to estimate the funds that went into teacher training for the new courses, since the funding cam from so many sources. I have seen an estimate that teacher training costs for the post-sputnik courses were seven times the cost of development, which would make the total over five hundred million dollars, a huge amount. But mostly the courses were not helped by this large effort. Teacher training was not effective, and most of the major post-sputnik efforts died.

We continue with such efforts in training teachers, for all of education. It is a major part of the educational funding of the National Science Foundation, and other major federal agencies.

Almost every new school movement is matched with a corresponding training activity. But, in spite of occasional glowing reports, it is seldom successful. Training teachers is a common problem with education generally. One might say it is the Achilles heel of education.

An Impossible task

I wish to argue that inservice training for a sufficient number of teachers for new curriculum and leaming methods is impossible by present means, and perhaps by any means. It is a myth to believe that we can effectively train enough teachers. I am basing this argument primarily on the United States, but I believe that similar factor apply worldwide.

The central problem is numbers – too many people in this country and on earth. With so many people who need to leam, our current systems for leaming employ large numbers of teachers. In the United States there are now about three million teachers in 90,000 schools. We have about 48 million students, of ever greater diversity. But most of our thinking and strategies in these matters is based on older traditions when the numbers were much smaller.

The numbers change everything, in ways that we are only beginning to understand. Others have noted this.

Sober thought also tells us that any suggestion that some two million teachers be retrained to change what they do in classrooms must be called wishful.

Leslie Hart
Human Brain and Human Learning
1983

We still spend enormous sums on inservice teacher training. Whenever something does not work, it is the recommended solution, just as with post-sputnik development. Major organizations, both nationally and in the states, support this approach.

Currently teacher training is being heavily touted for the use of the Intemet in classes, as it becomes clear that Intemet connections in all schools often do not lead to improved learning. An article in the New York Times of July 3, 2000, reports that 95% of schools in the United States now have Intemet connections. Once more, the cry in this article and in many other places is that we should train the teachers. One more, the teacher training is not necessarily appropriate. A friend, about to get ten computers in her class, is in a course to prepare for this that is teaching her about bits and motherboards!

The results of teacher training are very variable. Some teacher programs turn out to be very effective, but this is a small number. As with much of education, we look for success and try to imitate it. But these good examples often depend on the existence of special situations, such as a very superior teacher involved in the training, nor duplicable elsewhere.

Often the teachers are thrown in different directions every few years in these training programs. Several years ago California elementary teachers were told that they should integrate all subjects by establishing a common 'theme' for all areas. A friend chose 'trails' as her theme. But this approach was quickly downplayed. Teachers are tossed around with little consistency from year to year, making a difficult task even more difficult.

This variation is particularly bad with the critical elementary areas of reading and mathematics in the elementary grades, where the battle for different approaches has gone on for a long time. The pendulum often swings, although it would seem that research could settle the issue.

One approach that has been tried many times is the 'trickle down' approach, with a variety of names It recognizes that we cannot reach all teachers directly. The idea is that we will train a few teachers, and they will train other teachers at their schools. This may proceed for many generations. I was involved with one such effort involving educational technology for a school district in southern California. I had a chance to talk to teachers in the third generation, after I had run the first generation. I could find almost no relation between the two generations; nothing I did survived. I know of no large-scale evidence that the trickle down method works. It does not work as a method for reaching effectively large numbers of teachers.

Such efforts are generally poorly evaluated, with regard to their long-range effects in improving learning. This is a common problem in many areas of learning, even though some agencies insist on built-in evaluation as part of the project.

Although the sums spent in this direction are very large, they never are enough to reach all teachers. We can wonder if they will ever be enough, given the numbers of teachers we are now faced with. It seems unlikely. So teacher education is a dilemma: We need it, but we cannot afford it. The situation is much worse in the poor parts of the world.

The pattern is as follows:

1. We develop new curriculum, new ideas for improving learning.
2. These do not work
3. The suggested solution is to train the teachers.
4. This does not work.

SOLUTIONS TO THIS PROBLEM

Given that current methods of addressing the problems of inservice teacher training are inadequate, how do we proceed. There appear to me to be two ways out of this dilemma, both making effective use of the computer. Both are expensive at the beginning, but have possibilities for greatly reducing the long-term costs of learning. Both involve bold new directions, with little current experience, so both involve possible risks. They need major experimental efforts to demonstrate their effectiveness or lack of effectiveness. I see no other possibilities, but I welcome other ideas.

These two suggestions are related, in that they both involve expensive use of carefully prepared computer-based learning material. In the first case teachers are the learners. In the second the students are the learners. In both, distance leaming is a natural delivery method. In both, the highly interactive units would adapt to the individual user. In both the learning material could be used anywhere at any time. One involves tutorial computer-based units for teachers, and one computer-based tutorial units for students.

1. Teacher training via interactive computer material

Several years ago we made several unsuccessful efforts to obtain funding for computer-based learning units for teacher education in educational technology. Just before this we had conducted at Irvine an expensive training session of this kind, taught in a conventional fashion, funded by the state of California. I did not think it was too effective, in spite of high costs. A quick calculation suggested that this was far too expensive to scale to all teachers in the state, the country, or the world, if we brought all these teachers to Irvine. Further, the manpower to do this for all teachers would not be available. Hence I planned the proposals to do all this through the computer.

Such an approach does not need to be training in educational technology, although it was natural because computers will be required because of the subject matter. It could be done in any area.

Since the second suggestion also involves computer-based learning, I will postpone the discussion of the details of computer-based tutorial learning units, including how such material is developed.

2. Computer-based tutorial learning for students

The second approach, students learning through interactive computer material, is a much more radical approach to teacher training, because it removes the need for most special training of the teachers. It is based on the possibility of distance learning, both in schools and informal environments, using a new form of learning material. It would require a radical change in learning, compared to our current situation..

It would allow, after sufficient learning material is developed, far fewer teachers than we now need. So the educational systems would be very different than those today. Learning would be tutorial.

As with the first suggestion, almost no material of this kind exists at present. In the next section the notion of tutorial computer-based learning is developed further.

TUTORIAL LEARNING FOR TODAY

Tutorial learning with human tutors has a long history, but because of the expense involved it has always been used with a limited number of students. A skilled tutor works with one or several students. This situation does not resemble a lecture in any way. Often, as in the case of Socrates, the tutor proceeds by asking questions. With good tutors this approach has proved to be a very successful learning strategy, with students of all ages.

But tutorial learning with human tutors is far too costly to be possible for all learning, and we could never find enough tutors for our large populations today. But it is possible and practical if the computer can serve the role of the tutor. We have been developing such computer-based tutorial units, on a small scale, for over thirty years at the Educational Technology Center at the Universty of California, Irvine. It requires no technology or learning approaches beyond that available today.

Here are the critical features of such learning modules.

1. A very high degree of interaction

Tutorial learning is active learning, student centered. Although computer material is frequently called interactive, to achieve the tutorial format we need a higher degree of student-computer interaction than is commonly found today. Interaction refers both to the frequency of interaction, and the quality of each interaction, as discussed in the next two sections.

One important consequence of active tutorial learning is that students can discover much of their knowledge rather than being told it. Examples will be given later.

2. No long speeches on the part of the computer

Frequent interaction means that the time between two student inputs should be short. Our testing in public libraries shows that the maximum interval between two student inputs should be no longer than twenty seconds.

This implies that computer and student "speeches" should be limited, as in human dialogs. So we do not want in interactive material long pages of text, as in most Web sites today, or long video sequences. The interaction should resemble a conversation, not a series of long essays.

3. Use students' natural languages for interaction

The highest quality of interaction between two humans comes from our natural languages, perhaps the most powerful of all human tools. We seldom use pointing and multiple choice for human communication, so it should not be used with computers, a radical departure from today. This use of languages should be in both directions, student and computer.

Student input should be in the free-form natural language of the student. Thus the student might reply to a question from the computer or ask a question, in English or in another language.

Until recently this was possible only through typing. Now reasonable voice input is possible, with commercial available inexpensive speech recognition engines. Speaking is much more natural for humans than typing. With very young children it is the only approach possible.

4. Seek and help with individual student problems

A key to learning with tutors is that the tutor is constantly seeking student learning difficulties. The tutor needs to understand what problems are likely in each situation, and to find ways, usually through asking questions or giving problems to solve, to determine just what difficulties are to be found at each moment in learning.

This is the principle pedagogical purpose of the frequent and high quality interactions just mentioned. Once such difficulty is located, the tutor proceeds to assist the student, checking to see if this assistance was effective. This is a continuing frequent activity in leaning with tutors.

Another way of viewing this helping process is that assessment is intrinsic to the learning material, occurring frequently and indistinguishable from learning. Its purpose is to decide what learning material is required next. The student is not aware of taking tests.

5. Assure mastery for all learners

This frequent mediation for student learning problems can be continued until all students learn the material fully, to the mastery level. Benjamin Bloom and his students showed that mastery is possible with tutorial learning, in extensive experiments in the Chicago public schools. Several different learning sequences might be necessary, as not all students learn in the same way.

Since all learners succeed, we can have a much more positive view of learning, encouraging lifelong learning.

6. Anywhere, Anytime, all students

Presently we could reach very large numbers, with CD ROM or the Internet, with such learning material, assuming computers are available to the students. In the near future, with satellites, special inexpensive computers, and solar powered computers, we can expect to reach almost everyone on earth.

With distance learning the students can be anywhere. Learning can start and end at any time, with computers maintaining the records. Students can proceed at their own paces.

7. Distance learning

Although tutorial learning modules could be used in traditional schools, universities, and training centers, most of the future use would reach people wherever they are. Students might be in homes, libraries, shopping centers, community centers, museums of various types, or in specially build learning facilities. They could be sitting on a swing in a yard, on the beach, or in the middle of a field of poppies. Distance learning liberates us from particular learning locations.

Distance learning should be in a form that can reach very large numbers of students.

8. Peer learning

A valuable learning approach involves students helping each other. Learning circles can be established either locally, or remotely electronically. Student records stored by the computer will assist this process.

9. Intrinsic motivation

As students involved in distance learning will not be subject to the pressures and threats of standard classes, the learning materials must keep students interested in learning. Since everyone succeeds, the experience of learning can be enjoyable for all.

Learning modules must be intrinsically motivating, keeping students at difficult tasks. A high degree of interaction will be of major help here, as active learning keeps students involved. Other motivational approaches may be useful in holding attention, but the focus should be on learning rather than entertainment.

An important part of formative evaluation, part of the development process, will be to verify that the student's attention is maintained for long periods. In testing units in informal environments like shopping centers, where students are under no pressures to continue except their interests, we can record where many students leave the program, and rework such sections until they are motivationally strong.

10. Very large numbers of students

Our world now has six billion people. So educational activities need to look toward very large audiences, many cultures, and various languages. Types of distance learning suitable for groups of twenty or thirty, increasingly common in United States universities, will not be adequate to the needs of our society.

Since very large numbers of people would be involved, the units would need to work without teachers, as well as with teachers.

IS SUCH LEARNING MATERIAL POSSIBLE?

The picture presented for tutorial computer-based learning is very different than most learning today. To some it will appear, I am afraid, as a fantasy. But I believe it is a realistic possibility for the near future. I begin with examples of such material from the Educational Technology Center at the University of California, Irvine.

As mentioned, we have been developing tutorial material for over thirty years, with mostly much more primitive equipment than now available. An example is the Scientific Reasoning Series, developed about a dozen years ago. There are, in the form sold by the IBM K-12 group, twenty hours of student material. Other material developed was not marketed commercially.

Examples from this Series can serve to illustrate the possibilities for tutorial computer-based learning. In one, a program called Heat, the aim is to have all students invent the scientific concept of heat, starting with everyday knowledge about temperature. The program begins immediately asking the student how she or he measures his own temperature, and waits for a free-form answer. The student may need to be prompted if she or he does not answer in a reasonable time. The program continues in this questioning form for about one hour, one of the shorter programs in the Scientific Reasoning Series.

Other examples from the series show the possibilities of students discovering their own knowledge. One example is Families. The aim is to have students discover important scientific laws, Mendelian laws of genetics. The student makes experiments with imaginary animals, Nors. The computer is always watching what the student does, and offers advise only when necessary. All students discover these important laws. This is one of the most difficult programs in the Series, taking about two hours for a typical student.

In another program students discover the simple laws of electrical circuits, such as the need to have a closed circuit to light a bulb. This program is based on modules developed in the elementary science projects in the post-sputnik development. They do not use equipment at the display, but students are urged to do this on their own.

I remind the reader again that these were done many years ago on computers with far less capability than contemporary computers.

DEVELOPING TUTORIAL LEARNING MODULES

I will not discuss in full detail how such units are developed. The system we use was developed beginning thirty years ago at the University of California, Irvine, and the computer science group at the University of Geneva, in Switzerland, joined with us about ten years ago.

Creating tutorial learning requires a different development strategy than is common today. Four stages are involved, management, design, implementation, and evaluation. The designers are very good teachers in the area involved, working in groups of about four. They do only the design; they do not program, for example.

Further details can be found in the Irvine-Geneva paper at the Web site mentioned at the end of this paper. Other papers there also describe the development process.

COSTS FOR TUTORIAL LEARNING

The cost of learning needs careful consideration. Learning must be affordable for all. The cost for an hour of student learning is the most important figure.

At least three factors are involved in determining costs, the cost of development, the cost of delivery, and the cost of the management structure.

1. Development costs

In the post-sputnik development mentioned at the beginning of this paper, a course cost millions of dollars. A course at the United Kingdom Open University costs a similar sum to develop. Most recent development in the United States, such as the Web-based university courses, costs much less, but one can raise questions about quality of these passive courses. The computer-based learning literature is full of useless statements that it takes three hundred or so hours of time to produce one hour of student time, again a low figure for quality material, and not a reasonable way to approach the costs of development..

Development is not the whole ball of wax, so considering this alone in computing costs is very misleading. The Open University has long demonstrated that expensive development of quality material can lead to low costs per student.

2. Delivery costs

Conventional university courses have little development costs, but high delivery costs, because of the salaries of professors. Self-study such as reading a book has a low delivery cost.

An interesting factor in delivery costs is the number of students who can learn with the approach used. With some kinds of learning, delivery costs increase with the number of students, but another possibility is that they decline.

Management costs

In a conventional school these include all the administrators, often a considerable number, and all the record keeping. With computer-based distance learning the computer maintains all the records and does the administrative work, at a low cost per student.

Tutorial distance learning can reach large numbers of students, with low costs per student. With large numbers, expensive development is coupled with low delivery costs.

BACK TO TEACHER TRAINING

After this interlude to discuss tutorial computer-based learning we return to the problems with teacher training. I suggested two ways out of the dilemma presented by to typical failure of teacher training, computer-based learning for teachers, and computer based learning for students.

We should try both of these approaches. It may be that both will be needed, at least in the immediate future.

Careful research

Conduct extensive longitudinal studies on the results

REFERENCES

Additional information is at http://www.ics.uci.edu/~bork .

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Abstract: This paper reports the findings of a study on the use of technology by administrators at two universities. Instrumentation included a survey and interviews which investigated various factors (including time spent using technology, types of technology used, how administrators used technology in any classes in which they were teaching, and their awareness of how university faculty are using technology.

Introduction

Throughout the country, universities are implementing plans to integrate new technologies and teaching/learning strategies into their classes. As a part of these plans, they are developing computer/technology competencies for their students, as well as for their faculty members (Algozzine et. al, 1999). Faculty are asked to not only integrate technology into their content, but into their teaching methods, research agendas, and daily routines. Several universities and colleges are now concentrating on the task of designing and developing technology competencies for their faculty members (Hill & Somers, 1996). As university campuses become more technology-intensive and courses use more technology, we are finding that many faculty members require and request training in using various technologies. To assure that their faculty can meet competencies, many universities offer workshops, training sessions and one-on-one mentoring. These 'faculty development institutes' provide much needed skills which help faculty to attain these competencies. Accrediting bodies such as NCATE are also emphasizing the importance technology, "NCATE standards now expect its accredited schools of education to provide adequate access to computers and other technologies, and expect faculty and students to be able to use it successfully (NCATE, 2000)." On a whole, many university faculty members have answered this call for increased technology use by improving their technology skills and demonstrating those skills in their teaching methods. But, how are university administrators improving their computer/technology skills? And, what are they doing? What, if any, competencies might be needed? This paper will attempt to answer some of those questions and hopefully shed light on the use of technology by university administrators.

Survey and Interview Process

In this study, administrators from two universities (Auburn University Montgomery and Emporia State University) were given a survey and were interviewed about their daily technology use. Interviewees included department/division chairs, deans, associate deans, assistant deans, and vice-presidents. In addition to a survey on technology use, the researchers used a questioning protocol which included open-ended queries regarding technology use in 1) daily administrative duties, 2) teaching duties, 3) class scheduling and student record-keeping, 4) awareness of faculty use, and 5) faculty training needs. Results from the surveys and the interviews were then compiled and categorized, resulting in the findings below.

Findings

Interviews showed that administrators at both universities used various technologies in both their work and their classes. However, the use of the technologies was often dictated by various administrative duties. For example, administrators at one university were using Banner to access administrative records, including class scheduling and student records. Administrators at another university were using a UNIX-based system to access the information needed for administrative duties. Almost all of the administrators surveyed at both universities were using standard productivity software (such as word processing and e-mail) during their daily duties. It was found that the administrators had access to the Internet and most used the Internet at least one time each day.

The researchers also found that administrators who were teaching used a wide variety of technologies. Web-based instruction was being used by some of the administrators. For example, several of the administrators at one university were using WebCT as part of their coursework, either incorporated into the regular classwork or as a method of offering their courses on-line. Most of the administrators at both universities who taught classes were using software such as PowerPoint as part of their use of technology in their classes. However, the use of technologies by administrators who taught classes was sometimes limited by the scope and number of classes taught by the administrators. These administrators were usually teaching a class load which reflected their duties as both teachers and administrators. Very few of the administrators regularly taught classes in a computer lab where all of the students had access to computers. Instead, they included computer lab time in their classes, when appropriate. For example, one administrator taught a health and nutrition class and brought her class to the computer lab to demonstrate how to use the MacDine program (a nutrition-based program). Students then used the program as part of their normal class assignments.

Administrators at both universities were exceptionally aware of how their faculty members were using technology. This awareness is partly driven by the emphasis on technology use by accrediting bodies. The administrators see the need for further faculty training and are addressing this need by creating training opportunities and faculty training institutes. Some of these institutes are delivered campus-wide, while others are contained with colleges and departments/divisions. Although faculty needs are being addressed, administrators' technology training needs seem to be neglected. Unfortunately, many administrators feel as though they are falling behind their faculty in technology skills and use. In order for administrators to lead their faculty into the 21st century with new technologies and teaching paradigms, they must identify their own technological skills and address those needs with training, just as they have addressed the needs of their own faculty.

References

Algozzine, B., Bateman, L.R., Flowers, C.P., Gretes, J.A., Hughes, C.D., & Lambert, R. (1999). *Developing technology competencies in a college of education.* Current Issues in Education [Online], 2(3). Available: http://cie.edu.asu.edu/volume2/number3/

Hill, R.B., & Somers, J.A. (1996). *A process for initiating change: Developing technology goals for a college of education.* Journal of Teacher Education, 47, 300-306.

NCATE (2000). *Major themes of NCATE standards* [Online]. Available: http://www.ncate.org/accred/initial/themes.htm

Implementing an Instructional Management System: Final Report

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Abstract The national trend toward the use of high-stakes testing to make schools accountable for the standards students have mastered has forced school districts to take steps to ensure that the curriculum taught in the schools is based upon the standards the students will be tested on. This paper discusses the results of implementing a sophisticated Instructional Management System (IMS) to help accomplish this task. IMSeries is a sophisticated relational database that was implemented to change the paradigm of how teachers think about the lesson planning process. Rather than concentrating on what the students will do, this project encouraged teachers to begin by thinking about what the students will learn. By using this system, teachers were able to track which standards were mastered by each of their students and design their lessons based on individual students' needs. This paper presents an overview of this three year project in the hope that the lessons learned will be beneficial to other districts interested in exploring the use of computer systems to support instructional decision making.

Introduction

In the fall of 1997, the School District of Palm Beach County was awarded a Goals 2000 Professional Development grant. A major part of this grant was to select and implement an instructional management system (IMS) to help align the district's curriculum to Florida's Sunshine State Standards. The process of selecting the IMS has been reported in detail both at the International Conference of the Society for Information Technology (Elias, Cafolla, and Schoon, 1998) and in the Journal of Technology and Teacher Education (Elias, Cafolla, and Schoon, 2000). The purpose of this paper will be to present an overview of the final results of this three year project. Given the expense and time spent in selecting and implementing a sophisticated IMS, we feel it important to share the lessons we learned with others that might be considering similar systems.

Background

The nation school reform movement has focused on the use of high-stakes testing to ensure that students have mastered minimum performance standards. In Florida, the standards are called the Sunshine State Standards (SSS) and are measured by the Florida Comprehensive Assessment Test (FCAT). Like all of Florida's school districts, Palm Beach was required by the State to align its curriculum with these standards. To accomplish this task, school district staff led by the Office of School Improvement decided to investigate the use of a technology based Instructional Management System (IMS).

As educational institutions attempt to restructure and redesign the school and its' culture, they need a means of unobtrusively, continuously, and automatically gathering information and making it available to various decision makers. Data such as attendance, schedules, curriculum, assessments, resources, grades and performance evaluations are needed on a daily, monthly, and annual basis. The importance of the information generated and how it how it is used to support instructional decision making is obvious.

The vision of the Palm Beach school district was to develop a technological infrastructure with the ability to support genuine change in the way that teachers thought about teaching. A system that could serve as a means of revitalizing the process of continuous school improvement. The district applied for and received a Goals 2000 grant to engage in an effort to bring about significant school improvement by using technology in "...the acquisition and use of information for data-based decision making, Information Management Systems (IMS's) are of fundamental importance..." (Carter, 1997). Carter goes on to state "It is necessary to put the curriculum "on-line" in order to address adequately the close monitoring and reporting of student progress and performance against outcomes" (Carter, 1997). The District's goal was to select a system that was "...designed to align the Sunshine State Standards, curriculum, instruction, and assessment to address individual needs of the students and track their progress achieving the Sunshine State Standards." (Cartlidge, 1998).

To identify an appropriate management system, the school district formed a Design Team charged with the responsibility of identifying, evaluating, and testing various systems. In addition to Palm Beach district personal from the Office of School Improvement and the participating schools, the Design Team had consultants from Florida Atlantic University and the Area Center for Educational Enhancement. As noted above, the identification, evaluation, and selection of the management system IMSeries have been reported elsewhere (Elias, Cafolla, and Schoon, 1998; Elias, Cafolla, and Schoon, 2000).

Professional Development

One of the major components in implementing the IMS was concerned with preparing teachers to use the system to make instructional decisions. This training had several components. The first was the challenge of teaching the participants how to use the software. While all of the participants had some computer skills prior to being accepted into program, IMSeries is a complex relational database that requires several days of training to use.

More important than simply learning the software was changing the way teachers think about lesson planning. From the work done for this project and a similar project, the importance of linking outcomes to assessments eventually became clear. With the implementation of IMSeries at each school, it became obvious that the teachers desperately needed continuous, on-going staff development on unit and curriculum design in addition to IMS training in order to input meaningful activities, assessments, questions, etc. into the IMSERIES database and more importantly to align the curriculum with the Sunshine State Standards. Most of the participants still centered lesson planning around the activities the students would engage in. In the new paradigm, the teachers had to be taught to begin with the Florida Sunshine State standards that would be covered. Participants had to learn to begin by using IMS to determine which objectives needed to be taught. Numerous professional staff development sessions were thus organized to provide the curriculum training.

Understanding the instructional design process was the single most important component of this project. The implementation of an Instructional Management System may have resulted in no significant changes in student performance if not for a systematic change in the process by which faculty created and delivered instruction. Data from the study suggest that the project did not effectively begin to meet its' goals until curriculum design became the number one focus. The approach is currently changing from activity-based instruction to standards-based instruction. As one project teacher stated, "This project has changed my way of thinking 180 degrees. I have become more creative and thorough. By being trained to use the instructional management system, I now approach my unit design from the standards and benchmarks first and then I decide on the activities to meet those benchmarks."

Summary of Implementation Accomplishments

During the project, 84 units meeting the curriculum design criteria were developed by project partners. Fifteen of the units came from teachers at the three pilot schools, while the other 69 came from District curriculum writing teams during the summers. In addition, 57 additional units were created by university students. The total units to date that meet the curriculum design specifications are 141. However, individual pilot teachers also have units under development in the schools' databases. The databases at the individual schools contain the work that the pilot teachers completed during the project. A summary of the units by school is listed in Table 1.

Table 1
Instructional units by Pilot School

School	Completed Units	Units under Development	Assessments
Glades Central High	49	276	16
Lake Shore Middle	13	80	4
Pioneer Park Elementary		147	165

Impact

Implementing an IMS served as an impetus to changing teacher paradigms in curriculum design based on aligning standards and benchmarks to assessments and then selecting instructional activities to serve as the vehicle to reach those standards. As a result of the project, various instructional departments began to address curriculum design from a different perspective. Teachers are now learning to make instructional decisions based on what they want students to know and be able to do based on standards and benchmarks.
IMSeries provides teachers not only with a way of measuring whether students have achieved objective, but also get a sense of how they got there.

This project has also been an impetus for curriculum unit design at the university level. Several district staff members also serve as adjunct faculty at Florida Atlantic University and Nova Southeastern University. The curriculum unit design based on IMSeries has been the focus of their instruction in multiple content courses. Students producing curriculum units for coursework are teachers in Palm Beach County and those units are being prepared for Internet access.

Adapting IMSeries challenged district paradigms on data collection procedures and methodology. Before IMSeries was implemented, no elementary school in the district had the capacity to receive data from the mainframe. Data from the PC environment were not permitted to exchange data with the mainframe to prevent data corruption. This project set up and tested a new FTP procedure to allow attendance data to be exchanged between the schools and the district. The school district is implementing this new procedure district-wide. This has had a positive impact on the IMSeries project since the mainframe to school data transfer has reduced time and efforts for several offices.

Conclusion

This project began with the goal of using an instructional management system to gather, manage, and analyze crucial school district data. However, everyone involved with this project has discovered that an instructional management system can be much more than just a software system to manage information. It could turn out to be a major vehicle for changing and improving how teachers plan and assess curriculum, as it has been in Palm Beach County. The potential of this system is tremendous.

The challenge of high-stakes testing has made it incumbent on school districts to ensure that the curriculum that is actually taught in the schools is aligned with the standards the students will be tested on. The age of accountability is full upon us and, like it or not, schools, teachers and school districts will be judged based on student performance. Given thousands of students and hundreds of educational standards, making sure that each student has mastered each standard is daunting- for humans. For computers, however, it's simply a data base problem. Private businesses have used Management Information Systems to provide data to support decision-making. It is time for schools to begin using these types of systems to support making educational decisions.

References

Carter, D. (1997). Information management for site based decision making in school improvement and change. International Journal of Education Reform. 6, 174-188.

Cartlidge, L. (1998). Goals 2000 professional development technology continuation grant-application. West Palm Beach, FL: School District of Palm Beach County.

Elias, J., Cafolla, R., & Schoon, P. (2000). Selecting and Instructional Management System, Journal of Technology and Teacher Education, 8(2), 123-132.

Elias, J., Cafolla, R. Schoon, P. (1999), Selecting an Instructional Management System, 10th Annual International Conference of the Society for Information Technology and Teacher Education, April.

E3-Learning: More Than On-line Education

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Abstract: This paper describes the decisions and procedures that occurred when a traditional graduate level technology course was moved from the classroom lab setting to a partially on-line course with web enhancements. What we developed was an expansion of our initial plan and something quite different, far more complex, and more labor intensive. We knew that if we wanted schools to be different, we must prepare teachers differently ... significantly differently (Carroll, 2000). Our web enhancement efforts quickly triggered the development of an on-line educational support hub and the establishment of several on-line communities. Our on-line hub "E^3-Learning" quickly expanded to provide resources and discussion boards for faculty, students, along with technology directors, library and media directors, and classroom teachers from 35 school districts. Within six weeks of the decision to initially "take one course on-line" the enhancement site e3-learning agreed to provide statewide technology standards discussion boards for 13 participating universities, Ohio SchoolNet, Ohio Board of Regents, and the Ohio Board of Education.

The Project

Project E^3-Learning was receptive to developing a new educational model and delivery system, but it was not predicated on developing a new model. Initially we sought to simply use WebCT to offer a single on-line course. This, however, was not an idea we embraced for long. Instead, the goal of E^3-Learning became the incorporation of wish list items from students and faculty. Two years of archived student input along with current student information, and faculty-generated information was used to identify on-line course content. Where programmatic integrity was not endangered and where technology made a component inclusion possible, wish items were included.

Not all courses and not all course components can be brought to the web easily or effectively (Kelly & Masie, 2000). Thus only for items and in areas where we determined that we could succeed did we initially develop course modules. These modules were based on the ideas and desires of individuals who collaborated with us by using a WebBoard™ and by reviewing successful and unsuccessful on-line and distance education offerings.

Content and modules were made using WebCT™, WebBoard™, and Tegrity™ media equipment and Macromedia and Microsoft software. We were aware of some aspects of a web-enhanced course. In addition to well noted aspects of the web (anytime - any place education, and extended classroom content) we also decided to leverage the unique and frequently less considered properties of the web. We therefore decided to incorporate social and cultural needs of our students (Kim, 2000).

A "readiness test" was developed and administered to students desiring to enroll in one section of a technology in education course. Students not deemed "ready" to enroll in the on-line section were permitted to enroll in one of three traditional sections of the course. Each Instructor received WebCT training during the two quarters prior to offering the on-line course.

Initial Findings

Student Input. Student requests were quickly considered and either identified for eventual incorporation or deletion in the E3-learning program. Students with e-learning experiences do not like some traditional aspects of e-learning. Students stated that e-learning is basically linear education requiring substantially more reading with the submission of considerable written work. Although students knew that sometimes e-learning consisted of chat rooms and discussion boards, they were not enthusiastic about what they described as tedious and uninteresting participation." These findings were consistent with Kim's (2000) presentations. Likewise, those students who had experienced prior e-mail and listserve activities expressed displeasure them, especially when one participated in multiple e-learning courses. Students who responded anonymously reported that they were extremely dissatisfied with a prior on-line learning experience. They, however, reported, that they would not complain because "it was and easy credit."

Students reported that they wanted 1) an incorporation of interactive social and cultural components, 2) the possibility to partake in synchronous and/or asynchronous sessions, 3) to complete their work on computers that were in their classrooms or in their home (e.g., the same operating system and version of application), 4) time shifting and distance education (less driving time), 5) smaller modules that would permit them to establish a "content load" that would juxtapose with shorter units of available time, 6) online technical and academic support available at least daily during week-days, 7) self checks built into modules, and 8) tracking of WebCT activities.

Faculty Input. The initial class session of the course will be held in a traditional fashion. At the conclusion of the course all students were required to meet with a faculty member. A portfolio was submitted. In addition, follow-up questions and student responses were videotaped. In addition to posting papers, students were required to participate in online discussions. Students were also required to complete a computer skills check sheet. On this questionnaire, they identified their current level of performance and identified a skill level. Satisfactory levels of performance were "ability to model best practice" and/or "employ this application in my teaching". Each section of the questionnaire also consisted of a narrative section. All students were required to maintain a record or their statement and submit an example for the final portfolio. These were then used as queries during each student's oral examination. Faculty anticipate that the exit evaluation will be time consuming. We also know that this model will change over time.

E3-learning enhancement webpage. One faculty member had for two years (at another university) maintained and customized web content for his students. When he joined the faculty at WSU it became apparent that his personal web page was highly regarded by his students and others. While teaching a course load of 44 students during the first term, his web page recorded almost 19,000 visitors and downloaded over 40 megabytes of data per month. This became the template for the E3-learning.wright.edu web site. One graduate student and two undergraduate student workers are currently assigned to assist on this project.

Conclusions

Carrol (2000) artfully describes the concept and appropriate place for disruptive technology in education. We agree that if one enters into the pursuit of educational technology excellence one can well experience a disruptive event. With the "right" colleagues, disruption technology can be quite enjoyable. Tom Peters (2000) recently presented several thoughts one of which we will adhere to as we develop our programs. One of our favorites is

> 1965- 1980 was Ready, Aim, Fire;
> 1980 – 1995 was Ready, Fire, Aim;
> 1995 - ???? is Fire, Fire, Fire.
>
> John Roth's "Rules" [Nortel]

Figure 1

References

Carroll, T. G. (2000). If we didn't have the schools we have today, would we create the schools we have today? *Contemporary Issues in Technology and Teacher Education*, 1 (1).

Kelly, K and Masie, E. (2000) Conversations with Kevin Kelly and Elliott Masie: E-learning Update and Perspectives. TechLearn 2000.

Kim, A. J. (2000) Community Building: Secret Strategies for successful Online Communities. PeachPit Press. Berkeley, CA.

Peters T. (2000) Distinct of Extinct. The World eLearning Congress, Orlando, November 30.

Preparing Educational Leaders to Cultivate the Meaningful Use of Instructional Technology: Beyond Budgets and Basic Training

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Abstract: Bringing new technology into schools is a complex, challenging process for teachers and administrators alike. There is an overwhelming volume of literature on issues like selecting hardware and software, planning budgets, and providing teachers with the basic technology training they need to get started. However, effective leadership requires a sophisticated knowledge of, and sensitivity to, a myriad of other issues, such as the privacy and First Amendment rights of teachers and students, the problem of unequal student access to technology in school and at home, and the proper role of commercial and corporate entities in public schools. This paper will explore these issues, and suggest that educational leaders consider them in their day-to-day decisionmaking.

Introduction

I recently made a visit to a friend who is an elementary school principal. We met for approximately two hours one morning, during which time we discussed a variety of issues concerning the effective and appropriate integration of new technology into elementary education; we also took a walk around the school and chatted with some teachers about what has and has not worked well for them as they have tried to "technologize" their teaching. All in all, it was a very interesting morning for both of us. However, the time was not without its problems. At one point, my friend realized he had an assembly to introduce, grabbed his suit jacket, and tore off to the auditorium in the nick of time. Later, a teacher stopped by to ask for something he had promised her, and he realized he had forgotten to do what he had promised. Then a problem with a parent arose. Before I left that day, he said to me, "Now, here we have been having a very interesting and important conversation that we need to have more of. But in the time I spent having this conversation, I have failed at least three times as a principal."

As much as I learned about technology and schools in that visit, the most important lesson of the day came in that one statement he made. Anyone who has spent any time at all in a school knows that it is a site of constant activity and unpredictability, where all the energy of faculty and administrators is absorbed by the demands of the immediate circumstances. What that means for educational technology is that the focus of new technology initiatives tends to be on the "mechanics" of implementation—that is, on the nuts and bolts of installation and basic training, on how to make the machines work. Meanwhile, the questions of *why to* make the machines work, and whether it is even appropriate to buy into the aggressive implementation of educational technology, are rarely discussed. The fact that they are not often discussed, however, does not mean that they have no impact on what happens when new technology is introduced into the classroom. Teachers' concerns about technology often center on issues beyond implementation and training, on issues that lie at the heart of their sense of professionalism and their beliefs about the relationship between teachers and students. Where technicians focus on giving teachers technical skills, many teachers are thinking about how the technology might change the character of the classroom experience and the nature of their profession—in particular, how it might be used to deskill and deprofessionalize teaching. This is not to say that teachers are, on a whole, or ought to be, opposed to technology; more that they recognize that adding a new technology to the resources available to them is something of a mixed blessing whose implications are quite complicated.

The day-to-day challenges of supervising technological change in public schools are enough to occupy every waking moment of school administrators. Equipment malfunctions, budgeting decisions, hardware and software selection, and staff development all demand regular attention and care, and threaten to overwhelm school leaders. However, educational leaders also need to develop the habit of thinking about some of the other issues that are of great concern to teachers—for example, issues concerning privacy and professional autonomy, freedom of expression for teachers and students, the inequities of access to technology among student populations, and the commercialism that fuels so much of the push to put new technology in schools. Each of these topics will be discussed separately in the pages that follow.

Privacy

At the same time as new technologies have excited many teachers and offered interesting new ways to engage students in the learning process, they have also threatened the privacy of teachers and students. Computers provide a number of ways of monitoring classroom activity; who is permitted access to these records, and how that information is used, threaten to compromise the privacy of those whose activities have been recorded. For example, it is possible to determine which web sites have been visited on a particular computer, or with a particular account. Taken out of context, many such visits might appear inappropriate or unjustifiable, when there might actually be a perfectly good reason or explanation for the visit. For example, a student might mistakenly find himself at a web site considered to be inappropriate for him because there is a link to it from an acceptable site, but the record of sites visited would have no way of showing that the visit was accidental. A teacher might choose to visit a controversial site—for example, one containing hate speech—not to support or promote the views expressed there, but to learn about them in order to counter them. Again, all a record of sites visited would show is that someone was there, not why he or she was there, and it is possible that students and teachers will be unfairly penalized for misusing their Internet privileges. At the very least, users should be given the opportunity to explain their intent. Still, the mere knowledge that others will know where they have been is likely to have a chilling effect on their Internet wanderings. Howard Rheingold describes this as a "panoptic" effect—that is, when people are aware that they might be under surveillance at all times, they alter their behavior because they believe they are being watched (even if they are not) (Rheingold, 1993).

It is important to distinguish here between holding users accountable for their actions and violating their privacy. It is entirely reasonable to expect all account holders to abide by the rules of the acceptable use policy in force. When violations occur, there ought to be consequences (provided, of course, that the acceptable use policy is fair). However, as long as users are behaving responsibly, they need to be given some latitude in their activities. Of course the standards need to be different for teachers and students. But in an age where it sometimes feels as though anything goes in the name of "accountability," it is especially important to think about how everyone's privacy is going to be protected as more and more information about classroom activity is made available to wider audiences. In a recent court case, a parent sued for the right to view the local school district's web logs, in order to see if the district's acceptable use policy was working (http://www.eschoolnews.com /showstory.cfm?ArticleID=1724). Whether such logs are private or a matter of public record has yet to be determined. However, it is not hard to imagine how such records could be misconstrued if distributed publicly, stripped from the curricular context in which they were first generated.

Another Internet-related threat to privacy concerns "cookies," which are files placed on a user's hard drive, upon visiting a web site, that are usually meant to make the user's subsequent visits to that web site more useful, or more personalized. For example, some web sites ask for the user's name, and a cookie file is used to enable the site to welcome that user back by name when he or she visits again. Some sites monitor the purchases made there, and provide customized lists of recommended purchases based on that information.

There are many uses of cookies that are perfectly benign, and that pose no threat to the user's privacy. However, "third party" cookies are those that are used to create targeted advertising based on the person's web usage—for example, by keeping track of the sites visited by the user, or by asking the user for personal information and then using it, or selling it, for marketing purposes. Although browsers can be set to notify users that a web site uses cookies, most people turn that feature off, because cookies are so common and the constant popping up of the warning window becomes tedious. As a result, most people are unaware of the ways in which their privacy is compromised by third party cookies.

One problem with cookies that bears directly on schools is the question of whether cookie files are a matter of public record. In a recent court case, the publisher of an online newspaper in Cookesville, Tennessee asked for access to the cookie files on the computers of government employees, including public school teachers. The idea here was that taxpayers had a right to know if these employees were behaving responsibly on the job. However, here is another case, like the case involving web logs, where the files could easily be misinterpreted, particularly with respect to teachers. Internet research on school time, including visits to controversial sites, can be an entirely appropriate part of a teacher's lesson planning or professional development, but there is a good chance that their motives would be misjudged if their activities were made public.

Another school-related problem with cookies (which relates to the problem of commercialism) is that many schools can only afford new technology through partnerships with businesses that provide technology in exchange for the right to expose children to advertising, or to collect marketing data from them. For example, education "portal" web sites provide a kind of user-friendly gateway to the internet, often with advertising on the sites, and often with the collection of marketing data through the use of cookies. One such site, called Highwired.com, claims the right in its privacy policy to "share the personal information you provide to us with third parties who are affiliated with our sites, or who provide services to our sites" (http://www.lightspan.com). Their policy also states that if users supply their addresses and phone numbers, they may be contacted with promotional materials. The policy also asserts Highwired's right "to assign, sell, license or transfer any information, including personally identifying information, that our visitors have provided to us to third parties" (http://www.lightspan.com). One might argue that by stating these policies clearly on the web site, users have been amply warned. However, in this case, the policy is (like many such policies) hidden in a fine-print link that users have to know to look for, or they are unlikely to notice it at all. In an age of school-business "partnerships," one must always question whose interests are really being served, and whether public schools should have to sell their students to advertisers to finance the acquisition of curricular resources. At the very least, school leaders need to make a habit of reading this fine print before embarking on such partnership ventures.

Educational leaders should also be aware of the provisions of the Children's Online Privacy Protection Act of 1998. This law requires parental consent before a web site can gather personal information from children under the age of 13. Many sites had been asking children to complete surveys before entering a contest, or playing a game. Now, children under 13 need parental consent before they can provide such information. Three members of Congress have pushed this issue further, advocating legislation that would require schools to obtain parental consent before accepting free equipment or services from telecommunications companies, or risk losing federal funding (http://www.eschoolnews.com/showstory.cfm?ArticleID=1508). Opponents of this legislation argue that it would hinder valuable partnerships that provide resources to schools; advocates stress that no program that exchanges such resources for marketing data is appropriate in public schools.

Another privacy-threatening idea that has not spread widely, but that is worth keeping an eye on, is a proposal made by former New Hampshire Republican gubernatorial candidate Jeff Howard, who advocated the installation of web cameras in public school classrooms so parents would be able to see what was going on in their children's classes. Web cameras are already in use in some daycare centers and private schools, but have not yet been used in public schools. The American Federation of Teachers opposes the idea, suggesting that if parents want to know what is going on in their children's schools, there are less expensive and more appropriate ways to find out. Another potential problem is that people other than parents might somehow gain access to these web sites (which would be password-protected), which might pose a danger to the children involved (http://www.eschoolnews.com /showstory.cfm?ArticleID=1335).

Child safety is also related to Internet privacy concerns when it comes to the controversy over putting students' likenesses or full names on school web sites. Many schools refuse to do either, fearing that it would put those children at risk. However, many student journalists have opposed these policies, claiming that their rights to free expression have been compromised. The balance between protecting privacy and permitting expression is a complicated one. Although students have long been identified in school publications, those publications have never had worldwide distribution. To what extent do students have First Amendment rights on the Internet?

Freedom of Expression

Students do not have unlimited freedom of expression in school, or through official school publications; this has long been a source of frustration among student journalists, who can be censored when writing for official school newspapers. What many students have discovered, however, is that they can "go underground," creating online student newspapers that can legally circumvent the censorship of official school papers. The Student Press Law Center in Arlington, VA estimates that there are 10,000 underground high school newspapers on the Internet, much to the chagrin of many school administrators. As highlighted in the first episodes of the new television series "Boston Public," student-made web sites are often irreverent, and critical of school personnel. Besides the personal offense they sometimes pose to those named or criticized on the sites, they sometimes contain expressions of anger or alienation akin to that found on the Columbine gunmen's sites, leaving school officials wondering where the balance is between freedom of expression and personal and public safety (http://www.eschoolnews.com /showstory.cfm?ArticleID-1742). Another concern is that when students are censored in official school publications, they learn important lessons about responsible journalism and about libel. By going underground, they find an outlet for their views, but they do not always appreciate the consequences of their expression.

As a rule, courts have upheld the right of students to express their criticisms on their personal web sites. For example, a Missouri boy was suspended for ten days in 1998 because he criticized school officials on his web page, and provided a link to the school's official site, urging visitors to e-mail the principal. Although he complied with the school's request that he dismantle the site, he was still suspended, and the ACLU sued the district on his behalf; in February 1999, the courts upheld his right to have the web site. Similarly, a Florida student was also suspended for ten days in 1998 for criticizing his school and school administrators on his web site, but was able to get his punishment reduced with the help of the ACLU. In another 1998 case, an Ohio student was awarded $30,000 from his district when he challenged their suspending him for insulting his band teacher on his web site. In general, then, when students are punished for criticizing their schools on personal web pages, the courts uphold students' rights to do so.

One form of expression that has not been protected has been that which is believed to constitute a danger to the person being criticized. For example, a fourteen year old Pennsylvania boy made a web page about his math teacher, outlining "Why She Should Die" and soliciting donations to pay for a hit man. Although this was most likely a poor attempt at satire, the courts found it to be a threat to the woman's safety, and upheld the school's decision to expel the student. There is a distinction to be made, then, between critical speech and threatening speech; the former is generally protected, where the latter is not.

The issue of freedom of expression involves not only students' online expression, but the online information to which they are permitted access. It is becoming increasingly common for schools to install filtering software on their Internet-accessible computers, which blocks users' access to certain web sites. These filters come in several varieties, the most popular of which block access to a list of web sites that is continuously updated as online content changes.

At issue here are the criteria used to block sites. Some filters demonstrate political biases in what they filter—for example, by making pro-life sites available to students, while blocking pro-choice sites. Another issue would be whether teachers can override the block if they deem it appropriate to do so, or whether they are denied the autonomy to make choices for their own students. New York City teachers were recently frustrated by the installation of filtering software that they were not trained to override, and that blocked, among other things, the last chapter of *The Grapes of Wrath* (where a woman allows a starving man to drink milk from her breast) and web sites on diabetes (because erectile dysfunction is one of the disease's side effects). At the same time, they have expressed their dismay that many commercial sites, such as the Victoria's Secret online catalog, are not blocked.

There is also the question of whether filtering should be mandated in public schools. Several years ago, Senator John McCain promoted the School Internet Filtering Act, which would have required schools receiving federal "E-Rate" funds to install filters. There is a certain irony to Congressional interest in Internet filtering, given that they chose to release the Starr Report online. That is, they express a certain disdain for the kind of material that is available online, yet they also contribute to it. As a matter of fact, a Congressional committee on the E-Rate program had to leave a meeting several years ago on "Legislative Proposals to Protect Children from Inappropriate Materials on the Internet" to go vote on whether or not to release the Starr Report.

The E-Rate program, incidentally, is a federal effort to address another serious educational technology issue—that of the "digital divide." The disparities in access to technology among American children continue to be very disturbing, and need to be in the consciousness of school leaders.

Access

The expression "digital divide" has quickly gained currency in the past few years, referring to differences in access to new technology among different classes, ethnicities, genders, and geographical regions—in schools and communities, and at home. It refers not only to the presence or absence of computers, but to the ratio of computers to users, the type of software available, the existence of Internet connections, the quality and speed of those connections, and the content of online resources.

A 1998 report by the National Telecommunications and Information Administration of the U.S. Department of Commerce named the digital divide as "one of America's leading economic and civil rights issues" (www.ntia.doc.gov/ntiahome/fttn99/introduction.html); although access is increasing for all groups, it is increasing faster for some groups than others, thereby *increasing* the actual divide. This study found, for example, that white families were more likely to have Internet access at home than African American or Hispanic families at any location. Americans in rural areas had less Internet access than Americans in suburban or urban areas.

Political responses to digital divide problems have tended to focus on technical aspects of access. For example, the E-Rate program uses income from a tax collected from telecommunications companies to provide schools and libraries with telecommunications services. It emerged out of President Clinton's commitment to connect all American public schools to the Internet by the year 2000, and has provided millions of dollars of funding in the few years it has been in existence. However, the access issue goes beyond providing the technical connections; it also has to do with what people find when they get online, and whether it is relevant to their needs and concerns. A study conducted by the Children's Partnership found that Internet content tends to be short on exactly what underserved populations say they need the most. For example, when 21 million Americans over the age of 18 have incomes below the poverty line, there is precious little information online about local community services, employment, education, and job training. An estimated 87% of online documents are in English, yet some 32 million Americans speak a language other than English as their primary language. There are very few web sites that are accessible to adults with limited literacy skills. All told, this study estimated that 50 million Americans face at least one of the main barriers to finding the Internet useful—not because they weren't wired, but because there was very little for them online (www.childrenspartnership.org).

School leaders need to be aware of the many dimensions of the digital divide and its implications for school-based computer use. For example, schools in communities where access is limited might think about serving as community access centers for adults in those communities. Educators in communities where there is a wide range in children's home access have to be sensitive to those disparities when creating and grading homework assignments. School web sites and e-mail are celebrated as wonderful ways to communicate with parents, but only if parents have Internet access. Although access is increasing for all Americans, it is reasonable to expect the divide to continue to exist, and school leaders should be mindful of its consequences for students and teachers.

Commercialism

School leaders also need to be very thoughtful about the degree to which they allow commercialism into their schools through new technology. There are several key ways in which new technology stands to increase corporate involvement in schools. For one, the corporate world has an interest in shaping the curriculum so as to include in it the kind of training that they would otherwise have to provide new workers; right now, that certainly includes training in the use of computers. Although one responsibility of public education is certainly to prepare students for life as adults, including earning a living, it is important not to make the primary purpose of public education the efficient training of a workforce. Such a purpose comes only at the expense of a rich and varied educational experience that permits all students to explore their unique abilities and interests.

Second, a "global information economy" requires a high volume of sales of information products and services, and schools are a huge market for them; consequently, a good bit of corporate involvement in educational technology reflects profit motives, rather than the best interests of students. Schools are not only potentially lucrative markets for information industries; they are also good places for those products to be placed, because their presence in schools confers a degree of legitimacy on them that might increase home sales by parents, as well.

Finally, web sites have become the latest way for commercial interests to spread their message to students, adding "educational" sections to their sites and providing curricular materials online. Classroom materials that have been produced for decades by companies marketing products to children are now distributed via web sites. For example, the web site for M&M's candy provides pie charts showing the proportions of each M&M's color in a typical package, and lessons on how to teach probability through student use of M&M's packages.

A more elaborate chocolate undertaking comes from Hershey Foods, the teacher section of whose web site offers an entire, interdisciplinary, middle school curriculum centering around Hershey chocolate. Among the goals of one unit in the Hershey program are for students to "describe chocolate's place in a well-balanced diet" and "make a favorite chocolate snack or dessert"; teachers are reminded that "Flavored milk, such as chocolate, is well liked by children and helps to increase milk and nutrient intake" (http://www.hersheys.com/consumer/teacher/dream_machine/page_2.html#2). In 1934, Arthur E. Morgan, chair of the Tennessee Valley Authority, expressed his concern about the dangers of commercial involvement schools—dangers which, at that point, he felt had been averted:

> Suppose our public schools had been established on a purely commercial basis....There might be no charge to the public for our public schools; the teaching staff might be supplied by the toothpaste manufacturers or patent medicine manufacturers...and they would have textbooks describing the values of toothpaste or patent medicine. (Morgan, 1934, p. 81)

Although his scenario was meant to be regarded as ludicrous, it is not far from many contemporary commercial schemes to tap into a lucrative market, and a captive audience, of schoolchildren. School leaders need to be thoughtful about the degree to which they allow commercially-produced (and biased) curricular materials into the school environment.

Conclusion

In short, then, school leadership in a technological age requires thoughtfulness on many complicated issues. Unfortunately, the more practical level of technology implementation tends to monopolize the time of administrators, leaving these other issues inadequately addressed. Meanwhile, it is these issues that will often make or break technology initiatives in schools, because they are the ones that speak to teachers' concerns about themselves and their students, and that help them decide whether to buy into reform, or whether to resist it. In that sense, then, these issues are at least as important as the more "basic" matters of acquiring the machinery and teaching everyone how it works—matters which must be dealt with skillfully, but which will not, alone, ensure successful implementation of new technology.

References

Morgan, A. (1934). Radio as a cultural agency in sparsely settled regions and remote areas. In T. F. Tyler (Ed.), Radio as a cultural agency: Proceedings of a National Conference on the use of radio as a cultural agency in a democracy (pp. 77-83). Washington, DC: The National Committee on Education by Radio.

Rheingold, H. (1993). The virtual community: Homesteading on the electronic frontier. New York: Harper Perennial.

Leading Academic Change – through Connective Leadership and Learning

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Abstract: Leading academic change in our educational organisations requires a paradigm shift at two levels – both in *learning* as well as *educational leadership*. One of the central premises behind these much-needed paradigm shifts is my inherent belief that a major aim of education should be to prepare our students to participate in and contribute to contemporary society. To do so, the learning paradigm needs to shift from teacher-centred, "broadcast" instruction to interactive, connective learning in educational organisations. It is an environment that focuses on *learner-centred education*; embedding technology into the curriculum; and the *educational* institution becoming a *learning* organisation where teachers share learning with students. To reach that colourful, compelling dream of learner-centred education, we need visionary, connective leadership in educational institutions - a leadership that connects by two-way arrows, with a paradigm shift from independence to *interdependence*, from control to *connection*, from competition to *collaboration*, and from individual to *group*.

Introduction

Leading academic change in our educational organisations requires a paradigm shift at two levels – both in *learning* as well as *educational leadership*. One of the central premises behind these much-needed paradigm shifts is my inherent belief that a major aim of education should be to prepare our students to participate in and contribute to contemporary society. To do so, we need to go beyond the established traditional teaching and learning practices. In a contemporary classroom, it is the "connective learning" by knowledge workers that is going to prepare our young students for the challenges of the new millennium.

The *learning paradigm* needs to shift from teacher-centred, "broadcast" instruction to interactive, connective learning in our educational organisations, as illustrated in (Figure 1). It is an environment which focuses on *learner-centred education*; integration of technology in a seamless manner to support and extend our curriculum objectives; the *educational* institution becoming a *learning* organisation where teachers *share* learning with students; and students are exposed to a curriculum infused with exciting and technology rich learning programs. In a learner-centred model, the New Teacher, who employs meaningful use of learning technologies, becomes a role model in the class and offers creative problem solving experience. The teacher takes the role of *scaffolder of learning*, fostering learning how to learn.

To reach that colourful, compelling dream of learner-centred education, we need visionary, connective leadership in our educational institutions – a leadership that *connects by two-way arrows*. We need a shift in the *educational leadership paradigm* from "independence to *interdependence*, from control to *connection*, from competition to *collaboration*, from individual to *group,* and from tightly linked local alliances to loosely connected global *networks*" (Lipman-Blumen, 2000, p. 226). The new leadership model in educational institutions focuses less on the individual personality of the leader and more on the group – in all its diversity and interdependence. A connective leader does not indulge in, what the philosopher Jean Baudillard describes, the "dance of the fossils" – a preoccupation with controlling those 'lower down' in the hierarchy and focussing on the maintenance of present systems (Clarke, 2000, p. 131). A connective leader sees his environment as a network of peers rather than hierarchies of ranks. He helps to keep people around connected and energised in the new learning landscape – shifting their mindset from schooling to learning, from the traditional structures of sequential, linear understandings of schooling to constructivist, non-linear, hypermedia learning.

Following steps are needed for the *process of leading academic change* to be effective and meaningful:

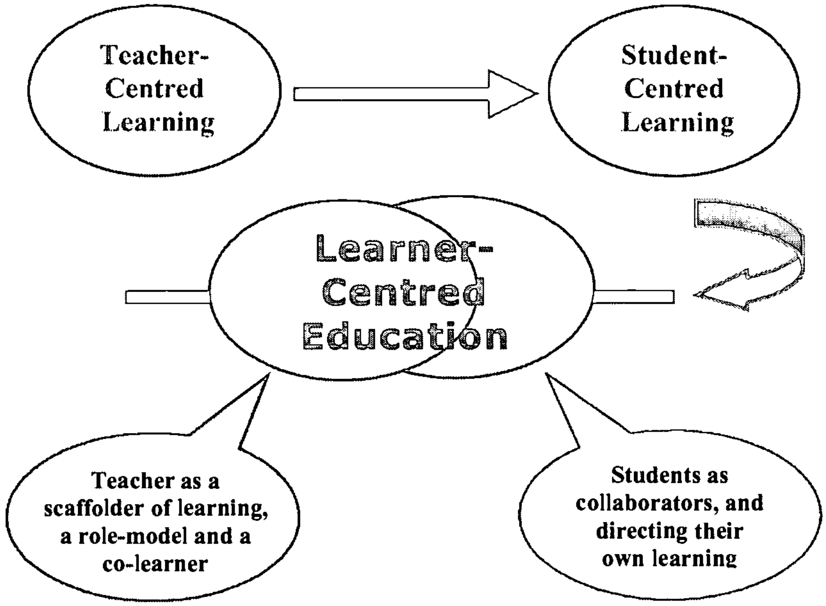

Figure 1: The shift in the learning paradigm from teacher-centred to learner-centred education.

1. Shaping a Shared, Strategic Vision of the Future

Clemmer (1999) reminds us, "Take time to dream!" In each creative mind a dream takes wings and keeps urging, "It could be, It will be...". In the mind of a visionary leader, it won't go until the dreamer heeds and shapes it into reality! (Clemmer, 1999, p. 28).

Simply stated, a vision is a realistic, credible, attractive and inspiring future for the organisation. Like a travel poster, a vision does not show how to get somewhere, but it does present a clear and exciting image of what the world might be like when you arrive.

Connective leaders have clarity of vision, which they share with their colleagues. They know that nothing else will unite and enthuse people in an organisation so much as a *shared vision* for the new connective learning landscape. A vision is not just an idea. It is rather a force in people's hearts, a force of impressive power. It gives people a sense of common ownership that enables them to cooperate with and support each other in pursuit of their common destiny. When people truly share a vision, they are connected, bound together by a common, lofty goal. A shared vision changes people's relationship with the learning organisation. It is no longer, "their organisation," it becomes "our organisation."

Nanus and Dobbs (1999) tell us that a shared vision empowers people encouraging them to take initiative to advance the common effort. A shared vision is a major source of hope and self-esteem for people in the organisation. Once people understand the big picture, they can see the value of their own contributions. They feel pride in being part of an organisation with an important social purpose. For many people a shared vision gives meaning to their lives and makes them want to go the extra mile to help the organisation achieve the vision.

A connective leader recognises that *shared visions emerge from personal visions*. This is how the connective leaders derive their energy and foster commitment. Peter Senge (1999) elucidates that learning organisations, that wish to build shared visions, continually encourage its members to develop personal visions. People with a strong sense of personal direction can join together to create a powerful synergy toward what I/we truly want. This is the art of visionary leadership – how shared visions are built from personal visions, "the art of seeing the forest *and* the trees" (Senge, 1999, p. 127). Visions that are genuinely shared require ongoing conversations where individuals not only express their personal dreams, but also learn to listen to each other's dreams. A connective leader facilitates this listening in the learning organisation, and ultimately as the shared vision develops, it becomes both "my vision" *and* "our vision".

2. Deciding On The Strategic Thrust Of An Organisation: Team Learning

In realising the vision, when it comes to embedding technology into curriculum, you can introduce it, you can give it a sharp focus, you can design it, you can write units of work, you can write endless outcomes of it. But at the end of the day, if it is going to work, it is teachers in the classroom – the barefoot doctors – who will make it work! I think, therefore, it is critical that the strategic thrust of an organisation should be on *team learning* as a connective leader understands that teams can learn: in sports, in the performing arts, in science, there are striking examples of the team that exceeds the intelligence of the individuals of the team, and where teams develop extraordinary capacities for coordinated actions in order to achieve the organisational vision.

In order to create a learning team environment, the connective leader encourages his members to imbibe the practices of dialogue and discussion – the two distinct ways that teams converse. Senge (1999) clarifies that in a dialogue, different views are presented as a means of discovering a new view. In a discussion, decisions are made. Dialogues do not seek agreement, rather a richer grasp of complex issues through a deep "listening" to one another. Effective learning teams need to be able to distinguish between dialogue and discussion and move consciously between the two. A connective leader acts as a facilitator of dialogue and discussion. As teams develop experience and skill in dialogue, the role of the connective leader as facilitator becomes less crucial and he can gradually become just one of the participants. Dialogue emerges from the "leaderless" group once the team members have developed their skill and understanding.

In an aligned learning team, a synergy develops and the shared vision becomes an extension of the team members' personal visions. Using Senge's (1999) metaphor in musical terms, the connective leader works towards developing the learning team as an ensemble. He strives to make the team members reach a state when the ensemble "plays as one." The music "flows *through* you rather than from you" (p. 235). In truly aligned team meetings, it is not remembered "who said what" but there is a shared understanding of just getting to a point of knowing what they need to do. In this sense, the word *team* takes a different meaning: it is a group of people "who need *one another* to act" (p. 236). Ultimately, the teams learn how to tap the potential of their colleagues as they realise that the IQ of the team can, potentially be, much greater than the IQ of the individuals.

A connective leader recognises that in order to achieve the vision, the strategic thrust of an organisation must remain on team learning. He understands that it is teams, not individuals, that are the fundamental learning unit in modern learning organisations. Unless teams can learn, the organisations *cannot* learn.

3. Strategic Issues

a) Staff Empowerment Issues

One of the primary strategic issues for an organisation should be to *plan a successful staff development program* that prepares them for the challenges of the connective learning environment. Teachers need to receive sufficient training and resources to help them effectively plan and execute projects that integrate technology across the subject areas. This teaching model requires them to rethink and reshape their curricula. For many, learning to integrate technology and curricula means mastering a series of challenges, including learning how to use a variety of technology applications; designing technology-enhanced curricula to meet students' needs; using and adapting online curricula; expanding their knowledge of their subject areas and taking on the new roles of *scaffolders of learning* and coach. Practical, real-life experiences will be shared with the audience on a variety of issues such as building a staff team of "computing in education trainers" with ongoing staff training, encouraging and rewarding top performance, and providing adequate resources to the staff.

b) Network Issues

It is essential that the educational organisation's *network is conducive to creating a learning environment* for students, teachers and parents to share and communicate with one another in a way that facilitates connective learning. Choosing a network operating system is very critical. The key things to consider are flexibility, security, ease of integration and use as well the cost involved. It is vital that the educational goals are realised by choosing *appropriate* technology. To do so, it is important to consider how technology that is going to be used to accomplish those educational goals will provide and support a challenging curriculum;

support learning programs for all students; support and provide meaningful professional development experiences for staff; and enhance "home-educational institution-community" collaboration and communication. Our organisation's case study will be shared with the audience.

c) Curriculum Issues

Embedding learning technologies into Outcomes based, learner-centred curriculum is at the *heart of connective learning paradigm*. A connective leader recognises that the textual environment has changed in the 20th century and will continue to evolve in the new millennium in which students will spend their adult lives. One of the major changes is that print is, in a sense, being realigned alongside other kinds of texts – mostly *visual*. We as professionals in our organisation need to adapt to the changing textual landscape – *bringing both print and visual texts together in our classrooms*. To broaden learning for our young people, we need to make them engage consciously with a range of media texts. This does not mean less reading for our students, as some of us may assume, in a conventional sense. On the contrary, as Andrew Goodwyn (1998) points out, "it means both more reading and more intelligent reading *in relation to each other*" (p. 131).

As scaffolders of learning, we need to recognise that the students will need support and stimulation as they struggle to make meaning of the wide range of texts. The learning programs, therefore, need to offer, what I call, *'multimedia scaffolding'* in order for our students to be able to personally engage with the texts and recognise a range of meanings into these texts – print or visual. An innovative, learner-centred unit of work on Shakespeare's *A Midsummer Night's Dream* will be shown to the audience. The unit draws upon an integrated hyper-linked world of a wide range of media texts – such as music, video clips, illustrations, written text, audio recording, web based animations – and invites the reader to make meaning of the texts *in relation to each other*.

Connective leaders do not oppress themselves with the "Tyranny of the OR" – "the rational view that cannot easily accept a paradox, that cannot live with two seemingly contradictory ideas at the same time" (Collins & Porras, 1999, p. 43). The "Tyranny of the OR" pushes people to believe that things must be done either A OR B, but not *both*. Instead of being oppressed by the "Tyranny of the OR", connective leaders liberate themselves with the "Genius of the AND" – the ability to embrace both extremes of a number of dimensions at the same time. Instead of choosing between A OR B, they work out to have both A AND B.

That is why, connective leaders, who liberate themselves with the "Genius of AND", strive to provide a connective learning landscape that embraces a whole gamut of learning activities such as online lessons by staff using the Intranet (and Internet), online discussions by staff and students, online class work and homework by students using Intranet at the learning organisation as well as from home, online marking of students' work, creating study notes by students using hypertext, online examination in classrooms, online recording of marks by teachers using the outcomes based multimedia electronic mark book, online reporting and writing of comments using a reporting program, access to student reports by the parents online from home. Specific examples of the work will be shown to the viewers in relation to the above-mentioned learning environment.

d) Student Issues

Don Tapscott (1998) suggests that the new generation (who are growing up with technology) *assimilate* technology as opposed to the adults who must *accommodate* it (who have an established thinking pattern). The children of the new generation are *active learners* engaging directly with the technology by using powerful tools to probe, analyse, organise and synthesise material. In this sense, they are becoming stronger, independent thinkers. It is the 'receiving' by students – not the 'delivering' – that is crucial. Good teaching ensures students 'receive' – that they are tuned into, and make a personal sense of, the information that abounds.

Various aspects of student issues such as student technology leadership; creating study notes using hypertexts (that reinforces the proactive role of the reader who actively constructs the text through the making of navigational choices); online discussions; creating own websites; and using visual texts will be addressed.

e) Wider Community Issues

The wider community must remain part of this picture. Educational organisations can no longer exist in isolation from the larger community they serve. For education to reflect the skills, attributes, and collaborative learning models needed in the adult world, schools must become an integral part of that world. Linking the greater community to share responsibility for the future of children is the key to achieving a truly *connected learning community*. It is essential we keep the parents informed about our vision and the strategies to achieve the connective learning environment. This can be achieved through a variety of ways such as conducting parent evenings, having open days, visits by key educationists, video production, brochures, newsletters and through the website of the organisation. Please refer to (Figure 2) for an overview of the Connective Learning landscape.

4. Generating Short-Term Wins

Connective leaders thank, appreciate, recognise and celebrate accomplishments. They realise that short-term performance improvements help transformations in a variety of ways. Kotter (1996) reminds us that short-term performance improvements help transformations in a variety of ways. They give the effort needed reinforcement. They show people that the sacrifices are paying off, that they are getting stronger. For those driving the change, these little wins offer an opportunity to relax for a few minutes and celebrate. A little celebration following a win can be good for the morale of the staff. The process of producing short-term wins can help the management test its vision against real conditions. Quick performance improvements undermine the efforts of cynics and major resisters. Visible results help retain the essential support of management. Short-term wins help build necessary momentum. Fence sitters are transformed into supporters and reluctant supporters into active participants. This momentum is critical, the energy needed to complete the process of change vision.

5. Consolidating Achievements and Evaluating Long-term Trends

A connective leader ensures that his team continues to consolidate achievements of the organisation whilst moving on to new pathways. The visionary leader also keeps in mind the long-term trends as he takes strategic decisions into employing meaningful use of learning technologies in the short term.

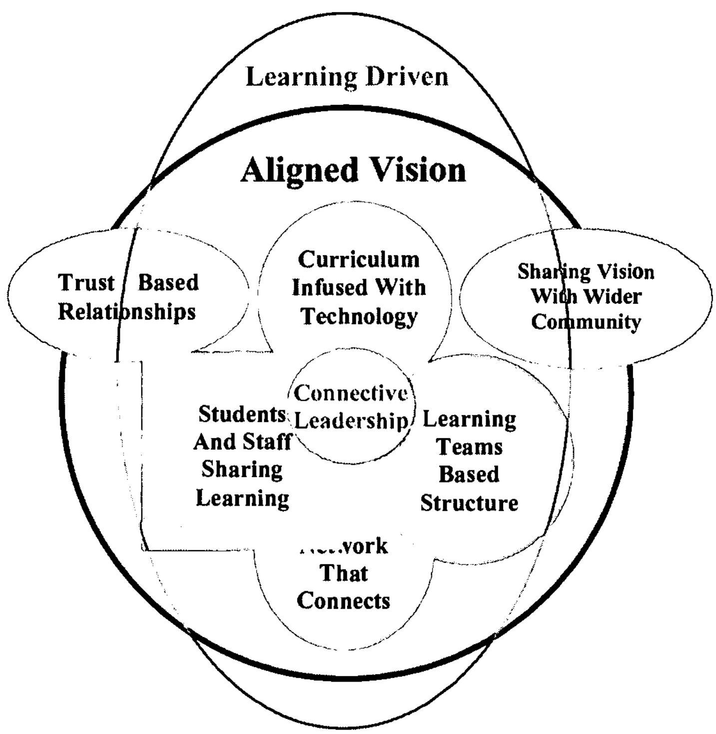

Figure 2: An overview of 'Connective Learning Landscape'.

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Concluding Remarks

For an effective, connective learning environment in our educational institutions, we need to make a paradigm shift at two levels – both in *learning* and *educational leadership*. At the heart of the learning organisation is a *shift of mind* – from seeing parts to seeing wholes, from reacting to the present to creating the future, from seeing ourselves as separate from the world to be connected to the world, and from employing reactive, teacher-centred instruction to collaborative, learner-centred education.

The *new learning paradigm* is more creative and satisfying for the teacher. It also empowers the students. It involves embedding learning technologies into the curriculum – a new model of learning – one based on *discovery* and *participation*. The new paradigm of connective learning, I believe, has enhanced outcomes for the knowledge workers who ultimately spend more time in collaborative work and creative problem solving; construct meaning in their own minds through interactive learning technologies and become stronger thinkers; become independent and interdependent learners with flexible outlooks; become pro-active risk takers; integrate the 4Rs (Reading, wRiting, aRithmatic and Reactive) with the 4Xs of the connective learning landscape (eXploration, eXpression, eXchange and eXtension); acquire research, resourcing, analytical and presentation skills; and experience a learning renaissance.

To accomplish this powerful dream of learner-centred education, we need a *new leadership paradigm* that connects by two-way arrows. In a contemporary learning organisation, as I perceive, the connective leader becomes a craftsman of shared vision, a scaffolder of learning and a teacher. Although initially it is the connective leader who must initiate and bear the torch of the strategy process for leading academic change, it is the people of the organisation who ultimately make this dream possible. Expecting everyone to share the burdens of leadership, the connective leader sparks in other people self-confidence, creativity, ownership and loyalty. He liberates the leader in everyone. As the implementation process of connective learning landscape proceeds, he monitors progress, keeps the board informed, and shares the celebration of various accomplishments with staff members from time to time.

Whether we are leading our lives, leading our work or leading our organisations, we are continually "going beyond what is" (Essex & Kusy, 1999, p. ix). If we are not going beyond what is, we may be *managing* what is but *not leading* others and ourselves into the future. Connective educational leadership "goes beyond what is." An innovative, visionary leader as a strategist in *leading academic change* for a connective learning environment must fast-forward his strategies and leadership into the future, *now*.

References

Clarke, P. (2000). *Learning Schools, Learning Systems*. London: Continuum.

Clemmer, J. (1999). *Growing The Distance*. Canada: TCG Press.

Collins, J. C., & Porras, J. I. (1999). *Built to Last*. London: Random House Business Books.

Essex L., & Kusy M. (1999). *Fast Forward Leadership*. London: Prentice Hall.

Goodwyn, A. (1998). *Literary And Media Texts In Secondary English*. New York: Cassell Education.

Kotter, J.P. (1996). *Leading Change*. Boston, MA: Harvard Business School Press.

Lipman-Blumen, J. (2000). *Connective Leadership*. New York: Oxford University Press.

Nanus, B., & Dobbs, S.M. (1999). *Leaders Who Make A Difference*. San Francisco: Jossey-Bass Publishers.

Senge, P.M. (1999). *The Fifth Discipline*. Sydney: Random House Australia.

Tapscott, D. (1998). *Growing Up Digital*. New York: McGraw-Hill.

Accountability, Technology, Flexibility: Ensuring Student Success

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Abstract. When school systems find they must adjust what they are delivering because their performance measures show they are "low performing," how can a system efficiently and effectively adjust the curriculum? Can the web help us test students more efficiently? How can teachers and administrators get meaningful, timely guidance so that they know what is expected, whether or not they are providing needed instruction, and which resources target those needs? This paper describes software applications that provide critical assistance to school systems in responding to the changing expectations being experienced in the emphasis on accountability and meeting "standards" or expectations.

Introduction

Accountability mandates require that districts, schools, principals and teachers focus clearly on those measures by which their students are held accountable. High stakes test results and state standards identify much of what school districts must ensure that their students learn, because these identify the bulk of specific accountability expectations. A critical issue is how school districts can respond quickly, accurately, and with continued flexibility to changing expectations. How can K-12 schools ensure that what we ask teachers to teach--and the resources we provide them to teach with--address the expectations of these accountability mandates? Can information technology help school systems to make sure they are teaching, not only the content of the curriculum required by the state, but also what is actually tested? Can educators and software developers work together to ensure student success? How can these issued be addressed in training pre-service teachers? This article offers four perspectives--District, State, University, and corporate--on using technology to meet accountability mandates.

Kathryn Floyd: The District Perspective

Electronic curriculum management for assisting low performing schools

Like Chicken Little, the public cries, "Our schools are failing! Our schools are failing!" What is the response to those cries? "High stakes" tests in public schools. What's at stake? Public trust and support for public schools. Results, in the form of improved outputs reflected in student test scores, are demanded by legislatures across the nation with the state boards of education enacting offices of accountability. The core issue confronting public education in most states is proving to the public that their students are showing improvement in academic performance: How will we define success? How will we know we have succeeded? Expectations for student learning are created, reviewed, revised, and updated continually.

In a not-too-unusual scenario, new teachers are provided the new curriculum (maybe one document per room, department or school), textbooks for the students, a lesson plan book, a grade book, and class rolls. Far too often the teacher sets everything aside but the textbook. S/he begins looking at the table of contents to decide *what* s/he will "cover." If s/he's a high school teacher, s/he will likely begin devising a semester syllabus to identify *when* s/he will "cover" *what*. Experienced teachers often look at a newly adopted textbook and related materials to see where the new book fits with what they are accustomed to teaching. If they find too much new material, they may pull out files from units taught in past years and decide how they can still use what they are comfortable with. After all, they are the curriculum experts, right?

Later, when assessments are given to their students, these teachers may look at the results and be dismayed to find their students' scores are not what they – and others – had hoped they would be. Student grades on classroom work might be relatively high, reflecting that the students had learned what the teacher expected them to. So where is the problem?" Our schools are accredited; why aren't they doing a good job? Given that the schools and teachers have been provided with the "inputs" accreditation requires, why is there not better "output?" The problem does not lie with the many wonderful teachers who are doing what is becoming, increasingly, an overwhelming task. It lies with how curriculum documents are developed.

Consider this analogy. Assume the teacher's skills in delivering instruction to be those of a skilled archer. The teacher/archer is provided with an array of targets and told to fire carefully. S/he scores a bulls-eye with every shot. Imagine the dismay when the scorekeeper notes a very, very low score! Scorekeeper: "Sorry. Your shots were very accurate, but you aimed at the *wrong targets!"* Teacher: "But I didn't know it mattered which one I hit, only that I hit one accurately!" Similarly, far too many classroom teachers are masters of the content, are wonderful at providing instruction, assessment, and classroom management, and truly love what they are doing, and yet find student tests scores sadly low. Such teachers may have done a masterful job of teaching and the students of learning what was taught. The problem is that what was taught so masterfully, and learned so well, was not what was measured on the mandated tests all students had to take!

As things stand, we cannot expect each teacher to review the curriculum to be taught and the objectives to be tested and then decide what part of the required textbook should be covered and what must be provided from other resources. This is an incredible responsibility--one that school systems can no longer afford to assume individual teachers can fulfill without adequate and very specific guidance. Schools are realizing they must somehow make sure the material in the curriculum and the objectives on the required tests are what teachers are "covering." But first, we must find an efficient and effective way to identify and share that critical information in a written curriculum. We must find a way to revise and update this curriculum, quickly and effectively. Assigning this labor-intensive task to teachers is simply requiring one more mission of those who are already overwhelmed by other responsibilities.

It would be easy to bemoan reducing the curriculum to the kinds of information that can be easily tested and scored. It would be easy to blame the use of norm-referenced tests as outcome measures, an admittedly questionable but publicly-demanded practice to show how local or state students compare to those in other schools across the nation. While all of those concerns may have legitimacy, we must, in the words of Mike Schmoker, "move beyond a counterproductive criticism of existing tests and move toward a more cooperative and transitional path."

The demand is huge for schools to take the expectations identified by the state and measured in mandated tests and align them in an easily-modifiable and teacher-friendly document. Only then can individual teachers focus their energies on instruction of students, on deciding *how* they can help students learn the skills and material and which resources they will use to do that effectively. The *what*--the expected outcomes--has really already been largely decided.; in most cases it just isn't a flexible, working document that is really designed to be used.

We must find a way to help all educators use expectations and performance outcomes to drive our improvement efforts. Educators must identify and use those tools that will help them immediately respond to changing expectations. We must optimize our use of every means of helping educators at all levels: identify patterns of weakness, modify the curriculum, and provide the needed instructional and professional development resources so teachers and others can focus on the "how" of teaching and learning--on instruction and on responding to the individual needs of the students. We need to find and utilize tools that maximize the use of information technology to help educators focus on instructional strategies to optimize student's learning what they are being help responsible for. Teachers need to know where those expectations originate and then be aware of the rewards or consequences if they don't help students master them. When armed with this information, teachers can adjust their pacing and time allocation. Teachers need help in making quick adjustments and in tailoring tests to determine mastery. In light of all that working with students today demands, we must utilize every means possible to maximize time and opportunity for learning.

Students need to be provided clear, up-front expectations and individualized study sheets to help them learn those areas where frequent classroom and end-of-year assessments show they need additional study. What schools are expecting their students to learn must have wide and intensive stakeholder support based on clear and frequent parent communication. The expectations need to be a clear, readily accessible and adaptable public document, not a "stealth" document. Parents need access to those expectations and to resources that help them help their students attain mastery.

Educators need to have access to information technology tools that reduce the labor-intensive nature of responding to all these needs. Pre-service teachers and leadership personnel need to be trained during their preparation programs about curriculum alignment is, why it is necessary, and how it may most efficiently and effectively be done. Teachers and leadership personnel need pre-service training and in-service professional development in how to analyze performance/test scores and related comparative data to use them to modify the expectations, identify gaps and/or overlaps in what is being taught, identify the resources available and/or needed, and allocate resource in the budgetary process to provide what teachers need to help students succeed. In short, *what's* expected in the classroom, the reasons *why* those are the expectations, and the *consequences* of failure to achieve them need to be clear to all. The results of the measures to determine success, however flawed any one assessment process may be in isolation, need to be studied and communicated clearly so educators, students, parents, and the community can know "Did we succeed?" Given that information, the task then is to make modifications to ensure greater success.

Before I retired as Assistant Superintendent of Pickens County Schools, we adopted Curriculum Designer and its related components, Skills Connection and Home2School, products of EdVision Corporation. Curriculum Designer is a curriculum planning system that enables school and district level curriculum teams to align curriculum with state and national standards and to produce a curriculum continuum for K-12, without gaps or duplications. This software efficiently and effectively identified the expectations from the various curriculum and standards requirements and assessments/tests our district was accountable for. Once drafted, our curriculum document could be modified almost instantly whenever the need arose. Skills Connection, a classroom assessment tool, draws on the same database—some 72,000 objectives—to integrate necessary objectives into classroom assessments without requiring teachers to craft each assessment individually. Skills Connection also provides a Home Study Guide for each skill to assist parents in helping their children study at home. *Home2School.com* (a free website for parents) provides constantly updated resources and tools to help parents effectively participate in their child's education. This site includes curriculum resources, tutorial lessons, reading lists, and other information of interest to parents. These software packages are incredible electronic information tools being used by school systems throughout the nation to develop action plans that can truly begin with the *end* in mind.

In this time when the cries of "The public schools are failing!" resound across our nation, we must do all we can to assist our educators in pre-service preparation, graduate coursework, and in-service professional development to become knowledgeable and skilled in using such tools. Information technology tools such as Curriculum Designer and Skills Connection can help educators immeasurably in working with others in their individual school settings and communities to help with the essential task of restoring schools--and the professional educators at all levels that work to help them succeed--to a source of national and local commitment and pride.

John Moore: The State Perspective

Using the web to meet accountability mandates

The state of South Dakota developed state standards at great expense over a considerable period of time. These standards were adopted by the legislature and mandated for school districts to adopt and implement. Teachers have to teach the standards. What we didn't have until recently was a way to measure accountability. No one--at the local, district, or state level--had any way to measure whether those standards were being taught. An external audit showed that there wasn't a true one to one correlation between the national test (SAT9) and South Dakota's state standards. The State legislature appropriated money for development of criterion referenced tests. We had the option to write the tests ourselves or to contract a third party to write the tests for us. This section shares how South Dakota schools used web-based assessments to target the instruction level of each student.

South Dakota has an interesting educational situation caused by the distribution of a small rural population over a large geographical area. There are a total of 176 public school districts. Twenty five percent of the school districts have seventy five percent of the student population. Much of the student population is in the eastern third of the state. How could the state deliver a world class education with so many small school districts?

Governor Bill Janklow recognized the unique situation South Dakota was facing and proceeded to wire every public school classroom with a T1 line. To make this project cost effective, prison inmates were used to provide the necessary labor. A local electrician was hired at each school district to supervise the project. Inmates slept on cots in the school gymnasiums. Many prisoners received job offers after being paroled because of this hands-on technical experience.

At South Dakota's State Department of Education, we've heard many wonderful stories as a result of wiring the schools. One elementary teacher observed an inmate who was approached by two first-grade boys.

One of the boys looked up at the inmate and asked, "Are you one of the prisoners?"

"Yup," was the reply.

The boy asked, "Did you kill someone?"

"No," the inmate replied. "I've never hurt anyone."

Then why are you in jail?" the boy asked.

"Because I didn't pay attention in school," the inmate answered.

According to Governor Janklow, South Dakota is now the best wired place on the planet. But that's only a start. The important thing now is to find ways to use this technology to give students the opportunity for a world class education. One way we're doing this is offering classes over the Digital Dakota Network (DDN) to students of all ages. This two-way audio-video system (V-Tel) is in operation for the 2000-2001 school year. The idea is to provide options for students who might not otherwise have an opportunity for certain subjects.

South Dakota is also the first state in the nation to provide an on-line state wide assessment. We have entered into a strategic partnership with EdVISION Corporation of San Diego, California, to provide an assessment that is aligned to the state content standards. Performance.com, the web-based assessment tool we've adopted in South Dakota, will tell teachers which content standards have been mastered and which need more work. The teacher can click on each standard and get instructional strategies on how to help students master standards. This web-based, computer-adaptive test covers four academic areas: reading, math, science, and language arts. It provides instant feedback to teachers, students and parents. Results are available immediately following the assessment. Student progress over a period of time may be tracked.

These web-based tests are significant alternative assessments to norm-referenced and traditional criterion-referenced tests. They utilize a computer-adaptive model to target the instruction level of each student by altering question difficulty based on previous answers. The reading test, for example, with which we began our statewide implementation of web-based testing, utilizes an expert system to report a proprietary Reading Progression Index (RPI) for students in grades 2 through 12. The test is tailored to each student as the test progresses. The interactive system uses the students' own responses to determine the difficulty of subsequent reading passages and response questions, without continued exposure to either very easy or very difficult questions. The average test time is 30 minutes, although students reading well above their grade level may take more time to complete the test. This means that testing time generally occupied only one class period.

Another logistical boon in web-based testing is that test proctors do not necessarily have to be teachers. The role of the test proctor in web-based testing is to *assist with computer use*, but *not with the test*, itself. Proctors monitor the test environment to ensure optimal testing conditions for all students. If the students are not computer literate in terms of using the mouse and scrolling, the proctor may need to take a little time and demonstrate computer use. Before the students begin tests, the proctors explain the purpose of the test, and describe how the test helps teachers gain information about individual reading levels. Proctors also describe the layout and design of the test, as well as its similarities and differences to types of assessments the students have encountered previously. They assess the students' physical comfort level, their ability to view their computer screens, and their ease with using a mouse. Finally, they follow scripted instructions to guide students through testing startup.

As with any new process, thorough training is key to successful implementation. When South Dakota adopted web-based testing from EdVISION, we asked their Professional Development team to spearhead certification workshops for our Testing Coordinators. Once this core group of our own educators were trained how to get each student to reach their potential using this assessment, they in turn trained proctors at their own school sites. EdVISION staff wrote a Test Coordinator's manual and a Proctor's Manual for us to distribute as part of the certification process. Follow-up workshops will be held in the spring to help teachers and administers interpret test results.

Research studies indicate that feedback is one of the most important motivators of students and teachers. One of the most valid complaints concerning external assessments is the amount of time is takes to get the scores returned. Information that could be used to inform teaching practices is unavailable when during critical times. The web-based testing we've adopted in South Dakota makes scores available immediately following testing. Thus, teachers can utilize the information interpreted from reports to make *immediate* changes in the students reading instruction. Teachers across the content areas can also use the information to determine the needs of students and how performance may be effected in these subject areas as well. Parents can be informed so that they can begin to assist in providing appropriate grade level reading materials and reading along with their child to increase reading comprehension.

While South Dakota was the first to adapt statewide web-based testing, it won't be the last. The new teachers who enter South Dakota and other innovative school systems with a knowledge of web-based assessment will find themselves on the cutting edge of what we're trying to accomplish. They will be able to more quickly embrace this assessment tool to evaluate, maintain, and foster their students' academic achievement.

Terry Bailey: The University Perspective

Technology and Pre-service Teachers

Teacher education institutions are well positioned to provide opportunities for pre-service teachers to learn about becoming successful K-12 educators through content, classroom, and curricular development. As we become a more technology-driven society, it is apparent that teacher education programs must address issues related to computer competency, technology integration, and Internet accountability. Faculty and administrators at Ball State University have used the software described here to introduce pre-service teachers to curriculum alignment and accountability measures. How can we help our teachers enter the field knowing how to align and integrate the skills their K-12 students are required to know?

Faculty and Administrators at Ball State University are using EdVISION's Curriculum Designer and Skills Connection software to show pre-service teachers how to align and integrate the skills that K-12 students are required to know. EdVISION's University Partnership program is designed to allow university professors the opportunity to utilize the software in a laboratory setting at no cost to the university. Students purchase a laboratory pack that includes the product manual, support materials, and product tutorial. The program resides on a group of predetermined computers available to students enrolled in the class. The internal security feature in Curriculum Designer is enabled to prevent unauthorized use of the software. EdVISION provides training for professors to support effective implementation of the products into the college classroom.

The University Partnership Program allows institutions like Ball State University to do the following:

- Introduce the power and the possibilities of electronic design and assessment software through curriculum design projects, classroom discussion, and project development to other colleges and universities at professional meetings and in classroom environments.
- Be a research and development "sounding board" for EdVISION as they further develop their products. Discussions with pre-service teachers in university courses and graduate students who are already working in the education field give us valuable information about how software is getting implemented on the job.
- Offer state-of-the-art facilities for online workshops and communication through 1-way or 2-way videoconferencing, videostreaming via the Internet, and community portals.
- Demonstrate the EdVISION's curriculum design and assessment software to superintendents, principals, teachers, and parents at professional meetings and community forums. We want to show how these products can be used as alignment, accountability, and assessment tools in the educational process.
- Provide ongoing training and support to pre-service and in-service K-12 teachers who are using products like Curriculum Designer and Skills Connection.

Pre-service teachers need experience with the infusion of curriculum alignment software into standards-based curricula. Our University Partnership with EdVISION has allowed us to offer a hands-on course in using curriculum design and assessment software. Participants engage in activities that revolve around the idea that learning a concept involves using technology *in context.* Students understand that setting and following standards are critical components for accountability. Without high standards for what we expect students to know and be able to do, we will not have the kinds of schools we want. Experience and research has shown that high standards and rigorous assessment alone will not guarantee success for all students. For expectations to be met, clear standards must be put into place and followed. The University Partnership program allows pre-service teachers to use software that was designed specifically to help with this implementation process.

Cheryl Reed: The Corporate Perspective

Accountability and .com—can this marriage be saved?

How can schools get the funding needed to ensure student success? If technologies like those discussed here are available to clarify, reshape, and drive our responses to escalating accountability mandates, how can districts get the money needed to purchase them? Are alliances between education and corporate concerns necessarily uneasy ones? Can we teach pre-service teachers and administrators how to get strategic funding?

My company, EdVISION Corporation, has worked with each of the school systems discussed by my co-authors in this article—and, of course, many others--to help them implement reform with software that meets the needs of their specific situations. My colleagues are Ph.D's, Ed.D's, former public school teachers and administrators, and former University professors and writers. In the Professional Development Department alone, we have a combined teaching/administrating experience of 110 years. Our company goal has always been to make possible a coherent curriculum for all students, leading to academic success measured by fair and accurate assessment. In short, we are educators who develop software, not software developers who market to educators.

Part of my enviable position at EdVISION is to connect people with resources. I know where the money is hidden. As Coordinator of Proposals and publications, (and formerly, as Assistant Professor of Writing at Penn State University), I have been consistently amazed at the amount of grant money that's available for educational endeavors. Pre-service teachers need to know that *people have money they want to give away—to us!* At Penn State, I was always the professor who had work study students, new computer software, stipends for overwork, and travel money for conferences. When my colleagues asked me, "How did you get *that?*" I'd say, "I asked for it." In my experience, it was as simple as that.

After many such encounters, I realized that huge amounts of money are available, but *most of us receive very little of it.* There appears to be a built-in disconnect. Why don't more worthy projects get funded? Why do so many proposals seem doomed to failure? After getting my own proposals for educational and publishing projects funded, and helping other people to write theirs, I have some suggestions for pre-service teachers to think about.

First, locating grant money takes time out of an already packed schedule. As much as possible, get information coming *to you* rather than going out to search for it. Many foundations, government agencies, and university websites have free electronic services (like the Grants Net Info listserv offered by the Department of Health and Human Services or the Foundation Center listserv) that will update you about grant foci and deadlines.

Second, decide how much time and money you want to invest finding grant money. Do you want to purchase a hard copy of government grants? Of private funding foundations? Books on grant writing? Do you want to set aside Friday afternoons (for example) to surf the web for grants? Do you want to pay a consultant firm to send you grant updates?

Third, find out what your institution already has available to you. Start at "home" with grants tailor-made to your situation, then branch out to larger opportunities. Find out what kinds of listservs, websites, and notification services your institution may have already purchased. Then, use these resources!

Fourth, *apply only to those grants that mirror your goals*. Most of us have a vision that *we* want to accomplish. We hope that the grant-funding institution can see it "our way." Yet, we have a *much* better chance of success if we analyze what a particular organization wants to fund, and see how our vision fits in with theirs. Think of the funding organization as the larger framework into which your request fits rather than the other way around. For example, if you think technology would solve a problem in your school, but the funding organization warns, "We are not looking for solutions which merely throw technology at a problem," you'll want to describe your project in a way that shows how technology will be *integrated* into the solution. How will your plan prevent the technology you buy from becoming "shelfware"—never utilized or implemented? How will technology help the people who will be implementing your plan?

Fifth, don't let the educator's ingrained shyness about asking for money get in your way. Use a business model when writing grant proposals, *not* a scholarly model. Let's take a close look at the difference between these two models: in my experience, the way you present a project is one of the major factors in whether or not a grant gets funded.

The scholarly model. Many writers--passionate about the school reform they want to enact—simply don't like to ask for money. They prepare their requests for funding the way they would prepare a formal scholarly article:

1) Pose an interesting research question,
2) Support your argument with several references to other scholars,
3) Show how it gets enacted in your own situation
4) *Very gently* suggest a possible conclusion—but leave it open for interpretation and further discussion.

These gentle, scholarly proposals aren't likely to be funded. The people reading them may see you have a real heart for your students, but they will have no idea what it is they are being asked to fund, or why, or how to evaluate whether or not your project has been successful!

The business model. Now let's look at a business model. The writer follows this plan:

1) *State the problem or issue.* State what you want to change in one or two lines. " The Stellar Students Academy needs a curriculum aligned to state standards if we want to maintain our top ranking among schools in this state."

2) *Make a promise.* What will solve the problem? Again, state it briefly—you can expand a bit later. "The adoption of an electronic curriculum will help craft a dynamic set of objectives so that students are taught the objectives on which they'll be tested."

3) *Describe a process.* This is the "this is how it all works" section, and depending on page limits set by the funding organization, it can be from several paragraphs to several pages. Use bolded headers, white space, charts, and other methods that organize material visually. Answer the questions asked in the foundation guidelines. Be able to describe how you'll fulfill your promise in some detail. What intervention is being attempted? Who will be involved? What kinds of changes in teacher schedule, workload, computer resources, etc. will this involve? What software needs to be installed? Who will do that? What timeline do you envision for implementation? What changes will have to be made in the existing system, schedule, or budget in order for your plan to work?

4) *State your estimated costs—in work hours and dollars.* Include cost sheets, implementation timelines, technical requirements, and plans for staff development. Will you have to pay the installers or staff trainers?

5) *State evaluation criteria.* What will *tangible* success look like? Why is *this* plan the most likely to achieve *this* goal? Offer a way for outcomes to be measured tangibly—test scores, workshops given, documents produced, parents involved.

6) *Restate your promise.* If this project gets funded, the organization can expect to see---This is important because---.

In most cases, grant writers are visionaries pitching ideas to pragmatists. Grant writers see a vision of what can be, and are willing to make whatever changes are necessary to make their vision happen. Grant writers envision transformation, innovation, new ways of seeing. Funding organizations, on the other hand, take a more pragmatic approach. What can work in the present system? How can we gain the most with the least amount of expenditure? Why should we fund *this* project over *that* one? How does this project fit in with our overall foundation mission? If there is any place that the marriage between academe and .com is strongest, it is in grants that propose schools adopt savvy new technologies. Communicating academic funding needs to government and private funding organizations is, in the words of business writer Geoffrey A. Moore, the "chasm" that teachers and administrators attempt to cross when they seek funding for technological innovation in their school districts. If we can help our pre-service teachers understand how to articulate clearly their vision for reform, we will have unleashed dynamic change agents into a school system already undergoing a massive transformation.

Community Innovations for SITE: Who is doing what with Clearinghouses and On-line Tools Development?

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Abstract: This interactive panel session aims to inform the further creative development of SITE's web sites. It will be particularly relevant to groups within and beyond the USA who are developing "clearinghouses" and/or new "on-line tool sets" for technology in pre-service and graduate teacher education. The session will also consider ways in which SITE can collaborate with related on-line communities.

The session goals are:
- Exchange information and contacts with one another
- Get a better sense of the recent landscapes of on-line development
- Enable participants to envision and form new alliances and partnerships
- Facilitate better use of resources
- Create an atmosphere for more focused planning and deployment of new capabilities
- Open the possibility for broader applications and co-learning among innovators
- Consider collaborative links with leading edge scholarship in technology and education
- Link with the SITE survey of teacher educators' needs and potential contributions

Background

Niki Davis' keynote paper 'SITE: A Site of Educational Leadership for the Emerging Knowledge Society' for this SITE 2001 conference suggests that SITE can model behavior for the emerging knowledge society (in press). Within it she describes the background to this innovative session:

'Most recently, I have begun to lead the further development of SITE's web site to support our objectives of committee and community support. David Gibson of the Teacher Education Network (TEN) PT3 catalyst project looked for collaboration with SITE during the 2000 conference, recognizing what the National Interagency Civil-Military Institute (NICI) web site and tools might bring to enhance teacher education (http://www.nici.org). As a result I have undertaken to lead a needs analysis of SITE membership and to investigate how NICI web tools might be used to support SITE, especially its working committees.

The Center for Innovative Learning Technologies (CILT) conference provided another opportunity to address SITE needs (http://www.cilt.org). Part of the work of the professional development sub-group at that conference resulted in a successful seed grant proposal for SITE-CILT collaboration, which will particularly support SITE membership needs for scholarly collaboration. The convergence of these two small projects and AACE's commitment to web development to support our scholarly community will be an important interactive session during the SITE conference. The goal of the session is to design an ongoing environment to continue SITE committee work arising from meetings of the committee and our new Saturday Town Meeting. The needs analysis is underway. We hope that all SITE delegates will participate in both sections: needs and contributions. The aim is to create a range of complementary synergies between these two, so that all participants benefit. The survey will become available on the SITE conference web site in early 2001 and will inform the redevelopment of SITE's web sites for the conference, committees, and other activities.'

This SITE Session

This interactive panel session is designed for SITE participants interested in developing our on-line community. It will be particularly relevant to leaders of national projects, PT3 implementation and catalyst grants and other groups within and beyond the USA who are actively building or planning to build 'clearinghouses' and/or new 'on-line tool sets' for technology in pre-service and graduate teacher education. The session will also consider ways in which SITE can collaborate with related on-line communities, including CILT's Knowledge Network (http://kn.cilt.org), The PT3 Teacher Education Network project linked with National Interagency Civil-Military Institute (NICI) web site and tools might bring to enhance teacher education (http://www.nici.org), ISTE's Subject Interest Group (SIG) for teacher education. Beyond the USA, MirandaNet provides support in collaboration with industrial sponsors (http://www.mirandanet.ac.uk) for change agents leading the deployment of new technology in school and teacher education in the UK and in the Czech Republic.

This interactive session aims to inform the creative development of SITE's web presence(s), and to do so in a way that does not ignore equity issues in its language and coverage.

The goals of the session are to:

1. Exchange information and contacts with one another
2. Get a better sense of the recent new landscapes of on-line development
3. Enable participants to envision and form new alliances and partnerships
4. Facilitate better use of resources
5. Create an atmosphere for more focused planning and deployment of new capabilities
6. Open the possibility for broader applications and co-learning among innovators
7. Consider collaborative links with leading edge scholarship in technology and education
8. Link with the SITE survey of teacher educators' needs and potential contributions

The discussions will also draw upon SITE's existing web site presences, which are the SITE conference web site and the on-line journal of Current Issues in Technology and Teacher Education. Glen Bull and Jerry Willis jointly edit this on-line journal under the SITE umbrella. However, the content sections within the journal are edited and controlled by the appropriate content association, with the whole publication organized by AACE (http://www.citejournal.org). The first issue of Current Issues in Technology and Teacher Education includes articles that discuss the challenges of on-line publishing. Although this interactive session aims to focus on on-line community development, rather than on-line publishing, similar issues impinge. These include the evolution of appropriate cataloguing (and/or a system of metadata); protocols for collaboration; and robust archiving including multimedia.

Outcomes

It is hoped that the outcomes of this interactive session will prime energetic developments on-line to create better facilities for SITE to support participants' need for their teaching, professional development and research. In doing so care will be taken to build upon web sites and scholarly collaboration, rather than to duplicate them. It is also planned to document these scholarly activities and publish them in academic papers, hopefully including the SITE on-line journal Current Issues in Technology and Teacher Education.

Reference

Davis N.E. (in press) SITE: A Site of Educational Leadership for the Emerging Knowledge Society, In Willis, D.A., Price, J., & Willis, J. (Eds.) *Proceedings of SITE 2001*. Orlando, March 2001, Association for the Advancement of Computing in Education Charlottesville, VA.

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The role of school administrators in the process of effectively integrating educational technology into school learning environments: New research from the mid-west.

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Abstract: The study reported in this paper examines the role of administrators in the integration of technology into the learning environment of three school districts in the mid-west region of the United States. The outcome of the study provides information that will assist school district and building administrators in developing a greater awareness of their role in supporting the use of technology in the instructional environment. School administrators, instructional staff and technology coordinators participated in this qualitative study. Data collection strategies selected for this qualitative study were focus groups and interviews. Conclusions and recommendations derived from these data are presented in the form of administrator role responsibilities.

Introduction

Based on an analysis of research similar to that reported by Stegall (1998), stating that school administrators did not mention technology leadership as an area of administrative responsibility during an analysis of their perceived areas of responsibility, the research described in this paper focuses upon the administrator's role in the process of integrating technology into teaching. This is a topic with a surprisingly short history. Bromley (1998) provided the reasoning for this phenomenon. Rather than starting with a determination of what schools should accomplish and then asking how technology might be used to achieve those goals, Bromley suggests that computing initiatives have most often been based on the attitude, "This technology exists, we've got to have it" – that is, educational computing has largely been technology driven rather than curriculum driven. As a result, putting computers in schools has all too often meant getting more of the same, only automated: electronic workbooks, computerized tracking of student "progress," and so on (p. 128). Given that this situation was once a widespread phenomenon across the country, it is not too difficult to understand the reasons why administrators did not consider deep involvement in this process to be necessary. The fact that many administrators are not comfortable with technology, and have participated in leader preparation programs that did not include reference to or use of technology adds to a lack of administrator involvement in the process (Gibson, 2000; Maurer & Davidson, 1998; Roden, 1997; The Office of Technology Assessment, 1988; 1989; 1995). As greater awareness of the potential of technology to positively impact learning has grown, and recognition of the need to transform the way schooling has occurred has increased, and the variable rates of technology adoption around the country have been recognized, the need for involving the whole educational team in the process of integrating technology has become a pressing reality.

Recent literature on educational leadership has sharpened the focus on technology issues facing educational administrators. The number one issue in the effective integration of educational technology into the learning environment is not the preparation of teachers for technology usage, but the presence of informed and effective leadership. Confirmation of this statement can be found in the literature on professional association web-sites related to establishing technology standards for administrators. Further evidence that what administrators do or fail to do makes a critical difference in the effective use of technology in schools can be found in the national movement to develop technology standards for school administrators. The question, "What should administrators know about and be able to do to ensure successful integration of technology in P-12 schools?" is being addressed by the Collaborative for Technology Standards for School Administrators(<www.iste.org>or<www.cnets.org>).

In his keynote address to the Expert Forum on Technology Standards for Administrators (Denver, Oct. 2000), Latham, Director of Assessment for TeacherUniverse suggested that the key to the technology vision was leadership. With the same thought in mind, standards advocates have suggested that developing national technology standards for school administrators is the beginning of the process of preparing school leaders to be capable and knowledgeable participants in the process of effectively integrating technology into learning environments.

The Research Process

Following analysis of the literature, and recognizing the need for leadership in their own school technology situations, a research team comprising students enrolled in a Master of Education program, specializing in Educational Administration and Supervision, at Wichita State University, Kansas, and a professor teaching in the program, recognized the need to consider administrators' roles in the process of integrating technology into school processes. A research study was designed to address this issue.

The purpose of the study was to analyze the role of administrators in the process of the integration of technology into the instructional environment of three school districts in which members of the study team were currently employed. The data collected were to be synthesized with information gleaned from the literature to form the basis of a guide to administrators interested in enhancing the success of the technology integration efforts of their building and districts.

The study addressed the following questions.

1. When integrating technology into the instructional environment, what is the building administrator's role as instructional leader?
2. What administrator supported processes are necessary when integrating technology into the instructional environment?
3. What building or district level structures are necessary for teachers to effectively integrate technology into teaching?

The research was qualitative in design and incorporated the collection of data using interviews and focus groups with instructional staff and administrators. Instructional staff included teachers, as well as those who were acting in the role of technology consultants for school districts.

The Research Design

The nature of the research, and the research questions implied a need for data to be rich in description, focused on individual perceptions and detailed in the analysis of the topic in question. As such, a qualitative design was chosen to match these expectations. Drawn from a naturalistic approach to educational inquiry (Erlandson, Harris, Skipper, & Allen, 1993; Lincoln & Guba, 1985; Patton, 1990), this study design adopted a discovery-oriented approach to data collection intended to minimize investigator manipulation (Patton, 1990). Data collection strategies able to provide the richness of data and the variety of perspectives necessary to understand the complexities of the situation under study (Erlandson et. al., 1993) were selected. The need to gather data on this topic using a variety of approaches was also necessary to support the trustworthiness of the data collected. The study team adhered to the need to triangulate the data collected (Lincoln & Guba, 1985).and increase the credibility of the findings through the use of focus groups and interviews. Teachers were randomly selected from each of the three schools to participate in one of three school-based focus groups. Focus groups were conducted when a minimum of six teachers agreed to participate. Principals and technology coordinators from each school participated in interviews. With the permission of all participants, each data collection activity was audio-taped to assist in accurately capturing all responses. Data from these activities were unitized (Erlandson et al., 1993) and subjected to the process of constant comparative analysis advocated by Lincoln and Guba (1985). This process was assisted by the use of a relational database allowing repetitive manipulations of the data until naturally occurring themes and categories emerged. The themes and categories created the framework for analysis of the administrator's role in technology integration.

Research Results

Categories and themes emerged during the data analysis process, indicating the areas of greatest concern for the respondents from these three mid-western school districts. Comments from study participants clustered around common themes related to existing practices, planning, curriculum issues, resources, staff issues, communication, support, obstacles, professional development, and implementation. These emergent themes have been maintained in the organization of the recommendations for school administrators presented below. Each statement is designed as a recommendation that all school administrators should follow.

1. Existing Practice
Become aware of existing practices in the building, in the community, and in the outside world
Support teachers and students enthusiastic about technology usage
Recognize the time investment of technology users
Celebrate all technology achievements

2. Planning
Ensure a current inventory of hardware/software/infrastructure
Document current technology practices
Be aware of teacher skill levels
Establish a Technology Planning Committee
Develop a shared vision for technology in which everyone has an active role.
Support the development of an evolving five year technology plan which includes a vision, mission, funding, goals, roles, timelines and responsibilities
Re-evaluate and update the technology plan annually
Incorporate technology into the school improvement plan
Encourage research, risk taking, and dreaming when planning and integrating technology.

3. Curriculum Issues
Provide support and time for analysis and planning for integrating technology into curriculum documents
Encourage and structure collaboration on, and communication of technology curriculum issues, changes and techniques throughout the district/building
Provide opportunities to visit other schools to evaluate alternative approaches to curriculum integration
Provide access to documents, expertise, and ideas about technology and curriculum integration issues

4. Resources
Be aware of the need for resource allocation in the areas of hardware, software, finance, access to information, training, time, technology support personnel and planning.
Develop an inventory of district and building level equipment
Create an awareness of technology needs as they relate to the achievement of student learning goals
Support budget decisions tied to the establishment and maintenance of technology configurations and personnel sufficient to support the needs of teachers and learners
Provide time for teachers and administrators to think about and learn to use technology effectively
Collaborate in the development and maintenance of district and building level technology plans
Be a financial advocate for teachers technology (hardware, software, training) needs
Utilize business expertise, community partnerships, and grant opportunities to support technology needs

5. Staff Issues
Become familiar with staff technology issues and needs at the district and building level
Address concerns related to teacher expectations, training, building and district support personnel in a timely and proactive manner
Support teachers as they struggle with integrating technology by recognizing frustrations and offering solutions, personal assistance and expertise
Design support structures and solutions for specific situations and needs
Employ a technology specialist whose primary responsibility is to support classroom teachers
Provide opportunities for identified teachers to participate in specialized training to develop teacher-based technology leadership in the school
Encourage the development of, and use of student and teacher expertise in supporting school technology goals

6. Communications
Communicate the district/building technology vision and plan to all stakeholders
Communicate past successes and new initiatives to all stakeholders
Communicate the need for continual technology change and school improvement, and its connection to learning,

Ensure mutual understanding and buy-in for district/building technology visions
Formalize communication between technology personnel at all levels, teachers, and administrators

7. Support
Provide funding for on-site technology support personnel
Actively listen to and respond in a timely manner to technology problems in the building
Be the voice between teachers' technology issues and the district office
Actively encourage teachers to incorporate technology into their classroom
Empower the staff to correct their own technology problems
Increase support staff as the use of technology is increased
Become aware of and use community technology resources

8. Obstacles
Find additional funding through grants, capital outlay, and other resources to supplement technology purchases and technology support mechanisms
Provide time for grant writing, technology plan development and maintenance, planning and conducting professional development, and learning how to implement technology into the classroom
Insist on consistency of computer configurations –hardware/software, infrastructure
Be aware of the reasons for and the various forms of teacher resistance
Develop appropriate incentives for teachers to be involved in implementing technology
Change attitudes within the district/building which lead to a reticence to provide financial support and professional development for technology integration
Be aware of and overcome technology related logistical problems within the school (e.g. wiring, power, space, security, etc.)
Be prepared for administrators and teachers unable to adjust to the change technology brings to education
Be prepared to constructively deal with 'educator fear of technology'
Have specific resources and techniques available for those experiencing difficulty integrating technology into the curriculum

9. Professional Development
Assess teachers' technology needs
Allow staff input into in-service topics prior to making decisions
Plan various types of professional development experiences
Provide time for on-going, results-based professional development
Provide time for collaboration on lesson planning, class implementation issues, and learning about hardware and software with other staff members
Hire an on-site technology expert to mentor the staff
Allocate sufficient funding for high quality professional development
Protect professional development budget allocations
Support staff risk taking
Model technology usage and risk taking

10. Implementation
Provide the opportunity for co-workers to collaborate
Allow staff time for implementation
Schedule on-going professional development sessions
Champion the technology vision so parents, teachers, and students see the relevance of technology to their learning processes
Develop staff buy-in to the technology vision
Incorporate technology into school goals
Allocate budget authority to support the technology vision
Provide time for staff to learn how to integrate technology

Conclusion

The results of this small study describing the perceptions of teachers, technology coordinators and administrators in three mid-western school districts in the United States mirror much of the material found in current literature on the topic. This study confirms the importance of an administrator's role in this process. In similar fashion, Mahmood and Hirt (1992) concluded that of all the variables impacting the integration of technology into schools, none was as important as support from school and district administrators. In describing goals necessary for creating a technology-effective, and integrated learning environment, McPherson (1995) focused upon the crucial role of school leaders and the need to create dynamic leadership and organizational support for the process. These and other writers have recognized that a key barrier to the use of technology in schools is the lack of administrative support (Maurer & Davidson, 1998; OTA, 1988, 1989, 1995; Rodin, 1997). This study has confirmed that administrators need to know how technology can restructure the teaching learning process and the importance of their role in the process.

Other writers have provided guidelines to assist administrators in successful technology implementation. These guidelines reflect the findings of this study. Stager (1995) suggested that administrators: work with the living; eliminate obstacles; stay on message; work on the teacher's turf; plan off-site institutes; provide adequate resources; avoid software du jour; practice what you preach; celebrate initiative; share learning stories; help teachers purchase technology; and cast a wide net (p. 80). A further pair of goals are provided by Meltzer who suggests that technology should be used in conjunction with greater emphasis on learner-centered pedagogical strategies, and that it must be integrated into the fabric of the school program" (p. 23-24). The research reported in this paper has suggested the need for a greater emphasis upon the role of school administrators if the investment in training teachers to integrate technology effectively into learning environments is to be fully realized.

References

Erlandson, D.A., Harris E.L., Skipper, B.L. & Allen, S.D. (1993). *Doing Naturalistic Inquiry: A guide to methods.* Newbury Park:Sage.

Gibson, I.W. (2000). *At the Intersection of Technology and Pedagogy: Considering Styles of Learning and Teaching.* ERSC Seminar Series Paper, University of Keele: United Kingdom.

Lincoln, Y. S., & Guba , E. G. (1985). *Naturalistic inquiry.* Newbury Park, CA: Sage.

Mahmood, M.A., & Hirt, S.A. (1992). *Evaluating a technology integration causal model for the K-12 public school curriculum: A LISREL analysis.* (ERIC Document Reproduction Service No. 346847)

Maurer, M.M. & Davidson, G.S. (1998). *Leadership in Instructional Technology.* Columbus, OH. Merrill.

McPherson, Sarah. (1995) Technology for educators: A graduate program for research and practice. *Technology and Teacher Education Annual.* Houston, TX: Association for the Advancement of Computing in Education.

Meltzer, J., & Sherman, T. M. (1997). Ten commandments for successful technology implementation and staff development. *The Bulletin, 81*(585), 23-32.Office of Technology Assessment. (1988). *Power on! New tools for teaching and learning.* Washington, D.C.: U.S. Government Printing Office.

Office of Technology Assessment. (1989). *Teachers and technology: Making the connection.* Washington, D.C.: U.S. Government Printing Office.

Office of Technology Assessment. (1995). *Linking for learning: A new source for education.* Washington, D.C.: U.S. Government Printing Office.

Patton, M. Q. (1990). *Qualitative evaluation and research methods (2nd ed.).* Newbury Park, CA: Sage.

Rodin, John. (1997). Training school leaders to be technology leaders. *Technology and Teacher Education Annual.* Houston, TX: Association for the Advancement of Computing in Education.

Stager, G. S. (1995). Laptop schools lead the way in professional development. *Educational Leadership, 53*(2), 78-81.

Stegall, P. (1998). The Principal – Key to Technology Implementation. Presented at the 95th annual meeting of the National Catholic Education Association (Los Angeles, California, April 14-17, 1998). p. 1-13.

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Instructional Technology as a Support System for Principal Certification

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Abstract

This session describes the creation of an electronic learning community for candidates in one Principal Certification Program. Individual web pages using a template to match program objectives enabled students to incorporate the Internet as a window through wich to look in on the internship learning experiences of other aspiring administrators.

Technological Needs

Lou Gerstner, CEO and chairperson of IBM, claims that nothing matters more for the future of American schools than finding great principals to lead them. . But like most organizations, schools are experiencing major transformations in the way they have traditionally conducted business. Although the role of the school administrator is commonly cited as the central to such changes, this role itself is in the midst of major transition. It requires institutes of higher education to rethink the preparation of a new genre of educational leaders who can effectively connect curricular, technological, and community needs. This project describes the creation of an electronic learning community for candidates in a Principal Certification Program at Indiana University of Pennsylvania who, by virtue of their age rather than their credentials, frequently have fewer electronic experiences than those for whose instructional supervision they are accountable.

Learning Objectives

The change that having a web page window and custom designed template geared to program competencies brought to this program reflects the distinction between technology being an "informating" (Zuboff, 1988) rather than an automating tool. Automating technologies make existing work more efficient. Informating efforts, however, stretch people to first think differently about the work they do and then to redesign that work. Most aspiring principals in this program have high levels of competence in the automating components of their professional life such as computerized grading, course scheduling, manipulating demographic transportation data, budgeting, and integrating computer assisted learning. Using the Internet in an informating way, however, set the stage for principal candidates to learn from each other's experiences during their supervised internship in a way that had not previously been possible. Until this change, students in a program that is performance-based followed their university course work by returning to their school districts to complete an administrative internship. The collaborative relationship and the important network of conversation recognized as central to adult learning traditionally ended in transition from university to public or private school environment. Web Pages enabled these aspiring administrators to have a window into the internship experiences of their classmates thus providing greater opportunity to sustain the benefits of collaborative learning that benefits both individuals and the organization of which they are part.

Ideals central to collaborative cycles of deep learning (Senge & Kim, 1997) mesh well with the Principal's Program at Indiana University of Pennsylvania that is anchored in applied leadership in action. Students fulfill program goals and state certification requirements through enacting actual improvement in their school districts in the six areas of: curriculum management, instructional supervision, organizational management, evaluation and research, technology and innovation, and human relations. The development of a template reflecting students' experiences in each of the six performance categories expanded our use of technology in the program itself and built a more synergistic element into the program in which an individual experiences add value in term of the more informed practices for the entire group. Throughout a seminar in School Administration, candidates formulate projects in each of the program's six core competency areas. This resulting Action Plan must meet the approval of the candidate's on-site mentor and must therefore reflect attention to the context of the school district in which the student completes his or her internship. The Action Plan addresses specific university and state requirements, but with enough flexibility that the circumstances and challenges of a wide variety of school districts fit constructively within the framework.

- Curricular projects must address standards and changing assessment instruments, the inclusion of special needs students, and the match of school curriculum to the workplace.
- Instructional Supervision projects require implementing useful staff development workshops and exploring supervisory techniques go beyond inspection oriented checklists and that differentiate in opportunities for

ongoing professional growth for both experienced and novice teachers.

- Research and Evaluation projects require principal candidates to present to an audience a report on student achievement, to develop a grant proposal, and to design, conduct, and report on survey research that address a local educational concern.
- Human Relations projects must bring the community into the school environment to provide insights into how teachers and students spend time together. A parallel project in this area must demonstrate the candidate's leadership in facilitating service learning in which students address a community need. And one of these projects must incorporate the issue of school safety.
- Technology and Innovations requirements involve regular electronic communication with faculty supervisors, participation in district technology committees, proposing a plan to upgrade technology training needs, and using the Internet to explore school leadership sites.
- Candidates must demonstrate an understanding of the Organizational Management of schools through a working knowledge of collective bargaining procedures, maintenance of custodial responsibilities, work schedules for special teachers, building compliance with safety codes, school emergency plans, transportation scheduling, master scheduling, budgeting, disciplinary codes and school law.

This well-defined but flexible infrastructure provides a program architecture that integrates the capacities and beliefs of a diverse group of veteran educators who share common administrative goals.

A Cycle of Deeper Learning

Our approach to the informating dimension of technology also reflects a "deep cycle of learning" (Senge & Kim, 1997) that successfully integrate opportunities for capacity building, practice, and further research. Personal home pages enable candidates to share projects through which they are mastering the previously described competencies. This builds an electronic window through which they can learn from both novice and experienced school administrators. Their administrative capacities are thus vicariously expanded into environments in which they have no direct personal involvement but the opportunity to scrutinize the successes and the struggles of their peers. Access to an electronic resource base that parallels the program's six competency areas enhances the research element of deeper learning cycles within this learning community. This insures that aspiring principals will have electronic as well as traditional research and literature from which to expand their knowledge during the required period of internship.

Conclusions

In the transition from experienced teacher to novice administrators. reconfiguring traditional portfolio documentation of core competencies in the program enabled aspiring principals to

- keep pace with current changes in curriculum, supervision, and school law,
- share strategies for dealing with contemporary school and community challenges,
- empower peers and staff members through providing greater access to information and to each other.

References

Gerstner, L., Semrad, R., Dole, D., & Johnston, W. (1994). *Reinventing education: Entrepreneurship in America's public schools*. New York: Dutton.

Senge, P. Kim, D. (1997). From fragmentation to integration: Building learning communities. *The Systems Thinker* 8 (4), 1-5.

Zuboff, S. (1988). *In the age of the smart machine*. New York.: Basic Books.

Managing Change
To Flexible Learning Using Online Technologies: Bridges To Cross, Lessons To Learn

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Abstract: Universities around the world are involved in dynamic change as they seek to take advantage of the potential of the internet and information technology to provide learning opportunities which are independent of time and location. They must develop creative solutions in order to cope with changing educational requirements in an increasingly demanding global market. Yet many of the early attempts to use information technology and the internet for teaching have been nothing more that unreflective rebadging of material or repackaging of the more traditional modes of learning. To be successful, effective educational methodologies need to be anchored to the diverse material circumstances characterising different groups of learners. The challenge for universities offering programs of study is to provide avenues for learning which are reflective of the needs of its 'learning community', take advantage of the benefits which information technology provides while keeping in mind the outcomes desired for programs.

One of the more significant responses has centered on the development of educational programs for flexible learning. The philosophy underpinning this new mode of learning goes beyond a traditional, narrow, delivery/teacher focussed approach, to one which encompasses an educational philosophy and a set of strategies, designed to center around the learner by encouraging flexible, interactive learning using a variety of media and technologies. This approach has resulted in a radically different tempo with both educators and students being plunged into a new educational environment which requires different mindsets and methodologies.

This paper is an analytical reflection on the policy and management issues necessary to champion a change to flexible learning. It highlights the bridges that will be crossed when redesigning and developing programs across a number of disciplines to increase student access to a wide variety of stimulating learning resources and delivery media. It discusses the resources and structures required to achieve what is often a significant cultural shift and changing of mindsets for parties involved. More importantly it describes lessons to be learnt along the way.

INTRODUCTION

Over the last two decades there has been a steady roll-out of new information technologies such as multimedia-capable computers and CD-ROMs. The rapid growth of the internet has resulted in enthusiastic claims for technology's ability to provide high quality education for all. As such, educational institutions worldwide are experiencing a period of unprecedented change, a paradigm shift as they are encouraged to go virtual with implications for the manner in which information technology is incorporated into educational programs. This paradigm shift involves "the rejection of one set of values and ideas about education and the adoption of a new set with regard to what constitutes effective pedagogy" Schubert (1986). Underlying this paradigm shift is an emphasis upon the student, how the student learns and a move from content delivery to the process of learning the content. In order to fully exploit the potential of online technologies to allow learners meaningful and effective participation in the emerging knowledge economy, educational communities, which include both teachers and students, need to make major adaptations and innovations in teaching and learning approaches.

The primary result of advances which have been made in various technologies is that educational institutions worldwide are rapidly embracing more flexible modes of program delivery. Images of students sitting at rows of desks where the teacher at the front of the classroom is the focus of attention as the conveyor of information to be copied down, memorised and then reproduced for exams are fading. The use of IT allows for a high degree of diversity in terms of learning activity, methods of interaction and collaboration with others, as well as reflection, areas which have been identified by learning theorists such as Biggs & Telfer (1987) and Laurillard (1993) as key aspects of learning. This facilitates the need for more learner-centered approaches to course design and delivery which increase student access to a wide variety of stimulating learning resources and delivery media rather than teacher-centered approaches. Importantly, while innovation is a key, any educational program must continue to provide suitable training and education for students such that they are "workplace ready" upon graduation.

Educational institutions are not just vehicles of instruction. A university for example, as a state of mind means social and cultural interaction and students will go to great lengths to socialise with each other in good old fashioned real reality. Before embarking down the 'cyberschool' trail there is a need to clarify for both staff and students what is meant by terms such as flexible learning and flexible delivery. Dissatisfaction may occur if staff are not properly trained and merely try to translate existing teaching and learning practices to a new medium (Daunt, 1997). Students entering courses that have been advertised as being delivered via electronic platforms to allow flexibility will have certain expectations as to the extent of that flexibility and what it means for them and the resources that will be available to them. It is important to note that some of expectations may be unrealistic.

Effective use of technologies in educational programs requires more than just an automation of existing practices. It should involve planning to generate online teaching strategies designed to ensure learning results in a 'change in understanding' (Alexander, 2000). For many this involves a significant cultural shift for both the teacher/instructor and the student. The appointment of suitable leaders to champion and manage this shift is critical to the successful transformation of programs from traditional to flexible methods of teaching and learning. The availability of a suitable level of resources and infrastructure from the outset to support and assist programs undergoing change, particularly in terms of staffing levels, will also have a marked impact on the quality of programs which evolve.

The first section of this paper highlights the need to understand the model of flexible teaching and learning to be adopted within a particular educational institution; the second section reflects on policy and management issues which arose as part of the process of shifting the paradigm in order to develop and deliver programs on a hi tech, flexible learning campus in one of the departments involved; and the third section looks at the process which evolved in order to design subjects for a flexible learning environment.

UNDERSTANDING FLEXIBLE TEACHING AND LEARNING

It is generally accepted that there appears to be variation and a deal of confusion surrounding the interpretation of the terms 'flexible learning', 'flexible teaching' and 'flexible delivery'. In fact all of these terms are interrelated and should be integrated into programs in varying degrees to cater for specific requirements of programs and to achieve the best possible learning outcomes for students in an environment which allows them choice according to their own circumstances. At the same time the knowledge resources and skills capabilities of academic staff involved in the process needs to be considered so that staff may guide and manage within the bounds of their own comfort zone. Underlying the whole process should be a sound pedagogical justification that the innovations promise benefits and that the changes to the status quo are desirable.

Some research shows that the more traditional forms of delivery (lecture/tutorial/oncampus attendance) are no longer meeting students' access needs and preferences whereas technology based delivery frees students/learners from the time and place dependency of traditional delivery methods (Bates 1995, McCann et al, 1998; Owston, 1997). One of the most significant challenges for program designers and developers is to ensure that programs are developed to incorporate the requirements of 'flexible delivery' and 'flexible learning'. There is a tendency by some to use the terms interchangeably. However a clear understanding of both terms is necessary before effective program development can begin. Cunningham et al (1997) suggest that if the focus of programs is to improve student learning by enhancing the learning of experience and not merely to use different techniques or technologies to deliver content then:

It is important to distinguish flexible learning from flexible delivery ...The former implies a focus on the core activity of education, the learning Process of the individual student, and student choice regarding the methods Employed in that process. By contrast, flexible delivery is an administrative Term which implies a focus on the modes in which content can be distributed So as to relieve students of the time/place/space determinism of on-campus Education, and on administrative systems which respond to consumer needs.

Flexible delivery has been seen by many as the white knight of educational training (Kay, 1997). In its true form it allows students the ability to enroll at any time and start learning straight away, regardless of location. The concept of semester is no longer applicable. It is replaced with "continuous enrolments" to allow the student to participate in learning at any time from home, work or a study center, or anywhere. The focus is squarely on individual learning. Brown, 1997 claims that students will benefit from taking a more active approach to their learning and will increase their self discipline. The use of computer-mediated communication systems can extend and support active, purposeful learning. Computer networks empower connectivity and communication and allow learners to define their own paths through the learning material (Nikolova & Collins, 1998). They also enhance group work by producing an interchange of ideas, increasing the level of dialogue and negotiated solutions between learners (Light, 1993).

Boud, Bridge and Willoughby (1975) and Fenwich (1985) discuss individualised learning in terms of the five degrees of freedom that students should be allowed in learning: freedom of content, method, pace, sequence and assessment. Being mindful of 'designing learning experiences to fit the context of the media to be used, including the value of interactivity, the incorporation of visual material' (Benson & Vincent, 1997) to cater for individualised learning, in this paper the term 'flexible learning' rather than 'flexible delivery' is preferred. Technology is used primarily to support learning and to provide more effective learning experiences rather than deliver 'off campus'.

The concept of flexible learning described in this paper lies along the continuum between traditional face to face lecture/tutorial in-class methods and distance/open learning methods. Programs developed involve a number of flexible modes of learning. Students may choose to access material in a variety of ways. New technologies are used to create communities of learners who can interact and communicate electronically with each other and with teaching staff at any time of day from any place; to allow increased dialogue where learners can clarify, challenge and build on ideas and concepts and see the relationships between them (Laurillard, 1995). At the same time student self access to learning resources is combined with face to face group sessions incorporated into programs throughout the semester to allow students to work collaboratively in small groups and workshops to regularly reflect on their learning. Assessment also involves different modes. Students are expected to be able to analyse, to synthesise, to reflect, and to abstract meaning. Mere tests of retention are no longer suitable. Students are required to participate in group sessions, use the bulletin board, complete interactive quizzes on the subject sites and undertake formal exams.

POLICY AND MANAGEMENT ISSUES

At the outset the shift from one mode of teaching and learning (traditional face to face) to another (flexible learning) presents a significant change and challenge. The extent of such a change will result in the need for more resources (time, money, effort), a planned vision for the future, and a degree of resistance (Carlopio, 1998). The key to successfully managing this challenge is a well planned and executed system of action. Mouritzen, (2000) outlines four measures of management which are critical: Processes and Products, Employees (staff), Customers/Clients (students), and Technology. These four components are discussed below.

Processes

What is particularly relevant to managing a change of this nature is a systematically planned and coordinated approach (system of action) at both the macro (institution) and micro (department/school) levels. At the outset the move needs to have the full support of the institution, be centrally driven and appropriately funded, with facilities and resources made known. These facilities and support units should include a centrally funded academic support unit which comprises a team of instructional designers and educational multimedia services personnel. This unit provides services across all departments/schools to assist academic staff to develop programs by combining knowledge of teaching and learning with an understanding of the educational potential of new technologies (Brown & Grigg, 1999). Imperative to the ongoing success of programs being developed and delivered is a centrally funded, responsive information technology (IT) section to service the needs of both employees and clients.

At the department/school level a program director (or program champion) needs to be appointed to oversee the development of programs or courses. It is the role of this person to champion change and ignite innovation (without overselling it); to manage time frames, budgets and costs; to ensure academic staff are supported in their endeavors to move from one mode to another in terms of time, training and resources; to ensure that programs developed are educationally sound; and that plans for the introduction of technology into teaching are made judiciously and driven by the 'learning' agenda rather than by technology (Alexander, 1995). This person acts as an interface between central administrative committees and staff involved in developing programs, must possess sound facilitation and management skills and plays a pivotal role in the whole process.

Implications for students(clients) and staff (employees)

Trigwell (1998) suggests that the effectiveness of particular teaching strategies is highly dependent upon a range of factors such as context of learning, the teacher's conception of learning, the planning and design of the learning experience (objectives, assessment) and the characteristics of the learners themselves. Moving to effective technology based teaching requires a shift in the teaching and learning approaches that are used if successful outcomes are to be achieved. This will often entail an adjustment for both staff and students. Staff move to become learning facilitators or mentors away from the traditional role of dispensers of knowledge. The emphasis shifts from content to concept and outcomes. This often involves an unsettling of strongly held convictions about the manner in which they teach and embrace learners in the learning experience. "Tried and true 'instincts' honed in years of teaching experience are not necessarily transferable online", (Benfield, 2000, p.1). It also involves enticing them to move away from sometimes erroneous presuppositions about what flexible learning using information technology entails to encompass a broader perspective which involves a multi modial approach to content delivery and learning. Many staff are naïve and assume that the task is one of simple conversion of existing programs and designing programs for flexible learning is easy. This is not the case. Programs need to be reconceptualised using additional resources (Phillips, 1998) and greater interactivity (Lander, 1999). There is a need to ensure that academics 'hasten slowly' and are not expected to move too far too soon in terms of embracing change and new technology.

The move to more student-centred approaches to program design and delivery methodology in education has focused desired outcomes on the students' abilities to think critically, solve problems and work collaboratively. Laurillard (1993) argues that the learner, through active participation in both arriving at, and articulating their personal understanding of new ideas and concepts, constructs knowledge. Students must become "self directed students… keen and capable of setting their own goals and standards with or without help from experts. The appropriate teacher function here is that of consultant and resource person" (Berge, 1998, p.1). It also requires a degree of trust from both staff and students. Staff need to trust that students will take responsibility for their learning and achieve satisfactory outcomes; students need to trust that this approach to learning will provide them with satisfactory outcomes. (Luck, et. Al, 1998). There also needs to be an assurance that students too are not moved too far, too soon in terms of embracing new learning methods which rely primarily on web based methods.

Flexible learning programs are both more labour intensive for staff and very demanding for students as they are expected to become more responsible for their own learning. With the introduction of flexible programs, students will have to grapple with the intricacies of bulletin boards, online quizzes, WWW discussion groups, self-access to learning resources. There should not be an implicit assumption that students possess the necessary learning and technical skills to enable them to cope in a collaborative online learning environment. Students will possess different levels of experience in relation to working in groups and level of computer skills. The first activities in programs should be designed to build group cohesion and coach computer skills involving the use of e-mail, WWW and WebCT.

There should also not be an implicit assumption that staff possess the necessary time and skills to develop and deliver quality programs and make informed choices about appropriate learning strategies, mix of delivery mechanisms and appropriate use of technology (Lundin, 1997). Many teachers lack confidence in using technology and should be encouraged and assisted to view technology as a device to enhance exploration and learning not just an additional thing to include in workloads. A change of mindset should be constructively effected.

In order for programs to succeed it is imperative that appropriate training and guidance be provided for both students and staff. Staff will require support from instructional design and IT teams to assist in the design and development of subjects. Training for both staff and students to enable them to manage new technologies becomes a critical issue. For example, sending messages is far more permanent than talking; interaction and communication online requires different skills i.e. there is a need to have something to say before you say it. Dealing with the daily deluge of online correspondence is a skill in itself. Self paced training manuals need to be developed to coach both staff and students in the use of new technologies and methods of learning. Hands on training sessions pitched at different levels of expertise are essential. Orientation programs should be designed to explain the complexities of an online teaching and learning environment. Students need guidance in the 'appropriate' use of online communication tools such as bulletin boards and chat rooms.

Choosing the Technology

Using the most appropriate technology to get the message across is often the hardest hurdle to cross. Brown & Teague (1998) argue that living in this technologically rich information age, it is hard not to be lured by the dazzle of technology. The danger is that program developers are attracted to technology for technology's sake. Developers should not lose sight of those questions of fundamental importance to the business of education and ask instead "what do I want my students to learn and what delivery options will best help them learn it"? Evans & Deschepper (1998, p.358) suggest that "Online can be many things. It can range from simple email contact to video conferencing. It can include chat sessions, frequently asked questions, bulletin boards. It can be technology rich, interactive CD etc. What it is NOT is a replacement for human interaction and face-to-face contact".

Program designers need to bear in mind that technology is merely the medium of delivery not an educational end in itself. Programs should be designed to include appropriate learning strategies and mix of delivery mechanisms to:

- cater for all the learners' needs
- accommodate the requirements of the subject matter
- take account of the lecturer's expertise and choices and
- ensure the feasibility of reaching learners where they are at no 'additional' cost per person.

Alexander (1998) suggests that we should decide to use technologies such as multimedia or the WWW only when that use provides new opportunities for students to learn – to visualise, to understand, to see complex relationships in ways that are not possible using any other media. The aim of the new technologies should be to promote independent, self-motivated learners. They should be capable of initiating, selecting and using appropriate strategies for acquiring, retaining and transferring knowledge.

The major advantages of the internet for improved learning are in the potential for interactiveness, the access to world wide resources and the possibility for flexible learning styles. Owston (1997, p. 29) identifies that 'the key to promoting improved learning with the Web appears to lie in how effectively the medium is exploited in the teaching and learning process'. However there are situations where delivery over the internet may not be the best option e.g. if you want students to follow an intellectual argument then the printed page is probably best; if you want them to follow a visual process then a VHS tape may be superior to a video clip which takes considerable time to download.

Products/Programs

The approach underpinning the design of educational programs for flexible learning should emphasise active and collaborative learning rather than the traditional one-way flow of instruction; should allow students choice in how, what and when they access and study a range of learning resources; and promote regular communication and interaction with their teachers and with fellow students. In addition, surveys of various academic stakeholders and discussions with industry should be undertaken prior to embarking on the program design. For each subject a team of writers is assembled including the staff member responsible for each subject, a research assistant in the area, an instructional designer and an information technology support person. All writers involved in the development of subjects are required to attend training sessions to assist them with subject design and development skills and the use of web courseware. Regular meetings of writers involved in the development of subjects for the whole program are held to discuss a variety of issues. These meetings allow for an interchange of ideas, an integration of content across subjects and a support base for those involved in the design and development process.

The Process of Designing and Delivering Programs

It is important to remember when designing subjects that the pedagogical background of subjects may differ. So too, may the mindset and skills level of the teaching staff member in charge of each subject vary. Teaching staff must be confident that they can cope with the manner in which the subject is designed which includes an understanding of the capabilities of the courseware used so that they can manage the subject effectively. Five processes or stages became evident when developing and offering programs for flexible learning:

- **Development** - The development phase involves two stages: During the first stage staff need to engage in a collaborative and dynamic approach to planning and designing curriculum. This involves working together to ensure subject content builds knowledge progressively.
  Stage two involves making decisions about the learning model to be adopted in individual subjects. This stage raises issues concerning the notion of academic freedom, the level of maturity and skills of students to cope with new learning methods and technology and the availability of resources to cater for innovation. This has implications for the subject resources which will be included as part of the writing of the subject. It is important during the development stage that pedagogy and not technology governs the overall process.
- **Delivery** –The subject is offered to students using the new delivery methods and technologies. It is useful, but not essential, to have the academic staff member who led the development team coordinate and/or deliver the subject for the first time. If this is not the case, what is most important is that the staff member responsible be totally informed and comfortable with all teaching and learning modes which have been incorporated into the subject and be competent in terms of the use of the technology. Depending on the amount of traditional contact (face to face), which has been included in the subject, it is usually critical that student access to subject sites is linked to enrolment in the program i.e. as students enroll in the subject they are granted access to the relevant subject sites. This is particularly relevant in subjects where there is very little face to face contact so that students may access and begin using material immediately. Instruction for students about navigating each subject site is essential.
- **Evaluation** - The effectiveness of each subject in the program must be evaluated by using the standard evaluative tools provided by the university. Where these are not appropriate and/or do not fit the new teaching and learning model adopted, individual instruments must be designed. These will include teaching and subject evaluations, contextual tools which measure the subject's effectiveness against similar subjects, and representative student and staff focus groups which discuss the strengths and weaknesses of the subjects offered for the first time.
- **Refinement** - At the completion of the first semester of offer, as a result of feedback from students and academic staff, adjustments and improvements are made to each subject with assistance from instructional design and IT support members of the team. Subject sites need to be updated to ensure material is current.
- **Maintenance** - This process will continue for the duration of the life of subject. Each year modifications made necessary by external changes in government requirements, technology upgrades, etc will occur. The end result is one of ongoing improvement to ensure that subjects delivered remain at the cutting edge in terms of content, flexible learning methods and technologies.

It is important to note that the amount of staff time necessary to complete each of these processes will depend upon the nature of the subject and the length of time the subject has been running. Staff workloads need to be adjusted to enable appropriate attention to each of the stages involved in designing and delivering programs online.

CONCLUSION

In summary, while the move to flexible learning using online technologies presents great opportunities, potential for exciting innovations and generally produces better learning outcomes for students, it also presents great challenges. The potential of information technology and the internet to create communities of learners across boundaries will continue to have a significant effect on the design of educational programs worldwide. The object of the lesson is to ensure that the integration of information technology into programs is premised upon learning and interaction and not just delivery of information and that the process of designing, developing and delivering programs is structured and properly managed. In the end effective and exciting teaching and learning require both staff and students to learn new skills, to cross bridges, to challenge and be challenged. The learning curve is often very steep. Making implementation a fulfilling experience for all concerned involves a systematic and comprehensive approach which balances the needs of the organisation with the needs of all the individuals involved in the process. The goal should be to achieve an appropriate balance of technical and professional support which enables both staff and students to use the new technologies to achieve enriched learning experiences in an environment which is complex and demanding.

BIBLIOGRAPHY

Alexander, S. (2000). "Teaching Online: Repackaging or Rethinking Learning" in Proceedings of *Moving Online* Conference, 18-19 August, 2000, Gold Coast, Australia.

Alexander, S. (1998). "Opportunities and Challenges for education in the technology age" in Proceedings of the International Conference, *Learning Together - Collaboration in Open Learning*, Perth, Australia.

Alexander, S. (1995). *Teaching and Learning on the World Wide Web*, AusWeb 95 Conference paper. http://www.scu.edu.au/sponsored/ausweb/ausweb95/papers/education2/alexander/

Bates, A.W. (1995). *Technology, Open Learning and Distance Education*, Routledge, London.

Benfield, G. (2000). "Teaching and Learning on the web: Exploring the Meanings of Silence", http://ultibase.rmit.edu.au/Articles/online/benfield1.htm on 17.7.00

Benson, R. & Vincent, M. (1997). "Electronic delivery of study materials: the students' response", Conference proceedings 13th Biennial Forum of Open and Distance Learning Association of Australia, Tasmania, Australia, pp. 37-42.

Berge, Z. (1998). "Changing Roles of Teachers and Learners" ON-LINE Ed Bulletin 30/8/98 cited at http://www.edfac.unimelb.edu.au/online-ed/mailouts/1998/aug30.html on the 12/10/98

Biggs, J.B. and Telfer, R. (1987). "The Process of Learning", 2nd Ed., Sydney, Prentice Hall.

Boud, D.J., Bridge, W.A., & Willoughby, L. (1975). PSI Now – A review of progress and problems. *British Journal of Education Technology* 6:15-34.

Brown, A. (1997). "Designing for Learning: What are the essential features of an effective on-line course?", in *Australian Journal of Educational Technology*, 13(2), 115-126.

Brown, A. & Grigg, T. (1999). "Creating a Centre of Excellence in Flexible Teaching and Learning", HERDSA, Vol 20 No 3. Pp.6-7.

Brown, A. & Teague, M. (1998). "Use of distance learning in technology-based training: A pilot study in Hong Kong", Paper presented at *3rd International Open Learning Conference*, Brisbane, Australia, 2-4 December.

Brown, J, Collins, A., and Duguid, P (1989). 'Situated cognition and the culture of learning', *Education Researcher*, 18, 32-42..

Carlopio, J.R. (1998). *Implementation: Making place innovation and technical change happen"*, McGraw-Hill Company, Australia.

Clark, R. (1994). 'Reconsidering research on learning from media'
http://www.educom.edu/program/nlii/articles/clark.htm, National Infrastructure Initiative, 9 pages.

Cunningham, S., Tapsall, S., Ryan, Y., Stedman, L., Badgon, K. and Flew, T. (1997). *New media and borderless education: a review of the convergence between global media networks and higher education.* Evaluations and investigations Program. Higher Education Division, Department of employment, Education, Training and Youth Affairs. AGPS: Canberra. http://www.detya.gov.au/highered/eippubs/eip97-22/eip9722.pdf

Daunt, C., (1997). "Is Teaching Different?" in the proceedings of Open Flexible and Distance Learning: Education and Training in the 21st Century, 13th Biennial Forum of Open and Distance Learning Association of Australia, Launceston.

Enterprising Nation: Renewing Australia's Managers to Meet the Challenges of the Asia-Pacific Century, (1995). Report of the Industry Task Force on Leadership and Management Skills, Commonwealth of Australia, (Karpin Report).

Evans, A. & Deschepper, A. (1998). "Inter university videoconferencing: Opening the doors to increased learner opportunities", Paper presented at *3rd International Open Learning Conference*, Brisbane, Australia, 2-4 December, pp107-111.

Fenwick, J.E. (1985). *Individualised Learning* Paper presented at the 13th ICDE conference, Melbourne.

Jonassen, D.H. (1985). Learning strategies: *A New Educational Technology.* 22:26-33.

Kay, D. (1997). "Flexible delivery: The white knight of training", in the proceedings of Open Flexible and Distance Learning: Education and Training in the 21st Century, 13th Biennial Forum of Open and Distance Learning Association of Australia, Launceston.

Lander, D. (1999). *Online Learning:ways to make task more interactive".* UltiBASE(May).

Laurillard, D. (1993). *Rethinking University Teaching: A Framework for the Effective Use of Educational Technology.* London: Routledge.

Laurillard, D. (1995). *Multimedia and the changing experience of the learner,* British Journal of Educational Technology, Vol 26, No 3, 179-189.

Lemke, J.L. (1997) in Reinking, D. et al. (eds.) *Literacy for the 21st Century: Technological Transformation in a Post-typographic World,* Erlbaum, pp 1-17.

Light, P. (1993), "Collaborative learning with Computers", in P. Scrimshaw (ed.) *Language, Classrooms and Computers,* London: Routledge.

Luck, J., Andrews, T., Jewell, R., Schlotzer, A. & Madsen, M. (1998). "Teaching Skills at a Distance: A Method to the Mode (Or the Mode less Travelled)", Conference proceedings at *3rd International Open Learning Conference*, Brisbane, Australia, 2-4 December, pp233-239.

Lundin, R. (1997). "Flexible delivery of continuing professional education: Models, issues and trends (g)", Conference proceedings 13th Biennial Forum of Open and Distance Learning Association of Australia, Tasmania, Australia, pp. 269-276.

McCann, D. et al (1998). "Educational Technology in Higher Education", Canberra, DEETYA, (http://www.deetya.gov.au/divisions/hed/highered/occpaper.htm).

Mouritsen, J. (2000). *"Intellectual Capital and Knowledge Management",* Paper presented at AAANZ 2000 Annual Conference, Hamilton Island, Queensland, 2-4 July.

Nikolova, I. & Collis, B. (1998), "Flexible learning and design of Instruction" in British Journal of Educational Technology, 29(1), 59-72.

Owston, R.D. (1997). "The World Wide Web: A technology to enhance teaching and learning?" *Educational Researcher,* March 1997, pp27-33.

Phillips, R (1998). *"Models of learning appropriate to educational applications of information technology".* In B. Black & N. Stanley (Eds.), *Teaching and Learning in Changing Times (pp.264-268). University of Western Australia, Perth: UWA.*

Schubert, W.H. (1986). *Curriculum: Perspective, Paradigm and Possibility,* Macmillan, New York.

Trigwell, K. (1998). "Increasing Faculty Understanding of Teaching" in Wright, A. (Ed.) *Teaching Improvement Practices.* Anker Publishing Company: Bolton, MA.

Wilson, B.G. (1996) Introduction: What is a constructivist learning environment? In: Wilson, B.G. (Ed), *Constructivist Learning Environments:Case studies in instructional design,* Educational Technology Publications, Englewood Cliffs, New Jersey.

Webfolios: Authentically Assessing Prospective Educational Leaders on the Web

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Abstract: Technology was incorporated in portfolio assessment to create webfolios, portfolios on the World Wide Web. The webfolios project was implemented in the very first preparation class for the prospective educational leaders. The article first briefly describes the webfolio project, followed by the presentation of the results of the project evaluation, in terms of its strengths and weaknesses. The article also reports the result of the collaboration aspect of the webfolios through feedback. The article ends with conclusion and recommendations.

Introduction

There is a growing concern expressed in a broader meaning of accountability to include assessment of student learning outcomes. Educators are directed to choose and apply assessment practices that inform their instruction and communicate to multiple audiences (National Association of State Boards of Education 1988). Portfolio assessment is recognized as an authentic assessment that evaluates the student in the process of performing real tasks with relevance to his or her education (McAfee & Leong 1994). A portfolio is an organized, goal-driven documentation of professional growth and achieved competence over a period of time (Campbell et al. 1997). Students are responsible to take a more active role in their own learning as they make decisions on what to include in their own portfolios as evidence for their learning, using multiple methods from multiple sources over time (Shaklee et al. 1997). In order to provide such a learning experience for all students, teachers need to facilitate practices of active learning, such as collaborative learning, problem solving, and the use of interactive technology (Cornerstones 1997).

An innovative instructional strategy of student assessment was piloted at California State University, Los Angeles in the very first class for the prospective educational leaders in the Administrative Services Credential Program. Technology was incorporated in portfolio assessment to create webfolios, portfolios on the World Wide Web. The webfolios not only provide access to students and faculty the most current resources available through the World Wide Web, but also empower them to be active partners in the learning and teaching process. Because the progress of webfolios construction can be observed on the Web, on-going feedback exchanges among peers, faculty, and other browsers become possible. This capability of presenting student learning over time or the progress of student accomplishment to the public, webfolios become a valuable assessment tool to demonstrate our accountability to the public.

The article first describes the webfolios project briefly, followed by the presentation of the results of the project evaluation. The article ends with conclusion and recommendations.

The Webfolios Project

The Webfolios Project was implemented in an induction course for prospective school administrators, with a goal of creating student portfolios on the World Wide Web, thus demonstrating course knowledge and technology skills. Students were to prepare their individual induction plans in webfolios, including at least four elements--Vision Statement, Vitae, Academic Plan, and Professional Growth Plan. Students received training on developing webpages: Creating a home page, Linking files, Inserting graphics, and Formatting. The course was taught in a computer lab with a network access where students could obtain resources available through internet. As webfolios were being created and revised by the students, they were uploaded in a curriculum website housed in the university's website. The final product of student webfolios can be accessed from the Cal State LA's curriculum website at http://curriculum.calstatela.edu/courses/edad500.

Strengths

The results indicated that webfolios had many strengths in addition to those of traditional portfolios. As in the case of portfolio assessment, students commented that their webfolios showed continuous growth and helped them organize. The effectiveness of the webfolio would be meaningful only when it accomplishes the goals of the course, which is for students to create own induction plans in portfolios. The instructor wanted to ensure that additional feature of integrating technology would not impede students from developing their induction plans in the portfolios. The result indicated that students accomplished the goal without being too concerned about the means, technology format, as evidenced by following comments. "The process of developing the webfolios is very hands-on, and brings us face to face with our preparation or lack thereof." "I could easily view where I am now and where I will be later." "I got to see a reflection of my strengths and weaknesses." "The webfolio was representative of who I am."

Accountability was one of the most frequently mentioned strengths of the webfolios. Many students commented how the webfolios demonstrated their knowledge of current technology, such as learning about many resources available through internet, communicating through email, and creating web pages. Students were also quite pleased about the opportunities to present their portfolios as well as their knowledge of technology to a wider audience. A student expressed the excitement of realizing this benefit of the webfolios in her comment, "It has become an up-to-date means of presenting oneself. The webfolio provides innovative ways for one to present and evaluate candidates."

Almost every student mentioned about the accessibility of the Web as a strength of the webfolio. Students considered webfolios as "opportunities to 'show your stuff' all over the world." The majority of the students were quite conscious of the opportunity for their prospective employers to access their webfolios. Students thought webfolios demonstrated current technology skills, organizational skills, and administrative knowledge in an impressive visual presentation. Two students' comments represent overall feelings of the students. "Webfolios communicate innovation to prospective employers and more employers have access to your information without you having to mail out packages." "It's free. What better way to promote yourself career wise!"

Unlike traditional portfolios where students often agonize in the process of developing portfolios but find satisfaction of accomplishment in the end, the process of creating webfolios was entertaining. More than 90% of the students commented how fun and convenient the process was. Students found the activity fun and interesting because they found it challenging yet were able to master each step and accomplish beyond their expectation on their own. Initially, students only expected have a simple document in each section of their webfolios as required in the class. However, each time they accomplished something on their webfolios, such as inserting a graphic or changing fonts, their webfolios looked nicer, more impressive, and more visually appealing. It was this enjoyable aspect of the activity that also contributed to upgrading the technology skills of the students. More than 95% of the students responded that their technology skills were increased. Many of them indicated that they no longer had the fear about technology and became very confident and willing to explore more on technology.

The students also noted how convenient it was to have all of their information on one computer disk. One student commented, "the webfolio provides room to add growth of portfolio without having to carry a lot with you." In addition, students also noted how easy it was to update information, revise the content, or reorganize the materials in the webfolios. A student added his sales pitch for the webfolios, "it organizes your documents for you."

Another strength of the webfolios deserves serious consideration as educators reflect on the authentic assessment of student learning. As Duncan (1996) points out, authentic assessment is based on meaningful performances that are drawn from "real-world" contexts. When students are helping each other to perform better without being concerned about the competition of their grades in class, authentic assessment of student performance is actualized. This collaboration was often mentioned by the students as a strength of the webfolios. Students not only helped each other with technology problems, but they also enthusiastically exchanged newly acquired knowledge about resources available through internet, such as graphics and valuable websites. Throughout the quarter, they supported each other with comments of encouragement, suggestions for improvement, and commendations for good work. Many students commented about how valuable sharing information and feedback comments were.

Weaknesses

There were some barriers to overcome for webfolios to be implemented in university classrooms in general. The first weakness of the webfolios was that students must have an access to a computer with internet. Some students had no access to a computer or the Netscape Editor outside the classroom and found it difficult to spend extra time on their webfolios away from school.

Another weakness of the webfolios was the extra time and effort required to train students on technology skills of creating webpages. The process of creating webpages was especially time and energy consuming for those students with limited technology skills. Some of the students commented that they could not have finished their webfolios without extra assistance provided by the instructor and the technology assistant.

The next weakness is a side effect of the access strength of the webfolios. Because webfolios are accessible to anybody who visits the website, students had to be careful about private information. Students were advised to delete private information, such as home phone numbers, address, information about their references, and other private information that they did not want to publicize so widely. Many of them included their email addresses in place of phone numbers and addresses. "References available upon request" replaced the list of references. One student expressed concerns about possible plagiarism since she was linking the courses in the academic plan web page to some of her well-written papers for the classes.

One of the greatest barriers to overcome for the full implementation of webfolios may be the university policy regarding the authority access to the websites. The university provided a space in the university curriculum website to build the course website. However, according to the university policy, only the instructor was authorized to update or make changes in that particular website. This policy created frustration both for the instructor, who had a burden of uploading 22 students' work each time any change was made, and for the students who had to wait to see the changes on the Web until they were uploaded by the busy instructor.

Feedback

As mentioned earlier, collaboration among students in the process of developing webfolios was evident as they shared their resources and internet information beyond the course required exchange of feedback. More than 90% of the students responded positively about the feedback comments received. The other 10% of the students who expressed negatively about the feedback received comments either too sparingly or untimely.

The feedback seemed to have served the purpose of providing another set of eyes for different perspectives. As mentioned by one student, " the comments were mostly good ideas which came from a 'fresh' viewpoint." Students also mentioned that the comments were frank, helpful, appreciated, and "caught some of the errors." Based on the comments received, students were able to reflect upon their own work and consider implementing the changes suggested. Students wanted more than brief comments, such as "nice job" or "great work." They appreciated the comments that indicated why the webfolios were "nice" or "great."

Students especially enjoyed the exchange of comments because of the non-judgmental nature of the activity. Unlike the comments received by the instructor, students were able to easily disregard the comments that they did not agree with. As one student commented, "yes, the feedback comments made me think about the changes... but the decision was left up to me. They were given to me as suggestions, but I had to decide whether the change was to be made or not."

Suggestions

Advice provided by the students for those who would be doing webfolios in the future was classified into four categories: (a) Personal Encouragement ; (b) Getting Help; (c) Organization; and (d) Webdesign. The first category resulted from the fact that it was the very first attempt to create webpages for most of the students. Their advice was to pay attention to the directions, be patient, and take time to be accurate. As one student commented, "Take a deep breath. It isn't as scary as you think. Pay attention the first time carefully and you'll be amazed at how easy it is at house."

While the second category about "getting help" still had to do with their being novices in creating webpages, it seemed to have evolved from their collaborative experiences with peers. Frequently mentioned advice was to work with a partner, talk with other students about input and ideas, and "view other people's web pages to get some ideas to make improvements on yours." The target source of getting help was expanded beyond the technician and the instructor to include peers, in general, as well as unknown webdesginers whose web pages were available on the Web.

The third category on "organization" covered two facets of webfolios, i.e., issues dealing with portfolios and technology aspect of the webfolios. Advice such as keeping files in order, planning ahead, and starting early applies to both traditional portfolios and webfolios. Other suggestions, however, covered specific issues dealing with creating webpages of the webfolios. Students suggested not only to "keep all of your files together and under one program so the linking process will be easier" but also to "become familiar with the names of your files or addresses that you use on a regular basis." As in the case with all other computer files, students also emphasized the importance of saving everything on multiple disks.

Finally the last suggestion demonstrated the knowledge acquired by the students from developing their own webfolios. Students remembered to point out the lack of spell-checker in the Netscape Editor. "Proofread constantly." In addition to the advice on technical issues like "link information from one source to another to give additional information," there were many professionally sound recommendations such as "be very creative, create an eye catcher, but be brief" or "add something that gives your homepage individuality and ties in to a little story/tidbit about you personally." Some students not only demonstrated competence as webdesigners but also the improved skills in providing feedback. "Add graphics sparingly because too many graphics will detract from the most important content of your webfolios, YOU."

Conclusion and Recommendations

The California State University has recently established policy goals, including university accountability in its Cornerstones Project to ensure provision of educational excellence in a teaching-centered, collegiate institution and to demonstrate effectiveness to the public (Cornerstones 1997). The focus of the Webfolios Project, or student portfolios on the World Wide Web, centers around this important issue of accountability through appropriate assessment of student learning outcomes and communication of assessment to multiple audiences.

The evaluation study of the webfolios seems to indicate that webfolios may be used as means to demonstrate accountability to multiple audiences. As in the case of traditional portfolios, students can assess the growth of their learning over time and demonstrate their accomplishments in their webfolios. In addition to increased technology skills, students praised about easy accessibility and convenience of portfolios on the Web as they found unique opportunities for collaboration as they shared information, resources, and on-going support throughout the course. Building one other to grow in knowledge and skills instead of competing against one another during the process of assessment helped students make assessment truly a part of learning. Webfolios may indeed become an authentic means of student learning outcomes.

From the results of the study, it is recommended that university policies be revisited regarding possible plagiarism through easy access in the World Wide Web and authorizing students access to upload their own webpages on the Web.

The completed student webfolios discussed in this article can be viewed from the Cal State LA's curriculum website at http://curriculum.calstatela.edu/courses/edad500.

References

Campbell, D., Cignetti, P., Melenyzer, B., Nettles, D., & Wyman, Jr., R. (1997). *How to develop a professional portfolio: A manual for teachers.* Boston: Allyn and Bacon.

Cornerstones. (1997). http://www.calstate.edu/cornerstones/reports/newreport.html.

Duncan, P.K. (1996). How can we prepare reflective administrators for a non-reflective world? "Alternative" assessment can help. *The Journal of CAPEA, 8, p.43-58.*

McAfee, O., & Leong, D. (1994). *Assessing and guiding young children's development and learning.* Boston: Allyn and Bacon.

National Association of the State Boards of Education. (1988). *Right from the start: The report of the NASBE Task force on Early Childhood Education.* Alexandria, VA: NASBE.

Shaklee, B., Barbour, N., Ambrose, R., & Hansford, S. (1997). *Designing and using portfolios.* Boston: Allyn and Bacon.

Three Roads Diverged and We Took All Three

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Abstract: The panel members will discuss and demonstrate through interactive videos and cd-rom some of the experiences along the journey implementing the technology integration projects (TIPs) and utilizing educational integration approaches in both the LITE (Linking Interactive Technologies and Educators) Institute and the WebMaster Institutes to achieve the desired outcomes of the ILC (Interactive Learning Campus). The three roads taken by DIAL to enhance teacher use of technology are: Technology Integration Projects (TIPs), LITE Institute and the WebMaster Institute program. The WebMaster program is a skill-based program while the TIPs projects and the Master Teacher Cadre meet on demand needs for curriculum and professional development and the LITE Institute encompasses the entire program for longevity and sustainability of technology use in the schools and communities.

Components of the Interactive Learning Campus (ILC)

Introduction

Learning on demand. Teaching has been called the noblest profession, the loneliest and the most critical for the future of our democracy. With the importance and challenges of the profession, how do we support these teachers? How do we help them to grow? One of the approaches the Interactive Learning Campus has taken is to offer professional development "on-demand" as teachers respond to the challenging task of creating student centered technology assisted curriculum. Teachers working with design teams of students, parents and partners are pushed by the requirements of the task, the diversity of opinions and the potential of technology.

How do teachers meet this challenge? They learn by doing. A web-based structure provides a framework for co-development and student use, and a rapid prototyping process supports the action/reflection cycle that is at the core of learning. Regular opportunities for reflection are provided through storytelling meetings, in which the teams think out loud with about their vision, ideas and questions.

Inquiry is based on the learners' questions, as they work toward a goal. Team members discuss, reflect, test out and refine their ideas. The IBL (Inquiry-based-learning) Website and the rapid-prototyping process support inquiry through the co-development of ideas by the design teams. This models the processes students will use in taking the courses.

As the design teams figure out how the content and the technology come together into course modules that will provoke student inquiry, they are asking the questions that drive their own professional development:

What is your vision of this course? How will students be different? *Vision map*;
What are the key ideas on this topic? *Goals map*;
What is interesting to students about these topics? *Scenarios*;
What are the knowledge bases that will support students' inquiry? *Knowledge Bases*;
How do students learn through these modules? *Digital Portfolios;*
How will these courses fit into the curriculum? *Concepts Skills and Curriculum alignment;*
What is the role of teacher in the use of these courses? *Teaching with Inquiry-based-learning*.

The Interactive Learning Campus is based on an action/reflection culture. Since part of **culture** is the stories we tell ourselves, we have built storytelling into the process of building our learning communities. These stories are the oral history of our understanding. They are dynamic and evolving. The stories help us understand each other in our understanding. Storytelling activities include: meet and make the thinking visible of the group; provide an ongoing record of the group's thinking; support individual story telling of teachers doing curriculum design; provide a context for developing waves of innovators; tell the stories of development to those implementing the courses.

Technology Integration Projects (TIPs): The Curriculum Road

Technology Integration Projects (TIPs) are the principal vehicle by which DIAL will implement broadly based systemic changes that will constructively alter the landscape of rural K-12 education. The intent of the Consortium is to create a new learning environment through its *Interactive Learning Campus* - increasing access to high-quality information and improving teaching and learning through engaged learning practices. There are ten essential areas of emphasis complementing DIAL's commitment to distance education and engaged learning. These will be implemented on a phased basis: Curriculum Development, Technology Integration, Project Management, Telecollaborative Development, Interdisciplinary Courses, Just-in-Time Professional Development, Preferred Learning Styles, Automated Assessments, and On-Demand Information Access.

The TIPs participants within DIAL schools have access to a variety of support systems during the entire curriculum development and technology integration process. In addition to the local students, parents, partners, and community resources available to the teachers, the DIAL professional staff will work closely with the teams. Currently five (5) first round of projects (Pathfinders) are nearing completion and a second round of six (6) projects (Trailblazers) is beginning development.

The Master Teacher Cadre: The Professional Development Road

The major focus of the Master Teacher Program is to build the human capacity throughout the consortium to fulfill the defined outcomes of the Interactive Learning Campus: ***1) increased access, 2) improved teaching and learning, and 3) enhanced community development.*** The Master Teacher Program will enhance human capacity of educators by: developing skills and processes that encompass engaged learning theory, creating comfort and models for distance education technologies, and identifying and practicing effective leadership and communication processes.

The Master Teacher Program is designed to use distance technology as a viable alternative to all levels of formal schooling: primary, intermediate, secondary, and post secondary. The program models this with the delivery of the graduate courses offered via a variety of distance technologies. The program centers around using engaged learning practices and an integrated educational approach working with three partnering universities to deliver the graduate programs. The partnering universities are The University of Nebraska –Lincoln, The University South Dakota, Vermillion and Dakota State University in Madison, South Dakota. The program utilizes learning theory that encompasses engaged learning and is related to the constructivist approach to andragogy. Practices that support engaged learning theory implement: understanding multiple intelligences and how the brain works, team building and teaming practices, a board sense and vision for student assessment. Skills, models and technologies practiced within the masters program serve as a model to schools throughout the consortium and the state of South Dakota.

The Master Teacher Program will provide training, practice and theory for the participants. The outcome of the programs will create and promote effective leadership and communication in their schools and throughout the state. Leadership theory and skills that embrace the concepts of team and collaborative efforts are essential to success of the outcomes of the Interactive Learning Campus. The goal is to enable small shifts and transitions in current education perspectives to happen. This will in turn lead to some very forward thinking teachers and principals who are able to create some areas for experimentation and flexibility.

The WebMaster Institute: The Digital Road

The WebMaster Institute program utilizes an integrated educational approach incorporating the New Jersey Institute of Technology and the University of South Dakota. The NJIT WebMaster 2001 Program is designed to accommodate the flexible needs of teachers and students who participate in its academically rich, distance learning courses. The program is designed to be self-placed and self-paced, consisting of three 30-hour training modules: Web Author, Web Graphics - Photoshop, and Web Graphics - Flash. Both teachers and students will complete the program via distance. The selected teams will be registered in the courses, be given unique account names and passwords to enter the courses. NJIT uses WebCT as the courseware tool for the online delivery of their courses. All participants receive the WebMaster 2001: WebMaster Fundamentals Certificate from NJIT. The University of South Dakota is granting graduate credit for the coursework completed by the teachers with an additional course on integration of the web-based skills. In addition the University of South Dakota is granting dual credit to the student team members. Each of the students receives one high school credit along with six college credit hours, which transfer in as two- three credit hour courses.

The goal of The WebMaster Institute is to have five teams of teachers and students, from each of the Consortium's thirty-three school, receive certification. This will result in 165 teachers and 165 students being available for joint internships within their schools and communities, as well as for the delivery of web-based courses through The LITE Institute.

1. It is possible for parents, school technologists and partners to also take the courses simultaneously with teachers and students. They will receive certification training through DIAL as well.
2. The WebMeister program is targeted for the student members of the team, resulting in dual credits for 10^{th}, 11^{th} and 12^{th} graders.
3. The WebMeister-Junior program will reach down and enable 5^{th} through 9^{th} grade students to participate fully with their teachers in WebMaster Institute curricula.
4. Every team will have the opportunity to apply their knowledge in community-based internship during or upon completion of the coursework.

The LITE Institute (Linking Interactive Technologies and Educators): The Interstate System

The principal dissemination vehicle for the delivery of these curriculum units is The LITE Institute, which focuses its services on: (1) capacity-building of K-12 educators, administrators, technologists, and librarians using traditional, distance, and just-in-time formats; (2) skills-building through curriculum development and technology integration courses and consultations, emphasizing high-quality course content, distance education, instructional design, and engaged learning best practices; and (3) evolving and emerging automated assessment technologies, tools and techniques, using such advancements as neural networks. Quite often, these are viewed a worlds within themselves. DIAL's goal is to merge these into everyday best practices within the Interactive Learning Campus.

The LITE Institute is a statewide technology-based resource. The overall strategy of the Institute requires seamless integration of four areas of contribution:

1. professional and staff development initiatives,
2. curriculum development and technology integration services,
3. comprehensive, cross-disciplinary distance learning courses, and learning assessments.

Summary

The three roads diverge in terms of the route they take. But unlike Frost's roads, our roads all end up uniting in the Interactive Learning Campus. Each initiative builds skills and contributes to the development and sustainability of the campus. As webmaster teams build technical skills, TIPs teams build Inquiry Based Learning Modules and the LITE Institute offers connections with a larger community, we see the campus grow and build new byways and highways to create interdependence in our learning community.

Software Agents for Distance Education and Institutional Support

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Abstract: In this paper the author explores the use of software agent technology to provide options and solutions for the challenges facing educational institutions that have limited or fixed resources. One of the challenges examined is that of providing quality instruction to increasing numbers of students, including those with non-traditional scheduling requirements without straining current resources. Other challenges include optimizing the existing network infrastructure and supporting institutional business goals

Introduction

Educational institutions have three major sets of overarching goals, those relating to the quality of instruction, those relating to the quality of the supporting organizational infrastructure and those general business oriented goals that affect all of the others. Concerns and challenges within these sets of goals can be successfully addressed by the application of agent technology.

Software agents are network-enabled applications that are being called "the next great wave of innovation and development across the Infosphere comprised of the Internet, Intranets, Extranets, World Wide Web, and countless other networked computer systems...This technology is expected to eventually have an effect as profound as the World Wide Web" (1997). If properly developed and fully utilized, this technology could prove to be not just a solution for existing problems or a method for achieving institutional goals, but a resource that could strengthen the institution's competitive position.

Pedagogical Agents

The instructional goals include the development of methods that retain or improve the effectiveness of instruction. This includes addressing all learning styles and personalizing instruction according to individual needs, while accommodating students who are geographically dispersed and increasingly require non-standard scheduling (Latchman, Salzmann, Gillet, & Bouzekri, 1999).

These goals can be addressed through the thoughtful application of pedagogical agents. A pedagogical agent is an agent that acts as a guide or instructor for education and training purposes. The primary function is to support humans in accordance with the application of pedagogical theory within learning environments. They will act upon the environment and interact with the user in ways that will facilitate learning, while dynamically responding to spontaneously occurring opportunities for instruction and personalized tutoring. This is possible because the agent monitors the progress and current knowledge of the student in each task. The agent has knowledge of the skills that are needed for the task, as a human expert would demonstrate them. It then compares this knowledge with the student's performance of the same skill.

Pedagogical Agents can be built with fuzzy logic and neural network components that will allow them to recognize the learning pattern of the student and from that pattern, predict what the student's response will be. This allows the agent to prepare personalized corrective strategies and materials regardless of the number of students being taught. The agent can independently choose to apply these strategies before the student realizes that there is a knowledge deficit in a given area. Such a system will track changes in the student's responses and bring them in line with the expert's responses as they are coded into the agent's knowledge base. A well-trained neural module would also allow the agent to differentiate between actual learning problems and errors made from carelessness or fatigue (Lively, 1992).

Agents can also be used in realistic simulations that provide multimodal instruction for both distance and traditional education environments (Lester, Rickel, & Johnson, 1999). These simulations can be used at anytime, by single students or with groups. Faculty staffing issues can be further addressed by using the agent capabilities that allow them to teach autonomously (Johnson, 1997). This allows the ratio of students to instructors to increase without affecting the quality of the instruction. This quality of instruction is enhanced through the use of personalized tutoring capabilities available with some agent applications (Rickel & Johnson, 1997).

For example, Adele is an animated pedagogical agent developed at USC's Information Sciences Institute's Center for Advanced Research in Technology for Education (CARTE) (Johnson, 1997). She is used for medical education in the areas of family medicine and graduate level geriatric dentistry. She was designed to run on conventional desktop workstations with conventional interfaces. In order to expand the agent's effectiveness, she runs in a student's Web browser. In this way she integrates Web-based resources with other learning materials and serves a guide through the lesson.

When operating in Advisor mode, Adele will interrupt any student action that is not in accordance with standard practice. She then suggests a different approach or action, or refers the student to a resource, such as a video demonstration, audio clip, or Web-based reference material. Regardless of the mode in which she is operating, Adele makes full use of opportunistic instruction by providing hints or references in all appropriate situations. She will also provide immediate responses when students ask "why" questions. In this way instruction is simultaneous with problem solving, and the student can immediately use the information.

Adele employs a hierarchical representation where the preconditions and effects of each step are explicit. This structure also includes sets of possible actions a student might take at different points in the program. She explains process steps in terms of motivating facts about the domain. For example, her response to a question about why an X-ray should be ordered would include reasons why X-rays are important in this type of case.

Adele's persona includes several behaviors as well as the ability to have new behaviors added. Actions and communications are generated using a behavior state approach. This consists of a library of searchable behavior fragments including visual segments showing her repertoire of movements, audio clips accompanied by a commercial speech synthesizer to serve as utterances, and occasionally segments of other background sounds, such as music. A behavior-sequencing engine dynamically joins selected fragments at run time. The result is that Adele displays seamless behavior and appearance to the student.

Projecting Adele's seamless behavior is a technical challenge due to the latency associated with Web-based applications. The solution places the agent's reactive behavior on the client machine. A solution for this is to move the student-monitoring part of the application to the client machine. Although this places more processing on the client, it is still at a level where any platform with a reasonable amount of memory and processor speed can successfully execute the program.

Learning Environments

Current advances in the technology for both agents and virtual environments have combined to provide many options for implementation within the learning environment. One such option is a simple, easily constructed, text-based Multi-User Dimension (MUD). These environments are substantive, provide opportunities for rich educational interactions and are scalable so that many learners can participate simultaneously (Kiss, 1997).

Since many mobile agents are designed to travel between MUDs in order to allow users to communicate in real-time, they must be capable of functioning in unfamiliar environments. In order to do this they must either have advanced reasoning capabilities or they must be able to get information from the environment itself. Agents can access some information by making queries, but frequently, this environmental data does not include definitions of its own semantics, and cannot be understood by all agents. One approach to facilitate interaction within unfamiliar environments for users and agents is that of creating annotated MUDs.

Whether human or agent, the inhabitants of well-designed spaces can find implicit clues concerning the purpose and operations of objects within their environment. This type of clue provides agents with an understanding of the meaning and context of the MUD. In this way an agent can directly query the environment in order to determine appropriate behavior within that space, available activities, and recommendations for exploiting the environment in accordance with its goals and abilities. Since it is not necessary to learn the space, the agent only has to interpret it. Annotations also ensure that the agent always has current information and is able to immediately make use of the knowledge, which results in a more rapid response.

In this approach, the environment can be modified in any way, and the agent responses will automatically change according to the annotations provided. At this time there are five types of annotations that can be integrated into MUDs and other environments (Doyle & Hayes-Roth, 1998).

- Emotional annotations provide information about either events or environments, and explain acceptable responses.
- Responsive annotations provide either domain specific actions or suggest the use of behaviors built into the agent in order to explain appropriate behaviors.
- Problem-solving annotations describe puzzles included in the MUD; provide hints about them that the agent might give the user through speech or action. When the puzzle has been solved, the annotations will update the agent with the current information.
- Role annotations inform the agent about actions or events that are relevant to its performance of specific functions within the environment. In this way the agent can combine its personality with domain-specific behaviors so that the user perceives and integrated, believable character.
- Game playing annotations describe the status of a game or any bounded multi-user interaction, and inform the agent of its performance within it. They will also suggest moves to the agent that are based on its skill level, personality and motivations. This category is dynamic and requires that the environment compute real time responses.

These annotations help to support a dynamic, constructivist environment to enhance student learning.

Infrastructure Support

Institutional support goals include such items as the optimization of existing classroom technology and network infrastructure. Both wide and local area networks can be optimized without additional staffing or extra hardware investments by employing network management agent applications (1999c). These applications can also automate daily tasks such as network and database backups, batch processing, mail sorting and scheduling (1999b). Network agents are also used to map dynamic networks, routing paths, and for allocation of distributed resources. Application, data and transaction security, as well as user access can be monitored and enforced according to the rules activated in agent applications.

Equally as important for educational institutions, is the ability of highly efficient agent search applications to reduce the network load associated with the traditional search and retrieval methods used for on-line research (Knapik & Johnson, 1998). The benefits of neural network enhanced information retrieval agents are even more evident when the technology is applied to Web-based searching. This hybrid virtually eliminates the massive bottlenecks and information latency that accompany current search tools. This is especially true of those meta-search tools that distribute the information retrieval between many services. This is because traditional search tools broadcast user queries to several information sources simultaneously. The results are then merged and all are made available to the user. Often the desired information is located by only one tool, and the others utilize the network in order to return irrelevant data, which must then be manually sorted by the user

Frequent users of these services know that the complexities of tagging and searching the information result in different findings being produced by different engines. Since the search engines cannot differentiate data patterns and characteristics, they frequently return non-applicable data. Agents with neural network modules can cut through the useless information using advanced pattern recognition capabilities, can discover and map information in its current location. In this way, dynamic information can be cataloged; and mis-catalogued, or poorly tagged information can still be identified regardless of what the original structure of the data was.

The search agent known as WebCrawler uses a collaborative approach. It reduces search time by posting all queries at a central location, and allowing other agents to access them. The agents then collaborate on those for which they have high priorities or qualifications. This collaboration can take the form of exchanging information or breaking the query into small segments, each of which is then executed by different agents (Knapik & Johnson, 1998).

Another approach to information filtering and retrieval by an assistant is found in BUZZwatch. This is an agent program that traces trends, themes and various subjects across real-time applications and archived information. It is an expert in data mining and text analysis that can facilitate research by combining time and series analysis. In this way it can help a user track the development of a subject through chat rooms, newspaper archives and on-line texts (1999b).

The Expert Finder finds information by tracing experts in any field requested by the user. In this way people can benefit from the knowledge of individuals of which they might not otherwise have been aware. This allows communities to leverage the combined knowledge of all members and allows the user to find an expert who can help with any problem.

An organization can also choose to mange its data with agent applications. This is becoming more attractive and necessary as traditional databases give way to huge and complex data warehouses and 3 dimensional repositories. In this environment, agents are critical for preventing data corruption and retrieval problems. This is accomplished through enforcing data constrains that reject out-of-range data, systemic deletions, duplications and other illegal operations.

Agents responsible for data integrity verify memory, I/O ports, actuators and other items during otherwise wasted CPU cycles. Some run in the background, testing referential integrity of data values. When problems are found, the agents can either issue reports about them or fix the error, depending on their specific parameters.

Many organizations are discovering that agents can perform backups of distributed databases without the databases being taken off line. The agent freezes tuples of data, records changes in a file, then executes incremental backups by merging the changes into the database. The Lotus Notes backup agent also fulfills the function of notifying the Database Administrator concerning issues such as available server space.

Business Support

The general goals of educational institutions parallel those of any business, and focus on functioning within constrains imposed by budget, staffing, facilities and other fixed resources. Methods to increase the personal productivity of staff and faculty would also be included within this set of goals (1999a). This might be addressed by the use of reliable automation for repetitive office and organizational support tasks. Another way agent technology helps support staff productivity is through the use of Personal Digital Assistants (PDAs).

Agent technology is growing at a remarkable rate in the area of personal digital assistants. These agents help in the business environment where they maintain user appointments, plan work processes, and collaborate with the user to perform complex tasks. They are also used extensively for mail management and in information retrieval situations where it is critical to sort through large amounts of data in order to find specific information. This is especially important in education where the amount of information available for research and teaching grows at an exponential rate.

Many of the agents designed for information retrieval and filtering are enhanced with neural network modules. These represent a hybrid form of retrieval agent with capabilities unrivaled by any other current approach. They enable the learner to access the precise information needed because they can be trained to search for specific items that match the users desires and preferences. The agent is optimized as the user provides data about the relevance of specific findings and then compares it to what they are actually looking for. The associative mapping capabilities from the neural technology allow the agent to remember the location of matcrial that displays the characteristics of the desired information. This allows agents to search in a manner well beyond the scope of technologies using page tags and keywords.

The increasing use of digital assistants from different platforms and with different standards has highlighted concerns about possible problems due to agent incompatibilities. Carnegie Mellon University has taken a proactive approach to the problem and is building agents that will facilitate the communications between incompatible types of agents. These are called matchmaker agents, and they are designed to translate using a new capability description language. This allows them to serve as intermediaries between agents requesting services and those providing them. Currently digital assistant research includes all aspects of daily management and information, such as personal calendar managers, financial portfolio mangers, and joint mission planning for large organizations (1999a).

Organizations that endorse the use of personal digital assistants not only help employees become more productive; they also gain an extra bonus in the area of network performance. This is because less bandwidth is required for these agents than is needed to use traditional databases that have vector space model information retrieval mechanisms. This translates into reduced communications costs for the institution and provides quality results to the user in less time. These advantages will become more apparent as the amount of accessible database information increases (Yoo, 1999).

Management must also ensure that the initial cost of any new technology support for the organization or for instructional methodology is offset by the benefits as determined in a cost of ownership, return on investment, or cost benefit analysis. Agent technology also provides solutions for these concerns (1999a). Because many agent applications run on common platforms or are cross-platform, using them does not require expenditures for major hardware upgrades. Although the overall costs are dependent on the specific technology and its implementation, the wide range of readily available applications addresses nearly every need and budget.

Conclusions

Overall, the advantages of agent technology for educational institutions cannot be overstated. This technology is able to positively address every major institutional goal while using a minimum of resources. Overall, the advantages of agent technology for educational institutions cannot be overstated. This technology is able to positively address every major institutional goal while using a minimum of resources.

The application of pedagogical agents is an area that should be explored by all schools and universities. If properly developed and fully utilized, this technology could prove to be not just a solution for existing problems, but a resource that could strengthen the institution's competitive position.

References

(1997). *The Agent Society*, [On-line]. The Agent Society Organization. Available: http://www.agent.org/frmain.htm [1999, 8/29/99].

(1999a, 8/1/99). *Intelligent software agents*, [On-line]. Carnegie Mellon University Robotics Institute. Available: http://www.cs.cmu.edu/~softagents/ [1999, 8/29].

(1999b). *MIT software agents group: Projects*, [On-line]. MIT Media Lab [1999, 8/29/99].

(1999c). *Products and Solutions*, [On-line]. Novell Corporation. Available: http://www.novell.com/products [1999, 12/1].

Doyle, P., & Hayes-Roth, B. (1998). Agents in annotated worlds. *ACM Autonomous Agents, 5*(1/98), 173-180.

Johnson, W. L. (1997). *Pedagogical agents*, [On-line]. Center for Advanced Research in Technology for Education. Available: http://www.isi.edu/isd/carte/ped_agents/pedagogical_agents.html [1999, 11/20].

Kiss, P. (1997). *Evaluation of MUDs and the role of intelligent agents.* Paper presented at the Combined Winter Conference on Educational Uses of MUDs, Jackson, WY.

Knapik, M., & Johnson, J. (1998). *Developing intelligent agents for distrubuted systems*. New York: McGraw-Hill.

Latchman, H. A., Salzmann, C., Gillet, D., & Bouzekri, H. (1999). Informaition technology enhanced learning in distance and conventional education. *IEEE Transactions on Education, 42*(4), 247-254.

Lester, J. C., Rickel, J. W., & Johnson, W. L. (1999). *Animated pedagogical agents: Face-to-face interaction in interactive learning environments*, [On-line]. Center for Advanced Reasearch in Technology for Education. Available: http://www.isi.edu/isd/VET/vet.html [1999, 11/20].

Lively, S. M. W. (1992). Using a neural network to predict student responses. *Proceedings of the ACM/SIGAPP symposium on Applied Computing, 2*, 669-676.

Rickel, J., & Johnson, W. L. (1997). *Integrating pedagogical capabilities in a virtual environment agent* . Marina del Rey: University of Southern California.

Yoo, Y. S. C. S. I. (1999). *Multi-agent learning approach to www information retrieval using neural network.* Paper presented at the IUI'99: proceedings of the 1999 international conference on intelligent user interfaces, Redondo Beach, CA.

System-wide Planning for Technology in Teacher Education: Lessons Learned at The University of Wisconsin System

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Abstract: This paper reports both the processes and outcomes of the University of Wisconsin System's effort to facilitate technology integration throughout its thirteen teacher preparation programs. The context and rationale for the effort, the change strategies employed, and the results of institutional and system planning are explained. The paper also reflects on lessons learned from the planning effort. The planning effort has been conducted within a context of organizational change characterized by facilitation, engagement, and decentralization.

Introduction: Context and Rationale

A former member of the University of Wisconsin Board of Regents noted that bringing about change in the university system was tantamount to "moving a battleship with your bare hands" (Weinstein 1993). The regent's frustration was with changing the direction of a large and complex system within a culture of faculty governance and the reluctance of institutions (and their curriculum) to change with the times and be more responsive to external stakeholders.

The topic of technology in teacher education can elicit similar frustration from policy makers and school district representatives. The state of Wisconsin is no different from other states in placing significant investments and emphasis on the technology proficiency of its students and teachers. The state is investing hundreds of millions of dollars in information technology hardware, software and infrastructure in K-12 schools. Furthermore, the state has estimated that approximately $20 million are expended annually in a combination of federal, state, and local funds in teacher professional development in technology (1999 TEACH Wisconsin).

In spite of these investments and expectations that they will promote greater student achievement, there is cause for concern. The National Center for Education Statistics reported that only twenty-three percent of both new and veteran teachers were "well prepared" to integrate educational technology into the curriculum (1999 NCES). And a state-wide assessment of the LoTI or Levels of Technology Integration survey (1999 Moersch) indicated that only seventeen percent of teachers surveyed in Wisconsin currently integrate technology into the curriculum (1999 TEACH Wisconsin).

The Change Process

To address concerns about technology preparation of new teachers and the continuing professional development of practicing teachers, the University of Wisconsin System initiated an effort to develop and promote best practices in technology throughout all of the institutions within the system. (The system is composed of fifteen institutions; thirteen of them have teacher preparation programs therefore those institutions were the focus of this effort.) This broad-based and inclusive planning effort was created to address concerns of external stakeholders as well as issues raised within System Administration about the extent to which the universities were integrating technology throughout the curriculum, including field experiences. System and institutional leaders had frequently been chided by legislators and other external constituents with anecdotal reports of how teachers were ill prepared to use technology in today's schools. In addition to the anecdotal reports, the surveys cited above were used to exert pressure on the system to address the issue of technology in teacher.

The framework for this effort was systemic; i.e., it was conducted at multiple levels of the organization. Both UW System Administration and individual institutions were expected to facilitate desired change. Wisconsin, like other states, has a consolidated system of higher education that was created to join state and teachers colleges with the land grant institution, as well as the urban institution. The state government merged the previous systems to provide better planning and coordination, curb growth, provide more effective and equitable distribution of state resources, avoid duplication and competition among institutions, and ultimately to better serve state citizens with improved access and planned resource allocation (Glenny, Berdahl, Paltridge 1971; Glenny 1977; Halstead 1974; Millard 1981). Moreover, technology is an area of academic planning in which coordinated planning and policy are frequently deemed necessary (Olcott 1996; Zeller 1995). In spite of these expectations, there is inherent tension between a central system administration and the individual campuses when trying to facilitate change; according to the literature, the very act of coordination can be viewed as a challenge (if not an attack) on institutional autonomy. If faculty perceive that decision-making--especially about fundamental curricular decisions such as technology integration into teacher education--are shifting from them to a central administration or bureaucracy, the hostility and tension will increase (Dearing 1972). More importantly, the goal of improved and more responsive programs would not be realized.

Given the role of System Administration and the need to manage tensions between the administration and institutions, the planning and change process was conducted at multiple levels with significant opportunities for discussion through facilitated iterative processes at individual campuses and system-wide. The initial impetus was top-down with the creation of a high-level task force that included representatives from state agencies, school districts and the universities. The Senior Vice President for Academic Affairs of the system, with the support and encouragement of the system president, created the task force. The task force was charged to (a) review standards from national and professional organizations for benchmarking purposes; (b) review state technology standards for PK-12 students; (c) collect information on current practices in UW programs to have data for assessment and decision making; and (d) work within the context of fundamental changes in teacher education program approval, licensure, and professional development. (See the Wisconsin Department of Public Instruction's Web site for information about reforms to teacher education: www.dpi.state.wi.us/dpi/dlsis/tel/restruct.html).

The Best Practices Task Force began data collection by surveying the institutions to obtain baseline information about current practices. Institutions reported on the following: (1) What courses and /or experiences are used to develop teachers' understanding of the uses of technology for the subjects they plan to teach? (2) What are the schools of education plans to assure that their faculty are (a) knowledgeable about current practices related to the use of computers and technology, and (b) able to integrate technology into their teaching and scholarship? (3) What are their plans for faculty professional development and training in technology? (4) What resources are available to support computing, educational communications, and instructional technology in teacher preparation programs? (5) How are schools of education working with schools and colleges of letters and science to address these technology issues for beginning and practicing teachers?

The results of this survey showed considerable variation in how institutions were addressing these key issues. For example, many institutions were still relying on discrete courses in instructional technology, rather than developing models for systemic integration into the curriculum. Moreover, while some institutions articulated comprehensive plans for faculty development, others merely cited a listing of workshops. The evidence of university-wide planning and responsibility for teacher education technology development was also inconsistent and of uneven quality. It was evident from this initial scan that much work needed to be done at multiple organizational levels to advocate for technology infusion throughout the programs. Therefore, the Best Practices Task Force developed an institutional, team-based strategy.

In addition to the top-down approach, strategies and processes also were enacted at middle levels of the organization. Institutional teams were developed to discuss issues, collect data, and develop institution-specific plans to integrate technology throughout the teacher education curriculum. The teams consisted of administrators and faculty from the university and local PK-12 districts, as well as technical and instructional design support staff. The teams were required to submit reports to system administration around the key areas of teacher proficiencies, faculty development, and infrastructure requirements. A survey of the literature that was conducted at the inception of the project revealed that these three areas needed to be addressed in any comprehensive approach to technology in teacher education. All thirteen teams from throughout the university system met three times using compressed video technology. The discussions were co-facilitated by the system PK-16 director and rotated among selected faculty. At the compressed video meetings, campus teams shared issues, progress and results, and submitted one-page summaries of their discussions around the critical issues. The team-based effort culminated in a face-to-face statewide conference of all team members. The conference time was divided into discussions for functional groups and institutional teams. Individuals from across the system were placed into functional groups (deans, higher education faculty, technical support, etc.) and were asked questions designed to stimulate discussion and planning across institutions. The institutional team meetings were structured to enable the teams to initiate specific goals and action steps to develop their institutional plans.

Finally, each campus submitted a report to System Administration that outlined the campus plan to integrate technology into teacher education. Those plans will become the basis for a White Paper that will be submitted to the Board of Regents in February 2001. Besides reporting on the status of technology integration into teacher education, the White Papa will highlight institutional best practices. It will also contain specific system-wide policy and program recommendations. It is anticipated that the Board of Regents will incorporate these recommendations into a larger UW System PK-16 initiative and an action agenda.

Since effective change must be multi-directional, bottom-up approaches were also used to stimulate pilot, proof-of-concept projects at the individual faculty level. The system has provided incentive funding for teacher professional development projects that involve UW and PK-12 faculty working collaboratively on projects that utilize technology within the curriculum. In addition, the system has provided funding for fellowships that support UW faculty working collaboratively with PK-12 faculty on research projects that examine the impacts of technology on teacher behavior and student learning. The VIT^{2}AL Web site (www.vital.wisconsin.edu) contains a description of these programs as well as descriptions of all projects funded via these initiatives.

The following figure illustrates the entire change process:

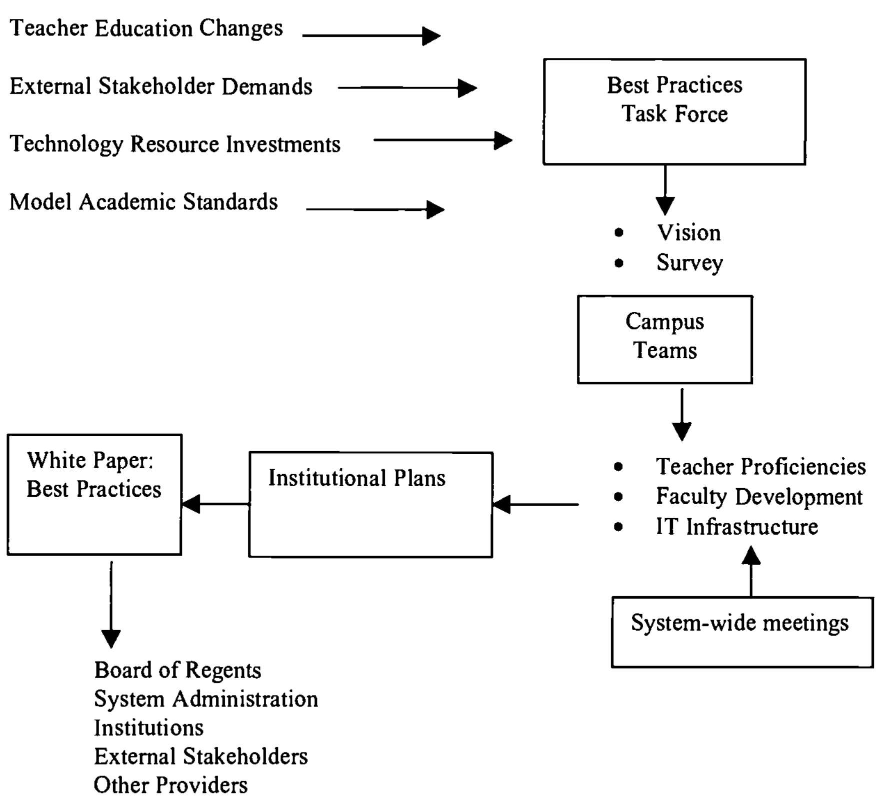

Figure 1: System-Wide Planning for Technology in Teacher Education

Outcomes: Results from Planning and Data Gathering Processes

The institutional teams addressed three questions separately in campus-based discussions, in three system-wide compressed videoconferences, and in their final campus plans submitted to System Administration. Those questions were (1) What do we want our teachers to know and be able to do when they leave teacher preparation programs? (2) What do our faculty need to know and be able to do to teach our students to use technology appropriately? (3) What are the infrastructure needs to accomplish student and faculty proficiency? Although these were dealt with separately, we were constantly reminded of the interrelationships between these issues.

Using a constant comparative method of analyzing the qualitative data from institutional reports (Conrad 1993; Maxwell 1998), six guiding principles emerged that informed and permeated the discussions of student skills and proficiencies, faculty development and leadership, and infrastructure requirements. Those principles included: (1) Caring and competent teachers would use technology with quality instructional practices and deep content knowledge. (2) Standards would form the basis for technology in teacher education; these would include adhering to ISTE's National Educational Technology Standards and Performance Indicators. In addition, Wisconsin's Model Academic Standards and technology standards for PK-12 students would inform teacher education practice. Technology integration would be part of systemic, standards-based reform. (3) Student-Centered technology integration would respond to needs of diverse learners and would focus ultimately on high achievement for all students. (4) Integrated technology throughout the curriculum, instead of technology grafted onto the curriculum through discrete courses would help ensure a systemic and long lasting impact on teaching and learning. (5) Lifelong Learning can be facilitated in technology-rich teacher education for both students and faculty by helping to foster learning communities. (6) Forward Thinking must always be a hallmark of technology planning; this encompasses not only includes keeping current with technological breakthroughs and changes, but in continuously improving curriculum and educational practice.

In terms of the teacher proficiencies, the institutional reports revealed that most students entering teacher education programs had a basic level of technology skill proficiency. However, it should be noted that programs were very sensitive to issues of the Digital Divide and students coming from socioeconomic or educational backgrounds that would impact negatively on their technology skills. Therefore, the plans provided support and remediation for students. The focus of the findings on teacher proficiencies resulted in identifying core proficiencies that would be articulated at the Beginning, Professional, and Master educator level (consistent with teacher education rule changes). Those proficiencies included (1) the collaborative use of technology; (2) technology as a learning tool; (3) responsible uses of technology (including ethical and legal issues); (4) and evaluating content.

Faculty use of technology would, at a minimum, require technology skills on par with students. But obviously the role of faculty as instructional leaders needed to be addressed. These leadership dispositions for higher education faculty were identified as mastering skills and core proficiencies, leadership consisting of initiative, collaboration and mentoring, and curriculum review and revision.

Discussions of institutional responsibility for infrastructure built upon the UW System's 1999-2001 Instructional Technology Plan in its requirements for equipment replacement cycles, wiring, software, technical and instructional design resources. What was unique to this plan, was the issue of university faculty working in collaboration with school districts and the resulting issues of unequal technical resources.

The Board of Regents will act upon the recommendations that have emerged from this process by the end of this academic year; without significant influx of resources (through reallocation and/or procuring new funding) and continued leadership it is unlikely that the effort will result in widespread, systematic change. Recommendations concerning teacher proficiencies will include the adoption of system-wide standards linked to categories of beginning, professional and master educator; measures to support students who need assistance to meet entry level requirements; technology proficiencies documented in student electronic portfolios; and teacher proficiencies tied to student achievement. Faculty leadership and professional development recommendations must include strong advocacy concerning the importance of technology integration into decisions regarding hiring, tenure, promotion, and merit. In addition, recommendations will foster better collaboration between schools of education/letters and science. In terms of infrastructure, recommendations will include the targeting of discretionary resources in course redesign (at campus and system levels) to teacher education, and system-wide academic systems to support faculty in the development of Web-based courses and resources. Finally, System Administration will recommend a long-term commitment to disseminate best practices through System-sponsored activities and resources. The Board will be encouraged to support a major budget initiative in the next biennial budget process (2003-2005) in teacher education, with a significant component related to technology integration.

Discussion

This has been an ambitious effort in system-wide planning within a context of facilitating policy and program change rather than mandating them. Lessons in leadership and change can be learned from this process and its results:

1. Stay focused within the organization. While there was initial pressure to engage private colleges and the technical colleges, we decided to focus our work internally, within a sphere or a circle of control where we could manage expectations and potentially bring about the most significant change. We plan to engage other providers later, in the next iteration of the ongoing planning and implementation processes.
2. Invite external stakeholders (state agencies, school districts, etc.) early in the planning stages to identify issues and engage support. External stakeholder involvement was crucial to maintaining a systemic approach to technology integration, lest the planning process become too focused on technology per se, rather than on technology for educational goals and outcomes.
3. Keep data collection simple. We used one-page worksheets for each of the campus reports on the major themes. While these worksheets did not yield detailed data, they did provide snapshots of the status of campus efforts; broad themes and trends could be identified. In a planning process that results in a system-wide effort, it is more important to have broad strokes than to have detail.
4. Anticipate variability and be prepared to explain variation and unevenness. The individual campus plans had to account for variation in mission, resources, and the regions in which campuses were located, among others. The challenge in a system-wide plan is to accept and even encourage differences, while encouraging systemic change. However, it must be noted that not all of the differences in campus reports could be attributed to justifiable differences. Many institutions' plans demonstrated less than a committed effort to address technology integration in a systematic way.
5. Employ multi-functional teams to include faculty, administrators, technical and instructional design support, as well as school district representatives. The multi-functional approach provides a process framework for underscoring a significant aspect of technology in education: that faculty can no longer operate as independent contractors. The success of their work is very dependent on teams of designers, technical support personnel and administrative leaders. In addition, we recommended that teams be represented by faculty who were novices in technology use as well as those described as experts. It was an important reality check to have novices (and even skeptics) involved in the planning process.
6. No one model or approach would work within a diverse system. This model of system-wide planning is consistent with general trends within the UW system, trends toward devolving decision-making from the central administration to the institutions, providing more incentives and rewards for institutional entrepreneurship, allowing more flexibility and experimentation. The current relationship between the central administration and the campuses is less governed by the need to regulate, mandate, and control and more consistent with organizational change that is facilitated, encouraged and supported. However, there continues to exist a larger regulatory environment that mandates rules for teacher program approval, for example. This process can be analyzed within a framework suggested by Dolence and Norris (1998) in which they contrast the processes of Industrial Age organizations with Information Age organizations. They characterize Industrial Age organizations with regulatory, centralized, faculty-centered, subsidized, dependent and existing

within a static and certain environment. Information Age organizations are decentralized, dynamic, student-centered, permissive and entrepreneurial. Unfortunately, the Information Age model does not totally square with the realty of technology planning within the state; evidence of both models exists within the current structure (both UW and the larger state environment) and any planning process must account for the ambiguity and tensions between these two.

Conclusion

This process began with an expectation of strategic change within a complex system. At this stage, it is a work-in-progress. Recommendations must be endorsed and implemented and continued work within the system and external to it must occur. Nevertheless, the process may be as important as the final product (s), whether those products be policy recommendations, funding, or programmatic directives. In the ambiguous, complex, recursive nature of planning in higher education, the very act of elevating an issue to the forefront of discussion, publicizing institutional activity and plans, inviting comparisons between and among institutions, can have a powerful impact on organizational change.

References

Conrad, C., Haworth, J. & Millar, S. (1993). *A silent success: Masters' education in the United States.* Baltimore, MD: Johns Hopkins University Press.

Dearing, B. (1972). Coordination: A view from the campus. In J. A. Perkins & B.B. Israel (Ed.), *Higher education: From autonomy to systems* (pp.50-71). New York, NY: International Council for Educational Development.

Dolence, M. G., & Norris, D.M. (1995). *Transforming higher education: A vision for learning in the 21st century.* Ann Arbor, MI: Society for College and University Planning.

Glenny, L. A. (1959). *Autonomy of public colleges: The challenge of coordination*. New York, NY: McGraw-Hill.

Halstead, D., K. (1974). *Statewide planning in higher education*. Washington, DC: U.S. Department of Health, Education, and. Welfare.

Maxwell, J. A. (1998). Designing a qualitative study. In L. R. Bickman, Rog, D.J. (Ed.), *Handbook of applied social research methods* (pp. 69-100). Thousand Oaks, CA: Sage Publications.

Olcott, D. (1991). Bridging the gap: Distance learning and academic policy. *Continuing High Education Review,* 55(1-2), 49-59.

Weinstein, Laurence A. *Moving a battleship with your bare hands: governing a university system*. (1993). Madison, WI: Magna Publications.

The Relationship between Leadership, Self-efficacy, Computer Experience, Attitudes, and Teachers' Implementation of Computers in the Classroom

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Abstract: The purpose of this study is to examine the relationship between leadership, self-efficacy, computer experience, attitudes, and teachers' implementation of computers in the classroom. A total of 160 elementary and secondary teachers from eleven schools districts in Central Pennsylvania identified certain factors that may influence their practices of using computers in their classrooms. Three types of computer uses were identified and the variables of experience and knowledge, perception of leadership, self-efficacy, and attitudes toward computers were related to teachers' use of computers. Regression models demonstrated that with low and middle computer uses of clerical/management and academic use, self-efficacy demonstrated significance. As the computer use moved to advanced uses, such as web-page development and desktop-publishing, experience and knowledge, professional development and leadership became significance factors.

Purpose

Educational change does not occur as a result of an introduction of a new innovation, it occurs as the result of implementing the innovation in the classroom (Hall & Hord, 1987). Implementing computers into the classroom can only be effective if the teachers use them. Certain variables exist that influence, either positively or negatively, teachers' practices of using computers in the classroom. These variables include teachers' perceptions of leadership, teachers' self-efficacy, teachers' past experiences and knowledge, attitudes toward computers and certain school and teacher characteristics. This study looks at the influence and relationship these variables have on teachers' practices of implementing computers in their classroom.

Many schools are currently in the process of preparing strategic plans that integrate technology into the curriculum. Regardless of the content of each school's Technology Plan, the number of computers that sit in the classrooms, or the amount of money spent for technology, it is the teachers' actual practices in the classrooms that determine what role, if any, technology will play (Callister & Dunne, 1992).

This study examined the relationship between leadership, self-efficacy, computer experience, attitudes, and teachers' implementation of computers in the classroom. Facilitating technological change is not effective unless ultimately the teachers' practices are changed to include technology. This study provides insight into the relationship and influence certain variables have on teachers' practices of implementing computers into their classroom

Theoretical Framework

This study roots itself in the theoretical and conceptual constructs of change theory in education (Jorde-Bloom & Ford, 1988; Hall & Hord, 1987,). Conceptually, change does not occur in education with the introduction of an innovation; change occurs when the innovation is actually implemented (Hall & Hord, 1987). In order to facilitate this change process, change facilitators need to understand what influences teachers' practices of implementing an innovation.

Studies have identified the need for leadership and support to be present in order to achieve successful educational change (Brown, 1993; Leithwood, 1994; Schmitt, 1990). These studies differ in the style of leadership that is most effective in implementing change. Some studies support the motivational tactics of Transformational Leadership to induce change (Brown, 1993; Leithwood, 1994). Other studies favor the more direct style of Transactional Leadership (Fairholm & Fairholm, 1984; Schmitt, 1990).

Other studies suggest efficacy is an important factor to the success of this type of curricular change (Dawson, 1998; Jorde-Bloom & Ford, 1988). The teacher is the one that ultimately delivers the curriculum to the student. If the teacher is uncomfortable with the change or feels there is little chance of student improvement, it is likely that the change will not occur, or it will be instituted incorrectly (Callister & Dunne, 1993).

Although the two variables of leadership and efficacy are important to implementing change, research exists that also supports the role of prior knowledge and experience as an important influence in implementing change and using a computer (Jorde-Bloom & Ford 1988; Levine & Donitsa-Schmidt, 1997; Shashaani, 1997;). Still, other studies are present that suggest attitudes toward computers (Levine & Donitsa-Schmidt, 1997), and sex (Shashaani, 1997) may be variables that might impact teachers' efficacy and actual practices of using computers and accepting change. For change to be effective, facilitators must be cognizant of all the variables associated with change. The end result of a positive change in this case is teachers using computers.

This research hypothesizes that practices of teachers are influenced through a series of perceptions. The first perception is based on Bandura's (1977) Theory of Self-Efficacy that implies teachers tend to use practices and strategies that they feel can be effectively delivered by them and that will have a positive impact on student learning (Dawson, 1998). These self-efficacy traits or beliefs are usually built as a result of past practices and experiences (Duffee & Aikenwood, 1992).

This study conceptualizes further that certain variables such as perception of leadership also have an impact on teachers' practices (Hall & Hord, 1987; Huling, Hall, Hord, & Rutherford, 1983). Huling, Hall, Hord and Rutherford (1983) have indicated that a certain style used by the principal has a much greater innovation implementation rate. General attitude towards an innovation (Bandura, 1986; Levine & Donitsa-Schmidt, 1997) may have an influence on efficacy (Bandura, 1986) and perception of leadership (Bass, 1981). It is the relationship of all these variables that influence teachers' practices of deciding whether to implement the innovation.

Study Design

Public school districts were researched to determine their technology utilization and possible participation in this study. Minimum technological standards for this study required school districts to have Internet access to all buildings and for each building to have either an Internet ready computer lab or an Internet ready computer in every classroom.

A total of 160 elementary and secondary teachers from eleven schools districts in Central Pennsylvania participated in this study. Almost 29% of those surveyed represented elementary teachers who taught all subject areas. The remaining teachers represented specific subject areas ranging from 10% language arts teachers to 3.1% computer science teachers. Approximately 28% of the respondents were male, over 56% were under the age of 46, nearly 51% had less than 15 years of experience, and nearly 48% stated they received over 20 hours of professional development in computer training.

Each participant received a six part Likert Style survey that included sections on computer use, computer experience and knowledge, perception of leadership, self-efficacy, attitudes toward computers, and various teacher and school characteristics. The survey was designed using multiple instruments from other studies dealing with leadership, and teachers' use of technology (American Institute of Research, 1998; Bass & Avolio, 1995; Becker & Anderson, 1998; Dawson, 1998; Knezek & Christensen, 1997; Milken Family Foundation, 1998a, 1998b; U. S. Department of Education, 1998).

Factor analysis was used on all variables for data reduction methods. Reliability levels were obtained as follows: for computer uses.76 to .89, for experience and knowledge .82 to .93, for perception of leadership .69 to .92, for self-efficacy .90 to .97, and for computer attitude .94. Pearson Product Correlation and Multiple Regression models were used with significance levels at $p < .05$.

Computer usage was broken down into three categorical uses: clerical/management use, academic use, and advanced use. All three-computer uses require teachers to adapt their practices in one way or another. While all three uses require teachers to adapt to this innovation, clerical/management uses such as grade reporting, word processing and e-mail were considered the least invasive procedural change for teachers to make. In essence, these are the computer uses that are least likely to have a major impact on the traditional ways of teaching. The researcher considered this a basic level of use. Academic uses such as drill/practice, remediating deficiencies, improving writing skills, and challenging bright students were considered intermediate use. Advanced uses such as web-page development and desktop publishing were considered higher order computer uses.

The study asked questions regarding the teachers' experience and knowledge about computers, the teachers' perception of leadership as it relates to technology implementation, the teachers' self-efficacy in computer use, and the teachers' attitudes toward computers. The researcher addressed questions relating to school and teacher characteristics such as age, sex, average class size, and professional development.

Findings

Approximately 92% of the teachers in this survey use computers to assist with one or more of their responsibilities as a teacher. Significant positive correlations were noted between: (a) application/Windows experience and transformational/reward, (b) application/Windows experience and self-efficacy in instructional, Internet, and computer application use, (c) application/Windows experience and computer attitudes, (d) Macintosh experience and self-efficacy in Internet and computer application use, (e) Macintosh experience and computer attitudes, (f) transformational/reward and self-efficacy in instructional and Internet use, (g) transformational/reward and computer attitudes, and (h) computer attitudes and self-efficacy in instructional, Internet and computer application use. A significant negative correlation was noted between computer attitudes and idealized influence (See Table 1).

	Acad Use	Cler Use	Adv Use	App Exp	Mac Exp	Tran Rew	Trans	Inspi Moti	Ideal Infl	Instr Self-	Inter Self-	App Self-	Com Att
Academic Use	1.00												
Clerical use	1.00	1.00											
Advanced Use	1.00	1.00	1.00										
Application Exp.	.16*	.52**	.52**	1.00									
Macintosh Experience	.32**	.21**	-.09	.00	1.00								
Transformational/Rew	.19*	.15	.29**	.18*	.16	1.00							
Transactional	-.04	-.11	.04	-01	-.09	.00	1.00						
Isnpirational Motivation	.00	.03	.03	-.08	.02	.00	.00	1.00					
Idealized Influence	-.11	-.18*	.08	-.05	-.12	.00	.00	.00	1.00				
Self-Efficacy Instructional Use	.41**	.34**	.17*	.33**	.17*	.28**	-.01	-.01	-.02	1.00			
Self-Efficacy in internet Use	.24**	.14	.24**	.48**	.33**	.20*	-.04	-.06	-.09	.00	1.00		
Application Self-Efficacy	.11	.49**	.16	.58**	.27**	-.01	-.03	.05	-.15	.00	.00	1.00	
Computer Attitudes	.24**	.38**	.22**	.44**	.24**	.30**	-.07	.13	-.18*	.30*	.20*	.41**	1.00

*p < .05, ** p < .01

Table 1. Pearson Correlations among Computer Use and Knowledge and Experience, Perception of Leadership, Self-Efficacy, and Attitudes toward Computer

Experience and knowledge have a positive influence on academic, clerical/management and advanced computer uses. Application and Windows experience showed positive correlations to all three-computer uses. Macintosh experience demonstrated a significant positive influence on clerical/management and academic uses of computers.

Perception of leadership showed a significant influence on all three-computer uses. An aspect of leadership that combines some transformational leadership attributes, along with contingent reward, has demonstrated significant positive influence on academic and advanced uses. Another aspect of leadership identified as idealized influence demonstrated a significant negative influence on clerical/management use.

Self-efficacy demonstrated significant positive influence on all three-computer uses. Self-efficacy in instructional use of computers demonstrated significant positive influence on all three-computer uses. Self-efficacy in Internet use demonstrated significant positive influence on academic and advanced uses of computers. Self-efficacy in computer applications demonstrated significant positive influence on clerical/management use of computers.

Attitudes toward computers demonstrated significant positive influence on academic, clerical/management and advanced uses of computers. The highest influence of computer attitudes was on clerical/management use (See Table 1).

	Clerical/Management Use			Academic Use			Advanced Use		
Independent Variables	B	SE	t	B	SE	t	B	SE	t
School Characteristics									
Access to Internet	-1.19	.85	-1.41	1.85	.91	2.04*	-.18	.88	-.20
Access to a Computer in the Classroom	.11	.31	.35	.59	.33	1.79	.21	.32	.66
Average Class Size	-.08	.06	-1.21	.10	.07	1.52	.00	.07	.00
Teacher Characteristics									
Age	-.05	.04	-1.22	-.03	.05	-.63	.00	.05	-.10
Sex	.01	.19	-.06	.11	.20	.55	-.48	.20	-2.44*
Professional Development	-.05	.06	-1.00	.08	.06	1.41	.13	.06	2.24*
Level Taught	.03	.10	.29	-.05	.10	-.52	.02	.10	.18
Experience and Knowledge									
Application/Windows	.20	.19	1.04	-.23	.20	-1.15	-.73	.20	3.74**
Macintosh	.05	.12	.38	.13	.13	1.01	.0\1	.12	.09
Perception of Leadership									
Transformation/Reward	-.11	.09	-1.27	.15	.10	1.60	.19	.09	2.09*
Transactional	-.06	.08	-.79	-.01	.08	-.08	.00	.08	-.06
Inspirational Motivation	.04	.09	.48	-.08	.09	-.87	.10	.09	1.06
Idealized Influence	-.06	.09	-.69	-.05	.09	-.57	.03	.09	.39
Self-Efficacy									
Self-efficacy in instructional use	.31	.11	2.71**	.28	.12	2.27*	-.19	.12	-1.63
Self-efficacy in internet use	-.01	.14	-.07	.18	.15	.85	-.14	.15	-.92
Application Self-Efficacy	.33	.16	2.15*	.09	.17	.52	-.30	.16	-1.90
Attitudes Towards Computer									
Computer attitudes	.02	.10	.24	.08	.17	.52	.03	.10	.30
Constant	2.70			-5.28			.33		
R^2	.43			.38			.46		

$p < .05$, ** $p < .01$, *** $p < .001$

Table 2. Multiple Regression Models for Clerical/Management, Academic, and Advanced Uses of Computers and School Characteristics, Teacher Characteristics, Experience and Knowledge, Perception of Leadership, Self-efficacy and Attitudes toward Computers

Table 2 summarizes the results of the multiple regression models used for this study. A multiple regression model that identified 43% of the variance in the dependent variable clerical/management use of computers found significant relationship between clerical/management use and the independent variables self-efficacy in instructional use and self-efficacy in application use. A multiple regression model that identified 38% of the variance in the dependent variable academic use of computers found significant relationships between academic use and the independent variables instructional self-efficacy and access to the Internet. A multiple regression model that identified 46% of the variance in the dependent variable advanced use of computers found significant relationships between advanced use and the independent variables sex, professional development, application/Windows experience, and transformational/reward leadership styles. The results of this study demonstrated that as teachers move up the ladder of computer use, the significance of variables such as access to computer tools and self-efficacy diminishes, while the importance of experience and knowledge, perception of leadership and the characteristics of teachers increases. These findings support the research on Levels of Use and Stages of Concern (Hall & Hord, 1987) regarding the implementation of innovations.

Educational Importance

Each of the independent variables has demonstrated either an influence or a relationship with all three-computer uses. While the impact of each independent variable varies with each computer use, each indicates a particular observation. Given the assertion that the use of computers ranged from the lowest level of use, clerical/management use, to the highest level of use, advanced use, the regression models indicate that the significance and relationship of the variables, to the specific use, changes.

The independent variable self-efficacy demonstrates significance in the regression model for the dependent variable clerical/management use. The regression model for the dependent variable academic use shows a relationship with self-efficacy and access to Internet. The regression model for the dependent variable advanced use shows a relationship between experience and knowledge, perception of leadership, and the teacher characteristics of sex and professional development.

As we moved up the ladder of computer use the significance of access to computer tools and self-efficacy diminishes while the importance of experience and knowledge, perception of leadership and the characteristic of teachers increase. This supports the research on Levels of Use and Stages of Concerns (Hall & Hord, 1987). The Levels of Use model basically identifies that people exist at differing levels of use when an innovation is implemented depending on certain variables. The Stages of Concern model suggests that a very different sequence of concerns emerge from experienced versus inexperienced users.

Lewin (1951) realized that when change occurs, there will be forces for change and forces against change, and that change will occur when forces for change outweigh forces against change. Lewin observed that change occurs only when attitudes and behaviors are different than they were before. To support change we need to understand what factors influence attitudes and behaviors. This study offers insight into the importance of understanding the factors that influence the implementation of innovations.

By realizing that certain factors have an influence on teachers' decisions to implement an innovation, leaders and change facilitators can begin to understand what they can do to help promote the implementation process. They can do this by understanding what factors influence teachers' decisions to implement an innovation, how the leader's interactions affect those factors, and how to promote the implementation by positively influencing the factors involved in teachers' decisions to implement the innovation.

The factors under consideration for this study included experience and knowledge, perception of leadership, self-efficacy and attitudes toward computers. While only one of these factors, perception of leadership, is under the direct control of the leader or change facilitator, the actions of the leader can influence the other factors (Bass, 1981; Dawson, 1998; Jorde-Bloom & Ford, 1988)

This study also gave insight into the understanding that teachers implement innovations such as computers in differing degrees and levels (Hall & Hord, 1988). As a result, factors that influence each level of implementation will likely change. Therefore, leaders must understand this phenomenon and plan the change process accordingly. While experience and knowledge, self-efficacy, and attitudes toward computers are perceptive traits decided by the teacher, the leader's action, or lack of action, would have an effect on those perceptions and ultimately the implementation of the innovation.

References

American Institute of Research (1998). In U. S. Department of Education's, *An educator's guide to evaluating the use of technology in schools and classrooms*. Washington, DC: U. S. Department of Education.

Bass, B. M. (1981). *Stogdill's handbook of leadership*. New York: The Free Press.

Bass, B. M. & Avolio, B. J. (1995). *MLQ multifactor leadership questionnaire for research: permission set*. Redwood City, California: Mind Garden.

Bandura, A. (1977). Self Efficacy: Toward a unifying theory of behavior change, Psychological Review, *84*(2), 191-215.

Bandura, A. (1986). *Social foundations of thought and action*. Englewood Cliffs, New Jersey: Prentice-Hall, Inc.

Becker, H. J. & Anderson, R. E. (1998). *Teaching learning and computing: 1998.* [On-line]. Available: http://www.crito.uci.edu/tlc.

Brown, J. (1993). Leadership for school improvement. *Emergency Librarian, 20*(3), 8-20.

Callister, T. A. & Dunne, F. (1993). The computer as a doorstep: Technology as disempowerment. *Phi Delta Kappa 74*, 324-326.

Dawson, K. M. (1998). *Factors influencing elementry teachers' instructional use of computers*. Ann Arbor, Michigan: UMI Dissertation Services.

Duffee, L. & Aikenhead, G. (1992). Curriculum change, student evaluation and teacher practical knowledge. *Science Education, 76*(5), 493-506.

Fariholm, G. & Fariholm, B. C. (1984). Sixteen power tactics principals can use to improve effectiveness. *NASSP Bulletin, 68*(485), 68-75.

Hall, G. E. & Hord, S. M. (1987). *Change in schools: Facilitating the process.* New York: State University of New York Press.

Huling, L.L., Hall, G. E., Hord, S. M. & Rutherford, W. L. (1983). *A multi-dimensional approach for assessing implementation success.* (Report No. 3157). Austin. The University of Texas at Austin. Research and Development Center for Teacher Education. (ERIC Document ED 250 328).

Jorde-Bloom, P. & Ford, M. (1988). Factors influencing early childhood administrators' decisions regarding the adoption of computer technology. *Journal of Educational Computing Research, 4*(1), 31-47.

Knezek, G. & Christensen, R. (1997, 1999) *Internal consistency reliability for teacher's attitudes towards informational technology (TAT) questionnaire* [On-line] Available: *http://www.tcet.unt.edu/research*.

Leithwood, K. (1994). Leadership for school restructuring. *Educational Administration Quarterly, 30*(4), 498 – 519.

Levine, T. & Donitsa-Schmidt, S. (1997). Commitment to learning: Effects of computer experience, confidence and attitudes. *Journal of Educational Computing Research, 16*(1), 83-107.

Lewin, K. (1951). *Field theory in social science*. New York: Harper.

Milken Family Foundation. (1998a). *Survey of highly effective technology-using teachers* [On-line]. Available: *http://www.mff.org/Tango3/survey/teachersurvey taf.*

Milken Family Foundation. (1998b). *California digital high school program process evaluation survey* [On-line]. Available: http://www.mff.org.

Schmitt, D. R. (1990). The effect a principal has on the effective school program. Paper presented at the annual meeting of the Association of Louisiana Evaluators (New Orleans, LA: September, 1990). ERIC Document 330 089.

Shashaani, L. (1997). Gender differences in computer attitudes and use among college students. *Computers and the Humanities, 30*, 37-51.

U. S. Department of Education. (1998). *An educator's guide to evaluating the use of technology in schools and classrooms.* Washington, DC: U. S. Department of Education.

A Multimedia Design for Leadership Training: From Process to Product

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Abstract: Training future educational leaders utilizing a variety of multimedia produced modules provides an excellent opportunity for introducing the benefits of well-designed courseware and the possibilities of exploring interactive computer-based instruction. This paper discusses the development of a software program that will be used at the graduate level by current and prospective leaders in the educational environment. This unit of instruction consists of content delivered in an educational organization course dealing with administrative theory developed with the Authorware program.

Introduction

Teaching leadership theories could provide a more pleasant and easier task when the instructional units are supported by interactive multimedia-based activities that stimulate learners to engage in higher order thinking (Alessi & Trollip ,1991). According to Thomas & Marium (1999), "Playing games in a graduate class for instructional leaders may seem childish. But the 'proster theory' asserts that the upper most part of the brain functions best when the environment is supportive and non-threatening" (p. 727). This unit was designed using the systematic approach for instructional design suggested by several authors, (Kemp, Morrison, & Ross , 1998; Dick, Carey, & Carey ,2000; Newby, Stepich, Lehman, & Russell, 2000) through an in-depth process, spanning two semesters.

Authorware, by Macromedia, was used to produce the instructional CD. One unit of instruction was designed for adult learners enrolled in the Educational Leadership Department at the Lebanese University, Beirut, Lebanon. This CD could also be relevant for use in American universities. Macromedia Authorware was selected as the program of choice because it allows for the development of interactive instructional units without the technically demanding task of computer programming (Kellogg, 1999). A demo of the CD will be provided along with a discussion of the process involved in the development of the unit.

Instructional Objectives

1. The learners will be able to state the definition of "Servant Leadership."
2. The learners will be able to recognize the six characteristics of the servant leadership.
3. The learners will be able to compare and contrast servant leadership with more traditional leadership styles.

The content for this unit came from an educational leadership course taken at Florida Atlantic University. The Servant Leadership theory posits that "It begins with the natural feeling that one wants to serve, is to serve *first*. Then conscious choice brings one to aspire to lead" (Greenleaf, 1970, p.1). This module was developed to engage the learner in a multi-sensory and interactive introduction to Servant Leadership theory. Servant Leadership has six characteristics (Laub, 1999). They are:

1. Display authenticity
2. Value people
3. Develop people

4. Build community
5. Provide leadership
6. Share leadership/vision

Project Rational

As the integration of technology into the teaching and learning process continues to be adopted into all educational environments, it becomes increasingly important to support instruction with the use of technological innovations. The aim of this project was twofold: (a) to integrate technology into instruction; and (b) to prepare the students to be instructional leaders in using technology.

The four stages of the instructional unit include:

1. Review the results of the assessment that the learners had in the previous class.
2. Introduce the Servant Leadership concept.
3. Present the six characteristics of the Servant Leadership.
4. Involve the learners in interactive activities that review the whole content of the class.

References

Alessi, S. M. & Trollip, S. R. (1991). *Computer- based instruction.* Englewood Cliffs, NJ: Prentice Hall.

Dick, W., Carey, L. & Carey, J. O. (2001). *The systematic design of instruction* (5th Ed). New York, NY: Addison-Wesley Educational Publishers.

Greenleaf, R. K. (1970). http://www.colstate.edu/servant/

Kellogg, O. (1999). *Macromedia authorware 5 attain authorized.* Berkeley, CA: Macromedia Press, in association with Peachpit Press.

Kemp, J. E., Morrison, G. R. & Ross, S. M. (1998). *Designing effective instruction* (2nd Ed). Upper Saddle River, NJ: Prentice Hall.

Laub, J. A. (1999). Assessing the servant organization: development of the servant organizational leadership assessment (SOLA) instrument. Doctoral Dissertation, Florida Atlantic University, 1999.

Newby, N. J., Stepich, D. A., Lehman, J.D. & Russell, J. D. (2000). *Instructional technology for teaching and Learning- Designing instruction, integrating computers, and using media* (2nd Ed). Upper Saddle River, NJ: Prentice Hall.

Thomas, D. & Marium, W. (1999). Using a game-format to teach national educational standards to aspiring school administrators. *Education*, 119(4), 727-79.

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Models of Instructional Technology Leadership in U.S. Schools

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Abstract: Recent studies indicate that half of all teachers who have access to technology in their schools do not make use of it in their instruction. The time has come for states and school districts to examine the potential of instructional technology leadership in the schools to address teacher training and support needs. In considering what type of roles instructional technology leaders might play in the schools, it is prudent to examine what models are already in place. An exploratory national survey was conducted to determine the presence of licensed IT professionals in school-based settings. Results were gathered through multiple channels: via the Internet, e-mail, and telephone interview. Results and implications of the study are presented.

Introduction

Although significant strides have been made in the effort to increase technology integration into K-12 classrooms, efforts still fall short. According to a recent study by the National Center for Educational Statistics (2000), "Nearly all public school teachers (99 percent) reported having computers available somewhere in their schools in 1999; 84 percent had computers in their classrooms, and 95 percent had computers available elsewhere in the school"(p. ii). However, these same teachers were not necessarily making use of these technology resources in their instruction. "Approximately half of the public school teachers who had computers or the Internet available in their schools used them for classroom instruction" (NCES, 2000, p. I). Only half. The question remains, where are we falling short?

Initial concerns that preservice teachers were not being adequately prepared to integrate technology in their instruction are being addressed. Several factors have been cited as hindering new teacher use of technology. These include inadequate training in the proper technology skills and methods, lack of technology modeling on the part of their university faculty, lack of positive technology experience in school settings, and university faculty out-of-touch with the technology explosion in schools and how it is effecting teaching practice (Kent & McNergnery, 1999; National Council for Accreditation of Teacher Education, 1997; Persichitte, Tharp, & Cafarella, 1997; Office of Technology Assessment, 1995; Byrum & Cashman, 1993). The re-design of entire teacher education programs is called for. The *Preparing Tomorrow's Teacher's to Use Technology* grant program has awarded greater than 75 million dollars to address this specific problem. In addition, standards have been adopted to serve as benchmarks to measure new teacher technology and technology integration skills. In June 2000, the *National Educational Technology Standards for Teachers* (NETS-T) were introduced and adopted by the National Council for Accreditation of Teacher Education (NCATE) effective for site visits beginning 2001.

However, the NCES study, *Teachers' Tools for the 21st Century* (2000) reported that less-experienced [*new*] teachers were much more likely than their more experienced colleagues to indicate that this [*college and graduate work*] prepared them to use computers and the Internet" (p. iii). 84 percent of novice teachers (3 years classroom experience or less) indicated that college and/or graduate work prepared them to some extent to use computers and the Internet. It would seem that inroads are being made into preparing tomorrow's teacher workforce.

But what can be done to assist today's teachers? Nearly half of all teachers who have access to technology do not make use of it in their classrooms (NCES, 2000). What barriers do they claim hinder their progress? While most inservice teachers indicated that time (82%) and access (78%) are still primary issues, training and support are also largely cited as barriers (NCES, 2000). Teachers cited lack of support regarding ways to integrate telecommunications into the curriculum (68%), inadequate training opportunities (67%), lack of technical support or advice (64%) and lack of administrative support (43%) as additional barriers to successful technology integration. As districts race to address at lcast the access issue, purchasing hardware and software, perhaps it is time to address training and support for the practicing teacher. The time has come for schools to establish instructional technology leadership positions.

NCATE recognizes standards for technology literacy at two levels beyond that of the typical teacher. The first is the *Basic Endorsement in Educational Computing and Technology Literacy*. The second is the *Standards for Advanced Programs in Educational Computing and Technology Leadership*. While the technology literacy endorsement focuses on the classroom use of technology, the technology leadership standards indicate the preparation of an educator who would act in a instructional specialist role, both training teachers and consulting with teachers and supporting teachers in effective technology integration in the classroom.

Description of the Study

In considering what type of roles instructional technology leaders might play in the schools, it is prudent to first determine what models are already in place. An exploratory national survey was conducted to determine the presence of licensed IT professionals in the school-based setting. Results were gathered through multiple channels: via the Internet (searching state department of education websites), through e-mail with identified licensure agencies or IT officials at the state level and IT licensure preparation programs at the university level, and by conducting telephone interviews with licensure agencies or IT officials in the department of education of states studied. Questions addressed the following areas:

- Does the state have a certification or licensure for the IT professional in the school?
- What is the type and title of the certification (what is the job title)?
- How long has this licensure been in effect?
- Is a teaching certificate required as a prerequisite to the IT licensure?
- If present, what are the IT licensure requirements?
- Does the state also have Library Media Specialist certification or licensure?
- If so, how does the role of the IT "specialist" differ from that of the Library Media Specialist?
- If present, does the state determine the model of IT "specialist" placement, or is it determined at the district level?

The results of the study are presented below.

But first...

Due to the lack of consensus on the terminology and the definition of IT professional in different states, the interviewers requested information on the licensure rules for not just IT specialists, but also technology coordinators who may play similar roles to instructional technologists. During the survey, some interviewed officials required the interviewer to clarify the term "instructional technology specialist" since this job title was not adopted in their states, and they were not familiar with the role played by IT specialists. In order to gather as much data as possible, the interviewers supplied an informal and broad definition for IT professional, and in the later interviews requested for licensure information on any kind of "technology person in public schools." In this paper, the term "IT professional" is used to refer to the variety of titles applied to the certified instructional technologists in this study, and the roles they may fulfill in school-based settings.

Results

States with Instructional Technology Certification or Licensure

Of all fifty states surveyed, seven states were identified as possessing licensure requirements for instructional technology (IT) professionals in the schools. Those states include Pennsylvania, Maine, Massachusetts, New Hampshire, New Mexico, North Carolina, and Wisconsin. In addition, at the time of the study, the Vermont State Board of Education was processing a proposal for Technology Coordinator Endorsement certification, anticipating adoption for the 2000-2001 school year. These eight states have already formulated explicit licensure rules for IT professional, and this licensure information served as the focus of this study.

Lack of Standardization on the Type and Title of the Certification

The eight states differed from each other in terms of the type and title for IT licensure. IT related certifications were in the form of an endorsement or add-on to an existing teaching certificate in three states: Maine, New Mexico, and Vermont. In the other states, however, IT certifications were stand-alone licenses. Moreover, the states adopted a variety of titles for IT related certificates. Only three states (Pennsylvania, Massachusetts, and North Carolina) adopted the term "Instructional Technology Specialist" for IT certification. Three states used the term "coordinator" as part of the title -- "Technology Coordinator" in Vermont, "Instructional Technology Coordinator" in Wisconsin, and "Information Technology Coordinator" in New Mexico. The remaining two states used a variation of "computer teacher" for IT certification. In Maine, the endorsement for "Computer Technology Teacher" also applies to district-level technology coordinators. New Hampshire requires that technology coordinators obtain "Computer Educator" certification. A licensure official in New Hampshire commented that it was considered convenient to set up one set of rules and apply them to both computer teachers and technology coordinators.

Certification for IT Professionals: A Recent Phenomenon

Instructional Technology certification has a short history. The earliest state to implement IT certification was Pennsylvania in 1987. Wisconsin issued an IT certificate for audio-visual directors effective starting from 1986, but this license was terminated in the new licensure rules approved in February, 2000, because it is believed in Wisconsin that "Instructional Technology specialist position has focused on the effort to increase the ability of all teachers to use technology effectively," and all teachers should be competent in technology. In Wisconsin, a licensed teacher can act in the capacity of IT Specialist without further licensing. Except for North Carolina, which implemented IT certification in the early 1990s, the remaining states adopted IT certification only recently: Maine and Massachusetts in 1996, and New Mexico and New Hampshire in 1999. At the time of this study, the state of Vermont was still processing the proposal for an IT Coordinator certification.

Variations on Teaching Certificate as a Prerequisite

The eight states vary as to whether a teaching certificate should be a prerequisite for obtaining an IT related certificate. By definition, the three states which award IT certification as an endorsement or add-on to the initial teaching certification require prior initial teaching licensure (Maine, New Mexico, and Vermont). In Wisconsin, IT certification is an administrative certification, and requires initial teaching certification as well as three years teaching experience as a classroom teacher. The remaining states did not explicitly specify the prerequisite of a teaching license at the state level if the applicant completes a master's degree or equivalent program in IT related field, but the other alternative to the certification (when the applicant does not have a required degree) necessitates a standard teaching certificate. Moreover, the absence of explicit requirement for a teaching certificate for those who hold a relevant degree does not necessarily mean that teaching license is not required. An official at the Bureau of Teacher Certification in

Pennsylvania responded that a teaching certificate could be a local school district's prerequisite or that of an institute of higher education which offers the program of study even though it is not a state requirement. Furthermore, in the state of North Carolina, a teaching certificate is not mandatory before acquiring IT Specialist certification, but it is directly related to the pay for IT professionals, who need at least 2 years teaching experience to attain master-level pay.

Similarities and Differences on Licensure Requirements

Regardless of the disparity of the states with respect to the types and titles of IT related certifications, the eight states share some similarities in licensure requirements. First, a dual emphasis was put on both the technical competencies and the knowledge and abilities of the IT professionals to integrate computer technology into the curriculum. Second, IT professionals are expected to perform a wide variety of roles instead of simply functioning as computer technicians. They are required to be proficient not only in computer and technology operations, installation, and maintenance, but more importantly, in the areas of technology application in teaching and learning, educational and technology-related research and theories, facilities and resource management, professional development, and technology leadership.

While the eight states agree on a broad role for IT professionals, their licensure requirements differ from each other in terms of the degree of specification and the points of emphasis for the required knowledge and skills. Maine underscores computer proficiencies, which are broken down into many sub-areas in the licensure rules, whereas the teaching-related knowledge is mentioned only briefly. New Mexico attaches special importance to the research abilities required of Technology Coordinators.

Differentiation of the Role of IT professionals from that of Library Media Specialists

Many of the IT graduate programs originated from audio-visual programs, and IT professionals employed in the schools were traditionally regarded as media services personnel. This tradition was believed to have deterred the development of the field of *instructional* technology in school-based settings. In this study, we found that the role of IT professionals is distinguished from that of Library Media Specialist in all the eight states. In addition, all eight states recognize and award IT professional and Library Media Specialist as two different certificates. In the states studied, Library Media Specialists are found to work usually in the library and are responsible for the production, management, and organization of library media. In contrast, IT professionals are concerned with technology support and curriculum integration, especially the use of information technology in education. Since the certification for IT professionals and the discrimination of the role of Library Media Specialist from that of IT professionals are fairly recent trends, real-world practice as yet does not reflect this in some of the eight states. In New Mexico, where the endorsement for Information Technology Coordinators was just approved in September 1999, many of the IT Coordinator positions are still served by Library Media Specialists. In Vermont, where the endorsement for IT Coordinator was not yet adopted, the interviewed information technology official stated that a Library Media Specialist can be assigned as a IT Coordinator as long as she/he meets the new standard for IT Coordinators.

Absence of Statewide Staffing Model for IT Professionals

There is no consistent model of staffing for certified IT professional in the schools from state to state, or even within certifying states. Unlike the standard for Library Media Specialists, no state reported any statewide model of required staffing for IT professionals. It is up to the local school district to make the decision on whether or not to fund and staff IT positions. Moreover, since IT certification is a rather new practice, staffing is a very flexible situation in many states. It varied from district to district and school to school. Pennsylvania did indicate that the IT Specialists most often worked at the district-level, and would often supervise non-certified computer technicians at each school. In addition, Pennsylvania school districts may employ IT Specialists in the field, particularly in larger schools. In Vermont, some small schools have no IT professional assigned, but some bigger schools do.

Implications of IT Certification

While few will argue the need for increased instructional technology training and support for inservice teachers, there is no agreement that certified IT professionals in the schools are the answer. Interviewees raised several arguments both for and against IT certification.

Potential Benefits of IT Certification

Potential benefits of IT certification were offered by officials from states awarding certification as well as from those that did not. One official proposed that the presence of IT certification itself brings validation and credibility to the use of instructional technology in the classroom. As more states require IT competencies for teaching certification and certification renewal, the importance of these requirements are supported by the employment of licensed IT support personnel. The differentiation between IT Specialist and Library Media Specialist roles allows the Library Media Specialist to focus on what they were trained to do, instead of "wearing too many hats." Another official offered that state-level certification might lead to consistent terminology, roles, placement, and especially pay for IT professional employed in schools. Where IT certification exists, districts and schools have established criteria to make informed hiring decisions.

Arguments Against IT Certification

Not all agree with the concept of certified IT support positions in schools. One interviewee stated that if state mandates for IT competency for initial and renewable teaching certification are successful, that certified IT support personnel would not be needed. Teachers who are particularly proficient or computer savvy could fulfill these support needs when they arise. Along this same line, some states prefer to focus on technology (hardware, software, and networking) needs, and to leave the instructional support role to existing Instructional Specialists. These states prefer to hire IT personnel based on technical certifications (such as Microsoft) that are awarded elsewhere.

Conclusions

Growing Attention to IT in all States

Although only eight states were found to have established or are in the process of establishing certification for Instructional Technology, the emphasis on integrating technology into education was evident in all states. Officials in many states currently without IT certification expressed hope that certification for IT professionals can be adopted in their states. Moreover, almost all of those interviewed indicated their states were attaching an increasing importance to the technology component in education. In addition, officials from many states stressed an increasing attention to raising the technology competency of all teachers.

As more states address technology integration as a required teacher competency for initial licensure and licensure renewal, it is likely that existing instructional support levels in place in schools will be strained. As each state strives to increase technology integration, we must consider how to best meet the needs of inservice teachers in terms of training and support. What must be kept in mind is that teachers will need training in more than hardware and software, but especially in the areas of learning environments, alternative assessment, cooperative learning, information literacy, visual literacy, lifelong learning, and self-directed learning. We must also consider that technology changes, and as such, the training and support of inservice teachers in technology integration will need to be continual and on going. A certified instructional support person trained in instructional technology and teaching methods may be the answer.

References

Byrum, D.C., & Cashman, C. (1993). Preservice teacher training in educational computing: Problems, perceptions, and preparation. *Journal of Technology and Teacher Education, 1,* 259-274.

Kent, T.W., & McNergney, R.F. (1999). *Will technology really change education: From blackboard to web.* Thousand Oaks, CA: Corwin Press.

National Center for Educational Statistics. (2000). *Teachers tools for the 21st century.* [Online]. Available: http://nces.ed.gov/pubresearch/pubsinfo.asp?pubid2000102

National Council for Accreditation of Teacher Education. (1997). *Technology and the new professional teacher: Preparing for the 21st century classroom.* [Online]. Available: http://www.ncate.org/projects/tech/TECH.HTM . Accessed May 12,1999.

Office of Technology Assessment, U.S. Congress. (1995). *Teachers and technology: Making the connection.* Washington, DC: Author.

Persichitte, K.A., Tharp, D.D., & Cafarella, E.P. (1997). *The use of technology by schools, colleges, and departments of education.* Washington, DC: American Association of Colleges for Teacher Education.

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Infusing Technology into Leadership Preparation

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Abstract: As we prepare teachers for technological competence necessary in this new century, we must assure that those who administer the educational systems in which teachers work also have the technological competence to support the work of the educators. This paper discusses how technological competence has been infused into the context of the curriculum of a doctoral program which prepares superintendents and other leaders based on AASA and Pennsylvania standards. The curriculum consists of eight domain areas, plus research skills. Technological competencies have been infused into the leadership curriculum. This paper describes those competencies, with descriptive examples of technological infusion.

Introduction

In 1993, the Duquesne University School of Education in Pittsburgh, Pennsylvania founded the innovative Interdisciplinary Doctoral Program for Educational Leaders (IDPEL). Based on the American Association of School Administrators (AASA) Standards, leadership research, and two years of planning with faculty and practitioners, this cohort program produced a first class that greatly improved upon the national ABD (All But Dissertation) rate, and raised the professional status of most of it's graduates to CEO, Assistant CEO and other executive level leadership positions. As subsequent cohorts follow a similar path, this program, committed to continuous improvement, recognized the need to systematically infuse the use of technology into the leadership curriculum of the program. This paper describes the program itself, it's major curricular objectives, the technological objectives that have been infused into the curriculum, and provides examples of technological outcomes.

The IDPEL program is based on the following mission and belief statements:

The mission of the Duquesne University Interdisciplinary Doctoral Program for Educational Leaders is to develop educators who will have the vision and the skills to move the American educational system to prominence in tomorrow's world. This will be accomplished through an innovative partnership program linking competence and the learner, University faculty, practicing educational administrators, and community leaders.

The Mission and all the instructional activities of the Interdisciplinary Doctoral Program for Educational Leaders (IDPEL) strands are rooted in several strongly held assumptions and beliefs:

1.Leadership skills can be developed;
2. A competency-based instructional approach is most appropriate in an adult learning environment;
3.A partnership among University faculty, school practitioners, community leaders, and the learners promotes a more dynamic and relevant learning environment and network of participants (also known as the Community of Scholars);
4. The network established among Community of Scholars members may take the form of large group meetings, small task force and colloquium groups, and small and large group dialogue and meetings via electronic technology;
5. Educational leadership must be grounded upon ethics and moral values;
6. A direct relationship exists between demonstrated competency and future behavior;
7. Cohort grouping provides for cooperative learning and ongoing support systems;
8. The combination of action and reflection best facilitates the integration of theory and practice;
9. An interdisciplinary approach provides the basis for a more comprehensive educational perspective;
10. Analytical skills form the basis for managing change in education;
11. Action research and problem solving are critical skills for effective educational leaders;
12. Instruction is best delivered in a variety of formats;
13. A mentor-apprentice relationship is significant in the development of educational and leadership skills;
14. The nature of adult learners requires the development of innovative scheduling patterns;
15. The need exists for a periodic updating of practicum skills.

Because of our belief in the importance of group process to the leadership of successful organizations, our program is cohort-based. We accept a cohort of approximately thirty students only every three years, so that faculty may provide sufficient support to students in their scholarly endeavors. Each student also has a practitioner mentor over the course of three years of coursework, that person is an executive level educational administrator. This level of support has greatly contributed to the academic success of cohort members. One major indicator of this is the fact that the inaugural cohort that began in 1993, and just passed our seven year statute of limitations, can boast a completion rate of almost 90%, far exceeding the national average for doctoral programs. The second cohort appears to be following in their footsteps with two-thirds of the group completed by only the beginning of their fifth year (inclusive of the three-coursework years.)

The cohort, which consists of currently practicing "middle managers" in education (e.g. principals, education related human service organization managers, university faculty, etc.), attend all courses together in a unique "eight days a semester and two weeks in the summer" schedule. The cohort is further broken down into "advisory groups" of approximately four to six individuals each, each group heterogeneously developed based on results of the Gallup Leadership Perceiver and observation during an initial two-week course. While each student in the program completes individual activities and assignments throughout the coursework, advisory groups also complete projects together. This enables us to discuss and refine group process skills so that they enhance and complement the content skills found in coursework and mentoring.

The coursework in which students engage is based on eight leadership domain areas outlined by the American Association of School Administrators, plus the domain of research skills. The eight domain areas are:

1.Leadership, Values, and Ethics
2.Policy and Governance
3.Instructional Management
4.Planning, Quality, Organizational Problem Solving, and Finance
5.Communications and Human Relations
6.Program Design, Implementation and Evaluation
7. Human Resource Management
8. Leadership and District Culture

Each of those domains is further defined into ten or more specific competencies, all contained on a "Practicum Checklist." This "Practicum Checklist" becomes the basis for the mentoring relationship over a three-year period between student and practicing educational administrator. By developing a portfolio of artifacts, combined with signatory responsibility of the mentor to assure that the student has practical knowledge of each area, we complement the theoretical base for these program areas provided within coursework.

Although it is now difficult to imagine, the first cohort began at a time when even e-mail was not a commonly used technological function. Therefore, while we did assure that even those first cohort members had e-mail accounts with the university, there was no systematic attention given to the technological skills needed by emerging executive level leaders. Therefore, as a new cohort was about to begin, Dr. Helen Sobehart, Director of the Interdisciplinary Doctoral Program for Educational Leaders, and Dr. Larry Tomei, Special Assistant to the Dean for Technology, collaborated on relevant technology for the Leadership Curriculum. Dr. Sobehart was the recently retired superintendent of a large suburban school district known for it's technological capacity. She knew first hand about technological skills necessary to be an effective superintendent. This included knowledge of technical capacity to support both instruction and management functions. Dr. Sobehart and Dr. Tomei reasoned that aspiring superintendents enrolled in the doctoral program would best gain these skills and knowledge by using them in the context of content area coursework throughout the program. Therefore, the first requirement of the program is to participate in a listserv structured for the cohort by which all program announcements and information are shared. More importantly, however, as the program progresses, students learn and apply not only various management packages as they relate to administration, but electronic communication skills, website development, technological planning, and electronic portfolio development. They also, of course, use various research packages and ultimately develop a web-based process for sharing and updating dissertation information with committee members.

The major curricular course goals of the program, and the related technological competencies are listed below. We also list software packages, websites, and other resources by which the technological competencies are met.

Strand: Professional Seminar

Relevant IDPEL Objectives:

- -The knowledge base which differentiates management functions from leadership with a long-term vision.
- -The ability to understand the function of and develop a relationship with all other human service agencies and organizations that parallel education in society.
- -The commitment to influence the attitude and understanding of all participants in the educational enterprise.

Tech Objective:

- -The use of basic tools to communicate and conduct research as a community of scholars and leaders.

Tech Competencies:

- -Office Productivity Tools
- -Internet as a Resource
- -Electronic Mail
- -Web CT, First Class

Sample Outcome:

- -Everyday use of large and small group listservs and other discussion tools to implement program.

Strand: Leadership and Ethics & Statistics and Problem-Solving

Relevant IDPEL Objectives:

- -The knowledge of ethical traditions in a multicultural society as they affect leadership in schools.
- -The ability to relate personal and professional values with a functional code of ethical behavior that characterizes all types of populations in a civilized, post-industrial society.
- -The commitment to create an ethical community in the school, community, and beyond.

Tech Objective:

-The use of tools to discuss, survey and quantify issues related to ethical behavior.

Tech Competencies:

-Databases for Research/Surveys

-Scanning Technology

-Listservs as Forums for Ethical Discussions

-Statistics Software

Sample Outcome:

-Design, implementation and analysis of survey regarding ethical behavior

Stand: Society and the Individual

Relevant IDPEL Objectives:

-The knowledge of the cultural, sociological, political, legal, scientific, economic contexts, and educational trends in which districts will operate in the 21st Century.

-The ability to analyze, synthesize, and assess those cultural, sociological, political, legal, scientific, and economic conditions that will impact current and future education decisions.

-The commitment to provide a broad vision of the total community.

Tech Objective:

-The application of various technologies to conduct lessons and research trends.

Tech Competencies:

-Teaching with Technology in the classroom of the future

-Teaching in the 21st century

Sample Outcome:

-Design and presentation of PowerPoint lesson on completed community project.

Strand: Planning, Quality, and Finance

Relevant IDPEL Objectives:

-The knowledge of educational planning process.

-The ability to identify problems and use available data in the planning process.

-The commitment to wed research tools and methods to the solution of actual problems.

Tech Objectives:

-The ability to effectively plan and budget for the use of technology for instruction and management.

Tech Competencies:

-Technology planning for school districts

-Internet as a Research Tool

-Spreadsheets

-Use of Web Home Pages for Districts

Sample Outcome:

-Semester long problem based work with real school district, resulting in community presentation package, incorporated financial analysis, research analysis, research synthesis, addition to/development of district website and/or other integrated tech to support problem solution.

Strand: Managing Environments

Relevant IDPEL Objectives:

-The knowledge of the effects of the school environment on the educational enterprise.

-The ability to use technology in the operation of the physical plant to facilitate a positive teaching and learning environment.

-The commitment to provide a broad vision of the total community.

Tech Objectives:

-The use of technology for decision-making in school environments and to expand the environments in which learning and management take place.

Tech Competencies:

-Administrative software for the school plant
-Technology decision-making: hardware and software
-Policies and procedures for implementing technology
-Distance Learning for lifelong learning

Sample Outcome:

-District technology plan incorporated into facilities plan.

Strand: Program Design & Models of School Evaluation/Human Resource Management

Relevant IDPEL Objectives:

-The knowledge of curriculum design, deliver, and evaluation of instruction and learning outcomes for students and staff.
-The ability to conceptualize and communicate the total educational program to all constituents.
-The commitment to meet the needs of all constituents.

Tech Objectives:

-The ability to use and evaluate electronic systems for assessing student, employee and program progress.

Tech Competencies:

-Electronic Portfolios for Assessment
-Internet Research on district achievement
-Electronic curriculum design and development
-Assessing instructional technology
-Teaching as Intentional Learning

Sample Outcome:

-Development of electronic portfolio for student or Human Resource use.
-Development of web-based dissertation communication process.

Strand: Leading the Dynamic Institution

Relevant IDPEL Objectives:

-The knowledge of the changing society and its effects on the administration of the educational institution.
-The ability to recognize societal changes and to be able to foster institutional change.
-The commitment to promote change in order to foster excellence.

Tech Objective:

-The ability to apply previously guided technological knowledge and skill.

Tech Competencies:

-Practical "Educator in the Workplace" program (technology-supported)

Sample Outcome:

-Establishment of technologically supported international relationship with corresponding colleagues or schools.
-Development of major RFP response for organizational changes/growth in actual organization.

To support the infusion of technology and provide the skills required to master the desired competencies, numerous handouts, web sites, and journal articles are provided. Some of the most important resources will be discussed during our presentation and include:

TECHNOLOGY RESOURCES	RESOURCE LOCATION	TECHNICAL COMPETENCY
Quicksheets for Application Software Packages	http://www2.duq.edu/quicksheets/index.cfm	-Office Productivity Tools -Internet as a Resource -Electronic Mail -Web CT, First Class -Internet as a Research Tool

		-Spreadsheets -Use of Web Home Pages for Districts
Impact of Educational Technology in The Classroom	http://www.duq.edu/~tomei/it_examples	-Teaching in the 21st Century
Learning Theories	http://www.duq.edu/~tomei/ed711psy/1lngtheo.htm	-Teaching with Technology in the classroom of the future
Text, Visual, and Web-Based Resources	http://www.duq.edu/~tomei/	-Electronic curriculum design and development
Management of Instructional Technology	http://webct.cc.duq.edu:8900/SCRIPT/GITED814/scripts/serve_home	-Technology planning for school districts -Administrative software for the school plant -Technology decision-making: hardware and software -Policies and procedures for implementing technology -Internet research on district achievement -Assessing instructional technology
Educator in the Workplace	http://webct.cc.duq.edu:8900/SCRIPT/GELED_595/scripts/serve_home	-Practical "Educator in the Workplace" program (technology-supported)
Electronic Portfolios for Teachers and Administrators	http://www.duq.edu/~tomei/portfolios/portf_1.htm	-Electronic Portfolios for Assessment
Distance Education	http://webct.cc.duq.edu:8900/GITED811/sess5.htm	-Distance Learning for Lifelong Learning

The above statements are only a representation of the major work completed by IDPEL students. For example, the Cohort of 2002 travels to Oxford University in March 2001 to spend a week collaborating with educational leaders from several countries through an International Leadership Conference in which Duquesne's Leadership Institute has been a partner for over a decade. Those collaborations will result in some international publication, but more importantly, ongoing electronic exchange of ideas, curriculum, products, and friendship.

Another example is an RFP response being developed for School Board training related to technology decisions often faced by Boards, and research related to the possible unintended effects of technology on the teaching/learning relationship. The most critical aspect of all, however, is that our students graduate with the vision, knowledge and skills to lead 21st century educational organizations, organizations which are often teaching students who "played with" computers at the same age many of us "played with" Legos. We learned to build real structures, our future leaders must learn to build virtual ones.

Move To The Top Of The Class
A Comprehensive Technology Staff Development Program

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Abstract

Teachers have increasing demands on their time and energy and need a staff development program that offers flexibly and a "just-in-time" approach that provides the skills they need when they need to acquire them. In order to offer this level of staff development, the *Move To The Top of the Class* program will combine 45-minute mini classes delivered during the teacher's conference period in conjunction with just in time, anywhere, any place on-line courses. This paper will look at the mechanics necessary in the delivery of this type of innovative staff development program.

"There is nothing more difficult to take in hand, more perilous to conduct, or more uncertain of its success than to take the lead in the introduction of a new order of things."

Niccolo Machiavelli

Background

While Birdville ISD has had an on-going staff development program in technology for a number of years, 3 high schools and two middle schools were targeted for intensive staff development this previous year. The program consisted of courses developed to deliver 45-minute mini classes covering a wide range of subjects through out the year. Though the program was considered a success several issues were brought to light in the implementation, management, and participation level. With the continuation and expansion of the technology staff development program for the coming year, now encompassing an additional 26 campuses these issues need to be addressed to improve upon the overall program. The issues are:

- Technology as a whole is too much to learn
- Failure to communicate course information to the faculty and staff.
- Lack of faculty input into selection of courses.
- Lack of access to the technology being taught in the courses
- Lack of time to enable practice and reinforcement of new skills
- Lack of follow-up support for implementation into the instructional program.

The additional campuses, which are elementary, generate other issues to be addressed:

- Need to switch from Macintosh platform to Windows platform.
- Need to address elementary instructional needs and teaching strategies.
- Need to identify technology appropriate to various grade levels.
- District mandating attendance.

- Implementation of technology standards for all teachers.

Based upon what has been learned from last years program and the new issues that lie ahead, a combination of offering the individual campuses on-campus courses in conjunction with on-line courses was developed.

Goals

Based upon a needs survey conducted by the district and on-going communication with district technology staff, the following goals were established:

- Improve staff productivity and develop positive attitudes in the utilization of technology
- Empower teachers in the use of technology as an effective instructional tool to impact teaching, learning, and student performance
- Provide an innovative, efficient and effective technology staff development program

Objectives

In order to help participants who are likely to be overwhelmed and frustrated by a wholesale approach (Nichols, 1998), the objectives of the *Move to the Top of the Class* program are:

- Educators will have a higher level of participation in technology staff development opportunities.
- Educators will be motivated to participate in extended development opportunities.
- Educators will demonstrate a positive attitude towards the use of technology.
- Educators will develop a sense of community.
- Educators will achieve basic professional competency using technology as a work tool to improve staff efficiency.
- Educators will integrate appropriate technologies into the instructional setting.
- The Program will improve the management system.
- District and program staff will improve communication channels between teachers, administrators, facilitators, and consultants.

Attached is an action plan for each goal (table 1). Outlined in each action are the benefits, responsible person, staff requirements, assessment and timeline.

Program Description

"If technology is to be widely used, teachers and administrators need training. Trying to use technology must be a part of every entry-level teachers preparation and should continue throughout the teachers career so that he or she can keep abreast of developing technologies" (National Governors' association. 1991).

In it's second year of implementation *Move to the Top Of The Class*, a series of on-campus and on-line courses, is designed to prepare teachers to integrate both the Internet and classroom computer applications into daily lessons. The series of courses will teach technology skills to teachers through the same project-based learning activities they use in their own classrooms. As teachers progress through the courses, they will develop technological skills and -- more importantly – strategies and materials they can put to immediate use in their classrooms. The emphasis is on supporting classroom instruction.

Teachers are frustrated because learning computer skills requires the ability to absorb so many different concepts and also requires a great deal of time to practice and experiment before they feel confident enough to involve their students (Fisher, 1998). This program allows the participant to absorb small amounts of information at a time and all the time they need to practice and review through on-line involvement.

Method Of Distribution

Two methods will be used for the implementation of this staff development program. All participants will have the option to work through various *Move to the Top Of The Class* courses at a scheduled class time with an instructor in their school's computer lab using the *On-campus Method.* Educators will have the additional option of participation using the *On-line Method.* Using this method they access the Internet in basically the same course.

On-campus Method

On-campus courses will be instructor lead and offered the top of every conference period at the campus for approximately 45-minutes in length. Participants are invited to attend as applicable during their conference periods. The skills taught for that course will use project based "student centered" activities. Each course will have templates available for direct use in the classroom.

On-line Method

Broadly defined, distance learning offers a delivery mode in which the physical classroom, the instructor, and the students are not all present in the same time and location. Distance learning delivery systems can be categorized as those that help eliminate barriers posed by location, those that help eliminate barriers of timing and those that help eliminate both spatial and temporal barriers simultaneously (Levenburg, 1998).

Mov*e to the Top of The Class* on-line courses deliver instruction through the Internet and offer interactivity, personalization, and the flexibility to learn anywhere you can access the Internet. The participants can learn at the learner's own pace and are not required to attend scheduled on-campus courses while still obtaining district credit. Thus, the on-line course provides "education on demand" giving the participant flexibility that allows them to fit course work among other demands on their time. Also, it allows the participant an opportunity to preview the courses, to ascertain the content of the course, and to check the level of prior knowledge needed for the course for the purpose of assessing the worthiness of the participant's time and attendance of an on-campus course thus freeing the participant to attend or participant in other courses.

Additionally students interact with one another and with the instructor in the discussion board. Along with discussions there are other on-line activities designed especially for the course. Other various on-line program features are electronic mail, on-line resources, and course materials.

How to participate, how to access the courses, what to expect, and how to find help are all important aspects of an on-line course that must be addressed. There is a guided tour of the on-line courses along with on-campus instruction lead, if you choose face-to-face interaction to familiarize yourself with the on-line courses. The orientation tour on-line or on-campus will cover the discussion board and the use of email from the on-line site also. There is a FAQ link to help with questions you might have along with phone numbers and e-mail addresses of the Program Administrators.

The design of the on-line course site is hierarchical in nature and therefore an easy structure to follow. Each course has all materials pertaining to it inside the folder for that course. All available templates and such are available to the on-line participant just the same as the on-campus participant.

Methods of Interaction

The On-campus Method allows educators to interact with other campus members where relationships are already formed therefore interaction is easy to achieve. Educators in this environment have common background and bond.

The On-line Method has participants from anywhere in the district participating therefore many methods are used to build a sense of community. It is important to create the comfort level for learners that will encourage them to contribute, explore, and communicate with people that they may never see in a face-to-face situation (Lassiter 1998). Discussion boards give that opportunity for participants to interact. Couple a *Move to the Top Of The Class* course with a moderated on-line discussion group and a powerful staff development tool is created.

In the On-line Method, participants can complete specific activities, post projects for others to view, or use the discussion group for follow-up discussion from an on-campus course. Participants involved can build a collaborative community through a discussion board to which instructor and participants will post messages. Discussions may include: topic of the course, sharing information found on the Web, strategizing with peers about the best way to implement a lesson in the classroom, or responding to a problem or issue posted by peers or the instructor.

Getting to know someone across a table requires social interaction skills that teachers are usually well skilled at, but across a telephone wire? A useful technique for on-line courses is to have participants introduce themselves to the group, share their experiences, tell what each hopes to gain by participating, and describe that knowledge or skills they can contribute to the group learning process (Lassiter 1998). Also, using the added resources links page participants can explore other forms of communicating with one another with programs like ICQ, Paltalk, and Net-meeting.

Methods Of Instruction

The On-campus Method will tend to be more lectures formatted with the constraint of the 45-minute time frame to work within. The "sage on the stage" instructional mode will be predominantly used to convey the skills for the course.

The On-line Method requires individual study and one-on-one interaction with the course instructor and on-line contact with other participants. When designing Web-based educational programs for adults, it is important to create an on-line environment that is conducive to learning, and one that encourages and support the self-directed learner. (Lassiter 1998) The instructional process is designed to be both highly interactive and personal. The on-line instructors will provide information, facilitate participant's activities, and identify resources. Since participants communicate one-on-one with the instructor, the instructor to some extent serves as their tutors, a much more intimate process that is not often experienced in classroom instruction. Thus, the role of the instructor in the on-line courses will be that of the tutor-facilitator, rather than one of lecturer.

Methods Of Evaluation

Several methods of evaluation will be used for each course independently. An evaluation of the time on task and the participant's presence at the course will be recorded by logging-on to Educator, the on-line system program. All courses will use the assessment log included in Educator for the evaluation of time on task and the participant's presence. The time factor of 45-minutes scheduled for an on-campus course is automatically attributed to the participant for all on-campus courses. On-line participants will be evaluated for time on task by the use of the access logs in Educator, but times will vary based on the levels of participation.

An evaluation survey will be as used as an assessment at the completion of each on-campus and on-line course. The evaluation survey allows the participant to assess their understanding of the philosophy presented, content presented, participation in course, and an overall assessment of the course. Certificates will be issued directly to the participant present at the on-campus course. On-line participants will be issued, per on-line course, certificates based on their on-line assessment log of equal or greater times on task of 45-minutes. These certificates will be delivered to their respective campus consultant for distribution to the participant. Using the access logs, totals will be kept of all participants time on task for all courses on-campus and/or on-line attendance and certificates will be issued to the *Move To The Top Of The Class* teachers with the highest totals for each campus.

Implementation

Implementation of this program will begin with a presentation about the program to campus principles at their monthly meeting. Having administrative buy in to the program is essential to the success of any good staff development program. Logistical concerns will be addressed such as the scheduled on-campus course dates; staff surveys forms for input into the decision process, campus logistical information for consultants, and the designated site facilitator for each campus. The instructor often finds it beneficial to rely on a site facilitator to act as a bridge between the students and the instructor (Willis, 1995). Choice of courses and their descriptions will be provided to the principals along with a survey results form to convey their campus's selections. In addition to the principal, the campus staff must be addressed. A positive introduction to the faculty is also essential to the overall success.

Each consultant will be assigned a campus and given the dates and subject for the on-campus courses. Simultaneously on-line courses will be aligned to the appropriate ESC Educational Technology Specialist for the facilitation of that course. The program will be publicized including all key elements such as delivery methods; methods of interaction; instructional modes; evaluation methods; along with courses and dates by the district, site facilitator, and campus administrator to all district employees. A variety of formats will be used to publicize the program (Table 1).

Conclusion

Although critics argue that schools are rushing to jump on the latest education bandwagon, it appears evident that educational environments cannot survive without implementing electronic media and instructional technologies. Indeed, today's schools are in a period of transformation (Fisher, 1998). Technology is the tool that is changing the world of teaching and learning. This transformation is being reflected by the Education Service Center Region XI in cooperation with Birdville ISD by providing for district teachers through the *Move To The Top Of The Class* staff development program not only ways to build the knowledge and skills needed to be proficient in the use of technology, to use technology in curriculum planning, and designing student learning activities that integrate technology, to engage students in "student centered" learning experiences, and to communicate and collaborate to promote the use of technology to improve teaching and learning but delivering this training in smart ways to allow the participant flexibility to fit course work among other demands of their time. Support for this transformation is offered in the forms of face-to-face on-campus courses with a consultant for each campus, and on-line versions of the on-campus courses and an on-line instructor for each course. With the support of the administration to encourage teachers to participate in the on-campus and/or on-line courses the hope is to offer non-threatening training and support for all participants.

References

-On-line:
Levenburg, Nancy M., and Major, Howard T. (1998). *Distance Learning: Implications For Higher Education In The 21st Century.* Available: http://horizon.unc.edu/TS/commentary/1998-11.asp.
Willis, Barry, and Engineering Outreach College of Engineering University Of Idaho (1995) *Guide #1 Distance Education: An Overview.* [On-line]. Available: http://www.uidaho.edu/evo/dist1.html.

-Proceedings references:
Lasseter, Marie, and Flanagan, Juanita (1998). *Engaging Adult Learners On-line: Strategies For The Development Of A Web-Based Professional Development Program In The University System Of Georgia.* WebNet1998.
Nichols, Paula (1998). *Stumbling Blocks and Stepping-Stones: Keys to Successful Video Conferencing Networks.* WebNet1998.
Fisher, Susan C., and Dove, Marianne K. (1998). *Muffled Voices: Teachers' Concerns Regarding Technological Change.* WebNet1998.

The Information Revolution and The Future Role of Educators

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Abstract: The purpose of this paper is to identify trends which are likely to come to fruition in the near term future and generate implications for the educational professional. The trends focus upon the information communications revolution and one subset, the coming Instructional Technology (IT) revolution. Ideas have been abstracted from the author's forthcoming chapter in the *International Handbook on Information Systems*. (In Press). H. Adelsberger, Collis, B., & Pawlowski, J. (Eds.). Berlin: Springer-Verlag.

Introduction

Humanity has passed through several major eras, based on technological advances, which have changed society dramatically. Examples include changing from 1) hunter to agrarian, 2) quill pen to printing, 3) agrarian to industrial, 4) manual to electrical, and 5) bits to digits (the digital revolution). The latter is also called the information technology communications (ICT) revolution and we are currently engaged and embroiled in its infancy. The four main waves of innovation since the 18th century include the Industrial revolution in Great Britain, fueled by steam power from 1780s to 1840s (and took 100 years), railway age from 1840s to 1890s, electric power and automobile from 1890s to 1950s, and the information age (1950s--).

After each of these major social revolutions became fully diffused into society, periods of relative calm, peace and stability ensued, interrupted by the occasional war. During each of these transitions to the new order of things, however, there was major chaos, upheaval, and uncertainty. For example, the transition to the age of electricity witnessed the major dislocation of slaves in the United States as the spread of rural electrification made them too expensive to maintain. The industrial revolution witnessed one of the greatest mass migrations in history as people left rural areas to form burgeoning urban areas which led to the growth of social support systems.

We are currently embroiled in the next major revolution, stimulated by the microcomputer and attendant digitization. This has been referred to as the Information Communications Technology (ICT) revolution. This revolution is resulting in significant changes in the way people and organizations communicate and function. It is radically changing, in both qualitative and quantitative ways, how we carry out our day to day activities.

One might ask, what does the future hold for educators with respect to the Instructional Technology (IT) revolution which is rapidly sweeping across the globe? Predicting the future beyond lunch is a risky business filled with uncertainty. There are simply too many twists and turns ahead in the road. Some have opted for developing vision of what the future should be like, rather than to predict it. Alan Kay, now Disney fellow once remarked that the best way to predict the future is to invent it. Another alternative (to ignoring the future and dealing with it as it comes) is to identify possible major events, how they might unfold, and prepare for them all This is called the scenario approach.

The Scenario Approach

The first scenario, at one extreme, is that nothing will change significantly from the current state of affairs. A teacher from the early 1900s who was magically transported to a current classroom would feel quite at home. The appropriate strategy might be to maintain a low profile in the trenches, keep your helmet pressed down around your ears and keep your head low. It is regularly practiced by many who are either within a few years of retirement or view their role as stewards of the institution who will turn it over to their successors in the same fine shape they received it. Some have suggested the lack of wisdom of this approach.

> Universities won't survive...higher education is in deep crisis. Already we are beginning to deliver more lectures and classes off-campus via satellite or two-way video at a fraction of the cost [of traditional courses]. Today's [campus] buildings are hopelessly unsuited and totally unneeded. (Drucker, quoted in Green, 1999, p 15).

In a series of studies of campus computing in the USA, Green paints a somewhat dismal picture of the preparedness for this change when he says "the evidence suggests that as an "enterprise," higher education remains mostly unprepared for the consequences of this coming convergence." (1999, p. 11).

The other extreme end of the scenario spectrum is that the ICT revolution will dramatically effect how instruction is delivered in a major and revolutionary fashion. A teacher of today, transported into this new future, would be bewildered, out of place, and find difficulty determining what to do or say. The viability of this scenario of the future of education is based on machine and intellectual technologies which have been promised and are being tested at this time, plus successful experiences on smaller or non-educational scales than proposed in the following scenario.

Below are some guidelines to prepare educators for the IT society based on a review of current and projected technological and sociological developments.

Specialize in Change and Reform

If IT is not "rocket science" and can be implemented by any educator with proper support, particularly that which is provided in the context of the interdisciplinary team (see below), why has it been so little used? One answer whose credibility is growing is that IT represents a major innovation and the diffusion of innovation involves change. Bates has argued that

> New technologies are associated with postindustrial forms of organization based on highly skilled and flexible workers with a good degree of autonomy organized into relatively small and flexible operational units. In contrast, universities and colleges have been characterized by a mixture of agrarian and industrial forms of organization, with hierarchical, bureaucratic, and relatively inflexible organizational structures and procedures...the introduction of new technologies for teaching will require a major shift toward postindustrial forms of organization for universities and colleges." (Bates, 2000, pp. 1, 2).

It behooves us to learn all we can about the process of diffusion of innovation (change), whether it comes from a managerial, administrative higher education framework (e.g., Bates, 2000), a business leadership framework (Kotter, 1996; Senge, 1990), a sociological, psychological framework (Rogers, 1995), or an educational technology framework (Fullan, 1991, 1992, Szabo et al, 1999). This leads directly to the second role.

Understand Innovation Rules and How They Apply to IT

IT must be respected as an innovation and its diffusion (Rogers, 1995: Szabo, 1996; Szabo & Anderson, 1997; Szabo, Anderson & Fuchs, 1999). This approach begins with an examination of those factors which characterize successful and unsuccessful innovation diffusion, from a variety of fields of human endeavor. It then constructs a system to optimize the effects of those factors. This paper looks at twelve characteristics of innovation and implications for the IT educator.

1. Innovation is warmly accepted as an abstract concept but rejected as an operational outcome (the rational behavior of individuals and institutions is to promote stability and resist change). As one vice-chancellor observed "I don't have time for cultural change." (Bates, 2000).
2. The vast majority of innovations fail—they never become widely adopted.
3. Most innovations aren't—they are merely tinkering with the system. "Schools and colleges are as productive and innovative as were Soviet collective farms." (Dator, 1993).

4. Innovations which become successfully diffused often have changed significantly to the point where they are barely recognizable. The telephone arose from an effort to help hearing impaired, etc. This underscores the importance of local control and empowerment to enable people to adapt the innovation to their particular requirements, along with the 'global brain' structure to disseminate the adaptations.
5. Historically diffusion of innovation has taken significantly longer to happen that we remember or hope for. It doesn't fit neatly into the five year appointment cycle of administrators or term of politicians. An example from machine technology is the mouse, which was developed in 1964 but did was not diffused into the computing scene until the introduction of Apple's Macintosh, 20 years later. For more on the man who developed the mouse, look at the Stanford Review of [Doug] Englebart's work at http://unrev.stanford.edu.
6. When will diffusion of innovation, particularly of IT, happen? Precision predicting is not possible. However, an estimate can be made, based on the time between the invention or development of some innovative idea and its widespread diffusion. This 'incubation time' has been pegged at roughly 20 years for high tech innovations (e.g., the mouse was introduced in 1964 and set the standard in 1984 with Apple's Macintosh) and educational innovations have larger incubation times. For the sake of argument, I'll choose 50 years for the latter. If we agree that instructional technology is a blend of a high tech and an educational innovation, we might conclude that the incubation time will be longer than 20 years but less than 50. When do we start marking time? Let's take the 1960s, the beginning of the early computer assisted instruction programs developed for digital computers. This yields a likely range of incubation time from 1980 to 2010 and puts us, at the time of this writing, well within the expected period of mass diffusion.
7. The innovator is a dedicated keeper of the dream with total focus. The commitment to bring the innovation to life the ability to inspire and motivate others is characteristic of all successful innovations. Due to the vision-driven nature of innovation, since no one has gone there before, innovation must be guided by a strong, concrete and shared (Senge, 1996) vision.
8. There is a school of thought that innovation can't be managed-it must be led (Kotter, 1996). The main tool in the hands of administrators is policy-formation and it works well in running an institution. However, there is almost no evidence that innovations arise because of administrative policy and it can be argued that administrative policies may be out of step with innovation and inhibit the creativity needed to innovate. As noted futurist Paul Saffo (1997) observed

   > "we are all preoccupied with trying to get standards established, and that's a good thing. But few people realize that once standards are established they stay around for vastly longer than we would wish and are used for purposes we never intended. And that's where vertigo comes in because if people realized the consequence of the standards karma they would be completely immobilized."

9. One view of innovation is that is simply the testing of many good ideas and discarding those which don't work. This means successful innovation is characterized by a great deal of trial and error and discarding failures; however, this activity is easily labeled failure. The majority of institutions and individuals do not tolerate failure and people who are supervised by them tend to be risk-aversive.
10. Innovation as an end has limited value: innovation as a means to an end have tremendous value. The value of IT will come not from itself, per se, but from the extent to which it can help educators 1) do what they normally do to improve learning (e.g., providing quick and detailed performance feedback) and 2) step up to new opportunities and applications previously not addressed (e.g., increasing access to specific learning by specific individuals in specific locations)
11. Related to the previous point, people and institutions pass through three identifiable stages which they encounter an innovation—play, use, create (PUC). The play stage is learning about the innovation—what it can and can't do, how to access and use it, how to trouble shoot. If learning is successful, the use stage begins in which the innovation is employed to help people accomplish task they already do, such as word processing for handouts, assignments and test items, spreadsheets for accounts and student marks, Only when a certain comfort/competence level is reached does the individual and institution begin to use the innovation to help do those things that couldn't be done, or even imagined earlier. For example the use of IT to provide access to education, training and information in a distributed learning environment (sometimes referred to as any time, anywhere, or just-in-time education). "...teachers, even those most enthusiastic about teaching with technology, typically pass

through several distinct stages before they become educational technology integrators and innovators." CEO Forum, 1999, p. 13). Corporate researchers have also identified a similar cycle of technological innovation. It has happened that an innovation's value was not appreciated because it was in the first stage, for example, the suggestion that a powerful use of the microcomputer would be as a storage and retrieval device for recipes in the kitchen of a home.

12. A critical mass of users, 50% by one estimate, is a common hallmark of success of an innovation. Since the IT culture cuts across all subjects, grade levels and barriers of time and geography, every educator is a potential user. One quickly concludes that, using conventional methods, there are not enough trainers or time to provide all the basic training needs, let alone address the on-going requirements of support, upgrades and so forth. To simply provide the necessary training to this large audience requires new initiatives and new solutions.

Focus on the Intellectual Technology, as Well as the Machine Technology

It is often stated that IT is too expensive. Exploring this notion further results in the conclusion that in education, machine technology costs are quantifiable and add-on, while the supposed benefits (increased achievement, effectiveness, attitude and access) are neither 1) easily quantified nor 2) valued in a practical, applied sense in education (which faculty member's increments or other rewards are based on how much their students achieve or how quickly)?

While it may be true that it is a zero-sum game for machine technology (money spent on IT must come from some other part of the budget), the intellectual technology represented in the employees of the university or college is a rich, renewable and expandable resource. And it is this technology which creates the programs which drive the learning process which is presented by the machine technology.

Predict Directions Computing is Going and the Implications for Education

Networking

The global network of interconnected servers and clients will enable every educator (and student) to not only obtain resources from any location in the world, it will also enable every educator to contribute resources where they have expertise.

Broadband Transmission

The first infrastructure technology element is broadband communication which will enable the transmission of interactive and multimedia computer files significantly larger than anything we have today outside the research laboratory. At the time of this writing, governments are selling expensive licenses (average cost in Britain of $7B per license; Wilhelm, 2000) for third generation (3G) broadband frequencies which will significantly increase the ability to transmit large (e.g., full motion, full color video) files using wireless technology.

Wireless Communication

Wireless communication will permit full access to all educational services we now have and more, from any place in the world without a physical connection. On the day everyone has a single access number and full multimedia capability on a portable wireless device, we will have to rethink how, when and why we communicate with students, colleagues, administrators, suppliers, and experts.

Internet Appliances

"Internet appliances are part of a new wave in consumer electronics that is fusing elements of wireless phones, audio-visual entertainment devices and traditional PCs into gadgets that are more portable, accessible and fun" (Burns & Bickers, 2000, p. 30). One such device resembles a 20 by 29 cm notepad with a digital screen, pencil-like pointing device and wireless connectivity. This prototype hand-held device and presumably its successors (1) are made possible by microchips with high power but low power consumption, (2) will enable complete, interactive, multimedia-based courses of instruction to be received anywhere, and (3) will become relatively inexpensive if the forecast high volume consumer demand drives down prices.

One implication is that the costs of distance education compared with conventional learning will become exceedingly attractive, especially when one considers the tradeoffs of the time and inconvenience and lost opportunity costs of relocating to an institution of higher education.

Databases

The next technology is exemplified by the VISA credit card phenomenon which operates with vast interconnected server-driven databases which collect, store, quickly analyze and regurgitate on demand, information requested by authorized users, clients, and administrators in report format which they specify and control. Imagine the existence of master, world wide educational databases which contain detailed information about every conceivable aspect of educational life everywhere on the globe. Educators will have to create, maintain, and use these databases for the benefit of their students, profession and livelihood.

New Models of Operation Infrastructure

The final infrastructure component is a function of the human rather than technological concepts. This involves a major reconstruction of the educational systems of the world. Indeed it will require a major cultural change (Bates, 2000, Szabo, 1996).

> The advent of the Internet is a massive, even unprecedented exercise in managing change...Success requires changing the model for how to organise the work and lead the organisation. It requires challenging traditional assumptions about organization, communication, decision-making, operating style, managerial behavior -- and then defining a new way. *That is a human problem, not a technological one*." [emphasis added].

CMC may result in a major leap forward in the development of the global brain. It certainly seems to be playing a role in the development of the operating system called Linux. Anyone can change the code to improve or extend its functionality, but the changes must be made available to other users. Theories of learning which place high value on knowledge construction through dialogue with others and reflection may benefit from enhanced CMC in the forms of computer conferencing, e-mail, list servs an other facilities which have yet to be developed.

Preserve Conditions of Intellectual Freedom and Open Political Institutions

The Post Industrial Society and its current incarnation, informationalism, promise men and women greater control of their social destinies. "But this is only possible under conditions of intellectual freedom and open political institutions, the freedom to pursue truth against those who wish to restrict it. This is the alpha and omega of the alphabet of knowledge." (Bell, 1999, lxxxiv). But this requires action based upon reflective thinking. "In times of rapid technological change, reflective practice is virtually an occupational necessity for everyone (Guiton, 1999, p. 52).

Respond to Changes in Educational and Social Goals

We are already witnessing increased demand for intellectual education and training for service, professional and managerial employment, coupled with decreased but nevertheless existing demands for skilled and semi-skilled workers. These latter will be reduced by such technologies as performance support systems and expert systems, which in turn will require building. There will also be a growing need to retrain and re-orient workers displaced by informationalism and provide entry into the market.

Another area of concern to educators is a somewhat uncomfortable concept--market share and competition with other educational institutions, commercial firms, and international alliances. Does your institution want a market share of the education and training industry, and if so how much? In the early days of the Internet, it will be easy for institutions to capture a nice share of the student market, but there are signs that will change as competition heats up.

Develop and Use Technology to Communicate

The capacity and speed of communications networks has increased massively. In 1970 it would have cost $187 to transmit the Encyclopedia Britannica as an electronic data file across the US. Today, the entire contents of the Library of Congress can be sent across America for $40.

The benefit of being online increases exponentially with the number of connections, which increase as communications costs plunge. Robert Metcalfe's Law states that the value of a network grows with the square of the number of users. (Economist, 2000). The birth of the internet started in 1990 and the browser in 1993. The number of users worldwide has already climbed to more than 350 M and may reach 1B in 4 years. Seven million pages are being added to the internet daily.

Computers aren't just for number-crunching anymore. They have become powerful but limited tools to support a wide range of communications. Consider the role of reflection and expertise among members of a class and how those elements can be used to enhance and enrich the educational experience of the whole class. Consider also access to scholars and the latest updated information on everything in the world you want to investigate.

Break Free from Conventional Bonds and Thinking

The term horseless carriage was used to define the first automobiles-a blend of the old and new. But retaining the old, while providing some level of comfort, may have hindered the appearance of the new. The view of the early airplane as a vehicle to transport individuals over short distances likely hindered the development of mass travel which we currently enjoy. Perhaps the term distance education will conjure up images of the classroom in different regions, led by a teacher, and have a stifling effect on the culture change necessary.

One way to break from conventional bonds is the look at things from a different perspective. It has been said that a chicken can be defined as a device which an egg uses to reproduce itself.

There are myriad details of how this could or should take shape; too many to include here. An extensive review of immersive instruction through virtual reality technology may be found in McLellan (1996). The outcome, however, is that any student can access the best education in the world from any location in the world in any time zone. The global brain will be strengthened. Now if we could just make similar progress and expand results like these into the arena of ethics, morals, and the realm of spirituality.

Change is guaranteed but what that future will look like must wait until it happens. It is likely however that change will continue at a rapid, even accelerating pace. Several other conjectures come to mind. First, unlike most of the rest of our economic, social and cultural environment, education has to date been largely untouched by the sweeping changes arising from the ICT revolution. It seems likely that this will change; that ICT will ultimately have a transforming effect upon the way we conceive of and deliver educational services.

References

Bates, A. W. (2000). *Managing technological change: Strategies for college and university leaders*. San Francisco: Jossey-Bass.

Bell, Daniel. (1999). *The coming of post-industrial society*. NY, NY: Basic Books.

Burns, S., & Bickers, C. (2000, June 29). Innovation: Microprocessors: Moving target. *Far Eastern Economic Review*, 163, 30-32.

CEO Forum on Education and Technology. (1999). *Professional development: A link to better learning (School technology and readiness report - Year two).* [On-Line]. Available: http://www.ceoforum.org/downloads/99report.pdf

Dator, J. (1993, June). *The college classroom of the year 2010*. A Seminar for Presidents of Community and Junior Colleges from Japan and the United States. University of Hawaii.

Economist, (23 September 2000) *Technological Innovation Diffusion* vol 356.

Fullan, M. G. (1991). *The new meaning of educational change.* (2nd ed.) . New York: Teachers College Press.

Fullan, M. G. (1992). *Successful school improvement.* Buckingham: Open University Press.

Guiton, P. (1999). Professional reflective practice and lifelong learning. In K. Harry, ed., *Higher education through open and distance education*. London, Routledge.

Green, K., C. (1999). When wishes come true: Colleges and the convergence of access, lifelong learning, and technology. *Change, 31*, 10-15.

Kotter, J. (1996). *Leading change.* Boston, MA: Harvard Business School Press.

McLellan, H. (1996). Virtual realities. In Jonassen, D. (Ed.). *Handbook of Research in Educational Technology.* New York: Macmillan.

Rogers, E.M. (1995). *Diffusion of innovations* (4th ed.). New York: The Free Press.

Saffo, P. (1997). [Interviewed by R. Adler]. Available at http://palm.fgreen.com/infoworld/interviews/saffo.html#GETTING OUT OF THE BOX

Senge, P. M,. (1990). *The fifth discipline: The art and practice of the learning organization.* NY, NY: Currency Doubleday.

Szabo, M. (1996). Change in the use of alternative delivery systems through professional development within colleges and universities. In *Educational Multimedia & Hypermedia*. Carlson, P., & Makedon, F. (eds.). Charlottesville, VA: Association for the Advancement of Computing in Education. 655-660.

Szabo, M., & Anderson, T. A., (1997, December). *A reconceptualization of the problem of instructional technology in post secondary education.* Paper presented at the annual meeting of the International Conference on Computers in Education. Kuching, Malaysia.

Szabo, M., Anderson, T., & Fuchs, A. (1999 June). *Report on a change system: The Training, Infrastructure and Empowerment System (TIES).* Paper presented at the annual convention of the World Conference on Multimedia and Hypermedia, Seattle, WA.

Wilhelm, K. (2000, June 29). Innovation: Telecoms: Trial of strength. *Far Eastern Economic Review*, 163, 34-35.

WANTED: A MIRACLE WORKER - a Consideration of Some Issues Arising From the Leadership of Entrepreneurial Activity in Information and Communications Technology in an Academic Setting.

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Abstract This paper seeks to explore notions of leadership in relation to the role of the Project Director of a nation-wide in-service ICT training and development for teachers provided by a University Faculty of Education. In examining leadership and the management of change the paper seeks to focus upon the dilemmas inherent in managers leading entrepreneurial activity in an academic environment. The paper also attempts to highlight some lessons learned, key issues requiring resolution and future papers to be written.

Wanted: a miracle worker who can do more with less, pacify rival groups, endure chronic second-guessing, tolerate low levels of support (if not outright opposition), process very large volumes of paper and work excessively long hours. He or she will have carte blanche to innovate, but cannot spend much money, directly hire personnel, or upset any constituency. Internal processes will frustrate a rapidly evolving project and the need to make key decisions in a split second. External quality assurance agencies will never leave you alone. Honourable failure is expected, success will be hard to believe. (after Evans 1992). Welcome to the surreal world of entrepreneurial activity within a university faculty of education in the UK.

Traditional revenue sources for universities in the UK are under downward pressure with year on year "efficiency gains". The nature of work within higher education is undergoing enormous and rapid change in the UK, and with little precedent to guide us, we academic managers are reinventing our professional role as we go. The cause stems from the new environment we are facing wherein competitive pressures are forcing universities to adopt new strategies, familiar to business and industry - mergers and acquisitions, reductions in staff, performance-based rewards - but heretofore almost completely unknown in education. Communities of scholars are becoming independent budgetary units. Government policy, student and community demands, corporate interests and technology have all stormed the walls of the university and we find ourselves in a classic double bind. Entrepreneurial activity is expected, indeed it is essential to survival, but our internal systems are not geared to it, nor is our culture - risk taking is increasingly necessary but creates suspicion and conflict in regard to the real role of university, intellectual and educational leadership.

Leading entrepreneurial activity in an academic setting is, for me at least, as much about managing change as it is about providing a service and making money. Many people make the mistake of assuming that change is a rational activity, undertaken by rational people. As I see it, the real challenge for both managers and managed is that most change is power coercive, forced upon us by external agents and agencies and it is that which produces antagonism and stress and an aversion to change.

Successful management of change requires certain qualities of what is most often referred to as leadership, as well as the ability to deal or negotiate successfully with vested interests and/or significant individuals. The status of an individual change agent is crucial, notions of credibility and the status of knowledge all play their part in ensuring success or failure of change, as indeed does communication.

For me there is an additional problematic issue in that leadership traditionally has been studied using male norms as the standard for behaviours. There is a whole edifice of conventional gendered expectations of management, with which to contend. Women managers are especially vulnerable to criticism when such stereotypical expectations are not met, Woman as leader requires a competent self, creative aggression and the ability to get things done that make life better (Cantor and Bernay 1992). In my view the leadership vision needs to consist of pointing to the more distant mountains and engaging as many as possible in a collaborative process of action, enquiry, reflection and improvement on the journey. A consequence of this might be that the peaks climbed may turn out to be different to the original first intentions. But ownership of change is a pre-requisite to successful innovation, there must at least be enthusiasm for the proposals. Leadership is creating a state of mind in others

Some lessons learned, issues to resolve and academic papers to be written

* There is no definitive answer out there about how to engage in entrepreneurial activity linked to the e-learning revolution. It is of course possible to gain insights, ideas and inspiration but the road to "success" is an extremely complex one and is due in great part to the cultural conditions of the institution in which one operates.
* Dealing with resistance can be very stressful. People attack you and your precious ideas and seem to show no respect for you. Ignore the temptation to get even with them, even though you know they need the money you are earning in order to keep their jobs.
* Be hopeful, certain that something makes sense regardless of how it turns out, hope is the strength to continually try.
* We need to engage in a structured dialogue about how emerging technologies can be employed to enhance the reputation of the university and the student experience.
* Universities are not businesses in the ordinary understanding of that word.
* Really important issues of public policy v economic perspective go against university culture.
* The development of technology-reliant training and education worthy of our reputation as the university with the seventh highest teaching quality ratings in UK is costly and risky, especially when the management and organisational infrastructure required for making such investment and development decisions are not well developed.
* Many of the possibilities created by new approaches to delivering e-education are not natural extensions of the traditional relationship that exists between academic staff, their academic homes and their publishers.
* The impact of technology, especially the internet, upon leadership behaviour will be profound. Can anyone lead by email?
* What counts as success? The nature of work in ICT, particularly courseware development, emphasises the value of productivity and aesthetics and when we analyse the process of production it can be seen that these often displace educational criteria. How can we ensure that education, in particular student learning, is of paramount importance - I believe this to be a research priority.
* The main determinant of success for our clients (teachers) has been the quality of the content, and in particular the pedagogical focus of it, and not the technology. This has in turn presented us with a niche market opportunity!
*There is an urgent need for most UK universities to decide what form their engagement in e-learning will take. The resultant ability or lack of it to assimilate change will influence the capacity to reconcile the mission, values and ideals of the academic community needs with an awareness that the student or "consumer" of the future is likely be an educational "channel surfer".
* The impact of ICT creates new roles and power structures, the title "Web Master" is but one example of a job title that highlights a range of complex gender-related issues that would benefit from further exploration.
* If as Kouzes (2000) believes "Collaboration will be the critical business competency in the Internet Age", then academic communities are in a strong position.
* The application of free market ideology to higher education does come at a price - the undermining of the purpose of universities is part of it.
...I also learned what makes a web page sticky!

References

Bates, A.W. (2000). Managing Technological Change, San Francisco, Jossey-Bass.
Bennis, W. (2000). Managing the Dream: Reflections on Leadership and Change, New York, Perseus Books.
Burbules, C. (2000). Globalization and Education: Critical Perspectives, New York, Routledge,
Cantor, D, Bernay, T. (1992). Women in Power, Boston, Houghton Mifflin.
Evans, R. (1995). Getting Real about Leadership, Education Week 14, (29), 36.
Fullan, M. (1998). Breaking the Bonds of Dependency in Educational Leadership, Educational Leadership, 4.
Katz, R. (1999). Dancing with the Devil: Information technology and the New Competition in Higher Education, San Francisco, Jossey-Bass.
Kotter, J. (1999). What Leaders Really Do, Boston, Harvard Business School Press.
Kouzes, J. (2000). Link Me to Your Leader, Business2.com issue 10/10/00
Ozga, J and Walker, L. (1999)."In the Company of Men" in Whitehead, S and Moodley, R. (eds) Transforming Managers: Gendering Change in the Public Sector, London, UCL Press.

Emerging Careers in Instructional Technology

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Abstract: The implementation of instructional technologies is creating a number of new careers in education. Three are instructional technology director, instructional technologist, and instructional technology technician. Also, numerous positions are required when institutions develop instructional technology modules in-house. This paper provides a brief overview of the major instructional technology positions, as well as a description of a faculty technology liaison and the details of an instructional technology director job description.

Overview - Instructional Technology Careers

Instructional Technology Director. The director and his or her assistants will supervise and direct all aspects of the instructional technology team. The director's major responsibilities include facilitating or overseeing institutional instructional technology planning and instructional technology implementation, recommending an instructional technology infrastructure, establishing faculty technology development programs, initiating instructional technology prototypes, recommending standards and policies, and facilitating instructional technology assessment. Harris and Waterhouse provide an example job description for an instructional technology director in Figure 1. (2001)

Instructional Technologist. The instructional technologist assists faculty with the integration of instructional technology to enhance teaching and learning. Instructional technologists might also be responsible for assisting faculty in the development of technology enhancements, which would entail a variety of responsibilities. Assisting faculty with development would most likely include the multiple roles of trainer, instructional designer, graphics artist, Web developer, and project manager. An instructional technologist's major responsibilities include faculty technology development, recommendations on infrastructure upgrades, consultations with faculty on Web-based instructional design and pedagogical issues, as well as the facilitation, evaluation, and reporting on technology prototype initiatives, and other duties as applicable.

Technical Specialist. The instructional technology technical specialist is mainly responsible for ensuring that the instructional technology infrastructure is functional at all times and that faculty and student technical difficulties are addressed in a timely fashion. Technical specialists typically assist faculty and staff with technical difficulties with software and, in some cases, with hardware if such support is not provided by the information technology department.

Faculty Technology Liaisons. The faculty technology liaison is a faculty member who devotes a portion of his/her time to instructional technology efforts by serving as a mentor to his/her peers and by assisting colleagues with the use of instructional technology. It is best if faculty liaisons are full-time faculty who are provided course release time to serve as the departmental instructional technology team member. These individuals are vital members of instructional technology support teams as well as their respective academic departments.

Development Team. The scope of the institution's development efforts and the level of sophistication of the products developed may require one or more of the following employees: (1) Project manager, (2) Content experts, (3) Web developers, (4) Graphic artists, (5) Editors, (6) Instructional designers, (7) Videographers, and (8) Photographers.

Figure 1. Director of Instructional Technology

Function of the Position: The Director of Instructional Technology is responsible for leading the institution's instructional technology efforts and for serving as liaison on instructional technology initiatives to administrative and academic departments. The Director oversees the planning, coordination, implementation and evaluation of appropriate instructional technologies to enhance teaching and learning. Specifically, the Director leads initiatives in faculty technology skill development and Web-based instruction. The Director of Instructional Technology also serves as a liaison to the executive leadership of the university on instructional technology initiatives.

Principal Duties and Responsibilities:

- Develop and maintain relations and facilitate communications between the Instructional Technology department and academic departments.
- Develop and maintain relations and facilitate communications between academic departments and the Information Technology department.
- Make recommendations on behalf of academic departments to the information technology department on infrastructure needed to support the implementation of instructional technologies.
- Serve as liaison to executive leadership on instructional technology initiatives.
- Insure that current instructional technologies are researched and that appropriate instructional technologies are recommended.
- Insure adequate training and resources for faculty to develop instructional technology skills.
- Solicit and evaluate software/hardware products in the area of instructional technology.
- Promote instructional technology collaborations among faculty.
- Propose and implement appropriate prototype projects to promote the study of innovative uses of instructional technology.
- Insure that the effectiveness of instructional technology prototype projects is evaluated and that needed revisions are implemented.
- Facilitate an ongoing instructional technology vision for the institution.
- Oversee the instructional technology planning process for the institution.
- Stay abreast of emerging instructional technologies and make recommendations on needed updates.
- Make recommendations to academic leaders on policies and faculty issues that promote faculty's acceptance and use of technology.

Special Skills Needed:

- Education: Master's degree in instructional technology or instructional design required; doctorate preferred.
- Experience: At least 5 years teaching in higher education and a demonstrated track record in the use of instructional technology.
- Outstanding ability and vision in the application of instructional technologies.
- Outstanding organizational skills.
- Outstanding interpersonal skills.
- Outstanding oral and written communications skills.

References

Harris, R., and Waterhouse S. (2001). *A 10-Step Guide to Establishing Instructional Technology.* Washington, D.C.: Executive Leadership Foundation.

ELECTRONIC PORTFOLIOS

Section Editor:
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It is a pleasure and an honor to introduce a new section in the SITE2001 Annual. This is the first year we have had a strand devoted to electronic portfolios (EP) in teacher education, although a number of past editions have included excellent reports of their development and use. In the mid-90s I was involved in the development of the Teachers for Tomorrow Program at the University of Houston. Our interns collected, sorted, and organized materials, lesson plans, reflections, and other relics of their preservice days. From this they winnowed the best examples and developed a paper portfolio. A few photos, a video, and audio tape or two were the extent of 'multimedia' in their presentations. How exciting it is to read the current developments in portfolios and recognize how far we have come is such a short time.

As in all sections this year the papers are arranged alphabetically by first author; however I will introduce them in categories for the reader. The papers is this section may be placed in three groups: Overview and Development, Graduate Program Use, and Preservice Program Use.

Overview and Development

Begin your exploration of this section with an article *by Zembal-Saul, Dana, and Haefner*, Penn State University, USA. While the authors report a case study of preservice teacher use of EP, their research provides an excellent overview and foundation in the underlying value of EP use. It also emphasizes the reflection of growth that may be shown in this type of portfolio. Having established a foundation look next at the paper by *Galloway*, Indiana University Northwest, who describes specific issues and procedures for the development and maintenance of EP. Based on the guiding principle that virtually anything can be represented electronically the author provides suggestions for methods and formats, soft as well as hard.

The third article by *Rodney, Knee, and Musgrove*, Florida Atlantic University, USA, addresses many of the early technical issues encountered when building EPs and outlines a practical solution to creating EP using the CDROM. They note the methods make portability, replication and updating CDROM portfolios easier for students and educators alike. For a final paper in this subsection, read *Hornung*, Lehigh University, USA. This report forms an excellent parallel to the third article in that the author addresses the human issues. She provides ten guidelines for the collection, selection, reflection and presentation of a portfolio. Although initially designed for a preK-5 setting these guidelines are of equal value for teacher educators planning the implementation of electronic portfolio.

Graduate Program Use

Two papers in this section of the Annual are centered on the use of electronic portfolios in graduate teacher education. Interestingly, both are web-based. The first, *by Pierson and Rapp*, University of Houston, USA, reports use of EP in a Master's program where the students develop their portfolio throughout their master's work and then compose a summative "epilogue" as one part of their comprehensive exam. In the second article, *Sparrow*, Florida Gulf Coast University, USA, describes how students are required to create and maintain an online portfolio as an alternative to a traditional comprehensive examination. Their program is delivered in an online format, and students are located around the world. Portfolio assessment provides an attractive alternative to exams by offering an authentic assessment of student knowledge in the quickly changing world of educational technology.

Preservice Program Use

The remaining six papers look at the development and application of Electronic Portfolios in preservice teacher education. The first two articles describe how EPs are developed throughout the students' college education. *Christensen, Gegelman, Grooters, and Holcomb*, Valley City State University, USA; report on the EP structure and guidelines that are built around the adopted VCSU Abilities of aesthetic engagement, collaboration, effective citizenship, global awareness, problem solving, technology, and wellness. This university provides each and every student with a laptop computer and requires all graduating education majors to develop an electronic portfolio as a graduation requirement. In the second article, *Ring,* University of Florida, USA, reviews the development and implementation of the electronic portfolio. Each student's electronic portfolio is viewed as a dynamic, interactive document that is developed over the student's entire college experience and may continue to develop indefinitely.

The next article, by *Olsen and Dimond,* Brigham Young University, USA, reports on the initial portfolio development by two undergraduate cohort groups, formed at the beginning of their junior year and remaining together while they complete their methods courses and teaching practicum. All students in the cohort begin creation of their electronic portfolio as they come into the program as juniors and continue through student teaching.

The fourth paper, authored by *Strickland, Williams, Jenks, and Zimmerly,* Idaho State University, USA; describes the design of an IT course constructed around the portfolio process, and coordinated with a course of educational planning, delivery and assessment. The authors report the results the first two semesters of their research with the use of EP.

The authors of the fifth paper, *Ray, Wright, Stallworth, and Wilson, University of Alabama, USA*, report perhaps the most exciting and relatively unusual EP development team. The team consisted of secondary education language arts and social studies faculty, instructional technology faculty, and graduate students from both disciplines. Students were evaluated on their electronic portfolios that consisted of websites, digitally edited teaching episodes, databases, concept maps, and more.

The final paper from *Zhang,* Randolph-Macon College, USA; describes a pilot project designed to meet preservice teachers request for more opportunities to apply technology skills for teaching and professional use. Four volunteer preservice teachers use and will learn various instructional technology skills for the development of their multimedia portfolio.

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Portfolios: The Plan, The Purpose, A Preview

Val Christensen, Valley City State Univ., USA; Patricia Gegelman, Valley City State Univ., USA; Larry Grooters, Valley City State Univ., USA; Linda Holcomb, Valley City State Univ., USA

We live in a technology-enhanced world. As a leading Teacher Education program in the state of North Dakota, Valley City State University (VCSU at http://www.vcsu.nodak.edu) has taken on the initiative to promote technology and train teachers for this world. In February of 1996, faculty at VCSU began using IBM notebook computers. The university became the second campus-wide notebook university in the nation during the fall of 1997.

Valley City State University provides each and every student with a laptop computer. This access to technology was the impetus for encouraging students to produce an electronic portfolio. Recent university requirements state that all graduating education majors will produce an electronic portfolio as a graduation requirement. This portfolio showcases the skills and abilities adopted by the university. Presentation of portfolios is evaluated by small groups of faculty as an exit exam. The University's 2000-2002 Bulletin states:

"As part of their graduation requirement at VCSU, all students must develop a digital portfolio that illustrates the intellectual and job-related abilities they have developed while studying at VCSU...Currently, students prepare their digital portfolios on CD-ROMs. The portfolio presents the best work each student has completed while studying at VCSU, work that illustrates the student's significant achievement of at least five of the eight VCSU Abilities. Some of these Abilities are major-specific, and some relate to the student's minor field, general education , or co-curricular activities."

Valley City State University faculty members have specified eight abilities that form the foundation of the student portfolio. These eight abilities are based on the Secretary's Commission on Achieving Necessary (SCAN) Skills research, but have been modified to meet the needs of this University. Each of the abilities also identifies specific skills that are required (See table below). During the spring of 2000, faculty members at VCSU developed a rubric to establish levels that must be met for each skill beginning in the general education courses and developing further in the courses for the students major. Progress is tracked at check-points by advisors and through completion of class projects.

UNIVERSITY ABILITIES	SKILLS
Aesthetic Engagement	• Receptivity • Visualization
Collaboration	• Positive Interdependence • Leadership
Communication	• Written • Spoken • Visual • Performance
Effective Citizenship	• Provides Service to Others • Change Agent Skills • Teaches Others
Global Awareness	• Works with Diversity • Understands System Interrelationships
Problem Solving	• Gathering Information • Creative Thinking • Systems Analysis • Problem Recognition • Decision Making
Technology	• Selects • Applies
Wellness	• Self-Management • Self-Worth

The Teacher Education Program Handbook lists twenty objectives designed to prepare entry-level teachers. Three objectives are included as examples of how the program matches to the university abilities.

The program is designed to prepare entry-level teachers who:

1. are competent in communication skills of listening, reading, writing, and speaking;
   ABILITIES MET: Collaboration, Communication, Problem Solving, Wellness

9. possess the knowledge of how to motivate students to want to learn;
   ABILITIES MET: Collaboration, Effective Citizenship, Problem Solving, Wellness

17. possess the knowledge and skills to be effective classroom managers;
   ABILITIES MET: Collaboration, Communication, Effective Citizenship, Global Awareness, Wellness

The elementary education department has mapped out projects that take place in each class that meet these skills and abilities and can be used in the student's electronic portfolio project. (See excerpt below.) Students then select projects for five of the eight abilities and demonstrate these in their senior electronic portfolios. The reflection process plays a major role in demonstrating these abilities. In addition to the five abilities, all education majors must meet the three education abilities, which are based on the University's teacher education model. The theme of the model is "Teachers as knowledge-based decision makers". The abilities of Planning, Implementing and Evaluating are the focus of this theme.

Elementary Education Major
Mapping Plan for Abilities and Skills

The following includes courses, projects, abilities, and skills designed to assist students who major in Elementary Education. Students may choose any of the projects listed below to meet requirements for their portfolio. (Minimal portfolio requirements include one skill from each of the eight ability areas.) Students must also demonstrate the teaching abilities of planning, implementing, and evaluating. Demonstration of the teaching abilities can be completed in one teaching situation or in three different situations where the ability is demonstrated individually.

Course	***Project***	***Ability***	***Skill***
EDUC 320	Inquiry Project	Communication	Writing
EDUC 323	Resource File	Problem Solving	Creative Thinking
EDUC 430	Diagnostic Testing	Global Perspective	Understands Systems
EDUC 355	Science Lesson	Effective Citizenship	Teaches Others
EDUC 431	Title I Work	Wellness	Self Management
EDUC 200	Teaching a Lesson	Planning ***Implementing*** Evaluating	

This senior electronic portfolio is currently required for the exit exam in the teacher education program at VCSU. A one-credit senior electronic portfolio class is offered in each department during each semester to aid students in the development of their portfolio. (See sample syllabus.) These classes review the expected layout of the portfolio, the types of projects that can be used and some of the technical skills required, as well as the intended audience that they are developing the project for. In addition, a handbook for the senior electronic portfolio project has been developed which includes how-to steps and examples (http://www.vcsu.nodak.edu/offices/titleiii/portfolios.htm).

Portfolio Seminar Syllabus
EDUC 491

This class is designed to help you complete your required portfolio for graduation. Six two-hour class sessions are planned for Monday afternoons between 4 and 6 PM.

Session I

- Discuss the relevance of the portfolio project as a capstone activity and importance to student.
- View sample portfolios discussing their strong and weak points.
- Talk about resumes.

Assignment: Write Resume and scan picture into laptop.

Session 2

- Discuss the Departmental requirements of Abilities
- Construct Main Menu slide and link to resume. Decide background, color, etc.

Assignment: Create a portfolio file on laptop and start collecting projects and storing them in this file.

Session 3

- Discuss audience for portfolio (personal or employment)
- Discuss non-linear format of the portfolio.
- Create a storyboard of projects for the portfolio.
- Pair projects with appropriate abilities.

Assignment: Complete storyboard and continue creating portfolio in PowerPoint.

Session 4

- Discuss reflective statements and their importance to the portfolio.
- Make a stronger connection between projects and Abilities.
- Demonstrate creating audio and video for PowerPoint.

Assignment: Write reflective statements and insert into portfolio.

Session 5

- Portfolio should be near completion.
- Address needs of students to that they can finish

Assignment: Complete portfolio for viewing.

Session 6 (meet individually with instructor)

- Class views portfolio, offers input, and makes suggestions

Assignment: Perfect portfolio for exit evaluation prior to graduation.

At the end of the semester, a day is reserved for graduating seniors to present their portfolio to a small group of faculty members. The faculty members then accept or reject the finished electronic portfolio. This process is still evolving with much evaluation and feedback instigating new change. (See Assessment of a Digital Portfolio.)

Assessment of a Digital Portfolio

Portfolio Creator: ______________________________

Evaluator's Name: ______________________________ Date of Evaluation ____________

Position: (Circle one) Self Group Peer Faculty Other

Direction for use of sheet

Mark the box above the appropriate level for each aspect assessed in the portfolio.
For scoring purposes the following numbers are applied: Unacceptable = 1, Developing = 2, Accomplished = 3, Exemplary = 4
If **Unacceptable** or **Developing** is marked, include a comment concerning improvements that need to be made.

Content Aspects	☐ Unacceptable	☐ Developing	☐ Satisfactory	☐ Exemplary
Demonstrates an understanding of Abilities & Skills ▪ Portfolio demonstrates student's understanding of the Abilities & Skills	▪ Portfolio is superficial in its approach and does not appropriately address the student's learning.	▪ Portfolio indicates a general understanding of the Abilities & Skills but needs more development.	▪ Most projects are well chosen and adequately demonstrate an understanding of the Abilities and Skills.	▪ The Portf clearly addresses of the Abilities a demonstrates a thorough underst of the Skills.

Comments on improvements needed:

	☐ Unacceptable	☐ Developing	☐ Satisfactory	Exemplary ☐
Grammatical Accuracy The following are applied correctly: ▪ Spelling ▪ Grammar ▪ Punctuation	▪ Portfolio contains many spelling errors or grammatically incorrect sentences. ▪ Written material lacks punctuation or is not correctly punctuated.	▪ Portfolio contains a few spelling errors or grammatically incorrect statements. ▪ Written material lacks some punctuation.	▪ The Portfolio contains none or very few spelling errors. ▪ Material is in most cases grammatically correct. ▪ Written material is punctuated correctly.	▪ The Portf has no spelling e grammatically in sentences. ▪ Sentences well constructed. ▪ Appropria punctuation is us all written materi

Comments on improvements needed:

	☐ Unacceptable	☐ Developing	☐ Satisfactory	☐ Exemplary
Informative & Reflective In the Portfolio: ▪ Reflections are clearly stated. ▪ The material presented is pertinent. ▪ The Portfolio is appropriately focused for the audience	▪ The Portfolio lacks clear reflection. It is not pertinent to the Abilities & Skills demonstrated. ▪ The student has not focused it for the audience.	▪ Portfolio demonstrates Abilities & Skills but they lack adequate reflection. ▪ The material may fit but could be more pertinent. It lacks clear focus	▪ Portfolio reflections are reasonably clear. Materials are pertinent to the Portfolio but may need to be more tightly affixed to the Abilities & Skills. ▪ The focus of the Portfolio seems appropriate for the audience.	▪ Portfolio reflections are cl well focused for t audience. ▪ All the m used are pertinen well applied to th Abilities & Skill

Comments on improvements needed:

Technological Aspects	Unacceptable	Developing	Satisfactory	Exemplary
Multimedia Application Appropriate use of: ▪ Sound ▪ Pictures ▪ Video ▪ Animation ▪ Hypertext	▪ Resources add little or nothing to the content. ▪ Some resources are annoying with no aesthetic appeal.	▪ Resources do not add much content be do add minimal aesthetic appeal.	▪ Resources add to the content & contribute to aesthetic appeal.	▪ Resource: contribute much content and add : aesthetic appeal.

Comments on improvements needed:

	Unacceptable	Developing	Satisfactory	Exemplary
Organization & Interface Design ▪ The Portfolio is well organized ▪ The portfolio is easily navigated. ▪ Transition through projects is appropriate.	▪ The organization of the Portfolio is difficult to follow and the user is not given enough navigational structure to view the Portfolio. ▪ Buttons are not clearly labeled.	▪ The Portfolio shows some weaknesses in organization and navigation is unclear in places. ▪ It is easy to get lost and difficult to return to original screen.	▪ Materials are well organized. ▪ Navigation is available but may be lacking in some areas. ▪ Most buttons or hypertext is clearly labeled and easily located.	▪ The Portf shows strong, log organization. ▪ Navigatio easily understood available where necessary. ▪ Buttons : hypertext is clear labeled.

Comments on improvements needed:

	Unacceptable	Developing	Satisfactory	Exemplary
Visual Design Appropriate use of: ▪ Colors ▪ Backgrounds ▪ Graphic's size, quality, & placement	▪ Shows little understanding of visual design principles. * ▪ Colors & backgrounds are inappropriately used. ▪ Graphics are miss-sized or poorly placed. ▪ Screens are unbalanced and difficult to understand	▪ Shows some balance and harmony. Graphics and colors need to be improved. ▪ Follows few visual design principles. *	▪ The format shows balance and harmony. ▪ Appropriate colors are chosen and graphics are clean and easy to understand. ▪ The Portfolio follows many visual design principles. *	▪ A visual t Interesting to vie' appropriate color and positioning o graphics. The ▪ Portfolio : an understanding visual design prir *

Comments on improvements needed:

Projects appropriately reflect the Abilities required in the student's major.	Portfolio demonstrates the student has met the goals of the student's major at a level appropriate to a graduating senior.

Electronic Portfolios (EP): A "How To" Guide

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Abstract: This paper is provided to motivate and assist readers in establishing an electronic portfolio (EP) based on a guiding principle: Virtually anything can be represented electronically. This is not a step-by-step procedural or reference document as much as it is an explanation of important technical issues in the development of an EP. The value of an EP is discussed and compared to traditional formats, including helpful information for constructing and maintaining a professional portfolio in an electronic, technology-based format.

Introduction

Considering today's trends toward competencies over courses, as teachers must document and demonstrate those competencies, a portfolio is becoming almost more important than a transcript. As we evolve toward portfolios, so too must teachers adapt to a computerized environment – thus, electronic portfolios (herein called EP).

Virtually every pre and inservice teacher should have an EP. Warner and Maureen (1999) suggest that by developing an EP, teachers will learn important computing skills and knowledge that can directly impact integration into the classroom. But, it is believed that, frequently, a lack of understanding or knowledge of computing prompts teachers to compromise or settle for something less than ideal technological achievement. And, without reliable or sound leadership from advisors and faculty, inexperienced teachers are likely to weaken or undermine their goal of an electronic portfolio. Many faculty advisors in higher education are still not technology users and will likely fail to motivate and lead, let alone actually guide teachers to create an EP.

This paper is therefore provided to motivate and assist readers in establishing their EP (Campbell, Cignetti, Melenyzer, Nettles, & Wyman, 1997; Dampier Australia Primary School, 2000). This is not a step-by-step procedural or reference document as much as it is an explanation of important issues in the development of an EP.

What Value Is An EP?

It is a mistake to ignore the value and usefulness of an EP. A common phenomenon among most users of technology, benefits are discovered as a result of being users of technology that may not be initially obvious. Kind of a "being in the right place at the right time" notion. For those who already maintain a technological lifestyle it may be that an EP is a natural extension of their daily life and may be easily established. However, most teachers are not yet that involved and may need more awareness of the benefits provided by an EP.

Its useful to compare with non-electronic formats. Papers, documents, class assignments, tests, instructional materials, etc., can all be packaged in a variety of traditional ways. For example, common methods include ring-binders, folders, even boxes for storing large quantities of papers. Photographs are sometimes placed in photo albums or their original envelopes from developing labs. Video tapes, usually VHS format, are also included in storage boxes often large enough to hold all of these kinds of materials. So, with such a large collection of bulk, regardless of the convenience of binders and plastic containers and convenience products of all sorts, consider the following comparisons with this more traditional approach:

(a) Distribution. Consider applying for a job in another city, or providing one's portfolio to various agencies or organizations. Without the use of UPS, Federal Express or DHL, how does one quickly distribute such bulk to the interested parties? Too, with only one "original," once delivered it may be permanently gone. Retrieving the materials can be as difficult as giving them out. This may seem overly dramatized for portfolios made up of little more than a single ring binder. Not so. Although, possibly less significant, the problem is the same. A zip disk or CD-ROM containing a complete EP can be easily reproduced and quickly distributed as often as desired without any need for retrieval at all. Even easier would be a Web-based EP that can be provided to interested parties as quickly as a word over the phone or a simple email message over any distance.

(b) Quantity/Economy. There is always some cost involved in reproduction of anything. Computer media has diminished in cost considerably. At the time of this writing, zip disks are under $10, blank CDRs are around a $1 each, all without buying in large quantities. Any comparison with photocopying paper portfolios shows the economy and practicality of an EP. A Web site is in many cases completely free. In some cases, where a base fee is required, expansion and addition to the site costs nothing extra. None of these factors are true for traditional formats.

(c) Replication. It's much easier to make multiple copies for distribution. Both zip and CD media will hold large amounts of information of all types and they can be easily replicated. Computer files can be copied as easily as drag & drop. CD's are even easier to recreate once a CD "image" is created and saved. A new CD of a complete EP can be created with as little as two or three clicks. On the other hand, a Web page doesn't require any replication at all and is readily accessible to the whole world.

(d) Size. This is the most obvious advantage. The amount of material that can be placed on a zip disk or CD is equivalent to many binders or boxes and yet takes up virtually no space at all. Today, it is literally possible to walk around with a complete library in your pocket.

(e) Security. A computer file is far from secure. Any computer file can be easily lost either through oversight and error to more technical media failure. But, combined with the ease and economy of replication, backup copies can be easily created and stored in different places. The permanence and security of an EP is in the numbers. By producing a sufficient number of backup and storage copies, quickly and easily done, an EP can be maintained securely forever.

(f) Maintenance. Most electronic material can be easily modified. Certainly, any records can be updated with new material but some records are considered permanent. Generally, electronic computerized material is more easily modified and maintained. Of course, a video or sound clip, aside from minor editing and enhancements, is naturally limited to the original sampling. Quality can sometimes be modified whereas content is permanent. Nevertheless, the simple matter of copying, organizing, modifying and storing electronic material far exceeds the efficacy and utility of traditional hard materials.

(g) Versatility. Electronic media is obviously more versatile than traditional hard materials. That is, a ring binder of material is much more difficult to convert to an electronic format than to produce a hard copy from an electronic version. Even to directly replicate a set of hardcopy materials into additional hardcopies (photo copying) is still more difficult and costly than producing a hard copy from an electronic original. I.e., having an EP means you have both whereas having only a hardcopy version limits one, because of obvious practicalities, to only the one original.

(h) Quality. Certainly not the least concern is the higher quality provided by modern computerized formats. Research has shown that even hand-written material is evaluated higher than typed material – but neither is considered as professional or high quality as computer-generated products. Video, sound and photo material, even when transferred to hardcopy, has improved to rival original/traditional formats.

Electronic Documentation

A guiding principle is suggested: Virtually anything can be represented electronically. It must be assumed that a given entry can be represented in electronic form – even if not originally created in that form – so one addresses how to achieve proper form and structure rather than to resist or deny the objective. I.e., it is important to pursue a complete portfolio, with virtually any desired component included, in a form that would, for example, fit entirely on a CD-ROM. Note that even a fully posted Web site can usually fit on a single CD.

How to begin? An electronic portfolio can be very difficult to generate from scratch to accommodate previously stored material, documents, events and historical notes or products. It is very important to start early and generate portfolio artifacts in an electronic format from the beginning and to continue that processes throughout all subsequent work. While every student should have an EP, it is up to the individuals to do it themselves so the student or teacher must take the initiative, invest the time and do the work. Working one step at a time, generate and/or store the materials yourself. Specific strategies are suggested in Figure 1:

1. Virtually every single experience or product can exist and should be documented electronically.
2. Identify specific artifacts that denote accomplishments for each and every standard.
3. Produce the appropriate abstract or summary of each artifact when its identified as a portfolio entry.
4. Gather or develop electronic artifacts EA. when you first complete the project - don't procrastinate.
5. Distinguish between a developing portfolio DP. – work in progress – and the final or professional EP.
6. Organize a developing portfolio DP. according to the standards or principles of your program.
7. Store all electronic artifacts EA together with backups safely stored in completely separate location.
8. Frequently review the organization of your EP - every 2-3 months, or whatever is manageable.
9. Regularly review and update file formats for each EA to stay compatible with developing software.
10. Regularly review and update the media used for storage to stay technologically current.

Figure 1: Electronic portfolio (EP) development and maintenance strategies.

There are obviously more common sense notions about caring for computerized material but these 10 guiding principles will help facilitate transformation into an electronic lifestyle. Some of the implications and details for these strategies are discussed in a more concrete fashion below.

Details

An EP can be very difficult to create from scratch. It is very important to start early and generate portfolio artifacts in an electronic format immediately and to continue that processes thereafter. While every teacher should have an EP, only the teacher can do it. Take the initiative and, one step at a time, generate the materials needed. Start now and do the work for each potential artifact as they're created or as they occur.

EP Formats

Your final EP can exist in various media formats and will likely need to change formats from time to time. One reason is to stay current (see Strategy #9, Figure 1) and the other would be to provide material to a target audience in the format they need. Consider the following:

Floppy Diskette holds only very little (1.44 megabytes). This is not practical as a storage medium. In many instances, floppy drives are no longer included on today's machines. Too, many single graphic files and certainly sound and video files are much larger than a floppy's full capacity. Still, for smaller files, floppy diskettes are still useful for transferring and moving information.

Zip disk holds a lot of information in one of two common formats: 100 or 250 megabytes. It is conceivable that some EPs could contain more than 100mb. For example, in the case of numerous video or sound files. It would not be likely for mere print media (word processed files) to fill this much space. In any event, two 100mb zip disks could be used and information arranged in a fashion to make it user-friendly – for example, placing all print media on one and audio/video on the second.

Jaz disk wow, holds a great deal of information (1 gigabyte) but is not likely to be widely available. It is not practical to send a EP to an administrator or program director (maybe when applying for a job) if they do not have a compatible device.

CD-ROM Virtually all computers today (some older may not) have the ability to at least read a CD-ROM. Acquiring access to a CD-"burner" for creating permanently Recordable (CD-R) or ReWritable (CD-RW) CDs is becoming more common. A CD-ROM at 650 megabytes would hold all material for virtually any EP. The price is right. The size is right. The compatibility is right. Goldilocks would be happy.

Video Tape Traditional VHS tapes (analog video material) are still thought by many today to constitute a technological presence. That is, some believe that having portfolio material included on video tape (classroom teaching, presentations, etc.) constitutes having one's portfolio in a technological format. Even the newer digital formats (digital-8mm), while higher quality, still constitutes a non-computerized media and therefore has inherent limitations: hard to distribute, costly to reproduce, awkward to access. While such recordings are a natural part of recording events, such material should be viewed as raw data from which presentable excerpts are distilled – ultimately, digitized into computerized presentations.

There are other media available today including so-called super diskettes, portable/removable hard disks, and even "thumb"-drives. However, these items above are still the most commonly available media among average professionals.

A Beginning: Easy Stuff

The most obvious material that is EA ready would be any word processed document. It's already electronic. Certainly, the instructor may have required a paper version but keep the electronic version as well and transfer it quickly to your DP. That is, take each word processed artifact and copy it to your portfolio storage area (organized by the standards or principles to be demonstrated). This storage area or working portfolio is developmental (DP) would likely be modified regularly.

Create a word processed Table of Contents file (start one today) in which each EA is listed by file name. It should also show all related files together and where on the disk (or other media) the file(s) can be found (path). Not only is this of obvious use to other readers, after several semesters you too will be glad to have this guide. The format or style of this can be easily modified later but at least there will be a working DP and that's the most important thing.

Anything in Electronic Format? – Really!

Often students fail to realize that virtually anything can be represented electronically. Of course, it would be a big mistake to hand write your term paper and hire someone to type it on a typewriter leaving you no electronic format at all. But, even this can be scanned and stored on disk as an image file. The point is anything can be represented electronically.

OCR - *Optical Character Recognition*… means that scanning a document can recreate the material in a character-by-character format as if it was originally typed into a word processor. However, unless you are very, very proficient at using this type of software, it can be quite difficult and somewhat impractical. Scanning the document is fine but it will likely remain in a "picture" format.

Consider the following examples:

Example 1

Consider a possible worst-case example. Students in a mathematics class learn to cut and fold paper to produce dice then to be used to practice and reinforce mathematics concepts of probability and statistics. Even this can be included in your EP (even on a CD). A simple photograph or two of the materials, manipulatives, maybe including a student using the materials, could be scanned and stored electronically. The EA would include the electronic picture and maybe a word processed anecdote or announcement describing its design and use (like an extended caption for the photograph) and any data from pilot testing or suggestions for using the activity and manipulatives. In other words, anything can be represented electronically.

Example 2

You're teaching in a classroom and recording on videotape to document strategies, a lesson plan, classroom management or other issues. Often, videotape is considered a major part of an EP but its problems are described above. Videotape cassettes should become peripheral components of a portfolio that exist separately and in some other location. If your final EP is to be on CD then how can this format accommodate (and represent electronically) the video material from the videotape? A representative sample portion, 2-3 minute segment(s), could be digitized into a computer file playable by most video computer software and thereby included in the EP.

One format would be AVI format (audio/visual integration) and is very common. Today, a more condensed format that saves a great deal of space without sacrificing quality is MPEG formats. To do this, video-capture hardware and software are required and are usually add-on components to a traditional computer setup. Pure sound files would be WAV or the more compressed MP3 (mpeg) formats. Again, the point is clearly that virtually anything can be computerized – and should be if its to become part of the EP.

Filenames

Filenames can be an important factor in managing your system as quick and efficient file recognition can be important. Various products associated together should share similar filenames, including the summary or reflective abstract. For improved organization, name the abstract file similar to the artifact file(s). For example, if the artifact has a filename such as "Lesson Plan.Doc" then name the supporting abstract something like "Lesson Plan AB.Doc" Or, if the artifact has a filename like "Teaching Video.AVI" with a written summary named "Teaching Vid Sumry.Doc" then name the supporting abstract something like "Teaching Vid ABS.Doc" That way, sorting displays will keep the files close together in a list. Too, the reader can easily associate the files that go together and can find abstracts of other EA because the same style is used throughout the EP. For more information on filenames, see the section below on versatility.

Folders

While many arrangements can suffice, it is suggested that a series of folders be created which correspond to the standards or conceptual framework of the program. For example, the Indiana University Northwest, School of Education has a 9 part conceptual framework for its undergraduate program (Indiana University Northwest, 2000) and a 5 part framework for its graduate program. Maybe name specific folders for each standard or program areas and place EA within each of these folders. Of course, material could be further organized within those folders based on the nature of the EA itself. It might be advisable to describe the assessment/evaluation context and maybe include any associated evaluation rubrics. In any event, structuring your EA according to the standards or framework of your program may be important to convincingly support your achievements and competencies.

Good Habits

It is not acceptable to simply put each semester's data disk in a shoebox with all those of previous classes. There are a million ways to fail in developing your EP and none of them are technological. They are all a matter of organization, habits, commitment and procrastination. The files themselves must be copied to the storage area of your developing portfolio (DP). Ultimately, it doesn't matter if this is a zip disk or a hard disk folder so long as it is maintained and developed. Always have one central location for the DP - not a home computer for some things while other files are kept on your laptop computer.

All - repeat - ALL disks fail. If "Murphy's Law" ever had a home its in the world of technology. Don't wait for it to fail - save it early! Don't wait to lose it - back it up! Don't wait for it to disappear - keep a copy! DON'T PROCRASTINATE - REPLICATE!

Versatility

As technology changes in the future, any file may need to be readable by someone with slightly different technology. Most state-of-the-art word processors are cross-platform (works on PC's and Macs both) and will likely be available for years to come. While this author suggests Microsoft Office tools (word processor, database, spreadsheet, etc.) as the most versatile and reliable cross-platform software tools, many Word Perfect users might suggest Corel products. In any event, maintain files in a versatile and latest-version format. As new software products evolve from old, stored files in the DP may need to be updated or converted. Do not hesitate. This is part of the regular and frequent maintenance discussed above.

Sometimes files need to be in multiple formats. The filenames themselves denote specific file formats. For example, "Letter.Wpd" - the W.P.D. indicates that it is likely a Corel Word Perfect word processed data file. There are many ways to convert one file type into an alternative format - like changing a BMP file into a JPG file (both are graphics files). Figure 2 provides a list of very common file formats and the typical filename extension associated with that file type (of course there are many, many more). Remember, file formats can usually be converted from one to another with minimal loss of appearance or function. Some skills are involved but help resources are available on campus, on the Internet and more.

FILE.PDF	- Acrobat Reader File – Widely compatible, printable, searchable – Read only
FILE.DOC	- Microsoft - WORD word processed data file
FILE.WPD	- Corel Word Perfect word processed data file
FILE.RTF	- Rich Text File - Generic word processed file - some formatting
FILE.TXT	- Plain Text File - Generic data (text only) - NO formatting
FILE.XLS	- Microsoft - Spread Sheet data file
FILE.MDB	- Microsoft - Database data file
FILE.WK4	- Lotus 123 - Spread Sheet data file
FILE.BMP	- Bitmapped Graphics file
FILE.JPG	- Graphics file - suitable for pictures on the Internet
FILE.GIF	- Graphics file - suitable for clip art on the Internet
FILE.PICT	- Graphics file - typically a Macintosh file format
FILE.TIF	- Graphics file...
FILE.EPS	- Graphics file...
FILE.PPT	- Microsoft - Power Point Presentation file
FILE.STK	- HyperStudio Stack - file
FILE.HTM	- or .HTML - Web Page file for Netscape or Int. Explorer
FILE.MOV	- Movie file - QuickTime Video can include Sound
FILE.AVI	- Movie file - Video can include Sound
FILE.MPG	- Movie file – Mpeg - video & sound – high quality, small file ... Best
FILE.WAV	- Sound File - Various levels of quality & wide compatibility
FILE.MP3	- Sound File - extremely reduced file size with good quality ... Best

Figure 2: Filename extensions as indicators of file types.

Miscellaneous Notions

Material throughout the EP can be hyper-linked together (easy in Ms-Word) and to the table of contents to make viewing everything more convenient and efficient.

Use a digital camera to take pictures of products, events, situations and more that should be in the EP. You can also use any regular camera and then ask when developing that your photos be produced and returned on a disk or CD (already in electronic format). Or take the paper photos and scan them into a computer to be saved on disk.

For any "computer" tasks you're not able to perform yourself, help is available at campus computer services, from professors and friends and even your local Kinko's.

Other material beyond the EA that support program standards might not be prescribed by other portfolio outlines. Nevertheless, such peripheral and ancillary material can also be stored electronically and may even be included in the final EP (space permitting) under a head of "other."

References

Campbell, D.M.; Cignetti, P. B.; Melenyzer, B.J.; Nettles, D. H.; & Wyman, R. M., Jr. (1997). *How to develop a professional portfolio: A manual for teachers.* Needham Heights, MA: Allyn & Bacon.

Dampier Australia Primary School - Electronic Portfolio Links (2000). [Online] Available: http://www.dampier.wa.edu.au/portfolio.html [2000, January 7].

Indiana University Northwest – Conceptual Framework Initial Program (2000). [Online] Available: http://www.iun.edu/~edu/model.htm [2000, November 22].

Warner, M., and Maureen, A. (1999). Educational progressions: Electronic portfolios in a virtual classroom. *Technological Horizons in Education Journal. 27* (3). P. 86-89.

Electronic Portfolios:
A Glimpse into a Child's Education

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Abstract: Electronic portfolios use the purposeful collection of students' work, progress and the achievements of the paper portfolio and puts them together using technology that enhances and expands the delivery of the portfolio. A collection of multi-media work is far easier to present electronically than to find the perfect container to hold a students artifacts from preK-5. Electronic portfolios can include graphics, video, and sound, in addition to all that is included in a paper portfolio. There is no limit to these portfolios. Its creation is guided by the imagination of the creator. Similar to the paper portfolio, students can take a lead role in using technology to develop their own electronic portfolios. The Moravian Project involves incorporating electronic portfolios as an assessment tool for students and teachers alike.

Introduction

Approximately ten years ago, educational portfolios were introduced into academia. Teachers would collect student work. Sometimes the student would take an active role in this selection of work. The collection of student work models that of an artist and the artwork they completed. Artists use these portfolios when interviewing for jobs or pursuing advanced degrees in art. Students with an academic portfolio might use a portfolio for the same purpose. These portfolios would show a selected audience information that can provide far different insights into a students performance than a letter of reference or a report card. Therefore, as this movement worked its way further into classrooms, so too did the idea of using a portfolio, over time, for student assessment.

Portfolio assessment is the purposeful collection of student work that includes efforts, progress, and achievement to document growth over time and focus on the processes involved with learning (Weldin & Tumarkin 1999). While there might be as many different variations of portfolios as there are learners, most fall into three main categories: the celebration portfolio, the growth or project portfolio and the status report portfolio (Stiggins, 1997). All three types of portfolio have merit and benefit both teachers and students. However, the target audience for each of these types of portfolios vary and the type of portfolio selected to be used should be kept in mind by the creator.

Electronic portfolios use the purposeful collection of students' work, progress and the achievements of the paper portfolio and puts them together using technology that enhances and expands the delivery of the portfolio. A collection of multi-media work is far easier to present electronically than to find the perfect container to hold a students artifacts from preK-5. Indeed, electronic portfolios can include graphics, video, and sound, in addition to all that is included in a paper portfolio. There is no limit to these portfolios. Its creation is guided by the imagination of the creator. Similar to the paper portfolio, students can often take a lead role in using technology to develop their own electronic portfolios.

A Project at Moravian Academy

The Lower School teachers at Moravian Academy (preK-5) have been encouraged for the past 7 years to collect student work to create paper portfolios. These portfolios travel with the children through to the fifth grade. However, not all teachers followed through on selecting artifacts and sending them on to the next grade teacher. At present, portfolios were paper-based, not electronic.

The goal of this project is to establish guidelines so teachers and students will know what to select from each student and that each portfolio collected will follow the same criteria. Students will also take part in reflection and assessing their own work. In addition to establishing the guidelines for the teachers at each grade level, the project focused on implementing electronic portfolios as the next logical step to incorporate the enhanced technology that the school had to offer its teachers and students. The impact of this project would change the entire focus of these paper portfolios. Teachers will invite students to take part in the selection of pieces for their portfolio. This participation will allow them to reflect on why they choose these pieces. Therefore, the students will have far more ownership over their learning. Personal ownership over learning is key to the learner and is a key goal for our project.

Guidelines for Portfolio Implementation at Moravian Academy

The Pennsylvania Department of Education developed guidelines that can be used in portfolio implementation. In his text on student-centered assessment, Stiggins (1997) presented several guidelines to keep in mind when developing a portfolio. His list of "active ingredients" describes successful ways to incorporate a portfolio for student assessment and achievement. When the guidelines for Moravian Academy were developed several suggestions from both the Pennsylvania Department of Education's and from Stiggins' research were considered and fit into our criteria of *Collection, Selection, Reflection and Presentation*:

1. Maintain a sharp focus on what is the purpose and the target of the portfolio. Think big. Start small.
2. Rely on quality assessments as the foundation for quality work.
3. Plan in advance what the portfolio will tell by setting guidelines for what is placed in a portfolio.
4. Plan in advance how it is that a portfolio will be used within an existing curriculum.
5. Insure that administrators, teachers, students and parents have ownership over the project in some way and are supportive from the beginning.
6. Establish specific criteria for the assessment.
7. Share the entire process of implementation with the students: collection, selection, reflection **and** presentation.
8. Involve students in the process of selection.
9. Involve students in the process of reflection.
10. Setup a time line with due dates for works to be included (be flexible with this timeline).

At present funding is sought for the implementation of this project. A pilot study was conducted with one classroom and general guidelines were followed. This portfolio was then used by the student for self-assessment and by the teacher during parent-teach conferences. Teachers at Moravian Academy will work with education students from Lehigh University to implement the guidelines of the project. The students from Lehigh will work with each team of three Moravian teachers in grades preK-5 to implement student portfolios for each child. The Lehigh student will be responsible for training the teachers in the creation and maintenance of electronic portfolios, using the template and guidelines established from the pilot project. These students will also serve as resources and trouble shooter if problems should arise.

Conclusion

While an electronic portfolio or even a paper portfolio may be described and supported, through research, as a strong and viable academic tool, not all educators will have the desire or the need to adopt this tool. Understandably, it takes time, effort, and additional energy to develop school or classroom guidelines to integrate portfolios. Yet, many of our schools fail our students because of a lack of appropriate and proper assessment of individuals. Many students are not successful with standardized tests. Others perform better after reflecting on their own work and the strengths that go with their own learning styles. Portfolio assessment developed with strong guidelines allows for the strong test taker and the reflective learner to find success in their accomplishments. This success can provide educators and parents, alike, with an insightful and, perhaps, enlightening glimpse into a child's education.

References

Stiggins, R.J. (1997). Student-centered classroom assessment. Upper Saddle River, NJ: Prentice Hall.

Weldin, D. & Tumarkin, S. (1999). Parent involvement: More power in the portfolio process. *Childhood Education*, 75 (2), 90-95.

Electronic Portfolios: Developed by Preservice Educators to Show Teaching Skills and Philosophies to be Used by Future Employers

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Abstract: This paper is a report on the work that has been done by two undergraduate cohorts in the David O. McKay School of Education. Approximately thirty students are formed into a cohort at the beginning of their junior year and remain together while they complete their methods courses and teaching practicum. All students in the cohort begin creation of their electronic portfolio as they come into the program. Electronic portfolios have been created and analyzed for the purpose of helping preservice teachers formulate and articulate their beliefs regarding the education of elementary students, and to collect evidence of planning, management, teaching strategies, and assessment that would be in harmony with those beliefs. This departure from traditional paper portfolios utilizes video clips of studentsÕ teaching, other visuals, written plans, and assessment to show their teaching abilities.

Introduction

As teachers of the ÒPlanning, Management, Teaching Strategies, and AssessmentÓ course for elementary education majors at Brigham Young University, we were asked to explore ways technology might be integrated into the course. The course is part of the cohort experience which goes throughout the studentsÕ junior year while they are also taking other methods courses and completing their teaching practicum.

Strengths and weaknesses of the course were analyzed. In so doing, the question arose as to the real value of one of the assignments: student paper portfolios which were created to promote reflection, and as a means of presenting to prospective employers an idea of the strengths and beliefs of the student. In surveying students who had previously completed the course, almost all reported that employers showed no interest in looking at their portfolios. Principals frequently commented to the instructors that they looked like a voluminous looseleaf of papers that would require too much time to gather pertinent information about the studentÕs teaching.

It was decided that electronic portfolios might offer a better alternative for students to showcase their teaching skills. The use of concise, personal philosophical statements which would show their beliefs in the various aspects of teaching, coupled with still images, audio, and video clips, seemed to be a more authentic and interesting means of communication, as opposed to the traditional paper portfolios.

The Project

The prospect of electronic portfolios was discussed with the students, and for the first semester it was decided to give students the option of doing either an electronic portfolio or the traditional paper portfolio. Even though students were assured that their choice would not make a difference in their grades, all thirty students chose to utilize the electronic format.

Categories for demonstrating teaching skills were discussed, and eight categories were decided upon with the flexibility given to students to change, add, or delete areas based on their need and preference. The eight categories were: Effective Teaching; The Learner; Parent and Community; Diversity; Personal and Professional Development; Assessment; Classroom Management; and Curriculum. (The first semester, most students chose to use the suggested categories; many students in the second semester cohort chose other categories to better reflect their individuality.)

The evolution of the project has been dramatic. During the first semester, many major difficulties were encountered, which included: the instructorsÕ ability to use the technology; the availability of the necessary hardware and software; sufficient time for instructors to assist students with video transfer and compression; and students who lacked the technological skills to independently accomplish the project.

During the first semester, the computers and software required for video capture and compressing were only available in a graduate lab, which was inaccessible to our undergraduate students. Thus much of the teachersÕ time was taken up with compressing files and burning CDs so the students could import those files into their presentations. During the second semester, there was no change in the availability of hardware and software (with the exception of the purchase of two digital video cameras and a digital still camera); however, planning and organizing differently improved the efficiency of the projectÕs implementation.

Results

Feedback on the value of electronic portfolios was sought from six principals in the public schools where students were placed, along with colleagues and administrators from the David O. McKay School of Education. Most of the principals were excited about the possibility of the video portion of electronic portfolios, which they believed would allow them to get a better feel for the studentÕs personality and ability to relate to students. The principals preferred a CD as the medium to view the portfolios. Only one principal said he would not be interested in seeing an electronic portfolio, but stated the reason was that he did not have the necessary computer skills to view the portfolio. However, he felt that knowing the students had the skills to create an electronic portfolio would increase his interest in hiring them.

Feedback from staff and administration in the School of Education was, for the most part, positive. Suggestions for improvement were offered. The criticism most often heard was the lack of evidence of student reflection. As one student shared his electronic portfolio with his instructors and an administrator he stated that, ÒThe most valuable thing that came out of this was not doing the portfolio itself, but what I learned about myself and my teaching beliefs.Ó However, that reflection was not evident in his portfolio. Since then, personal discussions with other students have revealed they also shared the same sentiment as the student just mentioned. Based on the feedback, as future students are assigned electronic portfolios, reflections on their teaching will be included.

Future Project

B.Y.U has received a PT3 Federal Technology Grant which will provide much needed help for the expansion of this project. However, some of the greatest support has come from the administration in the David O. McKay School of Education. Upon our request, the following kinds of support are being given: (1) two digital video cameras were provided for student use; (2) a still digital camera was purchased; (3) multiple workstations for our undergraduate students are at the moment being set up, including necessary computers, compression software, video capture software, video editing software, CD burners, and Zip drives; (4) necessary technological skills will be taught to our cohort by the Instructional & Psychology Technology instructor. The administration has also offered to provide the needed assistance required by our students in the computer lab.

It is projected that creation of electronic portfolios will be done by all students in the College of Education at Brigham Young University.

Implementing Web-Based Portfolio Assessment in a Graduate Instructional Technology Program

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Abstract: Web-based portfolios are a solution to presenting learning in our Masters program because they allow students to play a key role in directing their own learning, to demonstrate creative design, and to conveniently access work on any platform. Students store learning artifacts on a department server, and confidentiality is guaranteed through a Web-based form that automatically enables password protection. New students take a required course to learn about technical procedures related to maintaining the portfolio, as well as strategies for selecting portfolio items and for composing personal reflections on their work. Students review and reflect on their own learning during each course so that they will have a clear timeline of their own learning. As students' understandings mature, they create connections among discrete learning artifacts, designing various interfaces to customize the presentation for multiple audiences. During their final semester, students review the entire portfolio to select items that demonstrate achievement of program objectives and write reflections to accompany each item. Students will compose a summative "epilogue" as one part of their comprehensive exam. Despite some anticipated challenges, initial informal feedback from students is positive, so we remain committed to further developing our portfolio assessment process.

The appeal of performance portfolios continues to grow as a form of assessment for authentic activities in Pre-Kindergarten to higher education settings. We have previously described our ongoing investigation of Web-based portfolio assessment as a requirement for students in our graduate Instructional Technology (IT) program (Pierson & Kumari, 2000). Our initial plans for a portfolio strategy in our IT program began with a series of goals: What should a student graduating from our IT program know and be able to do? What kinds of evidence will verify that the information and skills have been learned, and how would we be convinced that goals have been met? What hardware, software, and networking will support successful portfolios, and how will they be compiled? And, in general, how effective is our program at preparing future instructional technologists? These questions are aligned with successfully implemented portfolios discussed by others (Barton & Collins, 1993; McLellan, 1993; Niguidula, 1997).

The new portfolio assessment process has now been implemented in our Masters program, and already practice has both confirmed some of our plans and caused us to reconsider other strategies. We have framed our current understanding of the process with Barrett's (2000) stages of electronic portfolio development: Defining the Portfolio Context and Goals, The Working Portfolio, The Reflective Portfolio, The Connected Portfolio, and The Presentation Portfolio.

Defining the Context and Goals

Purpose and Benefits

We began by defining why we felt Web-based portfolios were a solution to presenting our students' learning. A distinct advantage of portfolios is the student ownership of learning. We have recently redesigned our program with clear performance objectives that students will meet upon graduation, and it was important for us that students play a key role in directing their own route toward demonstrating proficiency with the objectives. Electronic portfolios are an ideal collection and presentation format since the artifacts of learning in our program are almost entirely digital products, and the Web-based format holds particular promise as it allows students to demonstrate creativity in presentation and organization (Watkins, 1996), permits flexible access from anywhere by the student, faculty, fellow students, and potential employers, and eliminates issues of software incompatibilities on multiple platforms (Mills, 1997). We anticipate that portfolios compiled throughout a graduate program will make the connections among discrete courses explicit, eliminating the prevalent perception that course products are produced in isolation merely to receive a grade. Finally, we look forward to the ongoing feedback on the effectiveness of our program that portfolios will provide our faculty. Such feedback, we believe, can directly feed continuous improvement and development of the program.

Structure and Storage

Electronic storage options are numerous, however we felt the Web the most promising primary storage format due to its flexibility, accessibility, and compatibility. Upon acceptance into the program, each student is given permanent disk-space on a department server to be used for the duration of his or her studies. Students are the managers of their own portfolios, however a consistent hierarchy of file organization based on our course numbering system is encouraged throughout the program to ensure orderly storage and easy faculty access to assignments. The Web environment gives students the option to store learning products in the most appropriate format, including word processing, electronic presentation, HTML, multimedia, and even PDF.

To encourage honest reflection on their own learning, students are guaranteed that their reflections will be kept confidential. Therefore, designing a plan for secure storage of student work was a priority from the beginning of our planning. Students voiced early concern as they participated in the planning process that the Web environment would leave their work artifacts and written articulations open to the public. They worried that their original ideas could fall into competitors' hands, or that potential employers could stumble onto incomplete forms of work in progress, possibly giving false impressions of their abilities and jeopardizing future career options.

Restricting access to sensitive or personal material in the portfolios presents a unique challenge in system administration. The portfolio files are housed on a Linux server, which can be very daunting and cryptic for users not familiar with UNIX-based command-line interfaces. Rather than make such file manipulation a requirement for all students from the beginning of their programs, we chose instead to make the technology as invisible as possible. Enabling password protection normally involves creating encrypted password files and Hypertext Access Restriction files for the various directories. The account administrator developed a Web-based form that allows students to easily enter their Linux login name, password, and desired Web password along with the password protection options they wish. Most students create a "portfolio" directory within which they place individual course directories. It is this main portfolio directory that is generally protected, thus simultaneously protecting all files beneath that level. A ColdFusion backend engine translates the users' requests into commands understood by the Linux operating system which in turn sets up all of the appropriate files, permissions, and encryption data automatically. An added feature of our system allows faculty access to student assignments without having to keep tack of every individual password. Each faculty member's unique IP address is added to the access restriction files so that the server automatically recognizes the computer and grants access to the files without prompting for a password. These storage and security options continue to be refined as we think through creative solutions to new challenges. Our goal is to keep requirements as consistent as possible so that students will not have to spend time reworking portfolio structure in place of focusing on other coursework.

Required Introductory Course

The compilation and evaluation of performance portfolios is something most of our graduate students have not personally encountered, so to ensure a smooth transition to quality work selection and collection, we have restructured our Masters course offerings to include a beginning required course called "The IT Professional." Along with teaching basic technical skills necessary for success in the rest of our courses and assimilating our students into our program as a cohort group, this course serves the vital purpose of introducing the portfolio concepts and procedures. Students receive instruction on technical considerations related to maintaining the Web-based portfolio, such as organizational guidelines, file transfer procedures, and procedures for storing learning reflections. Students establish the focus of their portfolios by writing individual goal statements, exploring strategies for selecting portfolio items to represent a range of work quality and type, and learning to compose personal reflections on their work.

The Working Portfolio

Once the portfolios are established during the first semester in our Master's program, students collect and store learning products in accordance with course objectives in subsequent courses. As all course objectives have been written with reference to the overall IT program objectives, the portfolios likewise remain aligned. All faculty are moving toward explicitly stated requirements in the form of rubrics, often developed collaboratively with students. The use of rubrics focuses student attention on course expectations from the beginning so that they will be better able to frame their own learning and progress in relation to the course.

We recognize the need in the final portfolio product for a balance between student-selected items chosen to show personal learning and those items suggested by the faculty to demonstrate learning in accordance with program goals (Snyder, Lippincott, & Bower, 1998). For this reason, students will be encouraged to save everything created in relation to each course so that they will have a variety of items from which to select when chronicling their learning at the end of their programs.

The Reflective Portfolio

Our IT portfolios will be useful only if they transcend merely pleasing displays of completed work to instead make compelling arguments of a student's knowledge and skill. All courses require students to review their own learning progress, either for each assignment or at end of each semester, and to write a reflective essay describing their understanding of their learning at that time.

During the initial semester of this reflection writing, many of our students have struggled with this process. Few have been asked to think purposefully about their own learning prior to this course, and they have questions about what to include, how deeply to comment, and how detailed to write. In the required IT Professional course, we discuss components of reflection, and contrast exemplary and weak reflection examples. As instructors, we hesitate to give students the detailed prescriptions they desired, such as specifically how long reflections should be and what the finished products should look like. We have compromised by coming to a common, yet flexible, reflection structure:

1) **Identification**: what course objective the reflection refers to
2) **Context**: for what purpose the item was created (i.e., created specifically for this course requirement or created for a professional purpose and modified for the course)
3) **Procedures**: the steps that the student followed to create the product
4) **Evaluation**: how the student perceives the quality of the product, including strengths and weakness
5) **Goals**: any plans the student has for continued learning in this area.

In addition, following the first semester of the course, representative examples of reflections for each of the objectives will be available for future students to refer to as models. We frequently encourage originality in format, and have seen students take advantage of the opportunity to display their unique skills. While some reflections rely effectively on text alone, others incorporate screen captures of other work documents, images, and audio. We hope to progress in our own understanding of what constitutes acceptable demonstration of competency as students continue to stretch the limits of the standard course assignments.

Reflections written during each individual course retain students' immediate thoughts and concerns, so that at the end of the Masters program, students will not be required to guess at their thoughts months, and sometimes years, previously. Reflections are written so that students will have a clear timeline of their own learning, and are viewed only by the course instructor for the purpose of better understanding the student's progress and needs. In essence, each student is developing an individual theory of instructional technology as it relates to his or her own understanding.

The Connected Portfolio

By compiling the portfolios in a Web-based environment, students are able to not only store information and products, but to use the hyperlink capability to organize the presentation in such a way that demonstrates their unique understanding of their own learning. Students are charged throughout the process to be the managers of their own learning, and as their understandings mature, these connections among discrete learning artifacts can be flexibly reconfigured. Once basic Web-editing skills are gained through experience in the program, students can easily design a number of different front-end interfaces that will customize the presentation of their work for multiple audiences. Faculty may be guided through the portfolio in one way for, for example, and future employers may initially see something very different in look and organization. Considered along with the selected items and written commentary, the electronic interface and the navigational sequence serve as the ultimate demonstration of creative design and systematic development expected of IT graduates. The Web as both a technology and an interface enables the student ultimate control in portfolio creation and management.

The Presentation Portfolio

During their final semester in the program, students will be asked to review their entire portfolio, including the reflections written in each course, to select those items that they feel demonstrate their achievement of the IT program objectives. They will write reflective captions to accompany each item to rationalize the inclusion of the item in the presentation portfolio and to include personal reflections about attaining their learning goals. These captions will provide a unique comparative thread among skills and projects, enabling faculty or other audiences to evaluate learning products with the assistance of a student's "voice." Final portfolios will be stored in an accessible and portable format, such as CD-ROM.

It is our hope that the portfolios will ultimately highlight the interrelations among instructional theory, research, and practice evidenced in the products of learning and, furthermore, enhance the ability of each student to articulate these ideas. Such individual examination of learning evidence and subsequent reflection is not typical in our existing traditional written comprehensive exam format (Bali, Wright, & Foster, 1997; Barton & Collins, 1993), and we envision a time in the near future when portfolio assessment might replace the written comprehensive exam as a graduation requirement. This assessment would better reflect the constructivist teaching and learning philosophy and project-based nature of our program. As a trial of the effectiveness of student reflection on their own learning as a measure of achievement, students will be required to compose a summative "epilogue" as one part of their comprehensive exam to address specifically posed questions about their portfolio intended to synthesize understanding of theory and practice. Successful completion of the portfolio will conclude with the final step of a portfolio consultation with faculty advisors.

The Portfolio Process to Date

Masters students who began our program in Fall 2000 with this new portfolio requirement are presently completing their degrees, so we recognize that challenges will continue to arise. We have assessed portfolio components in individual courses, but have not yet reviewed entire portfolios; grading consistency and additional time commitments with this alternative assessment procedure may still pose problems. Initial informal feedback from students is positive, however, so we remain committed to further developing and strengthening our portfolio assessment process.

References

Barrett, H. C. (2000). Create your own electronic portfolio: Using off-the-shelf software to showcase your own or student work. Learning & Leading with Technology, 27(7), 15-21.

Barton, J., & Collins, A. (1993). Portfolios in teacher education. Journal of Teacher Education, 44(3), 200-10.

McLellan, H. (1993, March). Evaluation in a situated learning environment. Educational Technology, 39-45.

Mills, E. (1997). Portfolios: A challenge for technology. International Journal of Instructional Media, 24(1), 23-9.

Niguidula, D. (1997). Picturing performance with digital portfolios. Educational Leadership, 55(3), 26-29.

Pierson, M. E., & Kumari, S. (2000). Web-Based student portfolios in a graduate instructional technology program. In the Proceedings of the Society for Information Technology in Teacher (SITE) 2000 Conference.

Snyder, J., Lippincott, A., & Bower, D. (1998). The inherent tensions in the multiple uses of portfolios in teacher education. Teacher Education Quarterly, 25(1), 45-60.

Watkins, S. (1996). World Wide Web authoring in the portfolio-assessed, (inter)networked composition course. Computers and Composition, 13(2), 219-230.

Electronic Portfolios: Technology Integration and the Preservice Teacher

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Abstract: With the implementation of national standards addressing technology, teacher preparation programs are faced with the issues of preparing teachers to effectively use and to seamlessly integrate technology across content areas. A team teaching approach at the University of Alabama required its secondary methods students to produce electronic portfolios during spring 2000. The teaching team consisted of secondary education language arts and social studies faculty, instructional technology faculty, and graduate students from both disciplines. This effort of modeling technological best practices resulted from numerous team meetings, intensive planning, and consistent project evaluation.

Introduction

The secondary education methods courses at the University of Alabama have traditionally incorporated technology on a limited basis. However, as the result of a team teaching approach, and in answer to technology integration needs the preservice teachers were required to attend technology seminars as part of regular classroom and methods work. Students were evaluated on their electronic portfolios that consisted of websites, digitally edited teaching episodes, databases, concept maps, and more. Through pretest and posttest surveys, the students were assessed on their perceptions of an electronic portfolio's value and their ideas of how technology can enhance teaching and learning in future classrooms. This session presents a discussion of the results from these assessments, procedural details, and the challenges and successes experienced by the teaching team and the students. Examples of student produced portfolios were presented along with ideas for developing a similar project in a variety of educational settings.

As educational technology standards are implemented, it becomes increasingly important for teacher preparation programs to model and to use technology. This presentation shares research from the trials and successes of how a teaching team and preservice teachers created electronic portfolios to increase use and applications of technology in the classroom.

Literature Review

Lankes (1998) defines electronic portfolios as a "purposeful collection of student work that exhibits the student's efforts, progress and achievements" (p. 18). Electronic portfolios differ from traditional portfolios in that information is collected, saved, and stored in an electronic format (Barrett, 1998). Electronic portfolios allow students to demonstrate problem-solving and critical thinking skills using authentic and performance based assessment (Campbell, Cignetti, Melenyzer, Nettles, & Wyman, 1997, Meyer, 1992). While more research is required to assess the effectiveness of electronic portfolios with pre-service teachers, existing research suggests that there are benefits to be gained from use with pre-service teachers (Herman & Morrell, 1999).

Numerous advantages related to the use of electronic portfolios are suggested by the literature. Bull, Montgomery, Overton, and Kimball (1999) write that electronic portfolios promote learner self-evaluation even as they maximize the use of diverse learning strategies. Barrett (1997) agrees with this assertion adding that electronic portfolios allow students to demonstrate problem-solving skills even as they are compelled to take responsibility for their learning. Campbell, Cignetti, Melnyer, Nettles, and Wyman (1997) argue that out of this learner responsibility comes a degree of control over the learning process and over the process of becoming a professional educator. The work of Herman and Morrell (1999) support this assertion as well. Throughout the process students are actively involved in their own assessment (Cole, Ryan, Kick, & Mathies, 2000).

The effective use of the medium requires ongoing evaluation (Barrett, 1998; Cole, Ryan, Kick, & Mathies, 2000), both on the part of the instructor and of the student. Cole, Ryan, Kick, & Mathies (2000) conclude that the central advantage of all portfolios, not just electronic, is that the instructor is able to assess the student's process of learning. Evaluation, requiring teamwork, creative thinking, and reflection (Bull, Montgomery, Overton, & Kimball, 1999), goes beyond the limits of the traditional classroom. Herman and Morrell (1999) argue that electronic portfolios shift the balance from teacher-centered learning to student-centered learning. Multiple sources of evaluation combined with self-evaluation encourage pre-service teachers to recognize and address individual strengths and weakness (Corbett-Prez & Dorman, 1999; Herman & Morrell, 1999). Herman & Morrell (1999) are convinced that electronic portfolios encourage students to "review their individual teaching values and frame the issues that they feel are vital to the learning process."

Barrett (1998) and Lankes (1998) maintain that electronic portfolios are an attractive method of alternative student-assessment. However, issues relating to this electronic format must be addressed before requiring students to engage in this type of assessment (Corbett-Prez & Dorman, 1999). Research suggests that the implementation of an electronic portfolio project requires considerable investment of time and effort on the part of the instructor and the student (Linn & Baker, 1992; Cole, Ryan, Kick, & Mathies, 2000).

Findings

The team teaching approach assisted in the overall success of the electronic portfolio integration project and has continued to be a model at the institution of this study. The evaluation process was important and has helped to enhance the accessibility of and support in using the technologies for teaching and learning. Efforts have continued and since technology is ever changing, the evaluation process of how to effectively use technology as tools for teaching and learning must continue. To that end, our teaching team remains committed to reflective planning for, using, and evaluating technology in instruction. As our efforts grow to include more faculty, in-service teachers, and pre-service teachers in other content areas, we are excited about the possibilities and understand the challenges. Our focus remains good pedagogy; therefore, our technology efforts will continue to be research-based, reflective, and appropriate across the various content areas.

References

Barrett, H. (1997). Collaborative planning for electronic portfolios: Asking strategic questions. [Online]. Retrieved May 2000 from the World Wide Web: http://transition.alaska.edu/www/portfolios/planning.html

Barrett, H. (October, 1998). Strategic questions: What to consider when planning for electronic portfolios. Learning and Leading with Technology, v26, p. 6 -13.

Bull, K. S., Montgomery, D., Overton, R. & Kimball, S. (March 1999). Developing collaborative electronic portfolios for pre-service teachers in computer mediated learning. Rural Special Education for the New Millennium. Conference Proceedings of the American Council on Rural Special Education (ACRES).

Campbell, Cignetti, Melenyzer, Nettles, & Wyman, (1997). How to develop a professional portfolio: A manual for teachers. Boston: Allyn & Bacon.

Cole, D.J., Ryan, C. W., Kick, F. & Mathies, B.K. (2000). Portfolios across the curriculum and beyond. Thousand Oaks, CA: Corwin Press, Inc.

Corbett-Perez, S. & Dorman, S. M. (August, 1999). Technology briefs. Journal of School Health, vol. 69, 6, p. 247.

Fulton, K (1998, Feb.). Learning in a digital age: The skills students need for technological fluency. T.H.E. Journal Online. Retrieved October 12, 1999 from the World Wide Web: http://www.thejournal.com/magazine/98/feb/298feats.html

Herman, L. P. & Morrell, M. (June , 1999). Educational progressions: Electronic portfolios in a virtual classroom. The Journal, 26, 11, p. 86.

Lankes, A. M. D. (April, 1998). Portfolios: A new wave in assessment. The Journal, vol. 25, p. 18.

Linn, R, & Baker E. (1992). Portfolios and accountability. CREST. Retrieved May 2000 from the World Wide Web: http://www.cse.ucla.edu/CRESTHome.html

McKenzie, J. (1999). Reaching the reluctant teacher. Retrieved May 29, 2000 from the World Wide Web: http://www.fno.org/sum99/reluctant.html

Meyer, C. A. (1992). What's the difference between "authentic" and "performance" assessment? Educational Technology, 33, 3, p. 34- 45.

The implementation and Integration of Web-based Portfolios into the Proteach Program at the University of Florida

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Abstract: This paper describes the development and implementation of the electronic portfolio program in the College of Education at the University of Florida. Beginning in the fall of 2000 all students entering the Proteach Program were required to develop electronic portfolios. Prior to this initiative an elaborate infrastructure was designed to support both the students and faculty involved with this innovation. Each student's electronic portfolio is viewed as a dynamic, interactive document that is developed over the student's entire college experience and may continue to develop indefinitely. It will contain illustrations of how the student has met Florida's Accomplished Practices, the student's professional goals and achievements, biographical information, and a personal teaching philosophy. Methods of developing electronic (online) portfolios are shared, ways of integrating these portfolios into practice are discussed, and an illustration of sample contents is reviewed.

Background

Preparing teachers for the 21st century has been a concern for both political and educational leaders in this country for the past two decades (Dede, 1995, Papert, 1999). This problem is compounded by the fact that "today a very substantial proportion of people are engaged in work, in jobs that did not exist when they were born and that number is increasing (Papert, 1999). NCATE has challenged higher education to incorporate technology across the entire teacher education program, not just as a "computer literacy" class added to the existing curriculum (NCATE report as quoted in Piper & Eskridge, 2000). In addition, the National Council of Teacher Accreditation (NCATE) requires its accredited schools of education to provide adequate access to computers and other technologies, and expects faculty and students to be able to use it [technology] (Major Themes of NCATE Standards, 2000).

In the past, professors were held accountable for what students learned. If parents or accreditation organizations wanted to know what students were learning, they asked the professor for a list of course objectives or an outline of the curriculum. Florida's Department of Education began measuring mastery of the state's accomplished practice standards by examining samples of students' work. Students' work is also the focus of assessment procedures used by many private funding agencies.

Because student work is to become part of the evaluation of our institution, we decided to develop an infrastructure for the development, storage, and presentation of student documents. In our model, each student will create, manipulate, refine, and collect evidence of his or her academic accomplishments. We intend to emphasize this procedure throughout the entire program of study.

In the literature, the word *portfolio* is usually accompanied by the word *assessment*. In our view, the descriptor "assessment" severely limits the potential of an electronic portfolio, and creates a perspective on the portfolio building process which undermines its distinctiveness and perhaps much of its value. Portfolios should help "learners become integral and conscious participants in the learning process" (Courts & McInerney, 1993). We feel that the role of the learner in the learning process is central to the development of electronic portfolios. If we are to use portfolios effectively in our preservice teacher program we must view portfolios as learning tools, rather than as end products. The portfolio itself has powerful pedagogical import and should have the "potential to inform learning" (Krause, 1996).

Purpose

Our students' electronic portfolios will contain proof of their proficiency on a set of Florida Accomplished Practices. These portfolios will then serve multiple purposes: students' self assessment and reflection about their learning, student maintenance collection and selection of the contents of the portfolio (maintenance), and the evaluation of our institutional performance in educating preservice teachers. Each student's portfolio will serve as an interactive document which will become the focus of an on-going reflection process. Students will be making decisions continuously about how to best represent themselves to their instructors, their peers, and their potential employers.

Rather than viewing the portfolio as a product or a container for holding students' work, we view it as an organic, evolving document which informs learning. While summative electronic portfolios can include (a) a representative sample of a student's work, (b) proof of accomplishment of accepted practices, (c) illustrations of outstanding achievement, (d) information about a student's goals and aspirations, (e) personal statements, and (f) a personal vitae and other documents relevant to future employment or academic development, formative portfolios offer a working environment for revision and reflection. Formative portfolios might contain works in progress, sample layouts, collaborative work including the work of others, and reference documents under consideration. For this reason, we believe that electronically stored portfolios should have public sections and secure, private developmental sections.

Structure

Although we want to support and encourage student decision making, it is important for those who must access student portfolios to be able to find specific information quickly and easily. Therefore, the index or home page for each student should be relatively uniform. Figure 1 contains an example of a sample student portfolio:

Name
University of Florida
College of Education
Proteach Portfolio

Florida Accomplished Practices
Courses
Teaching Philosophy
Professional Goals and Achievements

Resume
Personal Page
Links Page
Affiliation
Hobbies

Figure1: Sample Student Portfolio

Each category links to a page or pages developed by the student. Although the *format* of the index page is clearly defined, content development should remain flexible and student centered. Portfolios are very personal. Student creativity and reflection are important consequences of the portfolio development process. Portfolios not only encourage students to make decisions, they encourage students to reflect on their work. As Krause (1996) states, "Portfolios allow numerous opportunities for the learner to think flexibly and nonlinearly about how and to what degree learning and change over time have occurred." We have discovered that when planning portfolio implementation, there is always a great deal of discussion about student reflection. However, as the process becomes formalized, the portfolio specifications become more rigid and inflexible. We believe that preserving room for reflection should be a high priority when institutionalizing the use of portfolios.

Support

When the possibilities for acceptable completion of an assignment are widened to include more information channels--for example video, sound, or graphics--support for the student is essential. By building an infrastructure that attends to students' needs while simultaneously informing the learner, we hope to empower students to express themselves in more ways than text alone. In our model, the instructor of each course provides examples of how the course integrates with standards and/or curricular goals, as well as multiple ways in which this may be accomplished.

Next, instructional design students and/or student assistants analyzed the illustrations of acceptable work provided by the instructors and online support systems were developed. These support systems contain information sheets, tutorials related to the specific skills, descriptions of the accomplished practices or other standards, external links to pertinent references, video clips showing examples, a list of frequently asked questions, misconceptions, typical sample problems, and other helpful information. In addition, brown-bag seminars, workshops, and question-and-answer sessions, as well as one on one meetings with both faculty and students are held to provide additional support for specific endeavors. The goal of the support infrastructure is two fold: to help students improve their performance without making decisions for them, and to attend to the needs and concerns of faculty without adding additional work.

Using portfolios as a forum to demonstrate the accomplishment of given practices transfers a great deal of responsibility to the students. Decisions on how to best demonstrate their competence, such as which information channels to use (video, audio, photographs, text-based anecdotes, etc.) should remain with the students. Portfolio development increases the number of decisions students have to make about specific assignments, goals, and/or tasks.

Conclusion

Portfolios may be used effectively to model 21st century uses of technology to preservice teachers. As we watched our students create portfolios, we noticed collaboration and the sharing of ideas among students. As students began to reflect on their work and their learning experiences, they began to discuss ideas with their peers. Soon a healthy competition developed and their work clearly evolved. Many of them incorporated more advanced web development techniques and spent a considerable amount of time doing so. We are also happy to report that students have begun to drive this initiative. Faculty interest and participation has increased due to their exposure to student portfolios, and collaboration across colleges has occurred because of student suggestions.

We continue to have many questions about portfolio development. As our formal implementation plans are developed, we will attempt to determine how portfolios contribute to student learning. We will try to learn how to support a higher level of student reflection, an increased sense of ownership in our students' knowledge development, and an increase in students' self-esteem. We believe that by managing the vast amount of information in their portfolios, by deciding how to build a public representation of their accomplishments and of who they are, and by trying to integrate the various components of their public and personal histories, our students will develop skills and perspectives that will serve them well in the future.

References

Courts, P.L. & McInerny, K.H. (1993). *Assessment in Higher Education: Politics, Pedagogy, and Portfolios.* Westport, CT: Praeger.

Dede, C. (1995). Testimony to the U.S. Congress, House of Representatives, Joint Hearing on Educational Technology in the 21st Century. *Committee on Science and Committee on Economic and Educational Opportunities*. Online Publication http://www.newhorizons.org/article_dede5.html

Eskridge, S., and Piper, C. Electronic Portfolios in Reading Methods Courses, *S.I.T.E 2000 International Conference Proceedings* .November, 1999.

Krause, S. (1996). Portfolios in teacher education: Effects of instruction on preservice teachers' early comprehension of the portfolio process. *Journal of Teacher Education,*

NCATE Standards, (2000). Available online at http://www.NCATE.org

Papert, S. (1999). *Vision for Education: The Caperton - Papert Platform*. Essay written for the 91st annual National Governors' Association meeting held in St. Louis, Missouri in August of 1999. . Online Publication http://www.papert.org/articles/Vision_for_education.html

Easy methods and media for creating electronic CDROM portfolios

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Abstract: This paper seeks to outline a practical solution to creating electronic portfolios using the CDROM, which has traditionally been expensive and inaccessible in educational environments (Barrett: 1994). CDROM portfolios allow for easy updating and are a physical, sophisticated example of student work. They allow for storing large files and data types of students' work. The process of creating CDROM portfolios was at one point complex and difficult to learn and to teach. In this article, the authors outline methods that are in effect easy to learn and to teach. The authors have found that all errors are reduced when the artifacts for the portfolio are organized for presentation, mastered as an ISO 9660 or CD image and the image is then burnt to the CDR.

Electronic portfolios have undoubtedly become a critical component of authentic assessment methodology in education today (Barrett, 1999). E-portfolios as we have come to know them, have become popular among educators in all environments from k-12 to higher Ed. Aschermann, (1999) argues that e-portfolios are " a tangible collection of a student's best work". This perception has made e-portfolios very popular among educators and students. The portfolio provides both teachers and students with examples of what a student can do rather than merely relying upon a transcript of grades or formal evaluation forms.

Today both at the k-12 level and in higher-ed environments, e-portfolios are largely replacing notebook or ring binder portfolios (Lankes, 1995). The media to which we store e-portfolios however are not standardized. Traditional portfolios consisted of three ring binders or notebooks with printed copies of documents (artifacts) organized into specific categories. The content would differ from student to student but the media was largely paper-based. This meant that viewing or authoring a traditional portfolio relied on traditional methods such as word processing, printouts and the reading of documents from the binder. This portfolio required no special software to read or view its pages and was portable by just walking the portfolio from one person to the next.

This paper seeks to outline a practical solution to creating electronic portfolios using the CDROM, which has traditionally been expensive and inaccessible in educational environments (Barrett: 1994). The process of creating CDROM portfolios was also complex and difficult to learn and to teach. The methods outlined here are in effect easy to learn and to teach. Importantly too, the methods make portability, replication and updating CDROM portfolios easier for students and educators alike.

Electronic portfolios offer an important point of departure from traditional portfolios. Through their reliance upon the use of multimedia technology, teachers and students are allowed the flexibility of storing artifacts in different media types (Barrett, 1999). Most e-portfolios today are created with one or a number of types of software applications. These applications are of two types, generic software packages that can be employed for the purposes of creating electronic portfolios and commercial packages designed for creating electronic portfolios (Barrett, 1999).

The most popular type of e-portfolio is the Hypertext or HTML based portfolio. This is largely because the HTML portfolio is often published to the World Wide Web, where students can view it and share it with other recipients. In this environment, an e-portfolio becomes a showcase of skill, ability and work quality. Compared to traditional paper-based portfolios, web-based e-portfolios, for students and teachers alike, become a tangible expression of high quality work and skill. Carefully organized graphic and multimedia features and interface elements can reinforce website structure, and ease the user's cognitive load (Cafolla & Knee, 1997)

HTML web-based portfolios offer ease of editing and updating because students can often update their webs from home or from the school's computer lab. The declining cost of software has helped this portfolio-publishing environment because many HTML editors are free and some come standard on most personal computers today. Importantly too, HTML based portfolios are convenient because all that they require for viewing is a standard web browser, which today is free and is also standard on most personal computers. Students can also produce the projects they create and learn valuable multimedia creation as well. All this can be done for a very small investment of funds, (Knee, Musgrove & Musgrove, 2000). Despite the convenience, ease and flexibility of HTML portfolios, there remain a number of disadvantages when they are published to the Internet. Many school and home environments lack Internet connections that are necessary to view web-based portfolios. Classrooms that are housed in portables for example, often do not have access to the Internet, it means that publishing or viewing of web-based portfolios in this environment is not possible.

Security and protection of student work is perhaps that greatest detraction away from web-based e-portfolios. Banner ad content on free web services is often inappropriate in the k-12 environment. Furthermore, students' work is in no way protected. Pages on free webspace providers often contradict acceptable use policies of school districts where linking to external servers is disallowed. Additionally, viewing many websites that are published on free services are blocked by proxy servers and firewalls on the school's Intranet.

A more convenient way to publish HTML based portfolios is on a *Compact Disk - Read Only Memory* (CDROM). Traditionally some educators have avoided authoring CDROM portfolios with their students because of expenses and problems that have been associated with them (Aschermann 1999: Jackson 1997). Jackson (1997) has discussed the limitations of creating e-portfolios on CDROM, these problems included how many copies of the CD to create, how would the CD be updated outside of the school environment, how would the CD be kept compatible across all computing platforms and where would students and schools find the expensive equipment needed to master CDROMS.

CDROM Portfolios

The CDROM presents an important element in electronic portfolio creation for a number of reasons. In one sense, there is the practical reason and the other is the cognitive interactions which CDROM portfolios engender. Practically, CDROM portfolios: Are lightweight and small; are portable – can be viewed where no Internet connection is present; allow for easy updating; are physical, sophisticated example of student work; allow for quick and easy organization, indexing and searching. Additionally, CDROM portfolios are not easily limited by external factors such as the deficit of an Internet connection, slow modems, or slow network connections they allow student work to be protected and their privacy maintained. Furthermore, they allow for expansion over time and grade levels; they allow for storing large files and data types of students work.

On the cognitive plane authors such as Fischer, (as cited in Chappell and Schermerhorn, 1999) has noted that the move from a paper based to hypertext portfolios (on CDROM or on the web) affect student thought processes. They confer that hypertext encourages "multifarious ways of thinking" in juxtaposition to linear thought processes involved in creating paper-based ring binder portfolios. In this context, therefore electronic portfolios allow students to: engage in more interactive problem solving skills; engage in deeper logic order and sequential thinking; engage in project planning and implementation; engage in applying cognitive theories of thinking and learning.

One important advantage of CDROM portfolios is their size. Most CDROM disks have a 700MB capacity the equivalent of nearly 500 high-density floppy disks or 300,000 typed pages; it therefore means that students can store a large amount of data on a CDROM disk. Web published portfolios however are often restricted by server space due to high volume use.

Problems with creating CDROM portfolios

CDROM portfolios have however been criticized for a number of reasons. Some educators have argued against CDROM portfolios because of the cost of the hardware and software tools that are needed for the creation of CDROM portfolios (Barrett 1994). However from the authors' perspective at this point in time the cost of CDROM Drives and CDR/CDRW media disks have been significantly lowered. This occurrence has provided the opportunity for educational institutions to acquire these tools at a more reasonable cost. Furthermore, CDRW drives have become standard on most personal computers for sale in the open market. It therefore behooves us as educators to tap into the proliferation of these devices by having our students learn effective ways to use them in accomplishing their learning goals.

Others have argued that electronic CDROM portfolios do not allow for easy updating compared to web-based portfolios. We argue however that the methods that we have employed to create CDROM portfolios in fact lend themselves to easy updating and easy learning for students and teachers alike. Another criticism of CDROM portfolios is that they are not portable across different personal computing platforms because of incompatible disk formats.

CDRW Drives • Internal - 10X Recording (CD-R), 4X Recording (CD-RW), 32X Reading (Max.), $272 • External - 6x read, 4x write, and 4x re-write external; $268
CDR Disks • Pack of 10 $17.00
CDRW Disks • Pack of 10 $48.00
Software Costs • Adaptec Easy CD Creator v4.02 $79.99 • CDEveryWhere (Shareware limited to 50MB image) $39.99

Table 1: Cost of CDRW drives and Media as of November 1999.

For example, the disk format of a Macintosh pc is different from that of a Windows based pc, where CDROMs are concerned neither platform will read the other's disk. Although there is a point at which this is a legitimate criticism, the process we propose allows for the creation of a portfolio that can be viewed in the Macintosh, or Windows format.

Hardware considerations

Within a few years CDROM drives have moved from a luxurious accessory to an inexpensive necessity on personal computers. Today Compact Disk Rewriteable (CD-RW) drives are now standard on most windows PCs. CDRW disks and CD-Recordable (CD-R) disks are easily available in most stores (for cost estimate see table 1). In an educational context CD-R media is preferable because of their low cost. It however means that there needs to be a CDROM creation process that is error free, or at least where errors are kept at a minimum. The process we will outline will eliminate, or at least offset many of the technical problems associated with creating CDROM portfolios.

Software Considerations

The most critical component of CDROM creation is appropriate software. As educators we are interested in software that is intuitive, easy to learn and easy to share with our students in restrictive periods of time. In the world of CDROM creation there are two basic types of software, the proprietary kind that ships with the CDROM burner from the manufacturer and retail software that can be purchased, separately from the device. We suggest purchasing Adaptec's Easy CD Creator deluxe 4. Portions of this software often ships with some CDROM burners; these versions will also work for our purposes. The retail version sells in stores or on Adaptec's website for $79.00.

In CDROM creation software conflicts are usually responsible for a large number of errors. Software manufacturers usually advise that only the CDROM creation software run at each burn. This can sometimes be inconvenient. We have found too that badly fragmented Harddrives, anti virus software and other software applications also cause the CD creation process to often result in errors. The process that we are outlining below can be accomplished even when other applications are running on your computer.

Creating a universal portfolio – the process

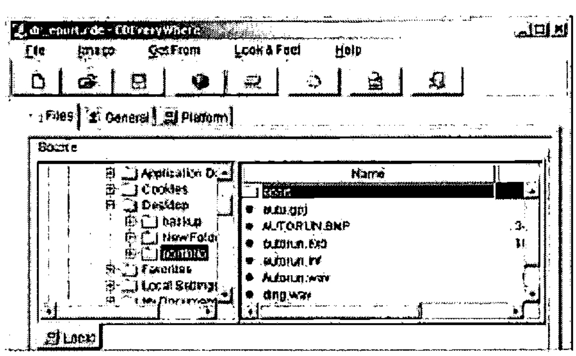
In creating CDROM portfolios the authors have found that all errors are reduced when the artifacts for the portfolio are organized for presentation, mastered as an ISO 9660 or CD image and the image is then burnt to the CDR media. The ISO 9660 file system is a standard CD Rom system authorized by the International Standards Organization (ISO), that allows you to read the same CD-ROM whether you are on a PC, Mac, or other major computer platform. Almost all computers with CD-ROM drives can read files from an ISO 9660 file system (Apple Development Connection 1998).

Making a CD IMAGE

Creating a CD image or ISO 9660 reduces error considerably. Also this approach allows for faster creation of a CDROM portfolio since burning the image to disk is faster than organizing, assembling and burning the files through the CDR software. To make a cd image we use a demo version of CDEveryWhere. CDEveryWhere allows the creation of a CDROM image that is portable across the popular pc computing platforms i.e. Macintosh, Windows and Linux. The program can be downloaded from (http://www.cdeverywhere.com). The version that we use allows for the creation of an image that is 50MB in size the paid version costs $39.95 and allows for a full CD image of 700 MB to be created.

Using CDEveryWhere

After the opening splash screen and the end user license agreement (EULA), the demo version of CDEveryWhere v.1 asks the user to agree to register, if you select register later the opening screen appears. To create an ISO9660 image you must first select the files. Under the source window navigate to the disk that has the portfolio artifacts that have been organized. In our case it is the folder called portfolio that has been selected.



The contents of the folder are exposed here in the Name window

Figure 1: You can navigate to your gathered artifacts in the source window of CDEveryWhere's interface.

The contents of the portfolio folder are then dragged from the Name window into the all platforms tab below. Please note that if All Platforms is not selected the CDROM will only work on the platform that is selected. We can now create the ISO 9660 or CD image by clicking on the Create CD image file icon as indicated below.

A dialog box asking for a save location appears.
Select a save location
Give the image a name.
Select Create

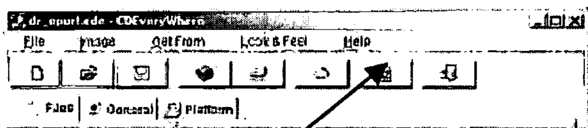


Figure 2: Click on the Create CD image button to begin the creation process.

The program then goes through the process of creating the image. A green checkmark indicates the completion of each step in the process. A red arrow indicates that the program is still completing a step.
When the process is complete, all steps have a green checkmark.
You then select the Close button.
When this step is complete the CDROM image is ready to be burnt to a CDRW or Recordable.

Using Adaptec Easy CD Creator. To burn the image to CDROM simply place a cdr or cdrw into your CD Burner.
Open Adaptec Easy CD Creator
The opening screen appears

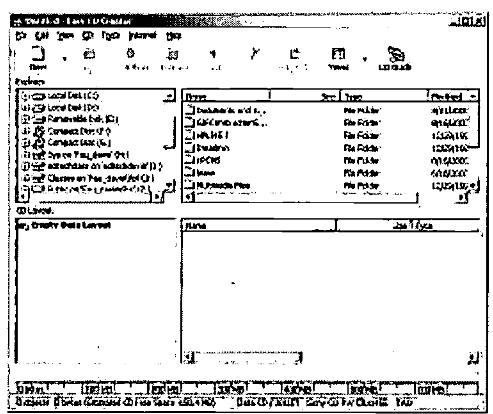


Figure 3: The opening screen of Easy CD Creator.

From the file menu choose Create CD from CD Image. The following dialog box appears. Browse to the CD

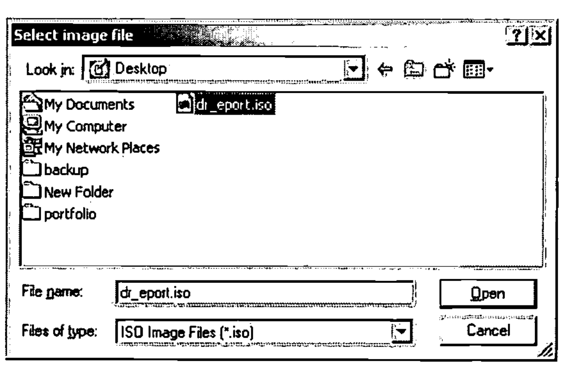


image that was created. Make sure that the Files of type dialog box is set to ISO image files.
Select Open
The CD Creation Setup dialog box appears.
Leave the settings as they are:
Click on the OK button
The CD Creation Process dialog box appears:
The program then goes through the steps of burning the CD image to the Recordable disk.
When the steps are complete, the Recording Phase indicator goes to 100% and a successful completion message appears. Students could go ahead and end the process by Clicking on the OK button.

Updating the CDROM

A CDROM created in this fashion is easily corrected and updated. The process is simply to edit the artifact of choice, recreate the CD image and then burn the corrected CD image to a new cdr disk. Educators are encouraged to use CDROM based electronic portfolios because they ensure that students' work will be protected and the privacy of students are safeguarded. In the school, environment CDROM portfolios discourage students from the desire to view external content, some of which may be deemed inappropriate by the school's authorities.

References

Apple Development Connection, (1998) ISO 9660 (& High Sierra) CD-ROM Format, Technote FL 25 [Online]. Available: http://devworld.apple.com/technotes/fl/fl_25.html. (October 7, 2000).

Aschermann, Jerry R. *Electronic Portfolios: Why? What? How?* Missouri, U.S. (ERIC Document Reproduction Service No. ED432305).

Barrett Helen C., (1994). *Technology-Supported Portfolio Assessment.* [Online]. Available: http://transition.alaska.edu/www/Portfolios/ElectronicPortfolios.html#Technology Storage Considerations. (September 27, 2000).

Barrett Helen C., (1994). *Technology-Supported Portfolio Assessment.* The Computing Teacher.

Boulware, Zella & Holt Dennis. (1998). Using CD-ROM Technology with Preservice Teachers to Develop Portfolios. In T.H.E. Journal [Online]. Available: http://www.thejournal.com/magazine/vault/A2053.cfm , (September 27, 2000).

Bull, Kay, Montgomery Dianne, Overton, Robert and Kimball Sarah, (1999) *Developing electronic portfolios for preservice teachers in computer mediated learning.* Oklahoma, U.S. (Eric Document Reproduction Service No. ED429767).

Cafolla, R. & Knee, R. (1996). Creating World Wide Web Sites, part I, Learning and Leading With Technology: the Journal of the International Society for Technology in Education, 24, (3), 6-10.

Chappell David S, and Schermerhorn Jr. John R., (1999). Using electronic student portfolios in management education: A stakeholder perspective Journal of Management Education 23, (6), 651-662.

Knee. R., Musgrove, A., & Musgrove. J. (2000) Lights, Camera Action: Streaming Video on Your Web Site, Learning and Leading With Technology, the Journal of the International Society for Technology in Education, 28, (1), 50-53.

Lankes, Anna Maria D. (1995). *Electronic Portfolios: A New Idea in Assessment.* New York, U.S. (ERIC Document Reproduction Service No. ED390377).

Online Portfolios for Educational Technology Graduate Students: An Ongoing Capstone Project

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Abstract: This paper describes online portfolios employed as an alternative to comprehensive final exams for a distance-learning M.Ed./M.A. program at Florida Gulf Coast University. The paper addresses the issues that contributed to the creation of online portfolios. The benefits of portfolio assessment are compared to traditional comprehensive exams. The paper discusses why online portfolios were an attractive option for distance learning students. Additional information is given to demonstrate the development and implementation of online portfolios at Florida Gulf Coast University. The paper describes the computer resources available to distance learning students. The benefits and drawbacks of online portfolios are examined.

Introduction

Florida Gulf Coast University, founded in 1991, is the tenth institution in the Florida State University System. The approximate enrollment is 2,700 with a faculty and staff of 500. The campus is located in Southwest Florida on 760 acres of land. The mission statement of the University encourages the use of distance learning, and the University's Strategic Plan states that FGCU will develop 25% of its enrollment using distance learning.

The Master's Degree in Curriculum and Instruction, with a concentration in Educational Technology, is offered entirely online through the College of Education. Students enrolled in the distance-learning program are located around the world. Travel to FGCU is not required and often cost prohibitive for many students. Due to the distinctive nature of the program, faculty and students examined alternatives to the oral or written comprehensive exam traditionally administered at the culmination of graduate work.

Portfolio assessment was an attractive alternative for evaluating student performance. Shannon and Boll (1996) demonstrated that increasing numbers of teacher education programs are using portfolios to document preservice teachers' experiences and attainment of competencies. The traditional portfolio, of maintaining and presenting information in a hard-copy format, yielded problems in the distance-learning program. Students would have to absorb the cost of shipping the final product to faculty. There could be delays in delivery of the materials. If professors recommended changes in the portfolios, the process of shipping and receiving would have to be repeated, creating more delays.

The development of an online portfolio solved many of these problems. Students were authentically assessed on their learning, shipping and response delays were eliminated, and faculty and students had instant, continuous, and free access to the portfolios. Since the degree had a concentration in Educational Technology, the actual development and maintenance of the online portfolios were a demonstration of student knowledge and ability.

What are Portfolios and Why Use Them?

According to Collins (1990), portfolios consisted of real-world performance products that could be used to assess students. Portfolio assessment is an authentic way to measure student knowledge. The portfolio is a collection of student work that demonstrates knowledge and skills gained throughout the program. Portfolios have included student papers, video tapes of the students' applying skills and knowledge, photographs of works completed, floppy disks containing copies of computer-based work, learning logs, and other items that students felt adequately represented the knowledge gained throughout the program. Portfolios have gained support in the educational community during the past decade (Koretz, 1998).

State requirements for successful completion of a Master's Degree in Florida include comprehensive written or oral examinations or a capstone project. To meet state graduation requirements, the portfolios would have to act as an equal alternative to comprehensive examinations. These exams traditionally measured students' abilities to synthesize and apply the knowledge they had gained in their coursework. Meadows and Dyal (1998) concluded that the traditional comprehensive exams provide only a cursory glimpse of the students' knowledge and do not adequately address the students' skills and practical experiences. Jonassen (1996) argued that examinations are stressful for the student and make the evaluation process artificial by limiting the supports and resources of real-life situations.

Students in the program expressed a desire to prepare a professional portfolio to more accurately demonstrate the knowledge attained during the program. To be an adequate substitute for the comprehensive exam, the portfolios needed to show students' application of skills and knowledge, as well as their synthesis of major themes of the Master's Degree. Barton and Collins (1993) stated that a portfolio not only allows students to take ownership of learning, but also provides them with the opportunity to demonstrate their ability to address the professional duties and experiences they will encounter. Additionally the experience of developing a portfolio will give educators practice in portfolio development to allow them to model the skills and knowledge to students they will be teaching. Barton and Collins (1993) argued that the implementation of portfolios shifts the entire educational process from a teacher as giver of knowledge to student as seeker of knowledge.

Portfolios are being widely used in elementary and secondary schools as an authentic assessment of student learning. Additionally, many school districts are requiring teachers to create annual portfolios to demonstrate professional development. The use of portfolio assessment at the graduate level seemed a logical progression of what research has proven to be good practice at other levels. As students and faculty discussed the portfolio project, a diverse understanding of portfolios became apparent. Students and faculty viewed portfolios as works in progress, showcase pieces, and as resumes or curriculum vitae. Danielson and Abrutyn (1997) described many different types of portfolios, including assessment, best works, employment, and admissions. Faculty concluded that portfolios could be developed to address all the needs of the students and still meet state requirements for graduation. Faculty and students agreed that the portfolio project would need to demonstrate their pedagogical knowledge as well as their technology skills. Students in the Educational Technology program would have taken many of their courses in computer applications and implementation. These types of projects would need to be included in a portfolio demonstrating the students' knowledge. The collection of work in the students' portfolios would serve as a representation of their knowledge, and as a resume for future professional endeavors.

Developing Portfolios Online

A shift away from the learning process as an accumulation of knowledge toward learning as the application of skills has increased the acceptance of portfolio assessment (Simonson, Smaldino, Albright, & Zvacek, 2000). The traditional portfolio format consisted of collecting and maintaining artifacts that demonstrated student knowledge and its application and synthesis in real-life situations. The artifacts could include papers, pictures of projects implemented, floppy disks of computer-based work, video tapes of the actual application of knowledge and skills, learning logs, and any other media that represented student growth (Jonassen, 1996).

Students enrolled in the Educational Technology Online (ETOL) program completed both educational foundations and computer courses. Students were required to write papers, explore various software packages, learn a programming language, and work with computer hardware. Included in a traditional portfolio would be hard copies of the papers, printouts of software as applied to the classroom, floppy disks of programs written, and pictures or videos of work with computer hardware.

Obviously, work from twelve courses could amount to a large collection of artifacts. Traditionally, the portfolio would be contained in a binder, file box, or other storage method conducive to logical organization. There were several drawbacks to this traditional format that did not meet the needs of the distance-learning students. The first issue was that students would have to incur the cost of shipping the completed work to FGCU near the completion of their coursework. Additionally, shipping can be time-consuming and the portfolio could be lost in the process. Once faculty received the portfolios, suggestions and comments could be emailed, but students may wish to recompile the artifacts in their portfolios. This process would involve the shipping the portfolio twice, increasing the costs and likelihood that materials could be damaged or lost in the process. Unless students were to ship their portfolios throughout their program, faculty would not have an ongoing assessment of student growth.

The M.Ed. has a concentration in Educational Technology. It was assumed that students would have the ability to create an electronic version of the portfolio. Other universities have employed CD-ROM's as the storage device for the portfolio (Li, 1999). In addition to CD-ROM's, Zip disks allow students to compile large amounts of information in a single location. The traditional artifacts could easily be formatted to be included on the CD or the Zip disk. Papers, learning logs, and digital pictures could be saved directly to the disk from the word processing software. Regular pictures could be scanned and included on the disk. Computer-based work, including computer programs written, would easily be saved in this manner as well. However, CD's and Zip disks still have to be shipped to faculty for evaluation. While shipping cost would be greatly reduced, feedback could be slow and students would need to resubmit the disk if any changes were made. Faculty would also not have continuous access to the portfolio to assess student growth. Additionally, students would need to ensure that the electronic information they had submitted was in a format that the faculty would be able to view on the university's computers. Students would need to save the artifacts in a format that is compatible with the faculty's software.

The logical step beyond the electronic portfolio was to implement an online portfolio. There are many advantages to this format with few disadvantages for the students. First, free web space is provided by the university for the duration of the student's enrollment. This eliminates the need for student's to purchase a CD burner or a Zip drive. Students have unlimited space and access to their website. They can update the portfolio at a time that is convenient for them. When students are ready to have faculty evaluate their websites, they simply email the URL to the professor. The professors can immediately examine and evaluate the portfolio. If feedback is given, the professor simply emails the student the comments. The need to ship disks or a completed portfolio is eliminated. The online portfolio is in HTML format, which eliminates the need for students to buy the same software as the university. HTML is the language of the Internet that can be read by any computer that has an Internet browser. Additionally, if students wish to share their portfolios with other students or faculty, they simply give them the URL of the web page. With permission, faculty can use the completed portfolios as models for new students and as a marketing tool for the ETOL program.

The drawbacks to online portfolios are mainly focused on student knowledge of web page design. If students had never designed a web page, the learning curve for beginning the page could be steep. However, one of the students' courses teaches web page design. Students use the latest web authoring software to make content-based web pages that will be implemented in their classrooms. This knowledge can be applied to the development of the online portfolio. Another drawback is that students would need to have access to either a digital camera or digital video camera, or have access to equipment such as scanners that convert traditional media to a digital format. This is necessary to make pictures and videos available through the Internet.

FGCU's Online Portfolio Process

The online Master's Degree offered at Florida Gulf Coast University presented a unique situation for students completing the program. The state mandates that students must pass comprehensive examinations or present a capstone project for successful completion of the degree. Students in the online program were located around the world and travel to the university was often time and cost prohibitive. As an alternative to comprehensive exams, the ETOL program implemented a policy requiring students to complete an online portfolio. In implementing this requirement, the faculty and students addressed several issues pertaining to the development of online portfolios.

Barry and Shannon (1997) recommend six strategies for successful portfolio implementation including, early communication of expectations, limiting the number of components, establishing criteria, teaching self-reflection and self-evaluation, providing adequate time for development, and providing training on the development. FGCU's portfolio implementation process closely followed these recommendations. Student input was a critical factor in the success of the online portfolios.

The first step in implementation included a discussion with the students currently enrolled in the program. Students and faculty recognized the potential of the online portfolios in addressing the desires of the faculty for a more authentic assessment of the students' learning. Students raised concerns regarding their ability to design of a website that would adhere to the standards of quality web publishing. Jonassen (1996) recommended developing a rubric that clearly states the desired outcomes of the portfolio. Students created a rubric based on HTML style guides, examination of existing web sites, and the need to present their knowledge in a portfolio-type web page. The rubric was a clear and early communication of the expectations for the online portfolio. The rubrics outlined criteria for content, navigation issues, and models of acceptable web site design.

In their websites, students were encouraged to compose a simple first page that gave personal and academic information. This introductory web page would contain links to pages for each of the student's courses. Each course page would contain material that students completed throughout the course, or projects that were a result of learning in that course. This provided a simple template for the web site layout. Students were offered flexibility and creativity in the remainder of the web site. Students could choose whatever work they felt best represented their knowledge. This allowed for self-reflection and self-evaluation of the work to be included on the web site. Additional self-reflection will occur as the students maintain the portfolio and communicate with faculty. Students were encouraged to use the rubric to self-assess their web site throughout its development. This was an excellent tool in guiding students in the creation a professional web site.

Information on the portfolio requirement is provided to students when they begin the program. This allows the student several semesters to compile the portfolio material and design the web site. A course in web page design is included in the ETOL program. This course included learning the most recent web page design software. This would allow students to gain the knowledge necessary to complete the online portfolio. Students were taught how to use FTP software to transfer their files to the university's server. Faculty taught students how to create subdirectories to organize their website and allow for other websites on the university-provided web space. Students were required to begin their portfolios in this course. Several other courses required students to update the portfolio and provide a log of the updates to the professor.

Students in the ETOL program were encouraged to share their portfolios with classmates. Faculty could use specific examples of student work to exemplify best practices. Students included digital video, pictures, papers, projects, and computer programs in their online portfolios. Student feedback indicated that the initial planning and development of the online portfolio was time intensive. Students felt that they had put a great deal of thought and planning into the development of the general outline of the web site. In most cases the extensive planning paid off, as students were able to easily and quickly update their portfolios as they completed projects in their courses. Students appreciated the authentic nature of portfolio assessment to the traditional comprehensive examinations.

Another benefit of the online portfolio is that students were esentially guaranteed a back-up copy of their portfolio. As students composed their portfolios on their home computers, they would be saving the web site on their hard drive. As students uploaded their website to the university's server, that created an additional copy of the portfolio. The university's server is backed up nightly, so any catastrophic losses would only be information uploaded in the previous 24 hours. This gave students the assurance that they would have a copy of their portfolios in two places if computer failure caused the loss of files on either end.

Faculty response to the online portfolios was equally positive. They appreciated the fact that they could check student progress in all of their courses throughout the student's enrollment. Faculty could make suggestions for improvement at any time to help guide students in a direction acceptable at the Master's Degree level. Faculty shared the online portfolios with prospective students and with other faculty at the university.

Conclusion

As distance learning opportunities expand, faculty and students need to address and adapt to the changing educational environment. Students enrolled in a degree program that is offered entirely online encounter a unique situation for assessment of learning. They may never step foot on the campus, some not even for graduation. This circumstance led faculty at FGCU to explore options to the traditional comprehensive examinations administered at the culmination of graduate work. Research supports the use of portfolios as an authentic assessment of student knowledge and skills. Many researchers prefer the real-life application of the portfolio as opposed to artificial nature of comprehensive examinations.

Faculty and students in the Educational Technology program agreed that an electronic portfolio would best represent their educational and technology knowledge gained throughout the program. Students were relieved of the pressures of comprehensive examinations. The online format allowed students to continually update and revise their portfolios. Faculty could monitor student progress and provide feedback throughout the program. Students and faculty communicated about the portfolios using email, chat rooms, and the telephone.

The initial learning curve of web page design and uploading the site to the remote server was addressed in one of the required courses. Faculty required portfolio updates throughout much of the coursework, preventing students from procrastinating on the project until their final semester. Students were able to self-assess their work through the use of the portfolio web page design rubric. By choosing the material to be included in the portfolio, students were able to reflect on their learning and growth.

The online portfolios provided benefits in addition to an authentic, real-world assessment of student knowledge. Students used the portfolios as resumes when they began looking for technology jobs. The portfolios were an excellent demonstration of students' technology skills. They were easily accessible and simultaneously available through the Internet to many potential employers. Faculty used completed portfolios as models of best practices and to market the program to future students. These professional and impressive web sites are an excellent selling point, demonstrating the technology skills that students mastered upon completion of the program. The ETOL program at FGCU will continue to employ the online portfolios as a reliable and valid measure of student knowledge and skills.

References

Barry, N. & Shannon, D. (1997). Portfolios in teacher education: A matter of perspective. *The Educational Forum,* 61(3): 320-320

Barton, J. & Collins, A. (1993). Portfolios in teacher education. *Journal of Teacher Education,* 44(3): 200-211.

Collins, A. (1990). Reformulating testing to measure learning and thinking. In Frederickson, N., Glaser, R., Lesgold, A., & Shafto, M. (Eds.), *Diagnostic monitoring of skill and knowledge acquistion*. Hillsdale, NJ: Lawrence Earlbaum Associates.

Danielson, C. & Abrutyn, L. (1997). *An introduction to using portfolios in the classroom.* Association for Supervision and Curriculum Development. Alexandria, VA.

Jonassen, D. (1996). *Computers in the classroom: Mindtools for critical thinking.* Engelwood Cliffs, NJ: Prentice-Hall.

Koretz, D. (1998). Large-scale portfolio assessments in the US: Evidence pertaining to the quality of measurment. *Assessment in Education: Principles, Policy & Practice,* 5(3): 309-335.

Li, L. (1999). Portfolio management. *Education,* 120(1): 128-130.

Meadows, R. & Dyal, A. (1998). Preparing educational leaders through the use of portfolio assessment: an alternative comprehensive examination. *Journal of Instructional Psychology,* 25(2): 94-100.

Shannon, D. & Boll, M. (1996). Assessment of preservice teachers using alternative assessment methods. *Journal of Personnel Evaluation in Education,* 10(2): 115-133.

Simonson, M., Smaldino, S., Albright, M., & Zvacek, S. (2000). *Teaching and learning at a distance: Foundations of distance education.* Upper Saddle River, NJ: Prentice-Hall.

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The Impact of Electronic Portfolios on Early Experience Preservice Elementary Teachers in Integrating Technology into their Instructional Process

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Abstract: This paper outlines the process for preservice students within Idaho State University's College of Education to meet mandated technology certification requirements. The College of Education has created a portfolio assessment process as a method for fulfilling this requirement. The resultant Instructional Technology course (EDUC3111) is constructed around the portfolio process. Evidence comprising the portfolio include tool software integration, educational software evaluation, and foundational standards regarding adaptations for special needs, basic computer/technical concepts and operation, equitable, ethical and legal use of technology, and the application of technology into instructional planning and delivery.

During academic year 1999-2000, there were 291 preservice elementary teachers enrolled in the fall semester and 124 enrolled in the spring semester. Each student submitted an electronic portfolio for assessment by the ITPA (Idaho Technology Portfolio Assessment) assessors. The students, during the fall semester, had a 97.6% success rate, and those in the second (spring) semester, 95.2%.

Introduction

Portfolio assessment has been used from elementary through graduate educational environments. While standardized testing measures can provide a picture of a student on a particular day, at a particular time, portfolios offer the opportunity to capture the student over time. Since this type of authentic assessment is a collection of "purposeful" work (Gilman, Andrews, & Rafferty, 1995; Jardine, 1995; Benoit & Yang, 1996), the assessor can view a continuum of products reflected in the portfolio contents.

A number of researchers (Wesson & King, 1996; Rothman, 1996; Tierney, 1992) believe portfolios allow students to be active participants in their learning and growth, increase self-discovery, and aid in reflection about their accomplishments, and knowledge acquired. For preservice education majors, the opportunity to document the integration of technology into a variety of classroom settings and subject areas, allows the students to reflect on characteristics of the learner, the best use of technology to address unique learning styles, and the points at which these electronic teaching/learning aids should be employed.

This belief in the role of portfolio assessment, coupled with the need to provide technology certification for our undergraduate education students, resulted in the creation of an Instructional Technology course (EDUC311). During this course, students build portfolios, including two student work samples from their teaching experience in the corequisite course, Planning, Delivery, and Assessment (EDUC309), a required early field experience.

The Electronic Portfolio Development

Idaho's State Legislature has mandated the integration of technology into the PK-12 classrooms. In response to this, the Idaho State University College of Education created a portfolio assessment process for practicing, certificated personnel in the schools as well as preservice students within its teacher education program.

A group of practicing educators and College of Education faculty produced a rubric for assessment and then benchmarked this in anticipation of the first series of portfolios for review. The schools undertook the task of preparing their teachers through a series of portfolio development workshops. In addition, the College of Education's Technology Outreach Unit also trained teachers in various school districts in portfolio development.

The training and support provided for teachers in developing the portfolios was beneficial and led to a concentration on the use of portfolios to document preservice teacher integration of technology. In the beginning, the course was a required core class for all education majors. While this first effort was important, the connection to the student's field experience was missing. As a result, the College created a corequisite course with the portfolio class. When this occurred, there were changes in the undergraduate technology course to better address the needs of its new corequisite. The joining of the two courses also helped provide an experiential grounding for the contents of the electronic portfolio in that these activities would be tied to a formalized classroom setting.

EDUC311 (Instructional Technology) and its partner course, EDUC309 (Planning, Delivery and Assessment) have concentrated their efforts in supporting the students as they move toward their first field experience and the development of the electronic portfolio. Cooperating teacher classrooms for this "electronic" field experience are selected with two major factors in mind: Identification of master teachers who can model best practices in instructional delivery, and classrooms where technology is accessible either within the self-contained room or through outside resources, such as the library/media center and/or computer laboratory.

The Problem

The goal was to align EDUC311, Instructional Technology, with EDUC309, Planning, Delivery, and Assessment, to form a cohesive reinforcement of practices expected by third year education majors during their first field experience. From the EDUC311 course perspective, the goal was to merge technology integration methodology and experience into the student's early field experience of planning, delivery, and assessment of instruction. A secondary purpose was to supervise students in the creation of electronic portfolios that could be successfully assessed by the Idaho Technology Portfolio Assessment Panel.

Methodology

Even though Idaho State University has in place a prerequisite computer course that all students must take before granted admittance into the College of Education, students arrive in the EDUC311, Instructional Technology, class with gaps in their technology understanding and skills. They also have little concrete information relating to the alignment between the Instructional Technology class and their EDUC309 corequisite. The first few class sessions, then, demonstrate what a technology portfolio is — the contents, the template used, the flexibility built into it— followed by a correlation between the two corequisite classes (EDUC311 and EDUC309). Students are also provided copies of the Idaho Technology Portfolio Guidelines.

The assessment process used by ITPA (Idaho Technology Portfolio Assessment) in evaluating certificated educators and preservice candidates is also the same. It is important to let the EDUC311 students know they will be judged equally with their cooperating teachers and other professionals in the field. Doing this reinforces the "fairness" of the assessment process and helps them see themselves as beginning professionals.

The Instructional Technology course is constructed around the integration of tool software, educational software, and ISTE (International Society of Technology in Education) foundational standards regarding adaptations for special needs, basic computer and technical concepts and operation, equitable, ethical and legal use of technology, and the application of technology into instruction.

Students enrolled in the EDUC311 course are provided a template for their electronic portfolio (see Figure 1). This is a Web-based umbrella with the various forms (cover sheet, release affidavit, student permission form, matrix of standards, software evaluation form, and troubleshooting affidavit) created and ready for student information and completion, as well as a series of menus and submenus and hyperlinks.

Electronic Portfolio Main Menu

Cover Sheet

Affidavit & Release Form

Student Confidentiality & Parental Consent

Standards Matrix

Overview of Portfolio Contents, Entry Menu

References and Resources Used

Figure 1: These are the major elements contained within the electronic portfolio. All items shown are templates already created and ready for the students to individualize as appropriate for their portfolio contents.

The bulk of the Instructional Technology course is centered on learning integration tactics for technology within the lessons they are developing in the EDUC309, Planning, Delivery, and Assessment, class. Students are asked to identify their instructional setting for EDUC309 placement — student demographics and profiles, subject area to be taught, grade level, access to technology in support of their teaching, etc. Once this is established, all the student's activities within EDUC311 are created through this focus. Thus, the degree and type of integration activities, the adaptations for students with special needs (e.g., physical, cognitive, and behavioral), equitable access to technology for all targeted students, and methods for outreach to families are dictated by their information about the cooperating teacher's classroom.

There are eight required entries in the Electronic Portfolio (see Figure 2): Evidence of tool integration in word processing, databases, spreadsheets, electronic presentations, telecommunications, software evaluation techniques, troubleshooting, and technology integrated student work samples to support student-centered teaching approaches. Entries 1 through 6 require learning activity plans to support the integration strategies. As much as possible, it is expected that the integration activities will be student centered.

Electronic Portfolio Entries Menu

Entry 1 Word processing	Entry 5 Telecommunication Tools
Entry 2 Databases	Entry 6 Student Work Samples
Entry 3 Spreadsheets	Entry 7 Evaluation of Educational Software
Entry 4 Presentation Tools	Entry 8 Checklist of Troubleshooting Techniques

Return to Electronic Portfolio Main Menu

Figure 2: This is an example of the Portfolio Entries Menu where the learning activity plans and evidence of products are placed.

Within the learning activity plans, evidence must be shown for adaptations, outreach to families, and clear assessment plans paired with the listed achievement targets. Any products (e.g., spreadsheets, charts, databases, handouts, scoring rubrics, etc.) must be included with the learning activity plans. Figure 3 presents an example of a submenu. This student included an example of a product (spreadsheet chart example) that directly relates to the learning activity plan. The other item, Gradebook, demonstrates the use of a spreadsheet for management in teaching.

Spreadsheet Submenu

1. Gradebook
2. Spreadsheet example
3. Spreadsheet Lesson Plan

Return to Entries Menu

Figure 3: Example submenu for Entry 3, Spreadsheets.

Students are also required to embed appropriate hypertext links for navigational purposes. In the example in Figure 3, Gradebook, Spreadsheet example, and Spreadsheet Lesson Plan are hypertext links and will lead the assessor to the pages in the portfolio pertaining to each. There is also a hypertext link for returning to the Entries Menu. To further support navigational ease, links are embedded into each of the item (Gradebook, Spreadsheet example, Spreadsheet Lesson Plan) pages for returning to this submenu.

Navigational ease is important for the student, as well as the individual perusing the portfolio. Links and overall structure of the electronic portfolio are considered in the evaluation of the portfolio in the EDUC311 class; however, ITPA (Idaho Technology Portfolio Assessment) assessors only consider the contents of the portfolio as it relates to evidence of expertise in technology integration within the teaching/learning environment. The assessment panel members consider the hypertext links as "conveniences" for them in examining the contents. Should links not work, the assessment members have access to the student's original files, which have been placed in appropriate folders within the electronic portfolio's file structure. Thus, in the worst case scenario, a student can still be successfully evaluated for their ability to use technology in learning activities through the original files.

Results

During the first year (AY 1999-2000) of the pairing of the two courses (EDUC311 and EDUC309), there were 291 preservice elementary teachers enrolled in the fall semester and 124 enrolled in the spring semester. Each of these students submitted their electronic portfolio for assessment by the ITPA (Idaho Technology Portfolio Assessment) assessors. The students, during the fall semester, had a 97.6% success rate, and those in the second (spring) semester, 95.2%. These percentages are significantly higher than inservice teacher populations assessed during the same time periods.

Furthermore, an examination of the technology integrated lessons created and taught by the spring semester students in their EDUC309 field experience displayed a measurable improvement from those submitted the first (fall) semester.

Discussion

The current status of the EDUC311, Instructional Technology, course is one of revision and growth. The alignment of the two corequisite courses continues with plans for greater collaboration and coordination among all instructors for the two offerings. However, even at this early stage of the development process, it appears the process of developing learning activity plans that include technology integration, coupled with the requirement for a minimum of two lessons being taught during the early field experience, has resulted in a heightened awareness of technology in education. Students are also learning ways to adapt to accommodate the use of technology in instruction.

The College of Education is also embarking on a path of portfolio development beyond that included in EDUC311. Students will be encouraged to develop an "entrance" portfolio, consisting of lower level entries, such as philosophy of teaching, diversity statements, and beginning case studies. The EDUC311 entry will, of course, be the electronic portfolio of integrated lessons, software evaluation, and other elements required for State certification. Beyond this, plans are being made to expand the portfolio concept to include an "exit" section. This would allow students to document their student teaching internship experience, including adding or replacing lessons already created in the electronic portfolio entries, video teaching samples, and greater inclusion of student work and assessment techniques. Eventually, the College hopes to move toward a totally electronic portfolio presence, where students would receive help in placing their "entrance" entries into a digitized format, followed by a full technology assessment portfolio piece (the "development" portion of the educational experience), and, finally, the "exit" pieces gathered during student teaching. The direction for this development aid is not clear at this time. Possibilities include expanding the student teaching internship seminar course to include portfolio refinement, and/or workshops offered periodically throughout the student's tenure within the College of Education. In either scenario, help would be provided for placing entries into the electronic portfolio, creating and editing images for placement (e.g., digital still and digital video camera material, as well as repurposing VHS video), and refinement of the portfolio to become a professional "snapshot" of the student's capabilities.

References

Benoit, J., & Yang, H. (1996). A redefinition of portfolio assessment based upon purpose: Findings and implications from a large-scale program. *Journal of Research and Development in Education, 29*, 181-191.

Gilman, D., Andrews, R., & Rafferty, C. (1995). Making assessment a meaningful part of instruction. *NASSP, 9*, 20-24.

Jardine, A. (1995). Keypoints of the "authentic assessment portfolio". *Intervention in School and Clinic, 31*, 252-253.

Rothman, R. (1996). Taking aim at testing. *The American School Board Journal, 183*, 27-30.

Tierney, R. (1992). Setting a new agenda for assessment. *Learning, 21*, 61-64.

Wesson, C. & King, R. (1996). Portfolio assessment in special education. *The Council for Exceptional Children, 28*, 44-48.

Making the Case for Science Teacher Learning: An Analysis of Argument and Evidence in Electronic Portfolios

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Abstract: This interpretive case study explores the nature of prospective elementary teachers' evidence-based philosophy statements for science teaching and learning, as portrayed in web-based science teaching portfolios. Evidence-based philosophy statements are explicit articulations of beliefs related to learning and teaching science. The 32 participants authored the portfolios in a web-based environment, allowing them to connect claims in their philosophies with evidence from their work as teachers. In addition to the electronic portfolios, exit interview transcripts were inductively analyzed. Based on the data, the claims in the prospective elementary teachers' philosophies became more science-specific and learner-sensitive over time. Supporting evidence was increasingly drawn from classroom-based experiences, requiring connections among theory and practice. In addition, there was evidence that the technology facilitated substantive reflection by (a) providing a simple means of making explicit connections between evidence and claims; (b) allowing prospective teachers to express themselves creatively without diminishing an emphasis on substance; and (c) providing a means of saving multiple versions (track changes over time).

Underpinnings, Objectives and Significance

Research on teacher development suggests that opportunities to reflect critically on practice can play an important role in learning to teach (Abell and Bryan, 1997; Glickman, 1990; LaBoskey, 1994; Russell and Munby, 1992). Teachers typically do not characterize their work as having a theoretical basis (Sergiovanni & Starratt, 1993). Rather, teachers describe their practice, offer hunches about "what works," and generate principles about teaching and learning from their perceptions of effective practice. It is impossible to effectively engage in the act of teaching without a framework or educational platform (Walker, 1971) -- to guide learning and teaching decisions. Yet, for prospective teachers, the platform is often implicit and contains a web of beliefs, values and propositions that are not necessarily internally consistent.

There is a great deal of evidence that suggests it is difficult to move preservice teachers beyond focusing on surface level features of classroom instruction to more critically reflective practices that can illuminate and refine their platform for learning and teaching (Borko, Livingston, McCaleb and Mauro, 1988; Calderhead, 1989; Feiman-Nemser and Buchmann, 1987; Gore and Zeichner, 1991; Weinstein, 1990). Calderhead (1989), for example, notes that student teachers have a tendency to avoid opportunities to reflect critically on their practice. He attributed this to several factors, including prospective teachers' emphasis on their own performance, their high level of ego, and their lack of analytical skills and language, all of which are necessary to evaluate their own teaching. Calderhead suggests that teacher educators provide scaffolded tasks of a nature and level such that prospective teachers can perform them, as well as learn from them.

Several teacher educators have proposed such approaches for assisting prospective teachers in critically analyzing and evaluating the teaching decisions they make (Abell and Bryan, 1997; Gore and Zeichner, 1991; Johnston, 1992; Zulich, Bean and Herrick, 1992). For instance, Gore and Zeichner (1991) attempted to use action research as a means of encouraging critical reflection among preservice teachers. Although their analysis of 18 student teacher action research projects indicated that this strategy has only limited success, the authors still support it as a way of structuring reflections. They assert that "it does not make much sense to seek to promote or assess reflective practice in general without establishing clear priorities for reflection." Others agree, pointing out that the key to success in terms of developing more critical reflective practice seems to rest in whether reflections are guided (Zulich et al., 1992).

Portfolios have gained fairly wide acceptance in teacher education in recent years. Dana and Tippins (1998) point out that the broad definition of portfolios in teacher education - a "collection of evidence" that demonstrates some aspect of teachers' knowledge, skills or dispositions - does not necessarily allow for opportunities to engage prospective teachers in meaningful reflection. For example, the following descriptions of teaching portfolios exemplify models that lack reflection: teaching portfolio as scrapbook, portfolio as overflowing container, and the extended resume (K.Wolf as cited in Dana and Tippins, 1998). Dana and Tippins go on to propose a model for science teaching portfolios that is firmly grounded in the literature on reflective practice and constructivism. They describe science teaching portfolios as "spaces where prospective teachers represent their unique constructions of what it means to teach science in ways which permit them to analyze, discuss and evaluate their own teaching practices and professional growth" (p.722).

Therefore, the research reported in this paper explores the nature of prospective elementary teachers' science teaching philosophies, as portrayed in web-based science teaching portfolios. More specifically, the research questions framing this study include: (1) How do prospective teachers describe and support their educational philosophies for science teaching and learning? and (2) What are the central claims of the philosophies and how do they relate to contemporary science education reform ideals?

Participants and Context

The electronic portfolios described in this study were developed by 32 prospective teachers as part of the course, Teaching Science in Elementary Schools. These prospective teachers were participating in an innovative, research-based, year-long internship program that is part of a professional development school partnership between the university and local school district. The course for which the portfolios were developed is one of four methods courses taken during the first half of the internship year. These courses are complemented by an intensive field experience.

Prospective teachers' web-based portfolios were developed throughout the course and included 2 main components: (1) a collection of evidence and (2) an evidence-based philosophy for science teaching and learning. All course assignments were submitted via web-based portfolios and included in the collection of evidence area. Three versions of the web-based philosophy for science teaching and learning were developed. The standard format for philosophy statements was a series of claims about science teaching and learning supported by multiple pieces of evidence (from collection of evidence). Each piece of evidence was then justified in light of the claim that was being made. Prospective teachers' initial versions were developed early in the course and revisited in light of new experiences and learning.

Research Methods

This interpretive case study of the nature of prospective elementary teachers' espoused science teaching philosophies, as portrayed in web-based science teaching portfolios, was done within the research traditions of phenomenological inquiry and grounded theory. Multiple data sources were employed to understand the nature of the espoused philosophies and to provide a way of triangulating findings across data types (Lincoln & Guba, 1985). The primary source of data was 32 prospective teachers' electronic portfolios. Three versions of each portfolio were collected across the semester. A secondary data source was transcripts of exit interviews with prospective teachers.

Inductive analysis was used to construct themes from the data set (Bogdan & Biklen, 1992; Merriam, 1988). All portfolios and transcripts were repeatedly examined to allow emergent patterns to surface (Lincoln & Guba, 1985). Multiple readings through the electronic portfolios and transcripts enabled the researchers to construct themes from the participants' words, which were recorded in margin notations (Miles & Huberman, 1994; Strauss & Corbin, 1990). A qualitative data analysis computer program facilitated the data reduction and analysis process. Developing assertions were tested by seeking both confirming and disconfirming evidence from the data set (Patton, 1990). Differences in the understandings of the researchers were resolved through negotiation until a point of consensus was reached.

Findings & Discussion

Early iterations of the prospective teachers' espoused philosophy statements were vague and not particular to science teaching and learning. Common claims included statements like, "Science learning should be engaging and enjoyable." Another common statement was, "Science learning should be hands-on." Evidence used to support these claims was primarily drawn from personal K-14 learning experiences. Other common sources of evidence included early course readings and learning experiences. Justification tended to be descriptive rather than evaluative. That is, few prospective teachers were able to provide rationales that demonstrated how specific evidence was used to support a particular claim.

Several improvements were noted in the second and third versions of prospective teachers' espoused philosophies. First, claims were more specific to science teaching and learning and reflected ideas consistent with contemporary reform in science education (NRC, 1996). For example, many prospective teachers identified the importance of having children design science investigations, collect data, and develop explanations grounded in those data. Second, a number of claims reflected cognitive considerations associated with learning for meaningful understanding. For example, claims of this type identified the importance of children's prior knowledge and alternative conceptions and the central role they play in developing appropriate and powerful learning opportunities.

Evidence for claims made in the later versions of the philosophies relied more heavily on field-based assignments. However, science-specific claims tended to receive support from learning activities used in the methods course. Finally, justification improved greatly in the later versions. With support and feedback from the course instructor and peers, prospective teachers were able to move beyond generating superficial connections to crafting more substantial relationships between evidence and claims.

During exit interviews, prospective teachers were asked to describe the "value-added" of developing web-based portfolios as opposed to more traditional paper portfolios. Most responded that their skills and confidence for using applications of technology had improved. They felt that this would make them more marketable as teachers. Some of the prospective teachers were able to articulate their ideas about "value-added" in terms of their own thinking and learning. These prospective teachers explained that creating an evidence-based philosophy supported them in making connections among course activities/readings and field-based experiences. The electronic format was described as helping them make explicit connections among claims and evidence easily. In addition, they acknowledged the value in being able to examine earlier versions of their philosophies and reflect on how their thinking had changed over time. Several commented that the electronic version allowed them to be creative and thoughtful without spending significant amounts of time on superficial "cutting and pasting" tasks.

In closing it is important to emphasize that the findings of this study are encouraging in light of the literature on prospective teachers' reflective practices. The findings suggest that developing several versions of an evidence-based philosophy statement may support prospective teachers in engaging in thoughtful reflection. More specifically, as prospective teachers are encouraged to re-evaluate their thinking in light of new experiences and learning, they are supported in making connections between theory and practice. In addition, there is evidence that the technology used facilitates substantive reflection by (a) providing a simple means of making explicit connections between evidence and claims; (b) allowing prospective teachers to express themselves creatively without diminishing an emphasis on substance; and (c) providing a means of saving multiple iterations that document changes over time. Given the important role of reflection in learning to teach, this study warrants additional research on the development electronic, evidence-based philosophies.

A Pilot Project: Integrating Multimedia Portfolio Development Into The Preservice Teacher Education at Randolph-Macon College

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Abstract: Randolph-Macon College offers teacher education as a minor program. To fulfill the requirements for teacher education, and to comply with the state regulations, instructional technology has not been taught as a course. Instead, it is integrated into Foundations of Curriculum and Instruction, Educational Psychology, and the capstone course Senior Seminar. Although this method has been relatively successful, preservice teachers request more opportunities be provided for learning new technology skills and applying them to teaching and other professional use. Research findings indicate that creating multimedia portfolio greatly enriches preservice teachers' technology experience. In this pilot project, four volunteer preservice teachers learn and use various instructional technology skills for the development of their electronic portfolios. The results of the study will impact the redesign of the Education Senior Seminar course.

Preservice teachers must be prepared to apply various computer skills for teaching and information management. They are expected to use advanced technology for classroom instruction and presentation. It has become a trend to introduce preservice teachers to the development of multimedia and web sites (Read & Cafolla 1999).

The preservice teachers at Randolph-Macon College attend technology workshops as part of the requirements of the Education Minor program. They learn the basics of educational media and technology at the Foundations of Curriculum and Instruction course. For the Educational Psychology course, preservice teachers learn how to create spreadsheet and databases, and analyze the information for their research paper. They also evaluate computer-based instruction and the resources found on the World Wide Web. In their senior year, the preservice teachers attend the capstone course, Senior Seminar, of which one-third of the class-time is dedicated to incorporating technology into the development of an integrated instructional unit, and publishing the unit on the World Wide Web. The instructional unit will then be used for their student teaching.

Feedback on this technology training curriculum has been positive. The preservice teachers all agreed that the Senior Seminar technology module was especially helpful, where they are encouraged to learn new technology skills and use them in their lesson plans. They also commented that they would welcome more opportunities to create multimedia-assisted presentations, including electronic portfolios.

Portfolio development is a requirement for the Randolph-Macon College preservice teachers. They update their personal portfolios throughout their study in the program, and by the time of student teaching, make the portfolios available for prospective employers to review. The format of their portfolios has been mainly limited to print and artifacts.

The pilot project is intended to encourage preservice teachers to begin to learn and use the advanced instructional technology at an early stage at the teacher education program. The objectives are: first, to enrich the preservice teachers' experience with educational media and technology; secondly, to enhance their evaluation and presentation of their professional growth; thirdly, to assist the participating preservice teachers in the development of quality portfolios using multimedia and the World Wide Web (Milman 1999); fourthly, to investigate the process and effectiveness of multimedia portfolio development. And lastly, based on the results of the pilot study, to evaluate the current curriculum of the capstone course and make possible changes to the Senior Seminar.

Four sophomore students from the Foundations class have volunteered to participate in the pilot project. At present they focus on studying portfolio models, and learning how to create quality sound and video recordings. They are also working on putting their philosophies for teaching and mini-lesson plans in PDF format and starting a Web site for the portfolio. They will videotape their final presentations for the course, and convert the videos to digital format. They will learn other advanced techniques as they progress with their study in the teacher education program. The techniques will include computer graphic processing, locating multimedia and web-based demonstration teaching materials, and creating digital sound and videos for the Web site.

For the on-going formative assessment of this pilot project, the student teachers keep journals of the development process, and monitor the time demanded for the project. The teacher educators help them examine the content of the portfolio. The instructional designer evaluates whether and how well the process promotes the student teachers' technology proficiency, and help to meet the *Technology Standards for Instructional Personnel* (1998). The instructional designer also identifies the costs and resource needed for the current project, and the financial implications of electronic portfolios development for all R-MC preservice teachers. The summative assessment will be conducted toward the end of the four preservice teachers' senior year. The participating student teachers will be interviewed. The process, the final products, and the participants' technology skills will be evaluated by the teacher educators, the cooperation teachers, the instructional designer, and possibly their prospective employers. The results of the assessment will be used for the redesign of the capstone course, Senior Seminar, at Randolph-Macon College.

References

Read D. & Cafolla R. (1999). Multimedia portfolios for preservice teachers: from theory to practice. *Journal of Technology and Teacher Education*, 7 (2), 97-113.

Milman, N. (1999, February). *Web-based electronic teaching portfolios for preservice teachers*. Paper presented at SITE 99: Society for Information Technology & Teacher Education International Conference, San Antonio, TX.

Virginia Department of Education. (1998). *Technology Standards For Instructional Personnel*, [Online]. Available: http://www.pen.k12.va.us/go/VDOE/Compliance/TeacherED/tech.html [2000, November 30].

FACULTY DEVELOPMENT

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As new communications technologies impact higher education, American education must be transformed to meet the needs of an emerging information society. Attaining this goal will require teachers who meet professional standards. Today's society needs a workforce that can apply knowledge, reason analytically, and solve problems. The faculty must be trained to determine the most appropriate tools for design, support and delivery of courses. The challenge for continuing professional development and renewal to adapt to this changing environment has become critical. The adaptation of existing courses to implement new technologies requires faculty to use recently acquired knowledge and new skills. The standards for teachers supporting these new skills have been developed by the professional organizations governing accreditation in each academic field (NCATE, 2001).

Both the International Society for Technology in Education (ISTE) and the National Council for the Accreditation of Teacher Education (NCATE) have specified the technology skills that teachers are expected to have when they enter the teaching field. These organizational standards provide the foundation for the professional development programs designed for higher education faculty. ISTE suggests that teachers be able to meet these standards: apply tools for enhancing their own professional use and productivity, use technology in communicating, collaborating, conducting research and solving problems, promote legal and ethical use of technology, use technology to support their instruction, and plan the delivery of instructional activities that integrate technology (ISTE, 1998).

The papers included in this section address various approaches available to meet the professional development challenge of these new standards. The papers have been grouped into five areas: 1) Campus Models for Faculty Development, 2) Program Implementation Strategies and Technologies, 3) Online and Other Distance Education Initiatives in Staff Development, 4) Case Studies and Research in Faculty Development, and 5) Pre-Service and PreK-12 Initiatives in Professional Development

Papers included in the Campus Models for Faculty Development section focus on the integration of education and technology. Since a critical part of training is to expose faculty to models of technology use for integration and application of today's technology tools, the models presented in these papers are designed to prepare faculty for the transition from the traditional classroom to the technology rich environment supported by the ISTE and NCATE standards. Bohannon's Course and Faculty Development at Florida Gulf Coast University is designed to promote and support the use of learning-centered teaching practices, the integration of technology into these. teaching practices, and the removal of barriers to teaching innovation; thereby, promoting the successful delivery of distance learning. Burrows and Ford describe a faculty development model for the integration of education and technology for medical educators. The skills acquired by the Faculty of Medicine Group will be subsequently transferred to the broader faculty of the University of Manitoba Bannatyne Campus. Laga and Elen outline the characteristics of support initiatives to stimulate professional development on ICT. An analysis is made of these initiatives to detect factors that make them effective and powerful and features are identified that may guide decisions. In another paper centering on empowerment of personnel, Pretorius describes survival skills necessary in an IT-enabled organization and an e-world. The need for personnel to have general and specialized skills appropriate to their specific roles in the enterprise is stressed. Ring and McCallister explore the similarities and differences between two individual technology faculty development programs that have been conducted within the College of Education at the University of Florida. Ziegler, Ziegler, and Burch discuss practical uses of classroom technology. They present a Technology Pyramid model that reviews the practical application of multiple learning models and the coordination of technology with each learning model.

The second section of papers represents Program Implementation Strategies and Technologies. Successful traditional instructional and evaluative strategies need to be examined and, if necessary, altered to continue their positive effects with students participating in situations with new technologies. These papers highlight activities that are working in our educational system. Frantiska describes the design and development of a workshop to instruct educators on the creation of educational hypermedia via an integrated project. Using the project as the main teaching tool allows for the learning of the new skills with immediate application to an end product. Funderburk and Schullo delineate the current best practices utilized for faculty training, support and professional development. The areas of technology review, training, and computing facilities are intertwined to provide the best possible computing environment in support of instruction and research. Gruber, Rees, and McCormick describe their ACTIVE – Authentic, Competency-based, Technology-enhanced, Integrated, Versatile, and Evaluative – curriculum which addresses the need to improve the preparation of preservice teachers by providing instruction that models the integration of technology into classroom delivery. Hofer discusses the grass roots technology staff development provided at the Teacher Technology Leadership Academy in the Archdiocese of Indianapolis. His model is an effective, train-the-trainer approach that provides research-based staff development in technology for classroom teachers. Poff highlights the evolution of a faculty and staff web development program. Stating that the key to successful implementation of such a program is to deliver the training in such a way as to make faculty want to participate in the training, to make the training relevant, and to encourage continual development once the training has been given. Articulating technology needs to administrators and policy makers is the main emphasis of the paper by Rakes and Rakes. They point out the continuing disconnect involving those who recognize the value and growing needs associated with innovation and administrators and policy makers. Staudt describe three Summer Technology Institutes that were conducted to help faculty develop their technology skills to aid in the improvement of their classroom teaching. The goal of these institutes was to produce quality teachers who are well versed in innovative instruction, skilled in technology usage, and prepared to serve the multicultural and diverse student populations of South Texas.

The third set of papers in this faculty development category centers around Online And Other Distance Education Initiatives. Teaching faculty to effectively communicate their ideas, information, course content, and activities through the Internet, video conferencing, and videotaping is vital in today's educational settings. The JASON Foundation for Education, as described by DeWall, supports a yearlong, multimedia, interdisciplinary program involving students and teachers in real-time science expeditions and interactive curricula linked to the national geography and science standards.

The Academy will offer online science content courses to middle level teaching beginning in Fall, 2001. Ekhaml and Ruskell provide online and print problem-based learning resources for college and university professors to incorporate PBL in their teaching units and to help students work on PBL assignments using these resources. Franklin and Blankson present the investigation of a cohort model in which faculty within a college work together to provide curriculum design and implementation support, online development expertise, shared technology skill improvement, and emotional support for the implementation of online courses. Maki presents the possibilities of videoconferencing in staff development and experiences that developed when teachers participated in interactive lessons instructed via ISDN-videoconference. Suggestions are made for the use of videoconferencing for in-service training and staff development. McVearry and Ehmann describe fundamental challenges that emerge for distance educators in online tutor training programs. Solutions to conquer these challenges are provided. Creating interactive instructional materials using Macromedia's Flash, an interactive session by Uttendorfer, will provide the foundation for hands-on experience for educators. Examples of online web-based lessons created for faculty development workshops are described.

Section Four contains Case Studies and Research in Faculty Development. Chambers and Holbeach describe an Australian case study concerning the supporting and development of IT skills of the education faculty and staff. A range of models of professional development, including individual consultations, group workshops, and paid external training, was offered to participants to assist in developing IT skills. Dutt-Doner, Larson, and Broyles discuss the challenge of developing college wide technology standards. Their case study examines the growing pains of one university's College of Education in designing and implementing technology standards. Gold examines the pedagogical role of the teacher in online education specifically with the transition from traditional classroom instruction to online instruction. The paper focuses on the pedagogical training that an online instructor needs to become an effective teacher. Project New Delhi, a video voyage on the World Wide Web, is presented by Kilbane. This multimedia teaching case study challenges preservice and inservice teachers to learn more about issues and problems in American education by exposing them to case studies about India's educational system. Through the design of video and other materials in the instructional environment, learners acquired new information and reconsider previous notions about education in this country and others. Chisholm and Wetzel explore the pedagogical beliefs of teacher educator who used technology in their teaching. The study used Smart Classrooms that mirrored the configuration found in many local schools where teachers have a limited number of computers. Schmertzing and Schmertzing present a study on the students' expectations of distance educators and the instructor roles in an interactive televised classroom. This ethnographic study of graduate education students suggests that students assigned new responsibilities to the instructor and expected the instructor to bridge the distance gap between the classrooms, clarify new rules for classroom behavior, and maintain a focus on course content despite the added technology related duties of the instructor. Solberg presents several case studies concerned with organizational learning and the venue for institutional change with online technologies. She presents a model for linking individual change to organization change. Tucker, deMontes, Willis, and Blocher describe a study of faculty perceptions to the integration of systems thinking in the teacher preparation program at Northern Arizona University. The study reports on how open faculty would be to professional development designed to better prepare them to incorporate systems thinking into their teacher preparation courses. Varnak and Tozoglu investigate the idea that technology teacher training is the only solution to improve teachers' performance in using technology in the classroom.

The last set of papers involves Pre-service and PreK-12 Initiatives. The technology environment that is developing throughout the world is causing an impact on the teaching and learning of the preservice and inservice elementary, middle, and high school teachers. Programs are being conducted to insure the professional development opportunities for these educators. Crawford and Edwards focus on the aspects of a nurturing, creative learning environment for preservice and inservice instructors, including instructional design models that promote self efficacy in technology integration, types of learning activities that work best with educators, and strategies to help implement technology integration and foster a sense of life-long learning. Giordano plans for sustained change by describing an instructional design model for teacher staff development to train teachers to integrate the Internet into their classroom routine. The paper describes the model, discusses the specific elements of the course design and its theoretical foundation, and offers examples of course elements to illustrate the pedagogy. Lundy, Sheldon, Rastauskas, and Woodell outline a framework for transforming technology integration with a public school system from isolated success stories to a district-wide movement. The program encourages educators to become leaders in their own development by taking advantage of outline resources that encourage mentoring and collaboration. Professorial change through technological collaboration is encouraged by the grant described by McGaughey, Radigan, Searle, and Smith. University professors model appropriate use of technology to help pre-service teachers acquire proficiency in the use of technology for curricular purposes. Polney, Squiciarini, and Walter document the key ideas and themes of a staff development trainer model and its applications and benefits with a school district, highlighting the administrative role of the model. Obstacles, challenges, and strengths of implementing technology into a school district are noted.

This collection of Faculty Development papers describe effective initiatives and innovative models that have been designed and conducted to improve the use and integration of technology at institutions of higher education and PreK-12 educational settings worldwide. Taken as a group, the methods and models provided will aid in the effective training of faculty and will address the critical need for continuing professional development and renewal to adapt to our changing technological environment.

References:

ISTE. (1998). National standards for technology in teacher preparation. [On-line]. Available: http://www.iste.org/Standards/index.html

NCATE. (2001). National Council of Accreditation for Teacher Education. [Online]. Available: http://www.ncate.org/2000/2000stds.pdf

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Course and Faculty Development at Florida Gulf Coast University

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Abstract

The goal of Course and Faculty Development at Florida Gulf Coast University is to support the use of learning-centered teaching practices, integration of technology, and delivery of distance learning by removing barriers. As one of three interdependent support units, Course and faculty development has contributed to the university-wide support system that allows faculty to achieve these goals. This model of faculty development uses ten distinct service strategies to accommodate the needs of a diverse, multicultural faculty. Having ten ways to access support allows faculty to engage in

As a result, during the first three years of operation 71% of the full-time faculty participated in one or more faculty development projects or activities, and 24% participated in six or more. The staff has contributed to the design of 113 web-based or web-enhanced courses, and over 65% of the full-time faculty report that they use the key technology tools for teaching and learning.

Description

In the fall of 1997, Florida Gulf Coast University (FGCU) was born into the technology revolution that has been transforming higher education in this country and abroad. As a new undergraduate teaching institution in the Florida State University System its mission stated that teaching and learning would be characterized by 1) the use of learning-centered teaching practices, 2) the integration of instructional technology, and 3) the delivery of twenty-five percent of its courses through distance learning. These instructional strategies represented a significant departure from traditional teaching practices, but were necessary if FGCU were going to enhance and expand learning opportunities for a burgeoning population of traditional and non-traditional students in Southwest Florida and beyond (Appendix A).

In response to this challenge, the University established the Office of Instructional Technology (IT), a faculty support system. The organizational structure of the Division of Instructional Technology was guided by the premise that the primary barriers to using technology for teaching and learning must be mitigated by a comprehensive faculty support and development system. Toward this end three interdependent units were established: Technology User Support, Multimedia Design Services, and Course and Faculty Development Services. This structure supports a faculty development initiative that is part of a university-wide system of high expectations, state-of-the-art infrastructure, college/university incentives, and comprehensive support services for students, faculty, and staff

The faculty development program is based on the belief that the majority of faculty members are not reluctant to explore teaching innovations, as the conventional wisdom suggests, but that there are barriers that prevent their best efforts to do so. We believe that systemic barriers demand a systemic solution. Therefore, it is necessary to describe the faculty development program at FGCU in the broader context of Instructional Technology. The interdependencies among Technology User Support, Multimedia Development Services, and Course and Faculty Development Services create an instructional environment where it is possible to achieve the goals of excellence in undergraduate teaching, and many faculty members report that doing so has been one of the most satisfying experiences of their careers.

Faculty development, as traditionally defined, is essential, but insufficient, as an intervention to meet the goals set forth in our mission. A faculty member with highly developed technical and pedagogical skill cannot deploy a brilliantly designed course if there is no equipment available, if he/she must spend hours each week providing technical as well as academic support to students, if there is no incentive in the personnel review process to acknowledge teaching innovation, and no alignment with institutional priorities. Therefore, "faculty development" has come to mean many things at FGCU. It means the traditional activities such as the skill development workshops, presentations by outside experts, and discussion seminars which are common on most campuses, but it also means individual consultations to solve an instructional problem, collaboration with an instructional design team to create or redesign a course, participation in a formative classroom peer coaching program, taking a self-paced software tutorial online, or requesting a house call. Each of these services promotes the faculty development agenda at FGCU while simultaneously removing barriers that hinder faculty progress. (Appendix B)

The first barrier to using technology is the difficulty of acquiring necessary classroom equipment. This barrier has been addressed at FGCU by equipping all classrooms with electronic teaching podiums that include a computer, document camera, VCR, ceiling-mounted color projector, speakers, jacks for peripheral equipment, telephone, and a control panel that allows faculty to move seamlessly from one form of media to another during the course of a class. When classroom activities are designed using audio, video and multimedia, the faculty members know that the equipment necessary to use those materials will be waiting for them. They also know that a phone call to tech support will have a staff member in the classroom within minutes if some part of that equipment malfunctions.

The second barrier to the use of technology is the need for a faculty member to master many specialized skill sets. These skill sets include knowledge of current instructional technology, application of instructional design theories, programming, multimedia development techniques, graphic design, and web development. This barrier has been addressed at FGCU by providing a staff of instructional designers, programmers, multimedia developers, graphic artists, and web developers who are members of ad hoc development teams that work with faculty in designing and implementing their course development projects. As subject matter experts on these teams faculty members not only produce technology-enhanced courses, but learn to be independent managers of those courses in the process. When faculty members engage in a course development project, they are simultaneously producing a new or redesigned course while learning about the pedagogy and uses of technology that are then incorporated in their course designs. The development team continues the consultation and coaching support for faculty until their services are no longer needed, and the faculty member has become an independent manager of the new course.

The third technology user barrier is "being new on campus". The first months of any job involve discovering "how things get done around here", but new faculty at FGCU must master a long list of digital tools in order to teach in classrooms and even to communicate. Easy and swift access to technology support services is provided by IT staff who serve as liaisons to new faculty, conducting personal conferences to discuss problems and to make connections with the appropriate services on campus to meet immediate teaching needs. This service complements the two days of group technology and pedagogy training that are offered as part of orientation sessions.

The fourth barrier to instructional innovation is the problem of limited time, schedule inflexibility, and learning style preferences. The Course and Faculty Development unit recognized that reliance on group training was insufficient to meet the needs of the diverse faculty in the five colleges at FGCU. The 187 full-time teaching faculty members represent the broadest spectrum of technological skill levels, knowledge of learning theory, and experience in technology integration and distance learning. Therefore, 10 strategies have been adopted for providing faculty development support to accommodate the time constraints and to match faculty with development opportunities that capitalize on their diverse learning styles. The ten strategies are organized in three categories: 1) Group Strategies - skill development workshops, topic centered study groups, faculty led sharing seminars; 2) Individualized Strategies - course development teams, instructional design consultations, house calls, peer coaching; and 3) Web-based Strategies - online tutorials, online faculty orientation (in development 2000-01), and user group facilitation

This means that a faculty member who wants to develop cooperative learning activities for a class could attend a 3-day workshop, or schedule a one-hour consultation with an instructional designer, or read the online articles, or enroll in an online instructor-led or self-paced tutorial, or lead a course development team in the design of cooperative learning activities, and/or participate in a peer coaching project to have a colleague observe and give feedback on use of a cooperative learning activity. This faculty development structure is intended to accommodate the diverse, multicultural characteristics of the faculty and provide a model of the many instructional options that help diverse learners succeed.

Once the organizational goals were established and the barriers were identified, a survey of the newly hired faculty was conducted to determine their needs. The Faculty Development Advisory Council was convened by the Director of Course and Faculty Development to review the survey results and refine the initial faculty development plan. The members of the council serve as liaisons between the colleges and IT, and participate in the annual planning process. The survey results indicated that there was a large core of faculty with a strong desire to achieve the goal of excellence in undergraduate teaching. Some members of the faculty came to FGCU expressly to focus on teaching and learning as they had been unable to do so in their former institutions where the pressure to publish and procure grants dominated their time. In addition, many students had come to FGCU to be part of this educational experiment and to learn in new ways. The natural synergy of desire and opportunity among faculty and students became the engine for innovation that the legislature envisioned, and resulted in a spirit of entrepreneurship that is seldom seen in bureaucratic organizations. Conversely, that same core of faculty had widely varying levels of technical skill, and ability to apply learning theories. This wide variation mandated that one size would definitely not fit all, but that the model for faculty development would have to be customized to accommodate the wide variety in faculty skill and background. This provided the opportunity to model the instructional principles we were promoting.

The Course and Faculty Development staff consists of a director, three instructional designers and a part-time student worker. The instructional designers serve as project managers of ad hoc course development teams, conduct group training, design online training, conduct consultations, evaluate software products, and produce instructional materials. These teams enlist the services of Media Development as needed. Last year IT merged with Broadcast Services to become a single organizational entity on campus. This relationship provides closer working relationships with WGCU-TV, the local Public Broadcasting System affiliate and WGCU-FM the National Public Radio station, which are both housed in the same facility as IT.

During the first three years of operation seventy-one percent (71%) of the full-time faculty participated in at least one course and faculty development activity or project. Twenty-four percent of the full-time faculty participated in six or more activities or projects. The instructional design staff has served as project managers and designers on 113 course development projects. Many of these courses have been developed for distance delivery, and others are campus-based courses that have technology-enhanced components.

After two years of operation FGCU completed a self-study in preparation for a visiting committee from the Southern Association of Colleges and Schools. The yearlong review of all campus operations involved over one hundred committee members and the collection of survey data from students, faculty, staff and community. Full accreditation was granted in May 1999, and the visiting committee included eight commendations, a record-setting number, in their report. Two of the eight commendations highlighted the effectiveness of the instructional technology support system.

> "The committee commends the university for its provision of state-of-the-art information technology in the classroom, and the Office of Instructional Technology for its success in assisting the faculty to make good use of this equipment."
>
> "The committee commends the university for the extent that it has infused information technology into the curricula, and prepared students to use these resources in everyday life and in future occupations."

At the end of three years 100% of the faculty responding to a survey indicated that they used the Internet as a resource for teaching and research and used email for instructional communication. Ninety-three percent use the classroom podiums routinely and create classroom materials with presentation software. Eighty-five percent regularly use the electronic databases that are part of the library collection. More than 50% of the faculty use synchronous collaboration tools or electronic bulletin boards to post and discuss assignment with students, use scanners to create graphic files for class presentations, and use a course web site as the primary construct for a distance learning course or as an enhancement for a campus-based course. More than 25% of the faculty are using digital or video cameras to collect materials for instruction, conducting class in a videoconferencing facility, or using online testing software.

In a student survey administered as part of the accreditation process 85% of the students felt that the instructional technology used in courses contributed to learning, 92% agreed that adequate technology was available to support teaching and learning, 89% agreed that FGCU had created an environment conducive to learning, and 71% agreed that distance learning was an effective alternative to traditional instruction. In the summer of 1999 a survey of all distance learning students showed that 86% of the students would take another distance learning course.

FGCU has been a living laboratory for teaching with technology during the past three years and much has been learned about using these powerful tools effectively. During the summer of 1999 a team of faculty and staff were assembled to identify a set of *Design Principles for Online Instruction.* The team included instructional designers, faculty who had been teaching online and web-enhanced courses and staff members from Instructional Technology. The team reviewed the literature, reflected on their teaching experiences, crafted a framework, and agreed upon a set of principles for – instructional design, multimedia design, management of online courses, academic and technical support systems. The resulting document became the basis for a series of faculty seminars on campus and presentations at state and national conferences. The University of Guadalajara and the College of Nursing at the University of Louisiana-Lafayette have both used these principles in their faculty development programs during the last year.

It seems impossible that only three years have passed since FGCU faced the challenge of taming the technology tiger and during that time more and more campuses have joined the effort. Like the railways and steel mills of the industrial revolution, technology has become a part of our way of life, and learning to harness its power requires both vision and endurance. At FGCU much progress has been made and yet, we have just begun.

Appendix A

F.G.C.U. Vision, Purpose, and Commitment

Vision and Institutional Purpose

Florida Gulf Coast University is dedicated to providing a learning-centered environment that offers the highest quality educational opportunities for the development of the knowledge, insights, competencies, and skills necessary for success in life and work. To maintain this learning-centered environment, the university as a whole and its units and individuals will actively practice continuous planning and assessment leading to improvement and renewal.

Florida Gulf Coast University is a comprehensive* public university created to address the educational needs of the rapidly growing Southwest Florida population and the increasing number of students who are seeking admittance into the State University System. The university's primary service area consists of Charlotte, Collier, Glades, Hendry, and Lee counties, with specialized programs drawing students from the state and beyond.

The university offers a broad range of undergraduate and graduate areas of study including arts and sciences, business, technology, education, environmental science, nursing/allied health, and public and social services. Professional development and continuing education programs are offered based on need and availability of resources. On-campus offerings along with distance education and partnerships with public and private organizations, agencies, and educational institutions enable the university to extend a rich diversity of higher education opportunities to Southwest Florida and beyond.

The university seeks to employ innovative ideas and technologies in the development and delivery of programs and services. The university also pursues regional and community-based public service activities and projects. To support the roles of teaching and public service, faculty and students are encouraged to engage in a wide array of creative inquiry and scholarship, including applied scholarship that focuses on the unique Southwest Florida environment and other issues of importance to the region and state. The library, which utilizes information technology in the delivery of instruction and information resources, actively promotes student learning and supports the information needs of the university.

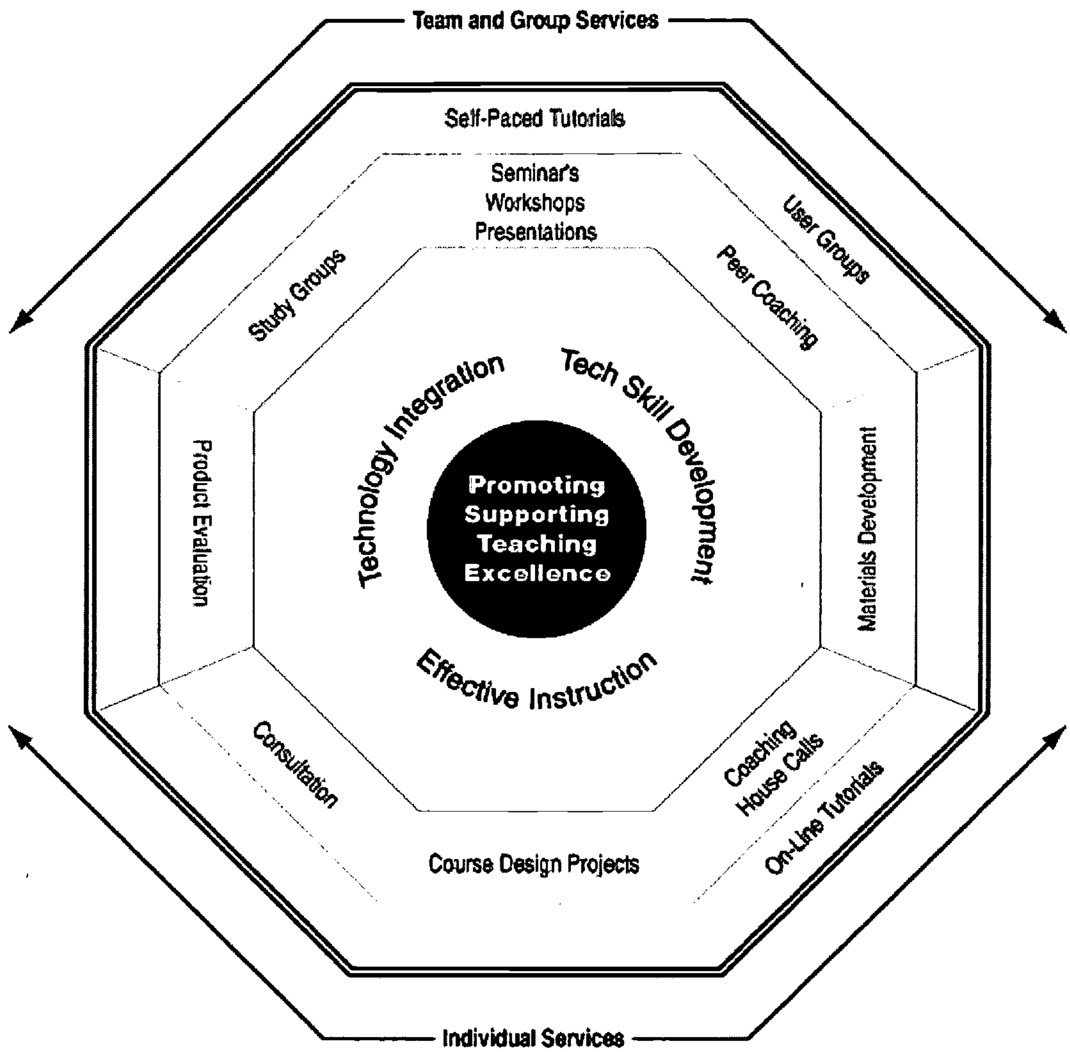
Institutional Commitment

Florida Gulf Coast University promotes an institutional culture that:

- Fosters the pursuit of truth and knowledge;
- Affirms academic freedom as the foundation for the transmission and advancement of knowledge;
- Seeks excellence in both educational offerings and services;
- Asserts that learner needs, rather than institutional preferences, should guide decisions concerning academic planning, policies and programs;
- Provides academic, student, and administrative support services designed to meet the needs of the university community;
- Recognizes, encourages and rewards quality teaching;
- Enhances the growth of faculty by supporting teaching, scholarship, service and professional development;
- Encourages collaboration in learning, governance, operations, and planning;
- Establishes mentor/advisor programs, particularly programs for undergraduates that include senior capstone projects or papers;
- Recognizes that informed and engaged citizens are essential to the creation of a civil and sustainable society; and
- Affirms that diversity is a source of renewal and vitality.

*Carnegie Foundation classification

Appendix B



Faculty Development Model

Florida Gulf Coast University

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Education and Technology – A Faculty Development Program for Medical Educators

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Abstract: A faculty development model for the integration of education and technology was designed and implemented to enhance teaching and learning. There is a great need to assist and provide support to medical faculty who wish to integrate technology into the learning environment. A consortium was formed of the key stakeholders. The educational framework for the Education and Technology Workshop was the Seven Principles for Good Practice in Undergraduate Education (Chickering and Gamson, 1987). Experiential learning theory provided the framework for understanding how technology can be integrated with the principles of teaching and learning (Kolb, 1994, 1971). We will discuss the successes and failures of this model and supply some reflection on future interventions and support strategies.

Introduction

There is a great need to assist and provide support to medical teachers who want to integrate technology into the learning environment. Attendance at the 2000 SITE conference by one of the authors was the impetus for the program. A consortium of key technology stakeholders was organized. Professional development teachers were recruited from the Continuing Medical Education department. A key person to involve in the project was an Academic Computing and Networking instructor who had assisted with other projects. A representative from library services was included, as was a representative from Education Support Services. Supports for integration of computer technology into the classroom, assisting teachers with connections, video projections and trouble shooting was critical to the success of the program.

Program Model

The desired outcome of the program was that the participants be able to use technology in a way that enhanced the understanding of the subject area, without compromising student-centered strategies that actively involved students in the learning process. Technology used without pedagogical consideration thrusts the learner back into a passive role. The program developers chose to use the "Seven Principles for Good Practice in Undergraduate Education" (Chickering and Gamson, 1987) as the framework for the program to underscore the desired outcome. Good practice principles encourage: student-faculty contact; cooperation among students; active learning; prompt feedback; time on task; high expectations; and respect for diverse talents and ways of learning. The program focused primarily on the what, when and why of using technology appropriately and effectively, and secondarily on the how of using technology. Kolb's four-stage cycle of learning theory (1994, 1971) was used as the structure to sequence the program. The four stages are immediate concrete learning experience, followed by observation and reflection, leading to abstract conceptualization and finally active experimentation. In our program a concrete learning experience with technology was the basis for the participant to make observations about their practice and to reflect on them. Adjunct self-directed web based training was available to participants, as was access to student mentors. The observations were made through self evaluation and peer evaluation of a micro-presentation on the final day of the program. These observations or evaluations provided the motivation for the participant to develop ideas for future practice, thereby creating a new experience. The program offered participants direct experience and reflective observation using PowerPoint software in an environment that required them to follow principles of effective practice. The focal point or deliverable of the program was a micro-presentation by the participant, on the second day of the program, that was self and peer evaluated for appropriate use of technology that enhanced understanding of the subject area.

Delivery

The first step was to recruit six trainers though a screening process that examined their previous experience with professional development and their level of technological competence. The selected trainers had to agree to conduct one two-day workshop annually for the medical faculty. They then attended a sixteen-hour, three-part program, sequenced over a one-month period, allowing time for preparation and reflection. Student mentors were available to assist participants with their micro-presentation preparation. The second step was the delivery of two faculty wide education and technology workshops. Participants were selected from a variety of health science departments. A condition of acceptance into the workshop was that they have basic technology skills, be present for the full workshop program and agree to be an education-technology resource within their home departments. The program developers acted as on-site resources during the first workshops the trainers conducted.

Outcomes

This faculty development model worked. Involving key players from various departments in the consortium contributed to the success of the program. Both trainers and workshop participants consider pedagogical principles when using technology. Six trainers were prepared and their abilities exceeded the program developers' expectations in terms of integration of technology for enhanced understanding while using good educational practices. The micro-presentations, self and peer evaluations were both positive and constructive. The participants evaluated the program very highly. The trainers facilitated two workshops for eighteen medical teachers who became departmental resources for education and technology. Our goal is to deliver additional workshops in 2001 to advance the appropriate use of technology within good educational practice.

Reflection – What Have We Learned

Technology must enhance learning not distract from it. Faculty development programs must focus on pedagogical considerations rather than on the technology itself. The micro-presentation is a critical element in the program because it forces participants to practice what they have learned. The financial resources available to train faculty is limited and this faculty development model is a low cost, self-perpetuating delivery method.

References

Chickering, A.W., & Gamson, Z.F. (1987). Seven principles of good practice in undergraduate education. AAHE Bulletin, 39, 3-7.

Kolb, D.A. (1994). Learning styles and disciplinary differences. In K. Feldman & M. Paulson (Eds.) Teaching and learning in the classroom (pp. 307-316). Cambridge, MA: Ginn Press.

Kolb, D.A. (1971). Individual learning styles and the learning process. Cambridge, MA: MIT Press.

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Developing a Faculty of Education Technology Integration Plan: Initial Stages of a Large Scale Faculty Professional Development Program

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University of Alberta

There is a strong consensus among many educators that the teaching of technology should be incorporated across the curriculum at the earliest levels of education (Logan, 1995). Although Faculties of Education tend to realize the importance of technology, they have been slow to respond to the needs of the field (Barksdale, 1996). Thus schools have been forced to compensate for this lack of leadership by developing their own in-service technology programs for teachers. There are a number of reasons why Faculties of Education have been slow to respond to the impact of technology. First, many faculty members require extensive professional development in the area of technology integration so that they can model appropriate uses of technology (Rogers, 2000). Second, faculty professional development programs must be designed so that these programs fit into a Faculty's overall Technology Integration Plan (TIP)—the development of a Faculty TIP is a difficult process, especially given the complex political nature of any university environment. Finally, regardless of the TIP, each Faculty must find the resources to carry out the action items defined in the TIP in order to achieve the goals of the TIP. This paper will describe the University of Alberta's Faculty of Education TIP and its importance in a comprehensive effort to foster Faculty Professional Development. It will also discuss a newly funded research study of our 120 faculty members with respect to technology integration for teaching, learning, and research.

The University of Alberta has an enrollment of 29,000 fulltime students. The number of students in the Faculty of Education consists of approximately 3,000 undergraduate students and 1,000 graduate students. The teaching staff consists of just over 100 fulltime faculty members and 200 part-time and full-time sessional instructors. The Faculty of Education has enjoyed a long history of integrating technology into teaching, learning and research, beginning in the mid-1960's. Currently the Faculty of Education runs a fairly elaborate computer network that uses 13 computers as servers (3 Sun computers, 4 NT computers and 6 Macintosh servers). The five student computer laboratories contain approximately 125 computers and over 100 classrooms have been wired with Category 5E Ethernet cable.

A good TIP needs to make provision for both long-term and short-term goals. In a very real sense, a technology integration plan is an evolving document, which is inclusive and flexible enough to enable quick changes based upon rapid changes in the technological world and, yet, specific enough to provide direction for immediate action. It also reflects the reality that, as faculty members in a professional faculty, we not only need to integrate technology into our own work, but, in turn, need to prepare our students to integrate technology into their work in schools and libraries. The following vision statement reflects our Faculty's long term commitment to technology integration.

Vision Statement: The Faculty of Education will foster an educational environment where technology is an integral part of the teaching and learning process, research and administration. In this environment, technology will be part of the everyday practice of how students learn, how faculty members teach, do research, and communicate with the field, and how administrative services facilitate activities within the Faculty.

Goals: Goal statements in the TIP are organized under three major headings—the teaching and learning process, research, and administration. Optimizing the teaching and learning process through technology integration is crucial to attracting and satisfying outstanding undergraduate and graduate students, as well as meeting the technology goals of the Alberta Government's Department of Learning and local school districts, and the professional development needs of teachers, librarians, and other professionals. The research process is being transformed in all areas of educational research as faculty and graduate students make increasing use of information and communications technology. In addition, technology is becoming a focus of research as researchers investigate the impact of technology on the teaching and learning process and the use of digital information and multi-media technologies in course delivery. In relation to administration, the Faculty of Education is actively supporting the implementation of a new PeopleSoft-based administrative information system at the University of Alberta, as well as developing new programs to meet its own specific needs.

The significance of adequate human and technological resources permeates the goals in each of these areas. These resources are essential to optimize the teaching and learning process, research excellence, and administrative efficiency. These resources are also crucial in order to attract and retain high quality personnel in the Faculty of Education and to ensure that the Faculty is able to demonstrate leadership and respond to the communities we serve.

1. *Teaching and learning process*: The Faculty of Education is responsible for the education of teachers, administrators, librarians, counselors, and other educational professionals. As educators, we are constantly searching for more effective ways to optimize the teaching and learning process. Used appropriately, technology has the potential to increase the quality, efficiency, and accessibility of our programs. We also have a responsibility to prepare teachers for Alberta's schools. The Alberta Department of Learning has explicitly stated that information technology must be "integrated into education to enhance student learning, and increase efficiency and flexibility of delivery." The Alberta School Act requires that pre-service graduates of our programs be able to demonstrate that they understand the functions of traditional and electronic teaching/learning technologies, and that they know how to use and engage students in using these technologies. The implementation date for Alberta Learning's new Technology Program of Studies is the year 2000. Hence, we need to provide both pre-service and practicing teachers with knowledge of computer technology and of methods of integrating computer technology into the curriculum.

A major goal of the Faculty of Education is to integrate information and communications technology across the curriculum in order to optimize the teaching and learning process in courses offered both on-campus and through alternative delivery. As well, the goal is to optimize the learning environments in schools and in the services and operations of libraries and information agencies.

2. *Research*: A second major goal of the Faculty's TIP is to integrate technology into the ongoing research processes in the Faculty. This should enable professors in the Faculty to undertake and conduct world-class research programs and, thereby, meet future research needs and requirements.

3. *Administration*: The third major goal of the Faculty of Education is the integration of technology to optimize efficiency and effectiveness of our administrative services.

To achieve these TIP goals the Faculty of Education has embarked on an ambitious professional development program. The first phase of the program is an extensive needs assessment of Faculty members. It was felt that for faculty professional development of technology integration to succeed we needed to hear the concerns of all faculty members not just the select group of early adapters. An interview questionnaire was created and three interviewers (Ph.D. students) were trained on the administration of the questionnaire. All 120 Education faculty members were contacted and 92 of these were interviewed (on average 1 hour). Data was collected in the form of interviewer notes and tape recorded sessions. These interviews were completed over a four month time frame (May 2000 – August 2000). The data collected from these interviews is now being analyzed. A cursory analysis of the data indicates the following:

1. Faculty members have specific learner outcomes that can only be achieved by a highly individualized program. This will require both individualized support and instructional materials for a very specific set of learner outcomes.
2. Faculty members generally share common learner outcomes with colleagues who closely work in their areas of teaching, learning, and research. This should result in naturally occurring groups of colleagues who share a common set of learning outcomes.
3. Faculty members share common learner outcomes with other faculty members in the Faculty of Education. Groups of faculty members from across the Faculty with common learner outcomes can be addressed on a faculty-wide basis.
4. Faculty members may share common learner outcomes with other faculty members throughout the University. In this case, we would work closely with university wide units (e.g., University Teaching Services, or Academic Technologies for Learning) to develop more general sets of learner outcomes.

The preliminary results also demonstrate that Faculty members require a "just-in-time need-to-know" support structure that can efficiently and effectively meet: a) technical infrastructure support requirement, i.e., hardware and system software; and b) technology integration support with respect to teaching, learning, research, and administration.

Our goal for the coming months will be to thoroughly analyze the interview data. Following from this data analysis process we intend to develop a program of professional development that is "context sensitive" to the needs of our academic environment.

Barksdale, J. (1996). Harvard Ed School gives itself a D- in technology. In http://scholastic.com/EL/exclusive/harvard496.html

Logan, R. (1995). The fifth language: Learning a living in the computer age. Toronto, ON: Stoddart

Rogers, D. (2000). A paradigm shift: Technology integration for higher education in the new millennium. Educational Technology Review, 13, 19-27

Supporting the Development of IT Skills of Education Faculty Staff: An Australian Case Study

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Abstract

This paper will explore the ways one Faculty of Education has approached the challenge of increasing the uses, in particular the more advanced uses, of information technology (IT) to support teaching through the professional development (PD) of staff. A range of models of professional development (such as individual consultations, group workshops, paying to attend external training) was offered to staff to assist in developing IT skills. The uptake of these different PD models is investigated, and the staff members' perceptions of the development of IT skills, and the preferred PD models for developing IT skills are explored.

Introduction

Over the past decade at the University of Melbourne, Victoria, Australia, there has been strong support, both financial and more generally, for increasing the uses of information technology (IT) and multimedia in undergraduate and postgraduate teaching and in other aspects of academic life. This support has been expressed through generous funding for the development of multimedia resources to support teaching and learning. For example, between 1996 and mid-2000 almost AUD$10 million of university central funds were invested in development and implementation of IT and multimedia projects (Alcorn 2000) and substantial further funding for multimedia developments and for the inclusion of IT in teaching was also provided by faculties of the university. This has impacted on all faculties of the university, including the Faculty of Education, and inclusion of IT is a routine aspect of the daily lives of academics and, for many, a routine part of their teaching. Despite this strong emphasis on the uses of IT over the past decade, there are still some staff in the Faculty of Education (and no doubt in other faculties!) for whom using IT as a regular aspect of their teaching is a challenge from which they have shied away.

The University of Melbourne is the second oldest university in Australia with total enrolments of approximately 30,000 students, with almost 4,000 students enrolled with the Faculty of Education in 2000. Degrees awarded in the Faculty of Education include undergraduate coursework degrees through to research Ph.D. and D.Ed. degrees. There are approximately 100 academic staff and about 80 general staff (mainly administrative) in the Faculty. In 2000 the position of 'Assistant Dean (Information Technology)' was created within the Faculty with a brief that included (among many other things) 'identifying staff IT training needs and developing a strategy for meeting them'. A number of the papers presented in the 'Faculty Development' stream at SITE2000 (*e.g.*, Beiser 2000, Kahn & Pred 2000) explored how similar needs had been addressed at other institutions and the experiences related in these papers informed how IT Professional Development was planned for 2000. This paper will explore how this challenge was taken up and the success of some of the strategies applied to assist and encourage staff of the Faculty to use IT in their academic lives.

Some Models of Professional Development

Professional Development (PD) has historically been developed under two guiding principles - effectiveness and cost. The models of PD that have developed are, in some way or another, a trade-off between these two principles. For instance, web-based PD has the advantage of being cheap to develop (write once, read anywhere, many times), but depends on self-directed learning (Shotsberger 1997) and may therefore not be very effective across a faculty. One on one mentoring, on the other hand, has a high rate of user approval, but is seen to be expensive.

Perhaps the most traditional form of IT Professional Development (IT PD) is the technology workshop, in which a skilled user and teacher imparts knowledge to a group through a mixture of verbal tuition and hands-on examples. Workshop models of PD have the advantage of meeting many users' needs at the same time, and are most successful when carefully targeted to groups with the same, or similar, skill levels and goals. There is, however, the problem of attenuation of learning between the workshop and the time of implementation (Guskey 1986). The workshop model thus needs to be supported by other models of PD, such as Just-in-Time support, or on-line materials.

Ohio State University recognized this in a report of July 1999 by their 'Faculty Instructional Technology Development Committee' (Ohio State University 1999). The report approached the issue of choosing appropriate models of PD for their faculty from a temporal viewpoint. They noted that the need for PD arises when faculty staff have:

- An urgent need for help ("How do I make my computer open PDF files"?).
- A need for help just in time to do a project/course/presentation ("How can I turn these notes in a PowerPoint presentation?").
- A need for long-range planning that involves new technologies ("I need to develop on-line materials to support my students").

To support these three separate time frames, they concluded that the implementation of a number of different PD models was necessary. Some examples of the models that they chose to use are shown below:

Urgent Need

- Students trained to be first level of support, with technical assistance from professional staff.
- Central help desk for common applications.

Just-in-Time

- Student mentors who organize PD sessions with staff for specific problems.
- Team members for on-going PD in specific projects.

Long Range

- Workshops on specific IT issues.
- Consultants to talk one-on-one with staff about issues such as teaching strategies of pedagogy.

In many universities only the urgent and long-range needs have been met — the former through a help desk to respond to technical problems, and the latter through workshops and seminars. This leaves a significant gap in the Professional Development program of a faculty that wishes to move forward in using IT in teaching and learning. In a discussion forum held by the Victorian Professional Development network, Terry Harrington (who runs an Australian Professional Development program with 15,000 enrolments) stated that teachers generally wanted Professional Development that was:

- engaging
- readily applicable
- no longer than it has to be, but not a one off event (Zbar 1999).

These needs appear to apply equally to staff at higher education institutions. The need for a Just-in-Time professional development model is behind much of the 'mentoring' models of PD. The mentors may be students, peers or experts, and respond to their mentee's specific needs by organising meetings with them in which the mentee's individual PD requirements are met. A US study in 1995 attributed the success of a technology mentor program to the individualized nature of the professional development - a self-paced workload focusing on the specific needs of the faculty member (Zachariades & Roberts 1995).

Models of professional development offered to staff at the Faculty of Education during 2000

After attending SITE2000 and further reading on the matter of IT PD for faculty members the following models of professional development (PD) about using IT were offered to staff of the Faculty of Education.

Group IT PD workshops

Areas of need for many staff were identified and workshops were offered by the IT PD Coordinator and attendance invited.

Individual IT PD consultations (one-to-one 'Just in Time' [JIT] PD)

Staff members telephoned or emailed in a request for help with either a specific need or with a request for developing skills with a certain product or goal. The IT PD coordinator would then visit the staff member in their office for a consultation.

Small group IT PD consultations

After staff had identified a common need they organized themselves into a small group (two or three individuals) and PD to meet their needs would be developed for them. This generally happened where staff members were working on a project together.

Technology Mentors

Academic staff (volunteers) were paired with technically able students (volunteers) and in ten meetings over approximately 12 weeks the technology mentor (student) identified the IT PD needs of the staff member, developed an IT PD plan, and gave individual tuition to the staff member on these identified areas. The technology mentors were supported in technical areas where required and were provided guidance and support in dealing with material they were not familiar with by the IT PD Coordinator.

External IT PD

Staff were invited to request IT PD at whatever level they required and if the PD required was beyond the skills of the IT PD coordinator, or was not offered by the university's Information Technology Service it could be met by an external consultant or by attending an external course. (This would be funded by faculty funds.)
It is interesting to note that there was no demand for 'External IT PD', that is for professional development courses offered outside the Faculty or university. It is likely that in the busy lives of faculty members that if PD is not readily available and close at hand then it does not occur. This style of PD will thus not be discussed further.

No charge was made to the staff or to their department for using any of these services (all costs were funded at the faculty level) and as demand increased the staffing providing PD was increased to meet the demands. No ceiling was placed on the PD available to any staff member or department.

Uptake and Perceptions of IT Professional Development Opportunities

The goal that over half of the staff of the Faculty would undertake IT PD during 2000 was met, which was very pleasing. There was a higher proportion of academic staff who took the opportunity for IT PD than general staff. This was probably a reflection of the topics covered by the large group IT PD workshops, these focussed on developing and maintaining web sites, which is of greater interest to teaching staff than administrative staff. The uptake of IT PD was uneven across the Faculty, with one department in particular not being well represented. These two issues will be addressed in 2001 by targeting more IT PD sessions for topics of interest to administrative staff and specifically targeting the staff of the department that was underrepresented in 2000. All staff surveyed that had made use of IT PD opportunities in the Faculty in 2000 stated that their IT skills had been enhanced during the year and all were 'satisfied' (28%) or 'very satisfied' (72%) with the IT PD that they had experienced. Some staff (6) that responded to the survey had not accessed any of the IT PD offered and of these only two felt that their IT skills had been enhanced during 2000. Encouraging staff to access the IT PD available to them will be a key goal in 2001.
Staff were asked to rank in order of their preference the different models of IT PD offered during the year. Only one staff member rated group IT PD workshops as their preferred model of IT PD, with the most popular model (60%) being one-to-one PD (where the staff member was visited in their office). Small group and technology mentors were ranked about equal, each IT PD model scoring approximately 20% as the first preference of staff. That the individualized one-to-one 'home delivered' model of IT PD was preferred is not surprising. The needs of staff were met through these customized sessions that were very convenient (as the time and location was

determined by the staff member) and very time efficient (as the materials covered were tailored to meet the needs of the individual).

Group IT PD classes

Scheduled large group (approximately 15-20 people) workshops about developing and maintaining web sites were attended by over 50 staff members (mainly academics) and this proved to be a very useful model of *initial* PD for an IT topic that was of interest to many people. Staff who attended the group workshop were then emailed to see if they would like a demonstration version of the software installed on their desktop computer. Where this was requested, the software was installed and at this time further PD was offered on a one-to-one basis to suit the needs and goals of the individual. Staff who had the demonstration version of the software installed on their desktop computer were contacted three weeks later to see if they would like a full (licensed) copy of the software installed. This again allowed staff who wished to develop these skills to have further one-to-one PD. This approach of large group workshops followed up with one-to-one IT PD meant that many staff who attended the group workshop could further develop those specific skills they required in the one-to-one PD sessions that followed. One comment about this was:

> *'I believe my skills level was above the group level (when I started Dreamweaver) and in a one-on-one I was able to improve my skills where needed at the appropriate time.'*

Individual IT PD consultations

In addition to individual consultations that were 'follow ups' to group PD, many staff requested individual consultations about other areas in which they wanted to develop IT skills. This model of PD was very popular with staff and all staff who utilized it rated it as either 'useful' or 'very useful'. Some comments about this model of PD included:

> *'The one on one really is best particularly with academic staff who have a vast range of skill levels, and also for the more advanced admin. staff who have previously had little access to someone who knows programs better than they do.'*

> *'My preference is for small groups or one-on-one PD. For technology PD that is related to my job, I generally have specific questions about particular software applications. I only use a few applications that I am unfamiliar with, so my questions are usually related to particular aspects of programs. These questions may not be relevant to other people. Also, it enables the possibility of asking follow-up questions or for clarification.'*

Another positive feature of the one-to-one IT PD model is that it is very time efficient. Some comments about this included:

> *'It was great that ...* (name of IT PD staff member deleted) *could come and show me what I needed to know. I couldn't fit in a general seminar.'*

> *'One-on-one means you can jump straight to what you need to know...'*

Small Group IT PD consultations

It is interesting, but not surprising, to note that almost all small groups of staff that requested PD on a particular area were working together on technology-based projects. Considerably fewer staff chose this style of PD compared to group workshops or one-to-one consultations. Perhaps the difficulty of coordinating with another staff member to find a suitable time was only overcome when there was a very strong need, such as working together on an IT-based project. Those staff members that requested small group IT PD found it very useful and relevant to their needs.

> *'I have found actually working on a project extremely helpful as I can apply it directly to my needs and ask for help as I need it'*

> *'The best way to learn is through engagement with real problems/needs relevant to the user. As such one to one and small group learning is best.'*

Technology Mentors
A pilot technology mentor scheme involved nine staff members ('mentees') who were paired with Education students as their technology mentor. A match between the staff member's IT needs and the IT skills of the students was made and it was ensured that the Education student (mentor) was not enrolled in a subject taught by that staff member. The staff-student pair set a schedule to meet approximately ten times during second semester. There was mixed success with this scheme. One staff member in particular was very pleased with the scheme.

> *'I am delighted with the scheme - in fact I have developed an academic conference paper on it.'*

For other staff the scheme was less successful, with one staff member withdrawing due to limited time to meet with her technology mentor, and others expressing dissatisfaction with some aspects of the scheme, including the matching of their skills levels with those of the mentors and timing difficulties. It is felt that if we were to continue a technology mentor scheme, then the mentors would need a greater amount of training in how to be an effective mentor and greater effort be put into matching staff and IT mentors.

Hidden Costs of PD

When considering models of IT PD, as for all expenditure, the balance of cost to effectiveness of each must be taken into consideration. When looking at the IT PD models offered, at first glance the large group IT PD workshops appear to be the most cost effective, as many staff can learn about the material in a single session. The one-to-one IT PD may appear to be perhaps 15 times more expensive, as the IT PD Coordinator is working with a single person at any time rather than with a group of 15. This is not really the case, as when a Faculty organizes a group IT PD workshop it is paying the salary not only of the IT PD Coordinator, but also the salaries of all participants of the workshop. This substantially changes the calculations of costs and benefits, and it is not unlikely that the IT PD Coordinator will be the lowest paid person attending a workshop! When costing PD within a faculty, the real costs of all participants of the PD should take into account, not just the cost of the presenter or room hire. It is likely to be considerably more cost effective for the IT PD Coordinator to spend half an hour in a customized IT PD consultation with a professor, than that professor to attend a two hour workshop where her specific needs may or may not be met.
However, I still believe that large group (15 people) IT PD workshops have many benefits — many staff can be introduced to the basics of an application or a style of teaching in a single session and useful discussions and collaborations may ensue. However, group IT PD workshops need to be supported with follow up individual or small group customized IT PD consultations that allow staff to further develop skills in those specific areas that they have a need or interest in developing. We found that making an opportunity for individual IT PD consultations when installing software onto staff machines following an IT PD workshop was extremely useful. Staff were pleased to be having the software installed (as they had requested it following the workshop) and were receptive to learning about it and to developing further skills in using it for their specific needs.

Conclusions

During 2000 much effort and resources were placed in developing and extending the IT skills of the staff of the Faculty of Education and from survey responses and from anecdotal comments the IT PD opportunities offered were appreciated by staff of the Faculty. With ever-increasing pressures on staff to publish more, dropping staff-student ratios, and pressures to use IT as a routine part of teaching, it is increasingly difficult for many staff to find the time to attend group IT PD workshops. Staff, and in particular senior staff, are more likely to seek help in developing their IT skills if the PD comes to them, at a time that suits, on a specific topic of need, rather than having to fit a workshop into a busy schedule. This 'Just in Time' model of IT PD is not as expensive as it may first appear when the costs of attendees, as well as that of the workshop leader, are taken into consideration.
After trialling a range of IT PD models in the Faculty of Education during 2000, we will continue in 2001 to support the position of IT PD Coordinator who will be responsible for organizing IT PD workshops for staff and for one-to-one and small group IT PD consultations, as these two models appear to be the most successful

for developing IT skills of staff in the Faculty. In addition to continuing these programs, in 2001 particular efforts will be placed in providing more IT PD for general (mainly administrative) staff of the Faculty and for ensuring the department that was underrepresented in 2000 is targeted for IT PD during 2001. These goals will be achieved by organising IT PD workshops of specific interest to administrative staff (who are then likely to request one-to-one consultations) and by organising workshops within the physical space of the underrepresented department and, where possible, in times that have already been allocated by the department as department seminar timeslots. This, too, is likely to generate requests for further one-to-one consultations. It must be noted that important factors in the success of the IT PD program were the strong interpersonal and technical skills of the IT PD Coordinator. That this person has skills that support staff in their learning about IT and encourages and develops confidence in using unfamiliar tools is critical to the success of such a program. Our faculty was fortunate to appoint such a person to this role and the increased confidence of staff in using advanced aspects of IT is evident. Many comments on the survey mentioned by name the IT PD Coordinator and specifically referred to his approachability, skills, and availability. It is interesting to note that the person in this role was not trained in IT as a discipline, but rather has a very strong knowledge of a wide range of software applications and how they can be used to support learning, was keen to learn new applications, and, most importantly, had a wonderful manner that made staff feel that they could achieve whatever they wanted to. This aspect of developing the confidence, as well as the competence, in using IT is an important, and sometimes overlooked, aspect of IT PD.

Bibliography

Alcorn, D. (2000) *Summary of Status Report on the Impact on Teaching and Learning of Multimedia and Educational Technology Development Grants*. Report presented to Academic Board 25 May 2000. Website http://talmet.unimelb.edu.au/ImpactReview/Impact_review_report.html [Accessed 11 October 2000].

Beisser, S.R. (2000) *Technology Mentorships In Higher Education: An Optimal Match For Expanding Educational Computing Skills*. SITE2000: 11th Conference of the Society of Information Technology in Teacher Education, San Diego,CA. (Ed. D.A. Willis, J.D. Price, J. Willis).

Guskey, T.R. (1986) Staff development and process of teacher change, *Educational Researcher*, **15**, 5.

Kahn, J. & Pred, R. (2000) Technology Use in Higher Education: A Faculty Development Model. *SITE2000: 11th Conference of the Society of Information Technology in Teacher Education*, San Diego, CA. (Eds D.A. Willis, J.D. Price, J. Willis).

Shotsberger P. (1997) Just-in-time Professional Development using the World Wide Web, *8th International Conference of the Society of Information Technology in Teacher Education*. (Eds J. Willis, J.D. Price, B. Robin, S. McNeil, D.A. Willis).

Zachariades, I., & Roberts, S. (1995) Collaborative approach to helping teacher education faculty model technology integration in their courses: An informal case. *Journal of Technology and Teacher Education*, **3**(4), 351-357.

Ohio State University (1999) *Faculty Instructional Technology Development Report*. Website http://telr.ohio-state.edu/faculty/de/resources/fitd.cfm

Zbar, V. (1999) Successful Models of Teacher Professional Development: Forum Report. Website http://203.12.60.74/pd/vpdn/docs/PD_Forum.doc [Accessed 27 November 2000].

Supporting the Professional Development of Preservice and Inservice Instructors: Aspects Toward a Nurturing, Creative Learning Environment

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Abstract: Professional development opportunities must offer a learning environment that creates a nurturing, creative, successful atmosphere for the learners. Instructional design models, learning styles and technology implementation strategies impact this supportive environment.

Introduction

The careful development of a learning environment is imperative towards the success of all learners within a classroom of eager, and perhaps not-so-eager, learners. This is obvious to all professionals within the realm of instruction. However, the thought and care that is focused upon developing a nurturing, creative learning environment for PreK-12 learners may not always be taken with preservice and inservice teacher educators; after all, many professional educators remain so focused upon the PreK-12 learners that we "miss the forest for the trees", so to speak. Preservice and inservice teacher educators also desire and deserve a supportive, nurturing, creative learning environment within the professional development opportunities.

Professional development opportunities that focus upon instructional uses of technology are examples of environments in which a nurturing, supportive atmosphere will aid the preservice and inservice teacher educators in developing a level of comfort with technology and, slowly, move towards the appropriate and successful integration of technology within their classroom. Numerous aspects lead towards a supportive, nurturing atmosphere in which the creativity and love of learning will present itself; but what specific aspects will aid the professional development opportunities when working with technology? Technology-phobic preservice and inservice teacher educators abound within the education profession but, with appropriate care and guidance, the technology-phobic can become the technology-savvy, learner-centered facilitator in the classroom.

Creating a Supportive, Nurturing and Creative Learning Environment

The fact remains that teachers must attend professional technology development. To embrace technology, teachers must have positive attitudes toward it. It is imperative that instructional technology trainers supply a supportive and nurturing environment. One way to foster a supportive environment is to offer multiple-session technology classes. Technology programs in school districts must no longer take the "treat 'em and street 'em" type philosophy where teachers are required to attend one-day workshops. The danger of one-day workshops is the tendency for educators to not use the newly learned technology. In a survey dispensed to an elementary school in the Houston metropolitan area, 89% of the teachers surveyed admitted that they did not use the technology after taking the one-day technology workshop. The same survey also illustrated 75% of those teachers appeared dissatisfied or somewhat dissatisfied with the technology professional development training that they had received. Ehley (1992) found that teachers require multi-session workshops in order to feel successful with the computer. One-day technology workshops have a tendency to leave teachers feeling isolated and frustrated. By breaking up the technology training into three to six learnable sessions, teachers appear less anxious about the computer and can concentrate on the material. In addition, multiple training sessions let teachers learn smaller chunks of material at a time for faster acquisition of the skill.

Another positive component of multiple training sessions is the fostering of relationships between fellow teachers. This bond can reduce feelings of anxiety and frustration and help create a supportive environment for all technology users. The bond can even continue to blossom after the training sessions have ended. The Intel Corporation has just unleashed a successful teaching technology program called, "Teach to the Future" in which an underlying belief that support for teachers does not end after finishing the 40-hour training modules is apparent. Further, Intel has created a lesson plan bank and listserv for all Intel participants to study and use. Through the implementation of supportive, nurturing, creative learning enviornments and longitudinal time elements that enhance the learner's acquisition of relevant knowledge and implementation skills, the success of the learning environment can be significantly heightened.

Instructional Uses of Technology

Teachers' attitudes toward technology and computers vary widely in any give school. If teachers see the introduction of computers into their subject as bringing curriculum change with it, they may react in different ways. While some may adopt a resistant attitude to this change, others may see the change as a cure for boredom and see themselves as innovators (Bennet 1980). In addition, attitudes not only affect choices but also can be unconsciously transferred to students through modeling (Martin 1986). Proving teachers with quality instructional uses of technology is an important step in giving teachers sufficient opportunities to acquire and learn technology for the classroom.

One way to show teachers how to use technology is give them authentic learning situations in their training. For example, one technology specialist sits down with a school group, team, or individual and identifies a teacher's technology needs. After the initial meeting, the specialist then proceeds to build a CTP or a Classroom Technology Plan for the teacher. In the CTP a list of technology goals are listed along with the real authentic products that will be produced. Real and authentic learning activities are crucial in developing a successful learning environment. Knowles (1984) was one of the first researchers to identify the importance of real and authentic learning situations in adult learning. Knowles felt that adults are motivated to learn after they experience a need in their real-life situation, because adults do not learn for the sake of learning they learn in order to be able to perform a task or solve a problem. To apply Knowles' theory in education, instead of showing teachers how to use spreadsheets by opening up a program and exploring the interface, a better instructional use would be to create a teacher gradebook. Creating a teacher gradebook is a real and authentic product that the teacher can take back into the classroom and use. The instructional uses of technology are ever expanding; however, the appropriate and successful integration of technology into the learning environment is imperative.

Conclusions

A technological revolution is under way that involves teachers. In considering the role of technology in learning, educators are faced with a number of challenges, including how to respond to technology and how to utilize it without diminishing the learning experiences (Field, 1997). The time has come to prepare our nation's educators with quality, supportive, and nurturing learning environments to learn the technology skills they so desperately need.

References

Bennett Y. (1980). Teachers' attitudes to curriculum innovation: Making explicit a psychological perspective. *The Vocational Aspect of Education, 23* (83), 71-76.

Ehley L. (1992). Building a vision for teacher technology in education. ERIC document 350 278. (I don't know how to format this one.

Field, D. (1998, May-June). The next best thing to being there. *Teacher Magazine, 9*, 48-51.

Knowles, M.S. (1984). *Andragogy in action*. San Francisco: Josey-Bass.

Martin, C.D. (1992). American and Soviet children's attitudes toward computers. Journal of Educational Computing Research, 8(2), 155-185.

The JASON Academy: Explorations in Online Science for Middle Level Teachers

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Abstract: The JASON Academy for Science Teaching and Learning is a new initiative of the JASON Foundation for Education. Beginning in September 2001, the Academy will offer online professional development courses for graduate credit and CEUs to middle level (grades 4-9) teachers of science. Twelve science content courses will include modules focusing on energy, marine science, Earth Systems, and pedagogy. The goal of the Academy is to enhance the science content background of teachers and provide them with the tools to help students learn more effectively.

Beginning in September 2001, the JASON Academy for Science Teaching and Learning will provide online science courses for middle level teachers (grades 4-9), supplemented by "Lab Pack" materials for hands-on science activities with students. The goal of the Academy is to improve the science content background of teachers of science to help them become more effective teachers. Taking advantage of multiple delivery systems offered by advanced systems architecture, the online courses will be tailored to meet individual teacher's learning and teaching styles. Courses will be integrated and thematic in design, but each will emphasize physical science—an area in which both teachers and students need more concept understanding and practice. The Academy's initial course offerings will include the following.

- A required introductory course, *Introduction to Online Middle School Science* (five weeks long and one credit unit) which will provide an orientation to navigating online science and using the Lab Pack materials in investigations with students.
- Eleven content courses, offered concurrently, each 5 weeks long and one credit unit.
    - *Light and Heat*
    - *Electricity and Magnetism*
    - *Forces and Motion*
    - *Water Quality*
    - *Ocean Science*
    - *Aquatic Ecosystems*
    - *Structure of the Earth*
    - *Earth's History*
    - *Earth in the Solar System*
    - *Teaching Project-Based Science*
    - *Assessing Student Learning and Work*
- Lab Packs containing light, temperature, and voltage probeware, software, and student activities will serve as the Academy "textbook." Teachers will use them with their students to reinforce the science concepts they have learned on-line. The kits will insure that teachers and students have experience collecting and analyzing data using hand-held devices and probeware.
- Pedagogy embedded throughout the courses with inquiry being the overarching mode of instruction and learning. Course modules will be tied both to the National Science Education Standards as well as to state science standards.
- Pre- and Post-Assessments and weekly quizzes and surveys to provide continuous feedback on teacher progress and course effectiveness.

The JASON Academy is forming partnerships with crediting institutions and credentialing agencies in several states to provide teachers with options for graduate credit as part of an advanced degree program and continuing education units to be used for certification and recertification requirements. Responses to a survey of state science supervisors provided valuable contact information for state university crediting and state certification requirements.

In November 2000, the JASON Academy conducted a field test of a two-week prototype of a JASON Academy course on Electricity and Magnetism. Findings included the following:

- Based on experience with the JASON prototype, 100% of the field testers would take another online JASON Academy course
- Overall rating of the course on a 5-point scale: 4.6
- Top reason to sing up for an online course: Expand science knowledge, followed by graduate credit and CEUs toward certification.

Field testing teachers appreciated the flexibility of online learning as well as the colleague interaction and ease informal presentation format.

The Challenge of Developing College Wide Technology Standards

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Abstract: The technology requirements prescribed by NCATE for teacher education programs pose unique challenges when *all* programs within a college of education and human development enter the self-examination process together. This research study examines the growing pains of one university's college of education in designing and implementing technology standards.

Purpose

The technology requirements prescribed by NCATE for teacher education programs pose unique challenges when *all* programs within a college of education and human development enter the self-examination process together. As technology competencies become integrated within the curriculum, faculty and student proficiency becomes an immediate rather than long-term necessity. Moreover, professors of education must model the use of technology throughout the curriculum. At the University of Southern Maine, the College of Education and Human Development enrollment shows that 80% of the students are in graduate programs and 25% are in non-teacher education programs including school counseling, clinical counseling, school psychologist, school administration, and adult education. Many graduate students do not have a technology rich background and, as commuting students, have little opportunity to use the university resources. Both students and faculty struggle with the technological changes in curriculum and instruction. This case study examines the growing pains of one university/ college of education in designing and implementing technology standards.

Perspectives on Technology in Higher Education

In the 1980s computer literacy emphasized programming skills, computer science theory, hardware platforms, and software applications (Friedstein, 1986, and Ayersman, 1996). Computer literacy was a rather esoteric arena; certainly not for everyone. By the 1990s, computer literacy became inexorably connected to functional literacy with employers expecting college graduates to be computer proficient. A few colleges and universities at the undergraduate level began to set fairly basic expectations for all students, advertised on the school website and in paper publications. Georgetown College and Mary Washington College are undergraduate institutions that have led the way in advising students to meet their technology expectations in advance of enrollment. At the University of Nebraska, the college of education asked all teacher education candidates to be computer competent before entering the teacher education program and the preservice teaching experience. Guidelines for entry-level computer competency skills were written and approved by the faculty in 1991.

However, many graduate students arrive with high levels of anxiety about technology that may affect their academic performance and personal self-esteem. Hudiburg and Necessary (1996) found that computer-anxious college students often used emotionally-focused coping strategies such as distancing, seeking social support, and escape avoidance. Low computer-anxious students use problem-solving strategies and were more likely to accept responsibility. Attitudinal issues are especially important to the non-traditional students' successful return to college. When they do learn to use computers, they experience greater increases in self-esteem than traditional students (Mruk, 1987).

Faculty, too, have differing attitudes towards the technology revolution. Kasworm (1997) advises college leadership to develop profiles of different faculty as learners with descriptions of how they approach or resist technology. Then a variety of paths for learning can be made available, from workshops to mentoring. Additional studies find that technology can increase and strengthen the ways faculty engage students both in and out of the classroom (Gillette, 1996). Faculty report that the increased time that is required to answer electronic messages is balanced by the flexibility of email over connecting by phone or making office appointments. Electronic conferencing seems to be a double-edged sword. Some students who are quiet in class increase their participation using email and electronic conferencing, needing the additional time and reflection to post either their observations or questions. In order to get increased use, key factors must be present: clear advantages for use, opportunity to overcome computer phobia, excellent support during learning, unique fit with lifestyle, and something to share (Wilson, 1996). One might extend the belief that these factors predict success for faculty as well.

The Process of Developing Technology Standards

A subcommittee of the College of Education and Human Development (CEHD) Technology and Media Committee was charged with the task of developing recommended technology entrance and exit standards for all programs to integrate within the college. In considering how to proceed NCATE technology standards, ISTE standards, and a variety of other universities' technology standards were consulted. It was agreed that the recommended entry standards would represent the technology skills that are necessary for students in any CEHD program to have in order to successfully engage in program/department communication and course learning activities. The recommended program technology outcomes would represent the goals or final outcomes that each graduate will have met upon completion of any CEHD program. And, the standards needed to be stated in such a way that all programs within the college would be able to apply them.

A draft document was presented to the CEHD Technology and Media Committee for feedback. Revisions were made based on this feedback and a second draft was given to the chair of the Faculty Development Subcommittee (FDC) (see Figure 1).

Recommended Minimal Entry Skills

- Demonstrate skills using e-mail communication tools
  Attachments Nicknames Cut & paste from document
  Utilizing a listserv Signature Organizing messages
  Sending Netiquette Replying
  Forwarding messages

- Demonstrate knowledge of and skills in using library databases

- Verify skill in using remote access to university (if applicable)

- Demonstrate skills in using Word Processing productivity tools: cut & paste, spell check, printing, formatting, editing, backing up work

- Operate a computer a system to successfully use software

- Demonstrate an ability to access and use the World Wide Web

Recommended Exit Skills

- Demonstrate an ability to load a new program (cd-rom)

- Using help functions and strategies for troubleshooting

- Having skills across computer platforms and applications
- Demonstrate an ability to use multi-media technology
- Create and use spreadsheet/databases
- Search literature databases
- Use electronic gradebook (if applicable)

Students admitted into programs in CEHD self-select into one of the following orientation sessions that will be held prior to the first semester in the program in order to demonstrate mastery of the entry skills:
Novice orientation & assessment – for those that need assistance in learning and demonstrating competency in the minimal entry skills
Advanced orientation & assessment – for those that need little or no assistance in demonstrating competency in the minimal entry skills
Non-matriculated students will be given this checklist of minimal entry requirements. They will also be required to demonstrate their ability to meet these entry skills.

Figure 1: Draft Entrance and Exit Technology Skills

The CEHD committee decided that an appropriate next course of action would be to document current faculty use of technology to support teaching, to identify faculty needs around technology, and to gather input from faculty regarding the draft entry standards and outcomes for students in as series of luncheons sponsored by the FDC. The goal was to gather rich descriptive data in order to gain an understanding of the faculty's experience and their deeply help convictions about curriculum, pedagogy and student needs in such a way as to contribute to the design and implementation of technology standards in higher education.

The following questions represent the major concerns of the faculty in regards to adopting technology standards:

- How should we handle non-matriculated students and these standards?
- Where will the resources come from to support faculty to learn to incorporate technology into their coursework and get the appropriate hardware/software?
- Aren't technology skills moving targets, having a fast rate of change?
- Will these standards deny people access to CEHD courses if they can't meet entrance standards?
- Should faculty integrate the teaching of these skills into their class sessions, or should students complete university workshops outside of class time?
- How can these standards apply to all CEHD programs?

With these concerns in mind, a second draft of the "entry standards" were presented to the CEHD faculty at a fall meeting attended by full-time faculty as representative samples of each of three departments: Professional Education, Teacher Education, and Human Resource Development. In the discussion, many of the concerns related to the language used in the document or the method by which students would be evaluated in relation to these technology standards. While the original intention of the standards subcommittee was to have a process by which students would demonstrate proficiency in the entry standards, faculty expressed concern about managing this assessment. Faculty felt strongly that "technology skills" should be changed to "technology standards" to reflect our intent. There was concern about the notion of technology "entrance requirements" to CEHD programs. How could students demonstrate mastery of the entrance standards prior to starting a program? Would non-matriculated students be required to meet these standards as well? Would non-traditional students be "shut out" of courses due to lack of technological proficiency? But, at the same time, how could programs systematically incorporate technology into courses if some students would have met the entry standards and others would not? These issues needed to be resolved before the entire faculty felt comfortable adopting the proposed entry standards.

At a subsequent meeting, the following recommended entry standards were adopted by the CEHD faculty – with the understanding that these were recommended and not required and that they would be included in the CEHD catalog so students would be made aware of their existence. But, in the discussion, it was apparent that faculty needed a common set of technology skills that all students could perform in order to systematically move them towards the technology outcomes (See Figure 2).

- Demonstrate skills using e-mail communication tools

Attachments	Cut & paste from document	Nicknames
Utilizing a listserv	Signature	Organizing messages
Sending	Netiquette	Replying
Forwarding messages		

- Demonstrate knowledge of and skills in using library databases
- Verify skill in using remote access to university (if applicable)
- Demonstrate skills in using word processing productivity tools: cut & paste, spell check, printing, formatting, editing, backing up work
- Operate a computer a system to successfully use software
- Demonstrate an ability to access and use the World Wide Web

Figure 2: Adopted Entry Technology Standards

Once the entry standards were adopted by the CEHD faculty, a second draft of the recommended technology outcomes were presented at each department meeting for feedback. The feedback was used to modify the outcomes for vote by the CEHD faculty. The focus of this discussion centered around using appropriate language in the document that would reflect general outcomes that all programs could apply. In addition, a general agreement was made that program faculty could determine how these outcomes were systematically incorporated into the coursework. At a spring CEHD faculty meeting, the CEHD Program Technology Outcomes officially adopted (see Figure 3).

As a result of an educational program in the College of Education and Human Development, students should be able to:

- Demonstrate an ability to load a new program
- Demonstrate an ability to use help functions and strategies for troubleshooting
- Demonstrate skills across computer platforms and applications
- Demonstrate an ability to use multi-media technology
- Demonstrate an ability to create and use spreadsheet/databases
- Search and evaluate electronic databases and World Wide Web sites
- Use electronic gradebook, budget software, financial software where applicable
- Demonstrate knowledge of equity, ethics, legal, and human issues concerning the use of computers and technology
- Integrate technology into professional work (e.g. internships, field work, etc.)

Figure 3: Adopted Program Technology Outcomes

In addition, a follow up motion was voted on and approved that required the CEHD Executive Council (Deans, department chairs, program directors, etc.) to review the standards and oversee the development of consistent evaluation of these outcomes across CEHD programs. This allows program faculty to determine the ways in which technology standards will be integrated into courses. In conjunction with adoption of these standards, a series of "Technology Day" workshops are being offered each semester to move faculty an d staff forward in their own technology skill development as well as their pedagogical awareness of ways to integrate technology in their teaching.

While it may appear that the process of developing integrated technology standards is complete, the technology subcommittee is now working to align the newly adopted ISTE standards (ISTE, 2000) with our already approved standards. In our upcoming 2002 NCATE review our college will be required to demonstrate the integration of the newly adopted ISTE standards into our programs.

Some Reflections Based on our Work

Based on college-wide conversations during the development of technology standards a number of recurring observations become apparent. First, faculty are beginning to use a variety of technology in their professional lives and in the classroom, however, without specific direction. Use is primarily centered around improved organization and student interest. Faculty are not using technology to promote higher level thinking and do not see themselves as pedagogical models related to technology. Second, faculty are most intrigued by the use of electronic communication systems to ease communication particularly with graduate students and in distance learning contexts. In addition, faculty use electronic communication to build relationships that extend beyond the original course. As Gillette (1996) pointed out, ease of communication encourages students to ask more questions and clarify tasks, resulting in an improvement of the ways students are engaged in their learning. In this way, technology can enhance the teaching-learning environment. Finally, the initiation of general technology entry standards and programmatic outcomes has raised specific concerns across programs which includes issues such as: assessing and monitoring technology competencies; computer access by commuting and/or distance learning students; standards as moving targets due to technology innovations; untrained faculty; lack of technical support personnel who have pedagogical understanding. These issues are still at the crux of our struggle in actually engaging faculty in systematically incorporating technology in their teaching and expecting students to produce technology-enriched products.

Recommendations to others considering our work

There are certainly a number of lessons that other colleges can take from our experience in working towards technology standards. First, create a technology plan with standards/outcomes at the core. Once a college is clear about the expectations, appropriate decisions can be made regarding faculty load, budgets, faculty/staff development, needed equipment and support, etc. Second, create technology entry standards that faculty can count on and use in curriculum planning and technology integration. It is important when making a programmatic attempt to integrate technology, that basic prior knowledge can be assumed so that course time does not have to be spent in teaching technology skills. Third, create technology outcomes that allow for program autonomy for course integration and assessment. It was a critical element in our work to make sure that all voices were heard across disciplines in the development of the standards. In addition, it has been essential that the adopted standards fit all the disciplines within the college so that individual programs can take the standards and integrate them appropriately. Fourth, entice faculty support through a better understanding of the pedagogical opportunities of technology as well as training them in specific hardware and software skills. Learning the technology skills is crucial, but developing a better pedagogical understanding of how to incorporate that technology to promote higher level thinking is just as important. Finally, include questions related to technology standards within the college-level curriculum review process. One way to ensure the appropriate integration of technology standards into program curriculum, is to require its inclusion in course syllabi.

Significance

Most colleges and universities do not assess computer literacy as part of the admission process and often do not define computer proficiency for their graduates. This unwritten policy of "don't ask; don't tell" has not served either students or faculty well. Rather than serving as barriers, clearly defined expectations can help students prepare for coming into higher education, use technology as a tool for learning throughout their program, and understand the expected technological outcomes of their education. More importantly, as we raise the bar in terms of technology skills within courses, colleges and universities can then focus their technology mission on educating for the critical use of technology.

References

Ayersman, D. J. & others. (1996). Creating a computer competency requirement for Mary Washington College Students. *Association of Small Computer Users in Education (ASCUE) 29th Summer Conference Proceedings*, North Myrtle Beach, SC, June 9-13th, 1996, pp. 24-30.

Friedstein, H. G. (1986). What computer courses do students really need? *College Teaching*. 34. (1): 8-10.

Gillette, D. H. (1996). Using electronic tools to promote active learning. *New Directions for Teaching and Learning*. No. 67. Fall. Jossey-Bass. San Francisco. Pp.59-70.

Hudiburg, R. A. & Necessary, J. R., (1996). Coping with computer stress. Paper presented at the *Annual Meeting of the American Educational Research Association*, New York, NY, April 8-12, 1996, 13 pages.

International Society for Technology in Education (2000). *National Educational Technology Standards for Teachers*. Intel Corporation.

Kaminer, N. (1997). Scholars and the use of the internet. *Library and Science Research*, 19 (4): 329-345.

Kasworm, C.E., (1997). The agony and the ecstasy of adult learning: faculty learning computer technology. What lessons can we learn from these experiences? Paper presented *at Annual Meeting of the American Association for Adult and Continuing Education*,, Cincinnati, OH, November 1997.

Light, P., C. Colburn, and V. Light. (1997). Computer mediated tutorial support for conventional university courses. *Journal of Computer Assisted Learning*, 13, (4): 228-35.

Mruk, C.J. (1987). Teaching adult learners basic computer skills: a new look at age, sex, and motivational factors. *Collegiate Microcomputer*, V. (3): 294-300. Strauss, A.L. and J. Corbin (1990). Basics of qualitative research: Grounded theory procedures and techniques. Newbury Park, CA: Sage.

Whitely, B.E. (1996). Gender differences in computer-related attitudes: It depends on what you ask. *Computers in Human Behavior*, 12 (2): 275-89.

Wilson, B. and others. (1996). Cultural assimilation of the internet: a case study. *Proceedings of Selected Research and Development Presentations at the 1996 National convention of the Association for Educational Communications and Technology*, Indianapolis, IN.

Problem-Based Learning Resources for College/University Professors

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Abstract: The authors define problem-based learning (PBL), an instructional method used by teachers and professors to teach problem solving and to replace rote memorization and passive learning. PBL's process is explained. The historic association with John Dewey's progressive movement and constructivism are also included. Questions are answered that deal with the changes from a traditional classroom to problem-based learning. Academic achievement, the roles of teacher and student, generating problems and assessment tools are covered. Examples are given for further study.

What is PBL?

Problem-based learning (PBL), a teaching technique or instructional method that was introduced in the mid-60's by Physician and Medical School Professor Dr. Howard Barrows at McMaster University in Ontario, Canada has now been used widely in medical schools, schools of nursing, pharmacy, dentistry and optometry, as well as in some undergraduate and graduate programs of other disciplines in colleges and universities in the U.S. and Canada. Many middle and high schools have also adopted the PBL method to raise student achievement and contribute to school improvement programs (Delisle, 1997).

Dewey and Constructivism

Problem-based learning has its roots in John Dewey's progressive movement. Dewey believed that teachers should teach by appealing to student's natural instincts to investigate and create. Problem-based learning is also considered as one of the best exemplars of a constructivist learning environment. Constructivism is a teaching/learning model that holds the notion that learners should generate their own knowledge through experience-based activities rather than being taught it by teachers(Roblyer, 2000).

The PBL Process

The PBL process is broken down into the following structured steps.
1. The teacher presents a problem.
2. The class is divided into groups.
3. The groups generate ideas/hypotheses.
4. The group members determine what they know about the problem.
5. The students determine what they need to know.
6. The students develop a plan to acquire the information needed from reliable sources.
7. The students use the new information to re-evaluate the problem.
8. The students generate a product such as a written paper, class presentation, or web page.

Some Frequently Asked Questions About Problem-Based Learning

Academic Achievement

Faculty question if content will be learned when using PBL. Palmer (1998) in *The Courage to Teach* shares about a medical school that instituted problem-based learning and found that content scores increased. Palmer thinks it is because the brain works best with information presented in patterns of connection—looking at the patient as a whole and the shared learning—the group is smarter than the individual alone.

Generating Problems

PBL is changing the way that teachers traditionally teach. So more preparation must go into getting ready for class. Creating problems seems to be the biggest challenge for teachers changing to problem-based learning. However, once teachers take the plunge, they find that the challenge makes them feel revitalized. The activity is intellectually stimulating (White,1995).

Role of the Student

This type of learning puts more pressure on the student. Because there is not one right answer, the students must look at different angles of the problem and come up with the best answer based on the situation. For students who are used to memorizing the teacher's notes, this causes anxiety. For bored students the challenge is welcome.

Role of the Teacher

The teacher goes from being a lecturer to being a coach (Lynrock, 1999). This is a change for the teacher in that new behavior skills are required. Instead of lecturing to a group of students, the classroom becomes much like a newsroom. Students are involved in different aspects of problem-based learning—researching information online, calling an expert, collaborating in a small group to agree on the final answer. It makes for a messy classroom which is sometimes hard for teachers to accept.

Assessment Tools

Because problem-based learning is different from traditional learning, different assessment tools are needed. Students work in groups, and peer assessment can help determine the contribution of different members to the group project. Oral and written reports of the solution can be used to assess what was learned. Traditional exams can also be used. Since each student will learn different things because of the activities involved, some form of self-assessment will help determine the new skills the student has acquired (Jones, 2000).

PBL Examples

One example of PBL is a webquest (Summerville, 2000). The teacher finds the information on the web and has the students interact with the data to do some kind of project. Many teachers are doing this and examples are on the web (http://edweb.sdsu.edu/webquest/webquest.html) Problem-based learning has been used successfully in graduate, undergraduate, and K-12 schools. It has also been used in various disciplines in arts and sciences such as criminal justice, political science, public administration, physics, biology, chemistry, and art as well as education and business (http://www.udel.edu/pbl).

Reiman (1998) in *Thinking for a Living* talks about the skills needed in the future. Problem-based learning helps prepare students for the jobs in their future.

References

Delisle, R.(1997). *Use problem-based learning in the classroom.* Alexandria,VA: Association for Supervision and Curriculum Development.
Jones, D. Problem-based learning. San Diego, CA: San Diego State University. Retrieved November 1, 2000 from World Wide Web: http://edweb.sdsu.edu/clrit/learningtree/PBL/Dis/PBL
Lynock,K & Robb, L.(1999). Problem solved: How to coach cognition. *Educational Leadership*, 57(3), 29-32.
Palmer, P.J. (1998). *The courage to teach.* San Francisco, CA: Jossey-Bass.
Reiman, J. (1998). *Thinking for a living.* Atlanta, GA: Longstreet.
Roblyer, M.D. & Edwards, J.(2000) *Integrating educational technology into teaching (2nd ed.).* Upper Saddle River, NJ: Prentice Hall.
Summerville, J. (2000). Webquests. *TechTrends*, 44(2), 31-35.
White, H. (1995). Creating problems for PBL. *A newsletter of the center for teaching effectiveness* # 47.
Retrieved October 24,2000 from World Wide Web: http://www.udel.edu/pbl/cte/jan95-chem.html

Together and Alone: The Instructional, Technical, and Psychological Outcomes of Faculty Building Online Courses

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Abstract: This paper seeks to report the findings of a study concerning online course development at a midwestern university. The study examined the use of a cohort model for online course development and the typical individual online course development to support the instructional, technical and psychological aspects of online course development by faculty in higher education. The study sought to answer the question: Can a cohort model provide the technological, instructional, and psychological support needed in the development of online courses in ways different from a faculty member working alone in the development of an online course?

Introduction

The migration of a traditional course to a web-based environment requires a rethinking of the instructional design, grading methods, group-work designs, technology skill level, and the community building that often occurs in a traditional classroom. Faculty members often lack the technical skills necessary to redesign the course materials for the web environment to meet the high standards they desire. This leads to frustration with online delivery and a negative feeling that the course will never "work as it did in the traditional classroom". In reality, this attitude is fact—the course will never work as it did in the traditional classroom—and must be changed to achieve the desired outcomes in this new visually based web environment. However, since course development for higher education faculty typically occurs in isolation, faculty can become frustrated with the development of new materials for the web, especially when they lack an understanding of how to work in this online medium.

The College of Education and College of Music has developed a group of online courses in support of their mission to provide ongoing opportunities to graduate students with a desire to obtain certification or renewed certification for teaching and administration as well as undergraduates often closed out of "high demand" courses. In an effort to meet a rising demand by undergraduates, area teachers, graduate students, superintendents, and international students for more flexible educational services, these colleges have developed online courses for the following students:

1. Graduate students in Computer Education and Technology who must obtain certification to become K-12 Technology Coordinators,
2. Graduate students in Music Education who must obtain certification to become K-12 Music Teachers,
3. K-12 teachers who now must obtain a masters degree in their field to maintain Ohio certification,
4. Superintendents in rural communities who must now be certified by the state of Ohio to hold a superintendent position,
5. Undergraduate students who need required courses for student teaching that are typically in "high demand" each quarter, and
6. Graduate students in African Studies and Instructional Technology as part of the College of Education linkages to the University of Western Cape in South Africa.

In discussions with the Center for Innovation in Technology for Learning (CITL), as the courses were being developed, faculty were concerned with developing the courses to meet the same standards as experienced in the traditional classroom. Often asked was the question, how could technical problems be addressed especially for the "novice technology user " by the faculty and the online student? Another major concern was how the lack of face-to-face contact with students would impact the faculty member as an instructor and on teaching evaluations. Questions were raised about the possibility of working with a team of faculty during the development of individual online courses. These questions lead to the development of a cohort of faculty who worked together to develop their individual online courses.

The Study

The members of the cohort group were College of Music and College of Education faculty presently developing online instruction using *Blackboard CourseInfo 3.11.* Personal interviews with faculty and a descriptive approach in which written information was used to substantiate the question to be answered was used during data collection. Attention was given to the details of the online course development process and changes as the faculty designed their courses.

The cohort met to establish the group, to identify technological needs and to discuss planned instructional methods for their courses. The cohort had opportunities to view other online courses in which *Blackboard CourseInfo* had been used and how the various materials were presented. Often the development of online course materials takes a different form than originally planned when faculty see various methods of presenting an idea. Cohort members discussed how small groups and discussion would occur within their course structures. The College of Music faculty had very different instructional problems than the College of Education in that the College of Music needed to be able to place sound files within the *Blackboard CourseInfo* for their students to evaluate. This posed a unique problem to the music faculty because most were novice users of this application of the technology. Help from the faculty in the College of Communications and WOUB Public Television was enlisted to help the faculty envision the possibilities of presenting the music scores online and to help develop the technical skills needed to accomplish the task. Most of the discussion by the cohort focused on course development, problem solving, technical problems, technological skills and course changes to be made as the course progresses. Discussion by the members of the cohort was recorded. An instructional technology graduate student and the researcher provided technical support to the members of the cohort. Members were asked to reflect upon the process of developing the course and the instructional and psychological hurdles that were encountered in the process. The graduate student and the researcher also maintained a journal of discussion with members, the meetings, and their reflections of the process as an observer.

A group of faculty who have worked alone in the development of their online courses was randomly selected from a list provided to the researcher from the CITL. The faculty were from colleges across the university. Selected faculty were interviewed using the same interview questions as the cohort group but with an emphasis on the individual course development process. Discussion and answers concerning the interview questions were recorded for examination.

All journals, self-assessments, meeting notes, and recordings from the cohort as well as discussions and comments from non-cohort faculty were examined to determine common themes and differences between the two groups in their instructional, technological, and psychological approaches to the development of online courses (Bogdan, R. & Biklen, S., 1998).

Findings

Multimedia and telecommunications technologies continue to evolve and advance with the promises of offering the learner with a richer and more meaningful education relevant for the future workplace and learning. The incredible growth had created challenges for educator to expand educational opportunities beyond University campuses to provide on-demand, anytime, anywhere instruction. However, faculty members often lack the skills necessary to create online courses because technology use was not part of their pre-service education (Cyrs, T. 1997). This study compared the use of a cohort model and the typical individual online course development by faculty with reference to technology, instructional and psychological support.

Solving Technical Problems

Technological problems comprised concerns related to the hardware and software used in online learning environments. These include problems related to bandwidth, speed of communication lines, software applications, and cost. The most prominent technological challenge identified by the study was the frustration associated with lack of knowledge in using the software (*Blackboard CourseInfo 3.11*) by individual faculty working alone. Individual faculty members working alone on course development adopted different approaches to developing their online courses:

Locate an Expert. The individual faculty members with limited skills and knowledge of developing online course used a paid expert in course development. The expert was typically a former student of the program who was very familiar with the course content. Typically they had no face-to-face interaction and all discussions were conducted via e-mail and the telephone. Using such an approach helped the faculty member to avoid having to be confronted with technology issues associated with the use of the software. The faculty member used the expert as a sounding board for technical problems.

Locate a Helper. Friends with technical knowledge were also identified as sources of help to some individual faculty members building online courses. One faculty member working alone stated, "I posted all the contents and inserted the images and then I gave it to my friend. He kind of made it look nicer by using *Photoshop* and inserted some graphics". The faculty member spent some time with the helper, three to four hours, to learn how to use the *Blackboard CourseInfo* software. The rest was e-mail back and forth, and it was effective. Several faculty stated, "Having a helper gave me the encouragement I needed to do more".

Locate a Mentor. Some faculty members identified mentoring as being an effective and efficient approach to online course development. Comments often included statements as; "it is faster if someone helped you than trying to figure it out yourself". The drawback to this approach was the limited number of meetings schedule to work together. Often the mentor and faculty member did not feel obligated to meet due to the independent nature of the course development.

Build a Team with Skills. In another approach a team of faculty members with expertise in different subject areas agreed to develop an online course together. Each member of the team was identified as having specific skills to give to the course. The member with skills and knowledge in technology applications was responsible for any technical setbacks that they encountered in the course development. This approach to "figuring things out" depended on one individual. The longer it took to figure it out, the longer the team had to wait.

Locate Support. Individual faculty members also identified several sources of support, one being the online manual for *Blackboard.* When confronted with a technical problem the faculty member referred to the online manual or used the "Help" menu. "I would go to the manual to try and figure it out and if I couldn't then I would call the mentor", stated an interviewee. Faculty learned to rely on their own ability to problem solve with the help of manuals. Several indicated they had not used online HELP functions in the past but were experts after developing the online course. The CITL was also named as a source of technical support by individual faculty. Periodically, the center organized workshops for faculty members.

The study indicated that in all the above-mentioned approaches there was also very limited interaction and the main channel of communication was through the e-mail. This left many feeling frustrated with the technical problems and slow rate of online course development. Frustrations were sometime due to messages that were not clear and instructions that are difficult to follow.

According to Forsyth (1990), a group is defined as two or more interdependent individuals who influence each other through social interactions. Communication within the cohort was mostly verbal, at any place and anytime. Individual's technical problems were discussed in offices, hallways, and meetings and at every possible opportunity. Proximity among individuals favored frequent interaction and communication. Individuals' had their offices in the same building and often next to each other. There were frequent face-to-face interactions that promoted positive interdependence.

Individuals felt supported technically and inspired to develop their online courses. One cohort member admitted his lack of desire to use the technology was altered when he began working with the cohort. He stated, "First it [cohort] has exposed me to the reality of using technology which I have been shying away from. Because I don't understand the language. But this challenge is helping me to face reality and I like that. I am excited working with a cohort". Several faculty in the cohort echoed the statement of this cohort member, "I saw how excited she [a cohort faculty member] was about the online course development and how well her course was going and I thought, I want to do this too. And I can with her help!"

Cohort members found that each had technical strengths that they could call upon when the technological tasks seemed overwhelming.

Battling with Instructional design

The impact of online learning on the learner was of major concern to all faculty members. Both the individual faculty members working alone on their online course development and the cohort faculty members voiced concerns about developing strategies that would empower the learner, encourage cooperative and independent learning as well as active learning in the online environment. A complaint often voiced by learners in the online learning environment is that they feel isolated and unconnected to other members in the class or to coursework.

How to design online instruction to meet the standards, how to stimulate critical thinking, questioning, and discussions, how to ensure effective group work, case study development, inquiry projects, and lectures were the same concerns voiced for the online instructional design as with the traditional instructional design. One individual faculty stated, "All of these things added together make an interesting course and only some of those things are available to you on the online format." In questioning the individual faculty, the medium seemed to drive the methodology thus challenging individual faculty member's ability to create online courses with desired instructional goals. In certain disciplines e.g. educational administration, faculty members were confronted with the problem of how to vary the instructional format. "The design was a real challenge and having to re-think teaching strategy was a real challenge". The designing of the online courses seemed most difficult to the novice faculty member and the amount of time spent in the design and redesign was often at the expense of other duties.

Deciding on the content, materials to include, how much information to provide was a constant question in the instructional design process. An individual faculty member stated, "Working in an environment that is filled with multiple media can lead to feeling of being overwhelmed. In developing the course, it was hard to figure out how much information I needed to put in the course. It took a lot of time and effort, many months of work." Many indicated that the course must be complete when implemented or the results can be disastrous. Faculty indicated that the changes made after the course is implemented take enough time without working on building the course as you teach.

The study also indicated that some individual faculty members were concerned with students' reaction to the information provided and choices for students. Several suggested, "There were hundred and hundreds of links. Information to reinforce content, there were quizzes and group projects." Bringing in a sense of humor and the personality of the instructor online was another concern of all faculty. "In a classroom you can use sense of humor, but in this format, I created some pop-up boxes to bring some other kind of things into the course. It was a little frustrating at times and it took longer hours to get things done".

Members of the cohort group were supportive of each other as a result of interaction and collaboration throughout the development of their online courses. The cohort members indicated that by working together they had an opportunity to become better acquainted with the courses that the other cohort members taught. They were able to better understand the connections between the courses in the curriculum and offer suggestions for connecting the courses through the instructional design process. One cohort member stated, "We saw that the audio/listening pieces could actually be worked on over a spring and summer rather than in just one course. This made the content of both courses richer for the student."

The cohort allowed their creative potentials to be combined for a common purpose. "We had a meeting and we talked about what each other is doing, how it has to be done and how to help each other". "If someone in the cohort was more technologically skilled, that person would help everyone learn how to use the technology and we would in turn help them with developing their content so they were not overwhelmed by doing it all". This allowed individuals to reveal themselves to one another and to receive feedbacks from the group. This process also helped individuals to develop new skills.

Psychological Concerns and Support

The study indicated that individual faculty members were worried about knowledge and skills in using the software (*Blackboard CourseInfo 3.11*). One faculty member said, " The first time I taught online I got 80 emails from the students the first day, which for some reason I hadn't anticipated. I thought, how could I ever do this many emails day to day? When I told a group of my colleagues about all the emails, they said, well you shouldn't have built the online course. I felt rejected by my peers. Here I wanted to be innovative and teach in a different medium and my colleagues didn't support it. I thought, I will never do this again".

The study also indicated that individual members realized that developing online courses was extremely labor intensive and so having about two people or three on a team, would enable the sharing of work, sharing of ideas and perceptions of what's going on and shape the activities for better learning. One individual faculty member who had found a helper said, "Availability of immediate help/support is essential for individuals working alone, as it releases stress".

Other concerns included how to ensure that the assignments were reasonable and the trouble of having to make this decision alone when there was not a clear understanding of the online environment. One member of the cohort concluded, "Working with a team guarantees moral support and this is too much work for one person to do".

The cohort members had the opportunity to interact and become interdependent emotionally as they worked toward a common success. The cohesiveness within the cohort promoted a sense of trust. Surrounded by a network of support and mutual understanding, members in the cohort had higher self-esteem and experienced lower levels of anxiety. Individuals within the cohort felt free to explore their own potentialities, risk self-revelation and try novice ideas because they felt surrounded by a supportive environment. The cohesive nature of the cohort afforded the opportunity to share thoughts and emotions. Consequently an emotional safety environment was created.

An empirical research on cohorts in university setting conducted by Hill (1992) and Kasten (1992) indicated that students in a cohort reported receiving psychological support from group members, feeling of reduced sense of loneliness, and developing strong affiliations. The study revealed that interaction made them feel connected and not isolated. The also felt emotionally secured. "She was by my side when I am doing all these".

Several cohort members echoed this research sentiment, "I know that they [other cohort members] will be there if I have problems so it makes this easier and I am sure that I will be successful and our program will be successful."

Conclusions

To change the world, faculty need reasons to take risks, to incur resistance, hazard failure, and to grasp the opportunities for action that their vision avails them. It is hoped that this research will provide information concerning the processes occurring when faculty develop online courses with respect to the technical, instructional, and psychological changes associated with online course development. While much research has been conducted concerning the learning that occurs online, the differences and similarities of the learning that occurs, little information is available concerning the changes that faculty undergo as they move from the traditional classroom to the online classroom.

With the use of a cohort formed by faculty, the isolation and frustration often felt in the development of online courses can be lessoned. The faculty members of the cohort group within a college or program typically have similar experiences in classroom instruction and similar interactions with the students that they will teach. The researcher's own experience and antidotes obtained from faculty who have developed their courses without support indicate that the isolation of developing and teaching online can be deterrent to continued online teaching. Also peer pressure by fellow faculty members does not always support the development of online courses, which leads to further isolation. Members of cohorts often remark that the cohort provides them with needed emotional support during periods of stress. The collegiality of the group supports the successes of each person within the cohort and lays a foundation for intellectual stimulation.

References

Bernt, F. L. & Bugbee, A. C. (1993). *Study and practices and attitudes related to academic success in a distance learning programme.* Distance Education, 14(1), 97-112.

Bogdan, R. & Biklen, S. K. (1998). *Qualitative research for education.* New York: Syracuse University.

Cyrs, T. Ed. (1997). *Teaching and learning at a distance: what is takes to effectively design, deliver and evaluate programs, 17.* San Francisco: Jossey-Bass Publishers.

Dicksen, D., & Tharp, D. (1996). Utilizing CBAM to promote systemic change: The use of instructional technologies in the classroom. *Technology and Teacher Education Annual 1996*. Charlottesville, VA: Association for the Advancement of Computing in Education.

Forsyth, D. (1990). *Group dynamics.* Pacific Grove, CA: Brooks and Cole.

Gilbert, K. (July 25, 2000). "Teaching on the Internet: The World Wide Course Delivery System". [Online] http://www.ihets.org/learntech/distance_ed/fdpapers/1997/gilbert.html.

Hannafin, M., Hill. J., & Land, S. (in press). Student-centered learning and interactive multimedia: Status, issues and implications. *Contemporary Education*

Hill, M. (1992). *Graduate cohorts: Perceptions of benefits and catalysts to cohesiveness or 19 heads are better than one*. Unpublished manuscript.

Hutton, S. (Nov. 11, 1999). *Course design strategies – traditional versus online. what transfers? what doesn't?.* Paper presented at the Annual Meeting of the American Association for Adult and Continuing Education. AZ: Phoenix.

Kasten, K. (1992). *Students' perceptions of the cohort model of instructional delivery*. Paper presented at the annual convention of the University Council of Education Administration, Minneapolis, MN.

McClintock, R. (1992). *Power and pedagogy: transforming education through information technology.* New York: Institute for Learning Technologies.

Morrison, G. (1999). *Distance education research: messages to the field.* IN: Wayne State University.

Reibel, J. (1994). *Institute for learning technologies: pedagogy for the 21st century*. New York: Institute for Learning Technologies.

Winn, B. (1990). Media and instructional methods. In D. R. Garrison & D. Shale (Eds.), *Education at a distance: From issues to practice* (pp. 53-66). Malabar, FL: Robert E. Krieger Publishing company.

Wolcott, L. (1995). The distance teacher as a reflective practitioner. *Educational Technology*, 35(1), 39-43.

Teachers as Multimedia Authors: A Workshop Developer's Experience

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Abstract: The advent of New Media provides a unique opportunity for teachers to develop their own educational websites. However, learning the necessary techniques and procedures can be difficult. One method for delivery of these skills is to develop a workshop with the objective of learning hypermedia development skills via an integrated project. Using the project as the main teaching tool allows for the learning of the new skills with immediate application to an end product.

Background

Considerable discussion has been made about how best to instruct teachers on designing and developing educational websites. In 1996, a three-hour workshop was given at the Massachusetts Educational Computing Conference on developing such a website. In such a short period of time it is necessary to impart the basic yet important concepts for a successful development process. It was decided to develop the workshop in an integrated lecture / lab format. That is, the participants would be taught a particular concept and then immediately implement it. This gives the participant quick feedback as to their progress in understanding the concepts as well as an appreciation for the practicality of them.

While this format aids the learner, it does create some additional concerns for the instructor / workshop developer. Pedagogically, the workshop was designed and presented in a top-down approach. A top-down approach can be analogized to the construction of a pyramid. The more intricate upper layers are dependent upon the larger, less detailed layers being laid down properly and forming a solid base for construction. The workshop developer must determine what concepts come first and then lay out the remaining sequence of concepts and procedures.

Design and Development

The basic structure of the finished project of the workshop was a main page discussing tornadoes and hurricanes at a high level of detail with links that point to a series of pages that describe each phenomenon in greater detail. Also, an interactive form could be chosen to collect information about the user. A person deciding to follow the tornado path would see text and graphics detailing tornado characteristics as well as a map of a tornado ground track as well as a sound file of an actual tornado. Following the hurricane path will encounter text and graphics describing hurricane behavior and statistics as well as a Quicktime movie of a hurricane from a weather satellite perspective.

The first step was to describe the basic structure of a web page in Hypertext Markup Language (HTML) which was the language used to develop all pages in the site. Drawing on the pyramid analogy, the participants were initially taught the basic structure of an HTML page including how to embed links to point to other pages. They then created the main page with the required text and links to the hurricane and tornado sequence pages. To further complete the skeleton of the site the structure of each of the tornado and hurricane pages were completed.

The hurricane sequence was arbitrarily chosen as the first sequence to be completed. The first page contained links and accompanying text that described Hurricane Luis that hit the Caribbean in 1995, a Quicktime movie of Hurricane Marilyn and text of how hurricanes are formed and categorized. Building upon the basic page structure, participants were instructed in embedding graphic files and then built the Luis page. Next was a discussion of animation and Quicktime formatted files. The students then added text and a link to the Quicktime file to the Marilyn page. Finally, methods of structuring text lead to an exercise of putting text on the formation / categorization page.

The tornado sequence was then constructed. The main tornado page consisted of a picture of the tornado which struck Wichita, KS in 1991 with some special (blinking) text. Also, a link was provided to view a diagram of the path of the tornado which struck Dimmitt, TX in 1995. Links were also added to point to a page containing a sound file of an actual tornado, a page describing tornado statistics on a state-by-state basis and a page about how to protect oneself in the event of a tornado. As with the hurricane sequence, students were instructed in the required HTML skill and then immediately implemented the necessary procedure(s) to construct the particular page. Along the way, the participants understood how to embed graphics of different types and how each type is appropriate for various instances. They also practiced embedding and understanding sound files, tables and alignment of text portions.

Another important skill that was obtained was the understanding of how all pages in the site can be connected to provide a concise, rich field of knowledge as seen in the figure 1. The dashed lines represent links back to the main pages. The importance of this skill can be seen by the complexity of linkages even in this relatively simple site.

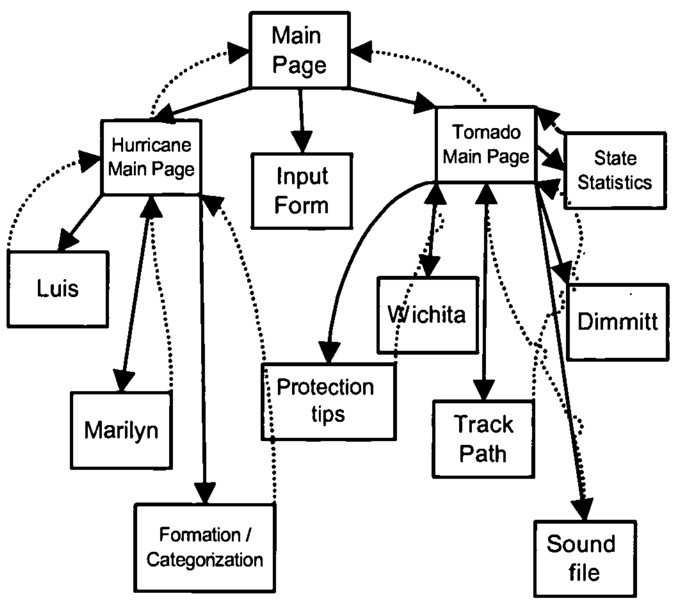

Figure 1: Final Website Configuration

Conclusion / Results

The experience for the instructor and students was a worthwhile one. Students commented on the utility of the skills learned and short time it took to acquire them. They also felt that this "boot camp" approach was an efficient use of their time and many felt a desire to continue learning more and to do some projects of their own. From an instructor's viewpoint, the experience was rewarding and informative. The short course time requires that great care be taken to follow concise but complete instruction immediately with relevant practice and feedback in an efficient manner.

Proactive Faculty Teaching and Learning Initiatives

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Abstract: Faculty do not always get the luxury of time or money to attend professional computer training sessions and read computing trade publications cover to cover. Yet, there is an expectation for continued professional development, often beyond their area of expertise. Academic Computing at the University of South Florida will present the current best practices utilized for faculty training, support and professional development. This presentation will also cover an overview of how Academic Computing integrates into the VITAL consortium and the evolution of faculty computing services. IT support professionals, and faculty will leave this presentation with abundant and diverse ideas to make faculty learning tailored, yet quick and effective.

The computer industry's constant evolution requires full time observation and training to stay abreast. For faculty, the constant pressure of infusing technology into the curriculum and classroom requires deft computing skills and current computing knowledge. Since faculty do not always get the luxury of time or money to attend professional computer training sessions and read computing trade publications cover to cover, there needs to be a treasure chest of efficient and effective computing resources. This expectation for continued professional development can often be met with campus computing resources.

At the University of South Florida several collaborative initiatives are addressing this hot topic. On a broad scale, the VITAL (Virtual Instructional Team for the Advancement of Learning) consortium was established in 1997 to provide a support structure for faculty wanting to integrate technology into their teaching and learning models. VITAL is comprised of seven departments joining forces to utilize differing approaches and services. VITAL units offer faculty assistance and support they need. Through VITAL, faculty members are encouraged to seek individual mentoring and assistance as well as attend workshops designed for small groups. Faculty who want individual assistance with technology issues can call upon a specific VITAL member, or they can reach a "generic" VITAL contact through multiple means. To facilitate access, VITAL has a web site (*http://www.usf.edu/vital*), an email list (*vital@usf.edu*), and a central phone number. Academic Computing participates in this consortium of departments. This paper will focus on the proactive measures Academic Computing takes to provide faculty with computing support and instruction.

Academic Computing supports faculty, students and research while providing a wide variety of technical services. Faculty technical development is also explicitly provided in the Academic Computing training center and the faculty computer lab. These areas, known as *Faculty Academic Computing Technologies* (FACT), were consolidated and devised to fill the need of faculty needing necessary skills and access to technical resources. Services offered by FACT can be categorized into three areas: technology review, training and computing facilities. Each part serves a different facet of faculty needs, but ultimately all three areas intertwine to provide the best possible computing environment in support of instruction and research.

Technology Review: The *FACT Review* is a means for faculty to learn about new technologies, costs, comparisons and diverse uses. This FACT area also provides electronic access to resources and tools developed within Academic Computing. Basically, computing tools desirable to faculty are reviewed or created and presented. A review database contains details about the products, such as, technical specifications, screen captures, demonstration files, links to relevant websites and reviews for usability and performance. The database is available online for searching, categorizing and comparing reviewed resources. Hands-on demonstration sessions are scheduled in multiple, short time chunks for participants to experiment with and consult with the review staff. Resources are identified by request, as well as by staff keeping pace with the technology industry. The process and database development began fall 2000 after conceptual ideas were gathered from technology trade publications and electronic resources (e.g., *PC Computing's A-List*). With a student staff of two, more than five products have been examined as of November 2000. The fledgling review process has not yet been fully advertised, but approximately 25 faculty members have participated in three product presentations. The growing clientele of faculty have expressed positive feedback. Most have noted that the service simplifies searching for appropriate tools to utilize in and out of the classroom, and minimizes time spent learning a new product.

Training & Presentation: The *Academic Computing Training Center* not only presents the review seminars as noted above, but also presents training on integrated environments for hosting web-based courses and basic through advanced computer skills instruction. The classes are known as 'Class Shorts' and are offered on a wide range of current software, hardware and programming topics. Classes are time chunked in 15 minute to 2 hour blocks and are offered at varying times throughout the day, evening and weekends. Approximately 20 classes are offered every week with 10 seats available in the training center. Classes are also organized into beginning, intermediate and advanced task specific levels. The sessions can be taken individually or in series. The goal of this format provides the potential for learning whole applications or just needed tasks. The result of this concept is a flexible type of computer skills training to meet the needs of a wide range of faculty and students. The program, which has been in operation since January 1998, has served approximately 5,500 participants both in the Academic Computing training center or at 'on site' instructional labs on any of USF's four campuses. The program utilizes training materials developed in house, free resources online and purchased course materials (e.g., *ez-ref* software). Another growing area of the training center is "training on request." Faculty request an Academic Computing instructor to come in their classroom (either lecture based or hands-on computing) and teach a computing topic. Most popular topics include: campus-computing services for students, web development and campus email. Faculty have also used the training as an extra credit tool for students in their courses.

Computing Facilities: The *FACT Lab* contains hardware and software in support of faculty technology development. The student-staffed support lab contains equipment and resources that enable faculty to learn new computing skills while developing class content, or to focus on professional development. This faculty-only lab provides equipment, consulting, instruction and support for tasks such as online course development and image design, CD burning, web development, scanning and digitizing text. In addition, faculty members also receive assistance via email and phone on a wide range of computing related topics and technical troubleshooting. The lab currently operates with six workstations 40 hours a week. In a typical semester, approximately 50 faculty have utilized the lab with more than 200 visits.

All areas are thriving due to a highly skilled staff who enthusiastically embraces developing, working with and presenting new technologies. Currently, one full time staff member and seven part time student employees sustain this area of Academic Computing. It has been our experience, that the abundant and diverse types of output for our resources make faculty learning flexible, tailored, quick and effective. The collaborative efforts of the VITAL consortium also help to increase awareness of these great resources, and offer additional means to reach our faculty audience. As a result, the services provided by Academic Computing are continually evolving to meet the needs of our diverse population and the challenges for improved learning presented by emerging technologies.

Teachers, Technology and Staff Development: Planning for Sustained Change

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Abstract: Teacher staff development implies change. Staff development for teachers to incorporate a new technology into their classroom practice assumes that changes in student and teacher behaviors will occur in the form of teachers and students using technology in the teaching and learning process. Technology training for teachers often falls short of its anticipated outcomes. This paper will describe an instructional design model for teacher staff development to train teachers to integrate the Internet into their classroom routine. It is proposed that a staff development program designed to effect change in a participants' values and beliefs, provide knowledge of skills and strategies for immediate application in the classroom, and acknowledge the stages of development in the adult learning process will result in sustained change in classroom activities. The instructional design for the teacher staff development delivered through *Project REFLECT* offers such a model.

Introduction

With the emphasis on school reform at the forefront of many discussions regarding American schooling, the imperative for teachers to learn to use technologies for instructional purposes has accelerated. Pressure can be observed from a variety of venues including the government through legislation, accreditation organizations, school administrators and decision-makers, the corporate world, and the general public.

Unfortunately, current technology training for teachers is inadequate. Only one in five teachers report they are comfortable using technology. The U.S. government recommends schools spend 30% of their technology monies on training but in reality only 12 - 18% is used for that purpose. Training is often a one-shot event and frequently is conducted by non-educators. Clearly there exists a need to transform the way we plan for, design, and conduct technology training for teachers.

The focus of this paper is to describe an instructional design for a staff development program for classroom teachers to learn to integrate the Internet into their day-to-day classroom routine. The staff development instructional design is manifested in an inservice course in which teachers learn new skills, explore classroom applications, and reflect on their teaching philosophies and practices. Although the ultimate goal of the course is to enhance the learning experiences of K-12 students, the course is a professional development experience delivered to teachers. The staff development focuses on teachers' acquisition of technology skills, identification and development of classroom pedagogical practices using Internet technologies, and recognition and evolution of participants' values, beliefs, and practices regarding Internet-based instruction in the K-12 classroom.

Theoretical Foundation

Teachers' Developmental Stages

The scope and sequence of the curriculum design follows a model of stages of development. This approach is based on the research on teacher competence and experienced and expert teachers (Berliner 1988; Sternberg and Horvath, 1995), diffusion of innovations models (Rogers, 1995) and the ACOT studies of adoption of technology (Fisher, Dwyer, and Yocam 1996).

Sternberg and Horvath (1995) suggest an Expert Teaching Prototype with three primary features distinguishing the expert from the novice: Knowledge, Efficiency, and Insight. Briefly, the Expert Teaching prototype suggests that experts bring more knowledge to bear in solving problems and do so more effectively and efficiently than do novices. Further, experts are more likely to arrive at creative solutions to problems than their novice counterparts. Sternberg and Horvath are quick to clarify that not every experienced teacher is expert. The expert teacher, then, is knowledgeable and has extensive accessible knowledge that is organized for use in teaching. The prototypical expert teacher has knowledge of the organizational context of the classroom and is able to adapt to the practical constraints of teaching. The expert teacher, according to Sternberg and Horvath, is able to perform the many activities of teaching with little or no cognitive effort. Finally the expert teacher is planful and self-aware in approaching problems and is able to derive solutions to problems through selective analysis of information (Sternberg and Horvath, 1995).

David Berliner describes his Pedagogical Developmental Stages, which focus on describing teachers within each of his five proposed stages. The stages characterize teachers in terms of their classroom processes, interpretation of classroom events, attention to feedback from classroom activities that affect immediate decision-making, and schema development. The five pedagogical development stages with a sample of defining characteristics are: Novice (deliberate, gaining procedural knowledge), Advanced Beginner (insightful, developing strategic knowledge, still unable to differentiate what is important), Competent (rational, sets priorities based on experiential knowledge, takes personal responsibility for classroom results), Proficient (intuitive, recognizes similarities within differing situations, analytic and deliberative), and Expert (arational and intuitive, non-analytical and non-deliberative, fluid and seamless).

Novice teachers, when confronted with new curricula or pedagogical approaches, begin with the literal, obvious aspects of the lesson or content. Teachers must first comprehend the content and develop a skill base with it before they can begin to apply the material to a learning situation. As teachers gain expertise, they begin to strategize how to teach with the new material and discover and create applications in the classroom for the new material. Later, teachers begin to focus on the interactions of the students with the content and teaching experiences and focus less on the "prescriptive" aspects of the curriculum. As teachers become accomplished with the given content, they re-work it into their personal instructional repertoire, building on it and reshaping it to accommodate their teaching philosophies, beliefs about learning, and student needs and interests. These developmental stages are not limited to beginning teachers. Indeed, experienced teachers, when faced with using or teaching a new curriculum or content also progress through the developmental stages.

This stage-oriented continuum loosely parallels some models for diffusion of innovation. Rogers (1995), for example, suggests five stages in the "innovation-decision process through which an individual passes from first knowledge of an innovation, to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation of the new idea, and to confirmation of this decision" (p. 163). The Apple Classroom of Tomorrow (ACOT) research also proposes stages of development for teachers to embrace technology for use as a routinized part of the curriculum, beginning with acknowledgement of the technology's presence, to using it for traditional teaching tasks, to adapting it to specific elements of the teaching and learning process and enhancing productivity, to using it effortlessly and with minimal cognitive expenditures, to creating new knowledge and learning experiences with the innovation. As teachers consider adoption of a new curriculum or content, they may be observed, over a period of time, moving through the stages of adoption as described by Rogers or the ACOT studies. This is significant for staff development planners. Since the purpose of staff development is to prepare teachers to adopt and embrace a new curriculum or pedagogical practice, understanding and considering the stages for adoption can enhance the staff development experience.

Rogers provides a model for the adoption of an innovation in his fourth edition, *Diffusion of Innovations* (1995). He purports that an individual's decision about an innovation is not instantaneous, but rather is a process that occurs over time. He suggests that there exist sequential stages in the process of innovation decision-making: Knowledge (awareness of the innovation and how it functions), Persuasion (a positive or negative attitude is formed about the innovation), Decision (decision-maker participates in activities that lead to a choice to either accept or reject the innovation), Implementation (innovation is put into use), and Confirmation (reinforcement for the innovation-decision already made is sought). Rogers' model is one of several that explain diffusion events.

The Apple Classroom of Tomorrow (ACOT) studies (Dwyer, Ringstaff, & Sandholtz, 1990) describe the evolution of teachers' use of technology in their classroom settings. Teachers in the study were provided with "constant access" to technology and were observed and interviewed over a period of time. The results of this early study contribute to our understanding of the process of teachers' integration of technology into their teaching practice. The researchers describe the instructional evolution in technology-intensive classrooms in five phases: Entry, Adoption, Adaptation, Appropriation, and Invention. At the Entry phase technology existed in the teachers' classrooms. Teachers attempted to fit the technology into the familiar paradigm of textbooks, chalkboards, and workbooks. At this phase experienced teachers were faced with the same problems as novice teachers: discipline, resources management, and personal frustration (Dwyer, Ringstaff, & Sandholtz, 1990). In the Adoption phase, teachers were described as attempting to use the technology resources to supplement and support traditional instruction. During the Adaptation phase the major theme that emerged was productivity. Students and teachers took advantage of their knowledge of the use of technology to become more productive. The Appropriation phase occurred in the second year of the project. This phase is evidenced by teachers demonstrating an understanding of the technology and using it effortlessly to accomplish their work. The final stage, Invention, is described as a "placeholder" in which ACOT teachers can further develop and wherein new learning environments may be created (Dwyer, Ringstaff, & Sandholtz, 1990).

The research on expert teachers development and pedagogical development and that on adoption of innovations informed the instructional design for the curriculum for *Project REFLECT*. The staff development for technology integration curriculum follows a paradigm similar to the models presented above, starting with basic and familiar topics, providing the learner the opportunity to develop a skill base with Internet technologies. As the learner becomes familiar or proficient with the skills of the innovation, the staff development curriculum guides the learner into exploring and then developing teaching strategies for using the content and skills. The learner begins to develop his/her own applications for use of the innovation for use in the classroom and ultimately embraces the content as a basic element of his or her own teaching. This model recognizes that teachers typically go through stages or processes prior to embracing an innovative curriculum or pedagogical practice and that this process is not instantaneous, but rather, takes time. The curriculum is presented in modules or strands in a developmental fashion. A more expert individual may be comfortable starting later on the developmental continuum. A table (Table 1) summarizing the aforementioned models and the developmental stage elements of the staff development model for *Project REFLECT* follows.

Expert Teaching Prototype (Sternberg)	**Pedagogical Developmental Stages (Berliner)**	**Diffusion of Innovations (Rogers)**	**Evolution of Teachers Use of Technology (ACOT)**	**Internet Integration Staff Development Curriculum Model (Project REFLECT)**
Knowledge	Novice	Knowledge	Entry	Acquire basic skills and concrete knowledge
	Advanced Beginner	Persuasion	Adoption	Incorporate into teaching repertoire as a supplemental tool
Efficiency	Competent	Decision	Adaptation	Develop original practical applications
	Proficient	Implementation	Appropriation	Use routinely and evaluate the efficacy of its sustained use
Insight	Expert	Confirmation	Invention	Create new content and pedagogical practices with the innovation

Table 1

Motivational, Change, and Adult Learning Theories

The literature on change theory informs us that change in a pattern or practice will occur only after individuals change their normative orientations to old patterns or practices and develop a commitment to new ones (Chin & Benne, 1984, p. 23). "Changes in normative orientations involve changes in attitudes, values, skills, and significant relationships, not just changes in knowledge, information, or intellectual rationales for action and practice" (Chin & Benne, 1984, p.23). This strategy for change is referred to as normative-re-educative. This theory goes on to suggest that acceptance of a new set of values and beliefs usually cannot be brought about in a piecemeal fashion. A value system is a system and therefore must change as a system, not item by item (Chin & Benne, 1984). The theory rests on the assumption that the individual plays an a active role in the re-education process, interacting with the stimuli from the environment and making decisions about how or whether to incorporate the new value among those existing. Lewin referred to this as life space (Marrow, 1977) in his Field Theory. Field theory is a motivational theory whereby the individual is seen as a system under tension (Patnoe, 1988). Tensions arise when there is a need or a want (Marrow, 1977, p. 34). Life space encompasses the needs, goals, unconscious influences, memories, beliefs, events of a political, economic, and social nature, and anything else that might have a direct effect on one's behavior (Marrow, 1977). Behavior, according to Lewin, is a function of the person and his environment. As a person attends to a tension and accommodates a new belief, value, idea, he begins the re-education process.

Effective re-education must affect the person being re-educated in three ways (Benne, 1984, p. 274). The person's cognitive structure must be altered (modes of perceptions, ways of seeing his physical and social worlds, and facts, concepts, expectations, and beliefs). The individual must modify his valences and values (principles of what he should consider doing and not doing, attractions and aversions to his and other groups and their standards, feelings in regard to status differences and authority, and reaction to different sources of approval and disapproval of himself). Finally, re-education must affect the individual's repertoire of behavioral skills. It takes time and effort in training for a group to learn a method of experimental inquiry where their own feelings, perceptions, commitments, and behavior are the data to be processed in the inquiry (Benne, 1984, p. 227). Extensive hands-on experiences do not automatically create correct concepts or knowledge (Benne, 1984).

The idea that deeply held beliefs can stand in the way of change is not new (Dwyer, 1990, p. 36). Teachers' beliefs about instruction and schooling are important factors that underlie the institution's resistance to change (Dwyer, 1990). Fenstermacher (1979) suggests that normative-re-education can be accomplished by getting teachers to reflect on their beliefs in light of reasonably objective feedback and on their actions and the consequences of their actions. First, however, Dwyer (1990, p. 37) maintains that teachers must see and understand the connection between their beliefs and actions and they must also be aware of alternative belief systems.

Argyris and Schön (1974) suggest that individuals (or systems) may have two sets of belief systems or theories that guide their actions: theories-in-use and espoused theories. Theories-in-use are part of the life world that are taken for granted and espoused theories are those theories or ideas that individuals say they believe (a smokescreen for their real values and motives) (Young, 1990, p. 132). A problem may occur when the ideology of the organization or system is incongruent with the real motives and goals of its participants (Young, 1990). Theories-in-use must be in sync with espoused theories (Argyris & Schön, 1974). Advocates of change tell teachers and administrators to abandon their conceptions, meanings, roles, and behaviors that have given meaning to their professional life for those values, beliefs, behaviors, ideas imposed by the change advocate (Marshak, 1996). This may force educators to adopt espoused theories, but it seems unlikely that one can abandon one's entire belief system on command.

"Most educators, parents, school board members, and bureaucrats significantly underestimate the complexity of school change because we focus almost exclusively on the external, rational, and technical elements of the process" (Marshak, 1996, p. 72). When we focus on the rational, we ignore the emotional experiences of change. Change theory, particularly, normative-re-educative change strategy, instructs us to attend to the whole system to effect change. Few changes will occur in schools and in practice unless faculty, students, and practitioners also become more aware of their espoused interpersonal theories and their interpersonal theories-in-use and until they integrate this kind of learning with the learning of technical theories and theories-in-use (Argyris, 1974, p. 180).

Knowles (1988) reminds us that adult learners are quite different from child and youth learners. He adopted the term "andragogy" for the instructional approaches employed with the adult learner in mind (Knowles, 1988, p. 37). The instructional setting for adult learners is typically more informal and involves the learners in the teaching and learning and evaluation processes (Knowles, 1970). The adult learner's motivation to learn is intrinsic; the timing of learning is varied, as are the groupings. The adult learner's rich experiences are often brought to the instructional table.

The Instructional Model

Design of the Course

The *Internet Classroom Teachers Training Course* (*ICTTC*) offered to teachers through the funded grant, *Project REFLECT*, is a comprehensive curriculum designed for K-12 classroom teachers to learn to effectively infuse the Internet into their regular curriculum. The staff development model weaves the technical knowledge and skills a classroom practitioner needs with pedagogical practices, organizational approaches, evaluative strategies, and the aims of the regular curriculum. These cognitive structures and behavioral skills are approached and brought about as each individual reflects on her or his own philosophical perspective and values, beliefs, and practices about teaching and learning. The design of the staff development model is based on the assumption that people learn best and retain more when they actively participate in the teaching and learning experience.

Elements of the Course Design

The course has three primary desired outcomes: 1) the acquisition of Internet technology skills for use in the classroom, 2) the development of pedagogical practices to incorporate the technology innovation, and 3) the identification and evolution of the course participants' values, beliefs and practices regarding the technology innovation. To this end the course content is divided into six modules or strands. The instructional design of the course provides for beginning with basic and familiar topics to develop a skill base and then moves toward the development of teaching strategies with the technology innovation. The course assignments through which the skills and pedagogical practices are developed have direct application for classroom practice. Discussion of issues, concerns, philosophies, and theories that underpin the Internet technology in the classroom are woven throughout.

The scope and sequence of the six modules acknowledges the stages of development of teachers adopting a curricular innovation. It presents the cognitive elements of the course in a simple to complex approach, allowing and encouraging participants to work the new content into their own teaching practices and to ultimately create new ways to use the content. This approach is consistent with and supportive of the Expert Teaching Prototype, developing the knowledge base, accommodating it into the classroom practices, and ultimately applying it fluidly and effortlessly into the teaching act.

Course participants generally work in pairs and are involved in mentoring one another in the *Project REFLECT* model - in class and through electronic dialogues outside of class - and are responsible for planning and conducting staff development activities for colleagues in their own schools using a "train-the-trainer" approach. Although the teachers generally move through the Pedagogical Development Stages over a long period of time, the experiences of students as teachers and teachers as students support the Pedagogical Development Stages and help to expedite the process. Course participants, informally, through the accomplishment of course activities and assignments, have the opportunity to mentor one another or to conduct mini-lessons for one's peers. It is evident through observation of these spontaneous and planned lessons that participants are tapping into their newly acquired well-organized knowledge base to efficiently solve problems or accomplish learning goals. In a more formalized activity, participants design and implement staff development activities related to the course content for teachers in their schools. Mentoring acknowledges the rich backgrounds that each adult learner brings to the course and also provides the opportunity to try out one's new knowledge and pedagogical practices in a "safe" environment, building content and pedagogical knowledge and assessing the "fit" of the innovation into one's own value system. The breadth and depth of the course curriculum and the manner in which the content is presented are key factors to the success of the ongoing and recurring use and further development of the content by individuals. Learners learn at different rates and bring a myriad of experiences, backgrounds, and beliefs to the instructional setting; therefore, the instructional design of the staff development course must consider these varied learning rates and stages and provide for learning to continue after the formal instruction of the course has ended. Course participants have an opportunity to return to the course resources (website and curriculum guide) long after the course has ended. They still have available all course resources after they individually have had the opportunity to consider the adoption of the curricular innovation or have developed the content or skill base to the degree whereby they can effortlessly accommodate it into their instructional repertoire. Too often staff development programs assume the training (and therefore learning) is ended at the conclusion of the session.

For sustained change to occur or for an individual to consider adopting a change, however, the individual's value system must be affected. Demonstrating knowledge of the innovation or observing a pedagogical practice associated with the innovation is not, in and of itself, sufficient to ensure real and sustained change. The staff development program must effect a change in the participants' value systems or attitudes. As *Project REFLECT* course participants acquire new knowledge and skills and accommodate these into their own classroom practices, they are provided opportunities to reflect on their new knowledge, ideas, and practices. These reflections occur informally in class and through electronic communications with classmates as well as individually through a form that is completed on the web by each participant at the end of each module. This reflective activity is one that provides a richness in the staff development experience, providing course participants with an opportunity to examine their values, beliefs, and philosophies and to analyze them for fit with the instructional technology experience. Participants also reflect on their own teaching and learning experiences and often develop strategies to enhance their own teaching and their students' learning.

Conclusion

The staff development model used in *Project REFLECT* for classroom teachers' Internet instruction considers the literature on teacher stages of development and change, motivation, and adult learning theories. The model begins by presenting basic and familiar topics to develop a skill base, moves toward the development of teaching strategies that have application for classroom practice, and encourages innovative uses of the new knowledge and skills. Discussion of issues, concerns, philosophies, and theories that underpin the technology in the classroom are woven throughout. Teachers are actively engaged in the learning process and build their new knowledge on their existing schema. Teachers reflect on their values, beliefs, and behaviors regarding use of the Internet technology innovation in their classroom practices. Staff development such as this, that affects the entire system, the whole person, can result in sustained change.

References

Argyris, C. & Schön, D. A. (1974). *Theory in practice: Increasing professional effectiveness.* San Francisco, CA: Jossey-Bass Publishers.

Berliner, D. C. (1988). *The development of expertise in pedagogy.* Paper presented at the meeting of the American Association of Colleges for Teacher Education, New Orleans, LA.

Benne, K. D. (1984). The process of re-education: An Assessment of Kurt Lewin's views. In Bennis, W. G., Benne, K. D. & Chin, R. (1984). *The planning of change. (4th edition).* Fort Worth, TX: Holt, Rinehart and Winston.

Chin, R. & Benne, K. D. (1984) General strategies for effecting changes in human systems. In Bennis, W. G., Benne, K. D. & Chin, R. (1984). *The planning of change. (4th edition).* Fort Worth, TX: Holt, Rinehart and Winston.

Dwyer, D. Ringstaff, C., & Sandholtz, J. H. (1990). *The evolution of teacher's instructional beliefs and practices in high-access-to-technology classrooms.* Boston, MA: Annual Meeting of the American Educational Research Association.

Fenstermacher, DG. (1979). A philosophical consideration of recent research on teacher effectiveness. In L. S. Schulman (Ed.), *Review of research in education, 6* (pp.157-185). Itasca, IL: Peacock.

Fisher, C., Dwyer, D. C., & Yocam, K. (1996). *Education and technology: Reflections on computing in classrooms.* San Francisco, CA: Jossey-Bass.

Knowles, M. S. (1970). *The modern practice of adult education.* New York: Association Press.

Knowles, M. S., Holton, E. F., and Swanson, R. A. (1998). *The adult learner, (5th ed.).* Houston, TX: Gulf Publishing.

Marrow, A. J. (1977). *The practical theorist: The life and work of Kurt Lewin.* New York: Teachers College Press.

Marshak, D. (1996). The emotional experience of school change: Resistance, loss & grief. *NASSP Bulletin 80,* (577), 72-77.

Patnoe, S. (1988). *A narrative history of experimental social psychology: The Lewin tradition.* NY: Springer-Verlag.

Rogers, E. M. (1995). *Diffusion of innovations, 4th edition.* New York, NY: The Free Press.

Sternberg, R. J. and Horvath, J. A. (1995). A prototype of expert teaching. *Educational Researcher,* 24 (6), 9-17.

Young, R. (1990). *A critical theory of education: Habermas and our children's future.* NY: Teachers College Press.

Teaching on the Web: A Constructivist Approach to Faculty Development

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I. Introduction

One of the affordances of the new online learning movement is the opportunity it presents to reexamine the ways in which some aspects of traditional instruction can be re-conceived to operate effectively in the online asynchronous environment. This technological shift -- from knowledge being fixed to a certain time and place, to knowledge being accessible at anytime and at anyplace -- creates the potential for a change in the way learning is transacted from those who provide information (i.e. teachers or facilitators) to those who receive it (i.e. students).

This article focuses on the training of teachers of higher education by means of a two-week workshop -- "Teaching on the Web: A Nuts and Bolts Approach" -- in online pedagogy and facilitation techniques. This workshop is used as the intervention to examine what the effects are of being an online learner on future online teachers.

Users were notified of the course through online advertising and email. Almost 90% of the students indicated voluntary participation. In the end, the class was well attended with 57 students on the official role; 44 completed the pre and/or post-course survey, a 77% completion rate. This group is the sample examined.

II. Results

This article sets out to answer the question whether or not exposure to the course had an effect on the forty-four sampled participants.

Hypothesis 1 - The extent to which respondents rethought their teaching practices was positively related to the increase in exposure to the course. This hypothesis was tested based on students answer to one survey question. *From 0 (not at all) to 10 (very much), please rate the extent to which this class helped you rethink your teaching practices?*

Using a linear regression model, comparing the dependent variable (mean= 5.74, SD=3.71) to the three independent variables, the results indicate a highly significant change in the sample's rethinking their teaching. The results are at the .000 level and the over half the variance (r square=.531) is explained by these three indicators. This confirms that the two-week intervention was successful in its aims of having teachers reexamine their ways of teaching when faced with the online medium. Total hours of exposure are the strongest indicator (partial p=.007), and more times students exposed themselves to the course and related materials, the stronger the effect.

Comparative changes in teachers' philosophies are difficult to assess in a two-week intervention, and the author does not claim that the course fundamentally changed teachers approach to instruction. No pre-course data measuring teaching philosophies was gathered. However, qualitative data from the discussion board, students' posts, and materials generated, and the result of hypothesis 2 indicate that the shift was more in line with constructivist methodology.

Hypothesis 2 - The extent to which attitudes towards various aspects of online teaching and learning was positively related to the increase in exposure to the course. To study attitudinal change, the investigator devised a 17-item likert scale ranging from strongly disagree to strongly agree.Each attitude indicator, that is the difference between pre and post individual attitude means, was compared. Out of the 17 attitudes, three proved to be significant to the .05 level in a paired sample test.

They were:

Online distance learning courses encourage more student participation than traditional face-to-face courses. (p=.005)

Online distance learning teachers and students can produce learning outcomes better than traditional face-to-face teachers and students. (p=.013)

Online distance learning courses have more student-to-student interaction than traditional face-to-face courses. (p=.014)

This finding is interesting and helps define what type of rethinking was taking place. Rethinking may be seen more in the direction of increased student participation and interaction. Students believed that learning outcomes derived from these practices were also efficacious. This finding provides additional validation of the course and its objective.

Hypothesis 3 - This measure examined whether the frequency of the distribution of pre and post scores of a 15 question multiple-choice exam. Using a paired sample t-test, these results are highly significant (p=.000). The mean difference scores (pre = 4.68, post mean = 8.16) shifted upward signaling an increase in knowledge gained.

This shift is not completely explained by the course intervention. This means that the three measures, total hours, logins, and posts, do not explain the full treatment effects. Perhaps, exposure to the course may not have resulted in all the learning gain. The course was not designed to teach for the test.

Hypothesis 4 - The question used to investigate this change was: *Should teaching online distance learning courses be a part of regular faculty work?* The difference in mean scores pre and post were compared to produce the dependent variable. Using a chi square test, a significant result was found (Chi Square = .036). The results can also be seen by the means of those who switched from before the course, indicating it was different from regular faculty work, to after the course, indicating it was the same as regular faculty work. The average means of the "different" group is 16 hours of course exposure while the "same" is 24. The six people that switched were exposed over 22 hours, higher than average.

These results point to the integration of the online teaching experience with the traditional one. Teachers who have more training feel as if the online world is an extension of their job, and not something unique or alien. These findings concur nicely with the Taylor and White survey (1991) of an Australian University's faculty attitudes toward distance learning, and Pierpoint and Hartnett study (1988) of American programs, which concluded that the art of teaching and interpersonal interaction were highly valued in job satisfaction. [1] [2]. Lonsdale indicates current faculty reward structures show an over-reliance on extrinsic rewards and a lack of congruence between the established reward mechanisms and intrinsic motivation. Intrinsic motivation is characterized by the desire to participate in an activity where the reward is the act of participation itself. [3] Constructivist-based teacher training courses may be a vehicle to stimulate the intrinsic motivations of classroom-based faculty members as they go online to teach.

III. ALN and Constructivism

As a theoretical approach, the course employed a constructivist philosophy in its design. Constructivist environments start with observations within a world of authentic artifacts rooted in authentic situations. Students, while accessing various materials, construct ongoing interpretations of their observations, and collaborate with their peers. Finally, students serve as coaches and teachers to each other to show their mastery of what they learned. Researchers have pointed out the connections between the online medium and the constructivists' framework of teaching and learning. [4] [5] [6] They claim that the learning methodology is as important as the instructional technology employed. There also seems to be a connection between the pedagogical tendency of the teacher and their Internet use and valuation. The more constructivist the orientation, the greater the teachers' average use of the Internet and the more positively they viewed its incorporation into instruction. [7]

In accordance with this research, the choice of instructional design for the training course was a deliberate decision; all attempts were made not to make an online teacher training course, but to make a *constructivist* online teacher training course. Instead of outcome, the class facilitator focused all his energies on process and tried to facilitate the students' own ability to acquire knowledge.

What are the facilities provided by ALN that make implementing the constructivist approach more feasible? To examine this, the instructional principles of a constructivist environment need to be more rigidly defined. Piaget's processes for knowledge construction are:

I. Assimilation - Associate new events with background knowledge and prior conceptions.
II. Accomodation- Change existing structures to new information.
III. Equilibrium – Balance internal understanding with external "reality" (e.g. other's understanding).
IV. Disequilibrium – Experience of a new invent without achieving a state of equilibrium. [8]

The table below maps the Piaget's four processes involved in the construction of knowledge, the principles involved and how they map to an ALN (adapted from Akyalcin, *Constructivism – an epistemological journey from Piaget to Papert*). [9]

Processes	Instructional Principles	ALN Components
Assimilation	Gauge the learner's previous knowledge and experience.	Pre-test, Introductory Posts
Assimilation	Orient the learner to his learning environment (LE).	Broadcast Emails, Syllabus, Resources To Do lists, Glossary, Course Information, FAQ, Synchronous Chat
Assimilation	Solicit problems from the learner and use those as the stimulus for learning activities, or establish a problem such that the learners will readily adopt the problem as their own.	Course Testing and Revision, Class Content, Synchronous Chat, Online Lectures and Readings, Non-graded, starter Activities, Facilitative Questions
Assimilation	Support the learner in developing ownership for the overall problem.	Discussion Forum feedback by other students' and facilitator
Assimilation	Anchor all learning activities to a larger task or problem. The learner should clearly perceive and accept the relevance of the specific learning activities in relation to the larger task.	Individual Unit activities leading to Team Project

Accomodation	Design the LE to support and challenge the learners' thinking.	Modularize Content so as to scaffold learning, Behavior Modeling by Facilitator, Quizzes for reinforcement Compare and Contrast Activities, Facilitative Questions, Discussion Forum feedback by other students' and facilitator
Accommodation	Design the task and the LE to reflect the complexity of the environment in which they must function after the learning has occurred.	Online Course Delivery, Modeling of Course Structure and Components, Team Project
Accommodation	Encourage testing ideas against alternative view and alternative contexts.	Discussion Forum, Modularize Content to introduce new concepts, Compare and Contrast Activities, Interactive Essay, Facilitative Questions
Equilibrium	Design an authentic task. An authentic LE is one in which the cognitive demands are consistent with the demands in the environment for which the learner is being prepared.	Team Projects
Equilibrium	Provide an opportunity for reflection on both the learning content and process.	Facilitator evaluation of team projects, Auto-marked quizzes, Open student evaluation to instructor
Disequilibrium	Provide an opportunity for changing and enhancing, drafting, and redrafting.	Unit summaries of student discussion
Disequilibrium	Challenge misconceptions.	Students' and Facilitator's Feedback, Project Gallery, Post-Test

VI. Results

In summary, results indicate that the teachers shifted towards a more constructivist orientation, valuing increased interaction and communication. Along with this change, teachers also gained some knowledge about distance education. This combination of content and experience provides dual reinforccmcnt validating the course experience.

After exposure to the course, the respondents felt that online courses offered more student participation than traditional face-to-face courses, and that online courses have more student-to-student interaction than traditional face-to-face courses. Moreover, teachers saw the online medium as more of an extension of their faculty work. That is, teachers saw teaching is their job and doing it online was now part of their job. This would indicate that the central issue for the future of teachers is more about training and less about the correct reward structures.

Institutions should take note that as their faculty force becomes more empowered using this online medium; they will want to use it. After all, teaching is sometimes referred to as a calling more than a regular vocation, and strong inner motivations need to be valued and recognized. The workshop's integration of method and medium is, the investigator claims, the primary reason for the positive results in changes in teachers' attitudes and thinking about educational practice. This reexamination of existing practices and adoption of ones more appropriate to the online learning environment is one of the affordances (i.e. change catalyst) of the Internet.

These findings buttress this corporatist, constructivist view of learning as contributing to deeper understanding that may affect behavioral change. From posted messages, activities, and surveys, the data showed that the ability to connect with others knowledge and experiences, as well as, their feedback is essential.

ACKNOWLEDGEMENTS

Parts of this paper are published in the Journal of Asynchronous Learning Networks and are republished with their permission. To review course materials, please see the following URL < http://wellspring.isinj.com/teachinfo/>.

REFERENCES

1. **Pierpoint, P.E. and Hartnett, R.A.** Faculty attitudes toward teaching in off-campus graduate programs. International Journal of Innovative Higher Education; 5 (1), 25-30, 1988.

2. **Taylor, J.C. and White, V.J.** Faculty attitudes towards teaching in the distance education mode: An exploratory investigation. Research in Distance Education; 7-11, 1991.

3. **Lonsdale, A..** Changes in incentives, rewards, and sanctions. Higher Educaion Management, 5. 223-235, 1993.

4. **Arminio, J.** The virtual campus: Technology and reform in higher education. Journal of College Student Personnel, 40(1), 114, Spring, 1999.

5. **Sprague, D.and Dede, C**. Constructivism in the classroom: If I teach this Way, am I doing my job? Learning and Leading with Technology, 27(1), 6-9, 16-17. September, 1999.

6. **Hits, S.R., Coppola, N., Rotter, N., Turoff M. and Benbunan-Fich, Racquel**. Measuring the Importance of Collaborative Learning for the Effectiveness of ALN: A Multi-Measure, Multi-Method Approach, Journal of Asynchronous Learning Networks, Vol. 4, No. 2. June, 2000.

7. **Becker, H.J**. "Internet Use by Teachers: Conditions of Professional Use and Teacher-Directed Student Use," Center for Research on Information Technology and Organizations. February 1999. Web address: http://www.crito.uci.edu/TLC/findings/Internet-Use/startpage.htm.

8. **Piaget, J**. The development of thought: Equilibration of cognitive structures. New York, Viking Press, 1977.

9. **Akyalcin, J.** Constructivism – an epistemological journey from Piaget to Papet, June, 1997. Web Address: http://www.kilvington.schnet.edu.au/construct.htm

Faculty Development for ACTIVE Learning

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Abstract: The ACTIVE project addresses the need to improve the preparation of preservice teachers through providing instruction that models the integration of technology into classroom delivery. The focus of this project is ACTIVE—Authentic, Competency-based, Technology-enhanced, Integrated, Versatile, and Evaluative—curriculum. This project was funded by a Title II Teacher Quality sub-grant and began in fall 2000. Initial results from the first six months of operation will be shared. The researchers are also seeking information on similar projects.

Introduction

Making use of the *Teacher Preparation StaR Chart: A Self-Assessment Tool for Colleges of Education* (CEO Forum, 2000) Western New Mexico University (WNMU) has an overall ranking as a Developing Tech institution. The low ranking shows a strong need for a university-wide program to meet the technology needs of the preservice educators attending our institution. At the same time, in an effort to enhance teacher quality, the state of New Mexico (NM) has revised the competencies upon which its teacher preparation programs are designed. The ACTIVE Learning Project was designed to begin meeting both needs.

The Project

At the October 1998 Western Interstate Commission for Higher Education (WICHE), a panel of four university presidents emphasized the necessity of modeling the correct application of teaching strategies that include the integration of technology. Effective preparation of preservice teachers requires a college experience where the use of technology is modeled by professors in all subject areas. Technology infusion, by itself, does not improve student achievement. Desired changes take place only when the technology is correctly used.

Five ACTIVE Teams have been formed to meet the need for a connected learning community. Each team will include a School of Education faculty member, a teaching field faculty member, a preservice teacher, and a clinical faculty advisor from local public schools. Each graduate of the Teacher Education Program at WNMU must declare a "teaching field" which requires a State Department of Education approved 24-36 credit hour sequence of courses, i.e., language arts, math, science, reading, bilingual, social studies, and fine arts. While taking these specific courses, the student also must take a sequence of professional education courses. Field experiences are included at three levels: Exploratory, Curriculum, and Practice Teaching. The students chosen for ACTIVE Teams will be mid-way through the Teacher Education Program. The connection between the ACTIVE Teams and the Clinical Faculty will make a public school classroom available for university faculty and preservice teachers to use their skills as they introduce curriculum designed through the project. Virtual connections will be established for team communication (Berg, 1999).

The age of most of the facilities at WNMU and the need for discussion and learning to take place 24 hours a day, and 7 days a week, necessitates the use of portable equipment to provide technology for this modeling (Young, 1997). ACTIVE teams are being provided laptops for this purpose. Chaffee (2000) describes the value of a similar initiative in North Dakota. The computers will remain university property and will be checked out to the faculty members for the duration of their participation in the project. Due to the fact that the majority of students attending WNMU cannot afford home computers, three laptop computers will also be made available to the student members of ACTIVE Teams on a shorter-term checkout basis. Faculty will be required to use WebCT for their courses and all ACTIVE participants will be included in a special WebCT group for collaboration and discussion (Biggs, 2000).

The initial activity of each ACTIVE Team was to set team training goals based upon the twenty NM Technology Competencies. In this way, the personnel of the project are able to design both individual and group sessions that meet the needs of the individual participants and teams. For training to be most effective, it must meet an immediate need of the trainee. The participants are also designing rubrics for the NM competencies (Krueger, Hansen, and Smaldino, 2000; Kemp et al., 2000).

This project is supported through the creation of an Expertise Center for ACTVE Learning. This space will house the personnel hired by this project, along with the technology and resources needed by the ACTIVE participants both for training and curriculum development, and will be fully integrated into the university's network so participants can access the Internet and printers. The Expertise Center will be available "to train faculty to use technology, show them how to use it effectively in the classroom, and offer just-in-time technical support" (Rogers, 2000).

The funding for the project was received in September 2000, delaying the establishment of the project. Three teams have been created by early November with two more to be created soon. Anecdotal evidence will be shared with conference participants.

References

Berg, G. A. (1999, Autumn/Winter). Community in distance learning through virtual teams. *Educational Technology Review*, 12, 23-29.

Biggs, K. (2000, September/October). Collaboration in and out of the classroom: Clemson's University Collaborative Learning Environment (CLE). *The Technology Source.* [On-line serial.] Available: http://horizon.unc.edu/TS/cases/2000-09.asp

CEO Forum on Education and Technology. (2000, January). *Teacher Preparation StaR Chart: A Self-Assessment Tool for Colleges of Education.* Washington, DC: Author.

Chaffee, E. E. (2000). Finding the will and the way. In Luker, M. A. (Ed.). *Preparing your campus for a networked future.* (pp. 81-92). San Francisco, CA: Jossey-Bass Publishers.

Kemp, L., Engan-Barker, D., Lewis, J., Coursol, D., Descy, D., Nelson, A., Krohn, S., and Moore, S. (2000, January). *Research in teacher education: Technology competencies in teacher education*. Mankato, MN: Minnesota State University, Mankato, College of Education.

Krueger, K., Hansen, L. and Smaldino, S. (2000). Preservice teacher technology competencies: A model for preparing teachers of tomorrow to use technology. *Society for Information Technology & Teacher Education, 2000,* Association for the Advancement of Computing in Education, San Diego, CA. [CD-ROM].

Rogers, D. L. (2000, Spring/Summer). A paradigm shift: technology integration for higher education in the new millennium. *Educational Technology Review,* 13, 19-27, 33.

Young, J.R. (1997, December 5). Invasion of the laptops: More colleges adopt mandatory computing programs. *The Chronicle of Higher Education*. Reprinted in *Technology in Higher Education,* 39-41.

Classrooms Under Construction: A Video Series

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Abstract: Professional development that supports teachers as they create constructivist learning environments supported by technology allows them to construct professional knowledge about pedagogy, content, and technology, as well as strategies for managing a changing classroom environment. By providing the very experiences promoted for constructivist learning environments in the classroom, through professional development, it is possible that teachers will confront their "theories in use" to enable them to create learning experiences appropriate for the children of the Information Age. For this purpose, the Technology Assistance Group at the Southwest Educational Development Laboratory created six videos that portray several K-8 classroom teachers as they grew through the process of creating constructivist classrooms supported by technology. Featured in these videos are vignettes of students, teachers, and principals who share their experiences in learning, supporting, and the use technology to change teaching practices.

Creating a Vision With Technology

These two videos were produced in conjunction with a three-year project that involved 150 teachers in six site schools across five states. They were designed to be used as professional experiences for in-service and pre-service educators and These two videos provide several vignettes of students and teachers using technology in rural school districts comprised of low income families. Suggestions for using these videos are included in the various activity modules found in the *Active Learning with Technology* (ALT) professional development portfolio.

Engaged Discoverers: Kids Constructing Knowledge with Technology. This video depicts K-12 classrooms in sixteen schools throughout the Southwest where a variety of technologies support student-centered approaches in the classroom. Innovative teachers create environments where students collaboratively solve authentic problems using technology as a tool and new roles for students and teachers encourage kids to become "engaged discovers." This video is used in the *Creating a Vision* module in the ALT portfolio where teachers watch how other teachers use technology in the classroom. This is also an excellent video for school administrators and interested community members to help them create a vision for technology. Total running time - 28:25 minutes.

Classrooms Under Construction: Integrating Student Centered Learning with Technology. This video portrays students, teachers, and principals from culturally divers schools across the Southwest in the process of constructing learner-centered classrooms using technology. Students, teachers, and administrators learn as well as teach, sharing and learning new ideas, new technologies, and new strategies for building knowledge that relates to their own experiences and to the world they inhabit. This video can be used in the *Examining Our Practice* in the ALT portfolio where teachers look at their own classrooms to identify characteristics of learner-centered activities supported by technology. Teachers in this video describe how they have learned to use technology in their classrooms and how they have changed their instructional strategies. Total running time - 24:20

Classroom Episodes

These videos were produced toward the end of the two years of the SEDL project and show individual classrooms with students and teachers actively involved with technology. All of these videos are available by contacting the Southwest Educational Development Laboratory at [www.sedl.org] or by contacting any of the authors.

2nd Grade Classroom Episode: The Desert. This classroom video episode depicts an interdisciplinary unit of study about the desert in a 2nd grade classroom. A variety of technologies are used to support student-centered approaches in this classroom. Total running time: 18:45 minutes.

Reading Buddies: 1st and 2nd Graders Learning Together. This classroom video episode depicts how first grade and fifth grade students learn together as they create an electronic alphabet book for the younger children in their school. Total running time - 18:30minutes.

6th Grade Classroom Episode: Collaborative Language Arts. This classroom episode depicts students engaged in several collaborative language arts activities, including writing and editing autobiographies, sharing book reviews, crating a myth, and writing free verse poems. A variety of technologies are used to support these activities. Total running time: 17:03 minutes.

9th Grade Classroom Episode: Spanish Travelers. This classroom episode depicts small groups of students working on a project-based learning activity. Their task is to find pertinent information and create a travel brochure for selected Spanish speaking countries. A variety of technologies are used to support their work, including computers, the Internet, digital cameras, and word-processing and database software. Total running time - 14:00 minutes.

Availability

The professional development modules from the *Active Learning with Technology* portfolio (ALT) mentioned earlier, can be downloaded from the following website: [http://www.sedl.org/tap/profdev.html] and all of these videos are available by contacting either the Southwest Educational Development Laboratory at [www.sedl.org] or any of the authors.

Creating a Culture Shift: Establishing a Technology and Learning Center

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Introduction
A culture shift is a change in the rules of conduct. The College of Education (COE) at the University of Missouri-St. Louis needed a cultural shift. With the university certifying over 500 teachers a year, these students need to be technologically literate. The evidence was that the students were not being adequately prepared to integrate technology into the curriculum. Pressure for technologically literate graduates was coming from the Missouri Department of Elementary and Secondary Education and from school districts. Students at the university also have practicums in technology rich classrooms and they may end up working in a technology rich classroom or MINTS* classroom. In the 21st Century, students hired from the University of Missouri-St. Louis must know how to integrate technology.

A number of indicators confirm that COE faculty—65 full time and more than twice that number of adjunct faculty need to increase their use of technology. Campus Computing reports that COE faculty made fewer requests than Arts and Science faculty for lab use; they made fewer requests for Internet connections, and they made no requests for use of the Computer on a Stick Classrooms.** Additionally, the computer classrooms available for faculty to use for classes were not fully scheduled.

One of the roles of Campus Computing has been to support the use and operation of technology in the COE. It also made sure that a faculty member's computer worked. Faculty was expected to take responsibility to learn applications, but they received no guidance for integrating that application into their courses. Additionally, when faculty did use technology in the classroom and a problem with integration arose they received little or no support since no group had been identified to help with the integration of technology in courses. This environment was one in which technology use was not encouraged. The faculty was on its own to find support.

Change
With impetus from the Dean of the College of Education, a culture shift is being undertaken for the use of technology in instruction. The centerpiece of the cultural change is the establishment of a technology and learning center. The proposed shift is both the mission of the center and a question. Can a technology culture change take place through a properly implemented technology and learning center?

With the Dean's push for change, many faculty were still missing adequate institutional support to develop the knowledge, competence and confidence to integrate technology. Many faculty had expressed a desire to incorporate more technology in their courses, but they needed support. They needed a change in culture so new ideas and approaches could be tried with help and assistance.

Shift
The Dean of the College of Education communicated numerous times his expectation that faculty should use and integrate technology. The Dean also began communicating messages and memos by e-mail only. Networked computers were installed in all faculty offices. Each faculty member was connected to e-mail and the Internet. File space was available for storage of large documents. Printers were connected to the network and many faculty had individual printers.

Through the leadership of the COE Dean and with the support of the Chancellor, funds were secured to establish a technology and learning center, to endow a chair in technology and learning, to hire an additional faculty member,

* Technology rich classrooms or MINTS (Multimedia Interactive Networked Technologies) classrooms are supported by the State of Missouri
** Computer on a Stick are classrooms with an internet connected computer and a projection system

and to reallocate funds within the current COE budget for staff and annual equipment upgrades. The E. Desmond Lee Technology and Learning Center, named and funded by a visionary leader in the St. Louis business community opened its doors on April 7, 2000. The center's purpose is to bring the college and general education community from limited and rudimentary use of technology in instruction to ubiquitous use.

From the beginning, the center was organized and operated very differently from all other computing facilities on campus. The Center is intended to be a place to "hang out." An emphasis is placed on having as few rules as possible and having staff that provides a level of assistance that encourages faculty and students to use technology. Staff members greet clients and encourage them to ask for help. The staff has been trained to provide useful service in a pleasant manner. Personnel have been asked and trained to provide a very high level of client service. The room--originally a chapel with a mosaic tile ceiling—is designed for individual and collaborative work. The 70--plus workstations are arranged for a variety of functions. Single stations may be used for individual work. Others are arranged in clusters for group projects. A seminar room is available with a SmartBoard™ with connected workstations. A presentation and discussion area enables faculty and students to give seminars. A "cyber lounge" is set up for informal gatherings. Signposts and friendly barriers direct students and faculty. Wireless computers are available to take in the courtyard or to use anywhere in the center. Digital cameras are available for on and off campus use. Support for faculty is immediate and appropriate. Food and drink are unrestricted.

Staff are instructed to work through a problem until it is solved. If the staff member cannot solve the problem, he or she must find another staff member who can. The first staff member is expected to stay with the problem and learn the solution as well. An example of this is the faculty member who came with a 150-page dissertation that needed to be scanned into a word processing and PDF format. The staff member quickly realized that scanning the documents one page at a time could take many, many hours. By seeking the assistance of a second staff member who knew how to use the DocuCenter, the dissertation was scanned into both formats, stored in a folder and e-mailed in about 30 minutes. The first staff member also learned the procedure. If no one is able to solve a problem, the solution becomes a staff project. In other words, staff is encouraged to look at problems as opportunities. Staff is encouraged to speak in non-technical terms and avoid jargon. The training and discussions at weekly staff meetings focus as much, if not more on serving clients as on learning the technology. Staff is chosen for having an aptitude for teaching themselves technology applications, largely through online tutorials.

The center programs that help faculty integrate technology in the classroom are numerous: workshops for faculty, demonstrations by teachers in the field, faculty work groups, discussions, and individual consultations. One positive result that happened through an individual consultation was a faculty member's decision to place all of his paper handout materials in digital folders for student access by computer, instead of copying and selling the paper documents in the bookstore. This has allowed him to use the materials differently in class. The faculty member who characterizes himself as a limited user is now instructing professors from other sections of this course on this technology use. This example, we believe, illustrates a cultural shift. The new culture being created intends to support and respect faculty in their use of technology at their individual comfort level.

The center is designed as a technology hothouse. Faculty and students can be nurtured in their growth and experiences with technology, and new ideas can be tried out in a supportive environment. The staff in the center is trying to help faculty see technology as enabling not intimidating.

Challenge

Establishing and sustaining a new of culture for educational technology is a large task. It takes a properly functioning infrastructure, a support system and the expectation that technology can and will be integrated in the curriculum. Through the leadership of the E. Desmond Lee Technology and Learning Center, faculty now have the opportunity to develop the knowledge, the competence and the confidence to integrate technology. The challenge is to build a seamless integration of technology in the college curriculum.

Effective Technology Staff Development: A Grass-Roots Approach

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Abstract: Training to support the integration of technology into the curriculum can be difficult. Research suggests that on-site, just-in-time instruction is more effective than one-time workshops in facilitating meaningful technology integration into the classroom. The Teacher Technology Leadership Academy in the Archdiocese of Indianapolis is a grass-roots approach to staff development in technology. It is a cost effective, train-the-trainer approach that provides research-based staff development in technology for classroom teachers. This model can be transferred to any school or district.

References

1. Knowles, M. (1984). *The adult learner: A neglected species* (3rd Ed.). Houston, Texas: Gulf Publishing.
2. Maurer, M.M. & Davidson, G.S. (1998). *Leadership in instructional technology*. Upper Saddle River, New Jersey: Prentice-Hall, Inc.
3. Quality Education Data, Inc. (2000). Technology Purchasing Forecast, 1999-2000 5th Ed.

Schools in the United States are currently receiving mixed marks for integrating technology into the classroom. According to the *1998 CEO Forum Study*, of 80,000 public schools surveyed nationally, 54% of schools were considered "low tech." Only 6% of schools were found to be "on target." The Archdiocese of Indianapolis faces many of the problems of the public schools with respect technology. The archdiocese consists of 71 parish-supported schools with nearly 25,000 students and 1,500 teachers in grades K-12.

It is not difficult to find the source of the problem of integrating technology in schools. Despite the fact that many current teachers are not prepared to use technology in their classes, they do not receive the kind of support they need. An average of $132.57 per student was spent on educational technology in 1999-2000 (Quality Education Data, 2000). Only $6.86 of this amount (5% of the total) was spent on professional development.

There are many different staff development models currently in use to help teachers learn the skills they need to use technology. According to Maurer (1998), there are three main staff development models for technology: the after-school workshop, the all-day, off-site workshop, and conferences. A common type of technology training occurs in after-school workshops. After the teacher has completed a day of work, they attempt to learn a new complex skill which they will not be able to immediately practice. Teachers rarely retain and use what they have learned under these conditions (Maurer, 1998).

Another common method is an all-day, off-site workshop. In Indianapolis, many teachers take advantage of the technology workshops offered at Butler University. While these programs are in-depth and helpful for teachers learning new skills, there is no follow-up or support after the workshop.

Conferences expose teachers to new ideas, but there typically is limited hands-on experience and discussion of ways in which these ideas could be transferred to their own classrooms. While each of these methods can be successful with a limited number of participants, none of them lead to significant, long-term benefits in the classroom (Maurer, 1998). Given the small staff and budget, it was important for the Archdiocese of Indianapolis to develop a program that was both efficient and effective.

To address the technology training needs for the Archdiocese of Indianapolis, the *Teacher Technology Leadership Academy* (TTLA) was created. This "train-the-trainer" model, based on the work of Malcolm Knowles (1984), has been effective in helping teachers not only enhance their software skills, but also to find ways to integrate technology into the curriculum. Each year, the TTLA is comprised of a cohort of 16 classroom teachers chosen based on their willingness to try innovative instructional strategies rather than their computing skills. The group meets six times during the school year. Each session is comprised of instruction in a new software tool (database, spreadsheet, etc.), laboratory time for practicing new skills learned, time to develop a lesson for the classroom using the tool, and time to work with their peers. One key aspect of the work sessions is that each participant works on a project that will be useful to her right away. This philosophy of working on immediately applicable skills (just-in-time learning) makes the learning relevant, practical and draws on teachers' own experience. By the end of each session, each participant leaves with software help sheets, a lesson plan, and a project created with the software tool. Most importantly, participants are provided with all the required materials to prepare other teachers to implement technology effectively.

During two years of operation, the participants of the TTLA have met with great success. Findings from pre- and post-tests of both attitudes towards technology in the classroom and skills learned indicated significant improvement (approximately 20% increase each). Twenty-four teachers (8 the first year, 16 the second) have completed the program and are currently implementing technology-infused lessons in their classrooms and training other teachers. As a result of the TTLA program, participants have designed and implemented a total of 142 lessons in the classroom, and seventy-three training sessions were offered by the participants for other teachers in 1999-2000 alone.

TTLA is more successful than many of the models noted above because of its reliance on the adult learning theory (andragogy) developed by Malcolm Knowles (1984). Knowles provides several guidelines for adult learners that were incorporated into the TTLA model. He asserts that instruction for adults should be different from instruction for children (pedagogy). Adults learn for different reasons than children and have far more life experiences to consider when planning instruction. He argues that adults need to learn through real-world experiences rather than textbooks or theory. Adults need to know the practical value of what they are learning. They approach learning more as problem solving. And adults learn best when the knowledge is of immediate practical value to them. The TTLA is designed to incorporate the principles of andragogy directly into the instruction.

Some commercial programs also incorporate many of these principles. While expert consultants from computer training companies and online software training provide an excellent source of teaching content, there are many advantages to creating a grass-roots program like the TTLA. We have found that teachers respond more to other teachers than a technology coordinator or an outside consultant. Teachers have credibility and familiarity with their peers (Maurer, 1998). The participants in TTLA know that the instructor knows what it is like to face the challenges of using technology in the classroom. The peer relationship is also important, not just with the instructor, but between students. Participant evaluations consistently highlight the value of working and talking with other teachers. They value the exchange of ideas and techniques sometimes more than the instruction itself. This cohort group then provides an important support system for participants as they meet with successes and challenges in the classroom. Perhaps most importantly, with a grass-roots system, the innovation can diffuse much more quickly as TTLA graduates work with their own staffs and other schools.

In developing grass-roots technology training programs, additional key items have proven to be helpful. First, it is crucial to recruit the right participants to be effective trainers. Interpersonal skills, enthusiasm, and an ability to explain things well are all important considerations. It is also important to train the trainers to work with other adults. In addition to all the handouts and presentation materials, TTLA participants leave with a good understanding of andragogy. It is equally important to support the trainers as they begin to train other teachers. A discussion board, mailing list, or other mechanism to provide answers to questions and concerns is critical. It is also important to chart and report the progress of the program. This can help to target any shortcomings or opportunities to constantly improve the program

As teachers, administrators and technology leaders confront the challenge of integrating technology into our schools, the creation of a grass-roots program grounded in the principles of andragogy can meet the challenge. As the community of leadership (Maurer, 1998) works together to support teachers in this worthy endeavor, significant progress has been possible.

Influence of Computer Assisted Teaching on Development of Faculty Staff Members at Atatürk University

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Abstract: With the intention of determining the attitudes of faculty instructors to Computer Assisted Teaching (CAT) in their own major fields of study I attempted to carry out this survey. This study is based on the collected data via a questionnaire applied on 98 staff members currently teaching at Atatürk University, Erzurum, Turkey. The survey intends to determine and analyze various opinions of the staff members about the effects of Computer Assisted Teaching (CAT) on their development.

Collected data from the replied questionnaire items were analyzed using frequency- percent and a report of the study that investigated the affect of Computer Assisted Teaching (CAT) on the development of the staff members at the university.

In conclusion, evidence based on the staff members' opinions was found that Computer Assisted Teaching (CAT) has a significant effect on the development of staff members.

Considering the influence of Computer Assisted Teaching on the development of staff members at Atatürk University, Erzurum-Turkey, a questionnaire containing 15 items, two of which were related to individual's field of study or department where he works and teaching experience at university. Other 13 items were intended to reveal the instructor's view on whether Computer Assisted Teaching affects the development of the instructor or not. Last item was not a multiple choice item. For that item the participant was expected to write his/her additional view on effects of Computer Assisted Teaching on the development of staff members at Atatürk University.

As stated by (Eley 1995, p.22-26) "it has been argued that computer-assisted learning (CAL) offers the possibility of introducing new teaching and learning styles which can expand the horizons of staff and students alike."

All the participants are working at 8 different departments of Faculty of Education at Atatürk University, Erzurum. 98 instructor filled in the questionnaire forms. The participants stated that there is not any Computer Assisted Teaching facility at the faculty, so that they could't deal with Computer Assisted Teaching or Learning issues. This is also supported by Eley's (1995) quotation from McDonough (1992) that:

"there is little evidence of universities having instituted a staff development programme to ensure that there is sufficient expertise to provide the necessary support for the use of computers in teaching and to encourage curriculum development. It is essential that this failure is remedied"

However they are not directly deal with Computer Assisted Teaching they declared their opinions on computer assisted teaching's influence on staff members' development. Mean of total points in the questionnaire results (2,71/3 and 32,61/36 points) indicates that a great majority of the instructors who participated agreed that Computer Assisted Teaching has a significant affect on development of instructors. Following questionnaire items indicates the percentage and frequency result tables. In each item frequency and percentage of each choice were given. Choices for 12 items were YES, NO and PARTLY. Points for the choices were as follows: YES=3 points, NO=1 point and PARTLY= 2 points. Overview of results are shown in Table I:

Item	QUESTIONNAIRE ITEMS	N	FREQUENCY			PERCENTS			Mean
			No	Partly	Yes	No	Partly	Yes	
3	Computer Assisted Teaching has an effect on the instructor's acquiring required qualities during his/her pre-service education	98	4	16	78	4,1	16,3	79,6	2,76
4	There should be Computer Assisted Teaching applications at the higher education institution where the instructor teaches for staff development.	98	2	10	86	2,0	10,2	87,8	2,86
5	Computer Assisted Teaching has an effect on acquiring the skill of determining the objectives of the course the instructor teaches in terms of staff development	98	6	26	66	6,1	26,5	67,3	2,61
6	To apply Computer Assisted Teaching is influential for the instructor on making an effective syllabus of his course.	98	2	36	60	2,0	36,7	61,2	2,59
7	Computer Assisted Teaching affects the instructor's skill of teaching his course within a shorter time.	98	2	30	66	2,0	30,6	67,3	2,65

8	As Computer Assisted Teaching saved the instructor's teaching time, it provides extra time for him to deal with creative issues, such as developing course material or project and so forth.	98	2	10	86	2,0	10,2	87,8	2,86
9	The instructor spending his time to create course content through Computer Assisted Teaching is in a continuous effort to get new knowledge, so that he develops renewing his knowledge.	98	2	20	76	2,0	20,4	77,6	2,76
10	As the students attending a computer assisted course can access to information more rapidly than any other way, the instructor adapts himself to this dynamic demands of the students, so that he develops in this way.	98	2	20	76	2,0	20,4	77,6	2,76
11	As the students attending a computer assisted course can access to information more rapidly than any other way, the instructor adapts himself to this dynamic demands of the students, so that he develops in this way.	98	0	8	90	0	8,2	91,8	2,92
12	Both the instructor and the student develop themselves by discussing vocational/academic topics by being a member of a listserv through the enlightenment of Computer Assisted Teaching.	98	0	30	68	0	30,6	69,4	2,69
13	Computer Assisted Teaching requires the instructor to use available measurement and evaluation techniques. Therefore Computer Assisted Teaching is influential on self development of the instructor	98	2	38	58	2,0	38,8	59,2	2,57
14	As the student of a Computer Assisted Teaching course is more active than those of a proper course, the instructor teaches his course actively and enthusiastically.	98	4	32	62	4,1	32,7	63,2	2,59

Table I. Frequencies of items.

Collected data were analyzed through Frequency and One Way ANOVA Test on SPSS v9.01.
Table II indicates that there is no significant difference among departments/fields of study (P>0,005) based on the instructors' views on the influence of Computer Assisted Teaching on the development of staff members.

PMEAN

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	,201	5	4,020E-02	,772	,573
Within Groups	4,794	92	5,211E-02		
Total	4,995	97			

Table II. Variance Analyses of Deparments

Also it is found that there is no significant difference among teaching experince periods of staff members considering the effect of Computer Assisted Teaching on instructors' development. (P>0,005). See Table III.

PMEAN

	Sum Square	df	Mea Squar	F	Sig.
Between	,250	4	6,256E-	1,226	,305
Within	4,745	93	5,102E-		
Total	4,995	97			

Table III. Variance Analyses of Teaching Experience Periods.

Some selected opinions of questionnaire participants for the item 15 requires to be written additionally are worth mentioning.

- Computer Assisted Teaching is influential on developing instructor's skills on selecting and evaluating educational softwares in his field of study.
- Computer Assisted Teaching develops instructor's skill of effectiveness on participating on Educational software developing activities.
- Computer Assisted Teaching influences positively instructor's ordering his information compiled from other sources in presenting during his courses

In conclusion staff members are strongly demanding to take part in Computer Assisted Teaching activities in terms of not only increasing quality of education but also developing teacher training at higer education level. It may be suggested that Computer Assisted Teaching environment at school should be provided according to the recent advanccd technological needs for both learners and the teaching staff. Otherwise realization of these invaluable opinions of the instructors cannot go beyond a nice dream.

References

Eley &Eley (1995). IT training and staff development in universities. Education + Training, Vol 37 Issue 1. 22-26

McDonough, W. R., (1992). "The provision of computing facilities for teaching", *University Computing*, Vol. 14, , pp. 62-5.

Smith, G.(1992). " Responsibility for staff development", *Studies in Higher Education*, Vol. 17 No. 1, pp. 27-41

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Characteristics of Support Initiatives to Stimulate Professional Development on ICT

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Abstract: Educational institutions have to support their staff in their professional development on ICT. The innovation and professional development literature suggest some, be it vague, principles to realise this support. In line with these principles a support strategy has been developed at the University of Leuven. In this contribution, an analysis is made of the different initiatives, in order to detect effective and powerful factors. An analysis scheme was developed. Powerful features of professional development initiatives that may guide decisions on elaborating educational support strategies and professional development initiatives are identified.

Educational institutions have to support their staff in their professional development on ICT. The diversity with respect to knowledge, skills and attitudes on ICT, requires a diversity of initiatives for professional development. Traditional professional development training initiatives are to be completed with a systematic support strategy, pointed to different phases of the professional educational development, covering a variety of ICT-issues and addressing a variety of target groups.

Laga, Elen and Waeytens (1999) argued that only 'integrated' support strategies can be successful. This means that various aspects of ICT-employment (hardware, software, education, symbol systems and management) are covered and their interrelationship is clarified. Because the use of ICT is (and should be) instrumental to the realisation of content specific educational goals, a second aspect of integration is that all discussions about the use of ICT are related to the educational approaches or philosophy of the institution. In addition to the integration requirements, the following principles for a global educational support strategy were identified: 1) the strategy covers all aspects and meets the needs of all ICT-users; 2) specific components of the strategy are targeted to specific users, with different questions and needs. Hence, support components of the strategy differ from one another with respect to the amount, intensity and content of support; and 3) support is intended to be self-destructive and oriented towards enhanced independence of ICT-users.
Although vague, these principles can be useful as general guidelines. Bearing them in mind, numerous and diverse initiatives can be part of a professional support strategy. Not all of these initiatives will be equally effective. However, it remains difficult at this stage to assess the (potential) effectiveness of both general support strategies and specific ICT-related professional development activities. This difficulty is related both to the number of influencing factors and the absence of a clear analysis scheme. In this contribution, such an analysis scheme is presented. In order to show its relevance, the scheme is used to analyse the ICT-related support initiatives and the strategy of the University of Leuven. The strategy was gradually developed by considering the above mentioned principles. An analysis of these initiatives, along with some evaluation results, enables to describe important features of specific initiatives for professional development and of the support strategy as a whole.

Analysis Scheme

The analysis scheme (see Table 1) contains elements presumed to be relevant for professional development in general, and professional development on ICT in particular. This scheme allows for a more analytical description of specific support initiatives. Such descriptions enable targeted evaluations and more encompassing comparisons. The following elements are included:

1) *Purpose*: What purpose do the organisers of this initiative have in mind? Sensitising, informing, training, coaching or a combination? In deciding about the purpose, knowledge, skills and attitudes about ICT of potential participants, have to be considered.

2) *Target group*: Different persons have different responsibilities with respect to the training or the specific course in which ICT could be used. They also have a different task in the realisation and implementation of the ICT-application.
3) *Perspective*: Is the initiative concentrated on an isolated issue (e.g., the use of e-mail), a specific viewpoint on the use of ICT in education (e.g., the educational viewpoint), or does it cover various aspects and viewpoints of ICT-employment (e.g., technology, organisation, ...)?
4) *Initiator*: Is the initiative the result of a request from the users (re-active) or has some other organisational body decided (pro-active) that users might benefit from the activity?
5) *Accessibility*: Can the target group get access to the support when they need?
6) *Control*: Who controls the programme and content of the support initiative: the users or the organisers?
7) *Commitment of the participants*: Does one expect active participation from the participants?
8) *Connection to the specific educational context of the participants*: Is the specific educational context of the participants taken into account during the support initiative?
9) *Number of participants*: Is the initiative directed towards individuals or groups?
10) *Instructional methods:* What instructional methods are used by the organisers?
11) *Use of ICT*: Do participants use ICT during the initiative?

Purpose	Sensitising
	Informing
	Training
	Coaching
Target group	Teaching staff
	Assistants
	Decision-makers
	Support staff
Perspective	Isolated issue (different perspectives)
	Educational view
	Technological view
	Managerial view
Initiator of the initiative	Pro-active
	Re-active
Accessibility of the support	Just-in-time
	Fixed
Control by the learner	Non
	Little
	A lot
	Complete

Commitment requested by the participants	Yes
	No
Connection to the specific educational context	No
	Small
	Strong
	Very strong
Number of participants	Collective
	Individual
Instructional methods	Lectures
	Demonstrations
	Discussions
	Collaborative work
	Project-work
	Assignments
	Tutoring
	Hands-on
Use of ICT by participants	Yes
	No

Table 1: Analysis scheme

Analysis of the Support Initiatives of the University of Leuven

The University of Leuven has gradually developed a diverse set of activities to support educational innovation and the use of ICT. Attempts were made to consolidate these activities (see Table 2) and elaborate an integrated ICT support strategy. By using the described analysis scheme, an analysis of these initiatives is made.

1) *Yearly conference about educational innovation*. The purpose of this conference is to sensitise staff and decision-makers for educational innovation. Innovation is emphasised, the use of ICT is only been viewed from an educational point. The conference is a fixed annually pro-active initiative. The target group has no control over programme or content, no active participation from the participants is required and there is no direct relation to their specific educational context. In addition to some lectures, staff may participate in discussions about specific subjects and can take a look at some ICT-applications realised by colleagues.
2) *Professional educational training for new teaching staff.* New staff is introduced in the educational philosophy of the institution. They get the opportunity to learn about and reflect upon different aspects of learning environments and their interrelationship. Participants are informed about the potential role of ICT in education in one session. The perspective is only educational. Participants get assignments in order to clarify the relation with their educational context. The extent to which ICT is discussed depends on the participants. They may ask for individual targeted support. This individual support complements the collective training where participants have no control over the programme and content. ICT is used as a means to spread information and assignments.
3) *Workshop for new teaching assistants*. New assistants are invited for a seminar on their educational task. During this seminar they can participate in a collective workshop about the educational use of ICT. The use of ICT is discussed from different points of view, but the educational viewpoint is emphasised. This pro-active workshop is fixed in time. Participants have no control over the programme. Active participation is

required. The precise content depends to some extent on their questions. The relatedness to the specific educational contexts of the participants is rather vague. The workshop contains exercises and discussions. Participants do not use ICT.

4) *Informative sessions*. Teaching staff and assistants are invited for informative sessions about isolated educational or technological issues on using ICT in education (e.g., 'influence of symbol systems on the learning of students', 'videoconferencing', 'teamwork through the net'). These pro-active sessions are fixed in time and have a fixed programme and content. No active participation is required and there is no direct relation with the specific educational contexts of the participants. During these collective sessions there is place for lecturing and discussion. Sometimes videoconferencing is used, in order to enable participation by staff members at a distant location.
5) *Training sessions*. These sessions are open to all staff members and emphasise an isolated issue of ICT (e.g., the evaluation (what, how and when) of ICT-applications and their use in an educational context). The training is collective, pro-active and fixed in time. Participants have no control over programme and content. During the training session active participation is requested. Lectures, assignments, teamwork and discussions are combined during the training sessions. There is a small relatedness to the specific educational context of the participants during assignments. Participants do not use ICT.
6) *Demonstrations*. Staff, assistants and students are invited for demonstrations of ICT-applications developed by colleagues. Participants are informed about different components of ICT: the development, the role in the learning environment, the structure of the application, the use of the application by the students, technological requirements and problems, software used, evaluation methods and results, etc. The demonstrations are fixed in time, collective and pro-active (although in the future they may be re-active). Participants have no control over programme or content, and no active participation is required. The educational context of participants is not taken into account. During demonstrations lecturing, demonstration and discussion are combined. Until three months after the demonstration, participants can explore the ICT-application and the informative given during the demonstration itself in a dedicated demonstration room. During this re-active and individual support, they use the involved ICT-application.
7) *Intensive training about the use of ICT in education*. Teaching staff and their assistants are intensively trained and coached in using ICT in their education. The training covers different aspects of ICT-employment from different perspectives. The training of 10 days is fixed in time and pro-active. The participants have some control over programme and content. Organisers are flexible enough to go along with questions and interest of the participants. The training is immediately related to the specific educational context of the participants. Being actually involved in a project on the use of ICT in education is an entry requirement. A project means that the participants have a plan to use ICT in their course. The training exists of lectures, assignments for each project team, collective assignments, workshops for hands-on experience, discussions between project teams, demonstrations and project work. Each project team can work with personalised technological and educational coaching on the design and development of the ICT-application of their project. ICT use by the participants is limited.
8) *Training about the use of ICT in education*. During this training teaching assistants are informed and trained in the use of ICT in education. The training covers all viewpoints of ICT-employment. It aims at exchanging experiences and preventing assistants to loose time in finding and trying out a lot of things while designing and developing an application. The training is pro-active and fixed in time (but spread over 8 months). Participants have some control over programme and content. The training is only partly fixed and organisers are flexible to go along with questions and interests of the participants. The relation with the specific context is high. To be actively involved in an educational ICT-related project is an entry requirement. Assistants must be responsible for the design and development of a specific ICT-application for a specific educational setting or course. During collective sessions, lectures, demonstrations, assignments and discussion are used. Between two sessions of the training, the participants get an assignment, directly related to their own project. ICT is used to offer informative materials, and to discuss related topics. Upon request of the participants, they may get individual coaching for completing the assignments or for their own project-related design, development, implementation and/or evaluation activities.
9) *Support path for beginning ICT-users*. Staff members who plan to use ICT in their course can be coached. This implies that they get five assignments on the design, development, implementation and evaluation of a specific ICT-application. The initiative is pro-active as well as re-active. Each assignment is at least one time discussed with an educational expert. On request more guidance regarding this and/or other aspects of the use of ICT can be provided. Participants control the content, the programme and the timing of the initiative. The initiative is partly fixed in time, partly just-in-time. ICT is used to distribute information.
10) *Individual support*. Teaching staff and assistants can raise specific questions about all design, development, implementation and evaluation activities and with respect to any aspect of ICT-employment. Answers to these questions are formulated or coaching with respect to these activities is given by educational, technological and/or media experts. This re-active support is just-in-time and the content is in full control of the participants. The support is directly related to the specific educational context of the participants.

There is no use of ICT to deliver the support. If different people have the same questions (e.g., about a specific software tool), those people are brought together. If appropriate, an informative session or training can be organised.

11) *Helpdesk.* All decision-makers, staff members and assistants can send questions about using ICT in education via e-mail to a helpdesk. Questions may be informative about a topic (e.g., examples of specific ICT-applications or tools), and be related to any aspect of ICT-employment. The helpdesk answers the question, informs where to find more information, refers to experts on the topic or to specific examples, etc. This initiative is re-active, just-in-time and individual. The relatedness of this content to the specific educational setting depends on the question.

Table 2 gives an overview of this analysis. There are no specific professional development activities for members of the support staff. This alternative of the element 'target group' is therefore left out this overview.

Observations of Particular Initiatives

Some of the described and analysed support initiatives are in their conceptual phase. Below are the most important observations, experienced problems and evaluation results of and with the other initiatives.

- Questions on ICT in education of staff members mainly address technological and/or organisational issues. These questions reflect a naïve view on the use of ICT in education. One of the consequences is that ICT is mostly added to and not integrated in the learning environment.
- This observation calls for caution with initiatives to sensitising staff. Any solely technological initiative would strengthen such a view. Therefore, sensitising initiatives should always be related to the realisation of student-centred learning environments.
- Informative sessions do not resolve questions about the contextualisation of the information presented. Regularly, participants feel left behind with questions about the meaning of the information for their own settings and what steps they have to take to transfer the informative into their courses.
- Effects of professional development activities on ICT become larger, when the relationship with the specific course or content is more direct and more active participation from the participants is required.
- Some of the participants of the intensive training on ICT testified that training leads to a radical change in their educational behaviour. Remarkable is the observation from the evaluation results, that mainly teaching staff had the feeling to have learned something, while assistants do not report large learning gains. Staff members may be more involved in the teaching task and have more questions about it. This corresponds to the opinion of Korthagen and Kessels (1999), that a learner must have personal concerns about teaching or must have encountered concrete problems in order to benefit from professional development activities.
- After only three sessions of the training for assistants, two of the seven projects asked for individual support with respect to specific educational and/or technological aspects. Four out of 15 projects that participated in the intensive training returned within a year for individual coaching with respect to educational or technological aspects. Training and coaching, fixed in a short time, seems not to be sufficient for those who are really working on an ICT-application.
- A good balance between pro- and re-active initiatives seems to work. Teaching staff and assistants mostly do not know what knowledge and skills they need for effectively using ICT in their courses. So pro-active initiatives are necessary. Otherwise it is not always possible to handle specific and concrete questions of individual staff in these (mostly) collective initiatives.
- The majority of people that asked individual support, were people who previously participated in some training. There are at least three possible explanations for this: 1) these people are aware that for an effective use of ICT in their education, there is a need for expertise they do not have, while others are unaware of this and do not experience problems with it; 2) they know that they can ask for individual support, others do not know this; or 3) other people have the knowledge and skills needed, hence, they do not need any training and/or individual support.
- During individual support it is not always easy to detect what one wants to realise, probably because staff members and assistants do not have an elaborated terminology to discuss educational issues. Another factor is that this 'counselling' requires specific skills of the support-giving experts.
- Participants of the intensive training who returned for individual support seemed not always to have changed their subjective educational theories. But in comparison of staff members and assistants who did not participate in any training on ICT, they can clarify what they want to realise and understand more easily questions and suggestions from the experts.

	Sensitising	Informing	Training	Coaching	Teaching staff	Assistants	Decision-makers	Isolated issue	Educational viewpoint	Technological viewpoint	Managerial viewpoint	Pro-active	Re-active	Fixed	Just-in-time	Control by the learner	Commitment requested	Relatedness to specific context	Individual	Collective	Lectures	Demonstrations	Discussions	Collaborative work	Project-work	Assignments	Tutoring	Hands-on	Use of ICT
Conference on innovation	X				X		X		X			X		X		/		/		X	X	X	X						
Training for new staff		X			X				X			X		X		*	X	*	(x)	X	X		X	X		X			X
Workshop on ICT		X	X			X			X	X	X	X		X		*	X	*		X			X	X		X			
Informative sessions		X			X	X		X				X		X		/		/		X	X		X						
Training days on ICT			X		X			X	X			X		X		/	X	*		X	X		X	X		X			
Demonstrations		X			X	X			X	X	X	X	(x)	X		/		/	(x)	X	X	X	X						(x)
Intensive training on ICT			X	X	X	X			X	X	X	X		X		**	X	***	X	X	X	X	X	X	X	X		X	(x)
Training on ICT		X	X	(x)		X			X	X	X	X		X	(x)	(***)	X	***	(x)	X	X	X	X	X		X			X
Support path				X	X	X			X	X	X		X	X	(x)	**	X	***	X								X		
Individual support		X		X	X	X		X					X		X	***	X	***	X								X		
Helpdesk		X			X	X	X	X	X	X	X		X		X	**		**	X	(x)									X

Table 2: Overview of the analysis of the initiatives, part of the global support strategy for professional development on ICT of the University of Leuven. (X = valid; ( ) = valid, but not standard; / = non; * = little or small; ** = a lot or strong; *** = complete or very strong)

- Some of the participants could not combine the intensive training with their daily work and perceived the training as too time-consuming. Others found it worthwhile that they had to free time for training.
- Based on the spontaneous reactions on the evaluation forms of the intensive training, one may conclude that most participants found it very useful to participate in the training in project groups. The discussions between staff members and their assistants seemed to have been very instructive. The same observations can be made for the training of assistants. One assistant who asked individual support came alone the first time. The second time he returned with the responsible staff member.
- People like to see examples of effective ICT-applications, and are very interested in the (positive ánd negative) experiences of colleagues with the design, development, implementation and evaluation of an ICT-application. This is in harmony with one of the findings from a study of the American Productivity & Quality Centre (APQC) on best practices in faculty instructional development on the use of technology in teaching (Bates, 1999). Faculty members seemed to learn best from peers through show-and-tell demonstrations by colleagues who developed good examples of technology-based teaching.
- Because the use of ICT in education, with all his aspects, is a rather new domain, only few people have (all) the required knowledge. If one wants to organise informative and training initiatives, one needs to appeal to others. Given the lack of widely spread experience, it is not easy to find persons who 1) want to contribute, 2) have the knowledge about the use of ICT in education, and 3) have the skills to develop activities that respond to the purpose of the initiative. Especially for the training activities, the creation of a rich learning environment is not a simple task. A good collaboration and coordination in a multidisciplinary team is therefore essential.

Conclusion: Powerful Features of Professional Development Initiatives

Although there is (at this moment) no empirical evidence about the effectiveness of the different initiatives and the global support strategy, one can identify some powerful features of professional development initiatives. These features may guide decisions while both elaborating an educational support strategy and designing specific professional development initiatives:

- In order to promote transfer the relationship between the educational context and the training elements must be as high as possible. Transfer is also facilitated when participants are active, have specific problems and/or questions.
- Staff members who have no concrete problems and/or questions should be reached by sensitising initiatives, but always in a context of educational innovation or the realisation of student-centred learning environments. Participants with concrete plans to use ICT should be given the opportunity to actively elaborate their plans from different perspectives. These plans are to be continuously challenged.
- One can only require active participation if the relevance of the initiative for their educational context is clear.
- Collaboration between staff members and their assistants benefits to all and should therefore be stimulated.
- Staff members who share their questions and experiences with respect to the design, development, implementation and evaluation of an ICT-application enrich the professional development on ICT of colleagues.
- Professional development on ICT requires time. It is necessary that participants get and make time.
- A good balance between pro- and re-active initiatives is beneficial.
- People need a place where individual questions are answered or individual support is provided just-in-time and upon request. If one wants during training that participants learn to detect the expertise they need for effectively using ICT in education, one also has to make this expertise available. Staff members cannot become experts on the use of ICT in education. They only can obtain more expertise about it.
- Re-active individual support or pro-active coaching initiatives should be flexible enough to deal with any type of questions about ICT-employment.

References

Bates, A. W. (1999). *Managing technological change. Strategies for college and university leaders*. San Francisco: Jossey-Bass.

Korthagen, F. A. J., & Kessels, J. P. A. M. (1999). Linking theory and practice: Changing the pedagogy of teacher education. *Educational Researcher, 28*(4), 4-17.

Laga, E., Elen, J., & Waeytens, K. (1999). *Supporting the use of ICT to improve instruction in higher education*. Leuven: University of Leuven (Paper presented on the 24th international IUT-conference, 1999, Brisbane).

Out of SITE and into Staff Development

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Abstract: This paper outlines a framework for transforming technology integration within a public school system from isolated success stories to a district-wide movement. This is accomplished in two phases: 1) A district staff development day based on the SITE conference model is used to expose educators to available resources and possibilities for curriculum and technology integration. 2) This day is followed by a yearlong focus on professional development and curriculum support utilizing online, interactive tools. Central to the entire process is encouraging educators to become leaders in their own development by taking advantage of online resources that encourage mentoring and collaboration.

Finding our Catalyst

Solutions can be few and far between in the field of Instructional Technology; however, it is the recurring themes that can be illuminating. After attending SITE for two years, one of these themes seemed to continually catch our attention. It appeared that many districts that had widespread success with technology integration had a catalyst of some sort, something that took integration from the level of dispersed, isolated successes to district-wide acceptance and participation.

Over the last three years, our office has experienced the more isolated successes with curriculum/technology integration. While this can be exciting, it is mostly one-on-one work that is resource intensive and does little to further district-wide progress. We began to look for our catalyst. We wanted something that would raise the district's technology energy past the activation level required to begin the desired chain reaction of integration throughout the district.

We decided our catalyst would be found in a staff development solution, and the SITE conference model would be an excellent method for delivery. Our commitment would be a year of unprecedented district-wide professional development beginning with a day devoted to curriculum/technology integration. Our proposal to utilize one of two district-wide staff development days was based on the following premise:

1. Staff Development is an important issue that is difficult to effectively address in a district as large and diverse as Framingham, MA (15 schools and 51 languages spoken in homes).
2. Curriculum/Technology Integration in Framingham has progressed slowly over the last two years, and it will continue at the current rate unless new methods of leveraging resources are implemented.
3. It is well documented that Professional Development is one of the vital components to effective Curriculum/Technology integration.

We believed that by pooling the resources of the Office of Technology with those of the Office of Curriculum and Staff Development we could develop a conference-style day based on the free-flowing model of the SITE conference with multiple concurrent presentations, discussion groups, and open rooms for some hands-on experimentation with technology resources.

This staff development day (to be held on October 20, 2000) would have four important components:

1. The presentations and discussions would be *by* teachers and *for* teachers. Seventy of our approximately 85 presenters would be Framingham teachers sharing their curriculum/technology integration experiences with 975 staff members.
2. Presentations would be rooted in resources available to teachers throughout the district. The Office of Technology guarantees a "toolbox" of resources for every teacher (e.g., Internet, Inspiration, MSOffice/AppleWorks, Timeliner, Hyperstudio, etc.) This means that staff members could immediately utilize the ideas they acquired from the presentations.
3. The SITE model would allow staff members to tailor the day to meet their individual needs. The intent would be to maximize their exposure to and enthusiasm for curriculum/technology integration.
4. The day would be a kick-off to a yearlong commitment to staff development as it relates to curriculum/technology integration. The day would not be expected to stand-alone. The follow-up instructional support with staff and the encouraging of collaboration would be vital to sustaining our desired "chain reaction."

Preparations

The details of arranging the professional development day took approximately 4 months to organize. This was the first time that Framingham would bring all of its educators into one location for one subject on a professional development day. Meetings with the Office of Staff Development were useful in arranging logistics of the day due to their experience with previous professional development days.

Presenters were mostly educators from Framingham, as we have mentioned. All presenters were required to use PowerPoint or Apple Works slide shows. No overheads were allowed. Meetings with these presenters were scheduled in order to convey the theme of the day, and to lend assistance in developing presentations. Presenters were provided with templates for slide shows. These templates included questions for the presenters that focused on the theme of the day. Many teachers found these to be quite helpful. These district presenters received $50 per presentation.

A select few presenters from outside of the Framingham Public Schools were invited. These included representatives from Public Broadcasting System (PBS), Apple Computers, Classroom Connect, CyberArts International, and representatives from institutions offering Masters programs in Instructional Technology. One stipulation placed on these presenters was that they focus on resources available to teachers for their classrooms or their own professional development. We were not looking for vendors who would show teachers products they could not afford.

The day was billed as *Curriculum and Technology Integration: a Day for Framingham Educators*. Every educator received a 6-page program (including a description of each presentation) 3 days prior to the event. This allowed attendees to choose presentations that interested them, as well as choose second and third options in case rooms were full. There was no pre-registration for sessions. Initially, presentations followed a SITE model with ½-hour presentations and some 1-hour discussions. Concern regarding logistics of the day caused us to change all sessions to 45 minutes. Three sessions were offered in the morning and 3 in the afternoon with an average of 22 presentations per session. Rooms dubbed "Follow-up Rooms" were added to allow attendees to extended discussions initiated by presentations. Attendees also had the option of visiting "Toolbox Rooms." These were lab setting in which teachers could spend some "play-time" learning about district-wide software and Internet resources.

Results of the Day

The professional development day was very successful. Key to the success of the day was the considerable support available to participants and attendees. The entire technology staff and members of the Office of Staff Development were available for technical and logistical support. Approximately 20 high school students also provided technical assistance and helped to move attendees from the auditorium to the presentation areas and back.

Results from a questionnaire enclosed in the programs suggest that attendees found the SITE conference model refreshing compared to the more traditional professional development day model in which teachers have little or no choice regarding the day's topics. A total of 181 responses were collected. All questions were measured on a 5-point Lickert scale with *a lower score being more favorable*. The most favorable responses were to questions regarding the multiple presentation format (mean=1.68) and regarding the realistic connection of presentations to using technology in the classroom (1.77). The least favorable response involved finding adequate choices for specific grade levels (2.34); however, this mean response is still quite favorable.

Other feedback, conversationally and in the form of e-mail, has been most encouraging. One attendee commented, "It was very well done...very professional and energizing...the other thing that made it so great was that everything that was demonstrated, was *so do-able*." Another comment from a presenter also hit the mark, "As I was leaving, a teacher stopped her car, got out, and said, 'I just had to tell you thank you - your presentation has given me the courage to try this in my own classroom.' This quote alone made the effort that went into my presentation worthwhile and speaks to the power of peers teaching peers."

We are currently collecting information on the impact of this day, but changes have already been noticed. There has been an increase in requests for assistance using technology in the classroom, especially in using *Inspiration, WebQuests, Journey North*, and other Internet based resources. We have also had more than 40 staff members sign up to use a new online collaboration tool (*Taskstream*) for developing lesson plans.

Free! to Learn

The staff development day appeared to be challenging enough, but to meet the anticipated flood of interest with yearlong instructional support and only two fulltime Instructional Technology Specialists seemed a task of heroic proportions. It was obvious that we needed to find additional resources that could be leveraged. It was important to find someone that shared our vision and could help maintain the momentum established at the staff development day. *School Change Network* and their "*Free! To Learn*" concept fit the bill.

Free! to Learn was originally developed by *School Change Network* as a newsletter and interactive "manifesto" designed to spread the idea that in today's networked world, educators ought to have the capacity to take charge of their own professional development. Soon after the inception of the *Free! to Learn* newsletter, *School Change Network* expanded the scope of the project to provide a suite of services that would help schools and districts shift to a new professional development paradigm – one in which teachers become the leaders of their own professional growth through collaboration, collegiality, and taking advantage of learning opportunities online.

The *Free! to Learn* approach to professional development dovetailed perfectly with our SITE-modeled staff development concept. In addition, *School Change Network* could bring the expertise and tools we needed to meet the curriculum/technology integration needs of our staff members. One of the most exciting directions our partnership will be taking is the use of an online, interactive curriculum development tool that encourages professional learning and collaboration through online peer mentoring. Our intention is that this tool, and some additional training, will result in a self-sustaining district-wide network of educators who can more effectively collaborate and take control of their own development.

Mentoring and collaboration are popular topics, and with the wide range of technology skills among educators, they are topics that can have an impact on teacher learning. We also feel that by using this online tool, we are approaching educators at a local level, instead of sending them to a third party, such as an online course. This tool facilitates professional collaboration within our own district, where teachers are in a comfortable environment with colleagues they know, and not with relatively unfamiliar "outside experts."

Where Do We Go from Here?

School Change Network will also assist in collecting and analyzing data to measure our progress as a district. We recognize that if this is to have a lasting impact on the Framingham Public Schools, it is necessary to show evidence of our success. We believe that data regarding the effect our approach will have on teachers can be readily collected. One area we will monitor is the development of lesson plans using the online mentoring tool. The lesson plans created with this tool will provide technology-integrated products that are connected to state frameworks, and can be used in classrooms. The biggest challenge will be quantifying changes in student learning as a result of our work with teachers.

We also need to be able to quantify progress in the dissemination of technology integration over the next year. As stated previously, this project was initiated by the desire to move from small occurrences of curriculum/technology integration and towards an expanding sphere of interest and activity.

It is our belief that this process will result in a framework that can be replicated for other districts to generate their own chain reaction, and that a presentation at SITE2001 of the project underway will help us to disseminate the framework. It is also our intention to submit a proposal to present our one-year results at SITE2002.

IMPLEMENTATIONS OF VIDEOCONFERENCING IN IN-SERVICE TEACHER TRAINING

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Abstract: This paper presents the possibilities of VC in staff development and experiences that the Ziridis School has had when teachers took part in interactive lessons instructed via ISDN-videoconference. The results of the experiences are explained and some suggestions for the use of ISDN-videoconferencing are made for in-service training and staff development. The paper is presented with videotaped-material of distance lessons and interviews of staff in Greece and remote teachers in Finland.

1. The Ziridis Schools

The Ziridis Schools is a private leading educational organization in Athens with a 67 years tradition. Today it has nearly 2000 students in Kindergarten, Elementary, Junior High School and Senior High School and a staff of 350.

The mission statement of the Ziridis Schools is: "In the most modern educational environment we create the citizens of the world. The leaders of tomorrow." Through experimentation and discovery the school promotes the special talents of each child.

The educational philosophy of the school is based on multiple intelligences, cooperative learning, teamteaching and interdisciplinary approaches. A special emphasis is given to ICT and various internet- and email-projects are implemented with schools in Greece, Europe and other countries of the world. The school has four modern computer laboratories, computers in classrooms and own production of CD-ROMs. The school is the first one in Greece using ISDN-videoconference as a tool for teaching and learning.

There is a special Center of Research and Development which works on the implementation innovations and teaching practices. It is divided into three departments: Information and Communication Technology, Teacher Training and New Programs, and Student Care [www.ziridis.gr].

2. In-service training

In order to reach the goals and fulfill the mission the staff must be aware of possibilities of ICT in education. As part of our in-service further education and staff development we have used ISDN-based videoconferencing. The educators have received instruction from the Department of Educational Sciences and Teacher Training of the University of Oulu where there exists a lot of experience of distance learning environments (wwwedu.oulu.fi). The lessons have been delivered using ISDN-videoconference technology from Finland and so the trainees have had authentic experiences as learners. Main focus has been placed on to classroom-based instruction.

Interaction. During the lessons the interaction between the teacher and the distance class is analyzed. The personality and teaching skills of teacher plays a significant role. He must be also familiar with communication using media. He must be like a director of a theatrical play who takes care of visual outlook. He must be a bit of a technician in order to handle the vc-equipment and supportive equipment (like document camera). The critical point is his professionalism and careful lesson planning.

But not only is the interaction between the teacher and the students important, but also the interaction between students is very important. The social atmosphere is a little different from a "normal" classroom situation. There might be even lessons that the remote classroom doesn't have a teacher at all and the pupils take care of technology and discipline. This needs a little training for pupils and a good team-spirit. A suitable group is considered as 8 to 12 students.

Physical environment. During training period is analyzed also the physical environment of distance lesson. Apart from appropriate videoconferencing equipment there also must be a suitable classroom for distance learning. Garish colors must not be used, the lights must be well-directed, proper furniture, sufficient and adequate appendix material for teaching etc. The placement of microphones, loudspeakers, screen or projector and camera are extremely essential, because sound and picture are the most important elements in the successful completion of the learning objectives.

Experiences. Videoconferencing has given challenges to create the contents of in-service training exactly according to the needs of the staff. The technology has facilitated the use of experts from a well-known foreign university which has a long history in videoconferencing and generally in the use of ICT in education. The staff of the Ziridis School has been trained by several professionals without them loosing their valuable time for travelling. And so the costs also have naturally been much lower.

When the teachers have themselves been as "pupils" in videoconference lesson, they understand the learning situation much better, the communication, the interaction, and the limitations with voice and picture. Many small details during a lesson, unintentional noises like cough, the tapping of a pencil, noises of a squeaky chair etc. They have also noticed how important it is to change the picture between two cameras (if it exists), rhythm of lesson like speaking, pausing, asking questions, showing transparencies, giving time to think or answer and so on. Also basic things like

- listening to one another,
- the way of making questions understandable,
- having eye-contact with pupils,
- is the teacher communicating for an individual or a group
- how does a teacher make his instruction interesting

All these points become more emphasized in videoconference lesson than in normal face-to-face situation. But it gives many possibilities for students to practice their skills of cooperative learning and team work, they must be more active and responsible in their own learning and they learn to be more self-disciplined.

3. Suggestions

Very good training for every teacher is to change opinions and to discuss about learning processes with other teachers in other teaching environments. It's advisable to organize special training for different categories of teachers, i.e. elementary school teachers and high school teachers in different groups. It is also very practical to divide teachers in groups according to their areas of specialization, because every teaching subject is different: language teaching differs a great deal from a physics laboratory and so the teaching methods also in VC-environment are different.

The experiences of the teachers of the Ziridis Schools in the use of videoconferencing as the way of in-service training have been very positive. The idea is to create a network of schools and universities in Greece and all over the world that are cooperating through VC. Also technology gives a number of possibilities for extended education of administrational staff. Therefore the persons of management and secretarial staff are able to share the experiences and learn from each other.

References

Mäki, J. (1998) *Videoconferencing in music education.* Paper presented in conference "New Trends in Education". University of Jyväslylä, Finland.

Mäki, J. (1999) *Possibilities of Videoconferencing in a remote island.* Paper presented in conference "Education in Symi". City of Symi, Greece.

Mäki, J. (1999) *ISDN-videoconferencing in education.* Paper presented in conference "Distance learning and life-long learning". University of the Aegean, Rhodes Greece.

Mäki, J. (2000) *Videoconferencing as an educational tool.* Paper presented in conference "1st European Conference for Innovations in Education". Research and Development Center, The Ziridis Schools. Athens, Greece.

Mäki, J. (2000) *Videoconferencing: from theory to practise.* Paper presented in conference "Computers and Education". SEPDETH and Macedonian University. Thessaloniki, Greece.

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Smart Classrooms Led by Technology Using Teacher Educators

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Abstract. The College of Education at a western upper division state university has two computer classrooms, called Smart Classrooms, that mirror the configuration found in many local schools where teachers have a limited number of computers. This paper presents the results of a qualitative study in which the authors explored the pedagogical beliefs of five teacher educators who used technology in their teaching. The researchers wished to know their reasons for booking the classroom and their cultural preferences in designing instructional activities. The data consisted of interview transcriptions and responses to written follow up questions. Data analysis indicated that the faculty chose to use a Smart Classroom because it matched their teaching methods. They developed a variety of meaningful technology uses for their students and addressed many elements of multicultural integration. The authors discuss implications for faculty development and raise questions for further study.

Introduction

Teacher education faculty serve as role models for their students; their uses of technology and attitudes towards it directly impact student teachers' implementation of educational technology (Huang, 1994). Equally, they serve as models for teaching in culturally supportive ways. Their attitudes towards and assumptions about diversity manifest themselves in how they use technology to support learning differences, diverse needs and cultural preferences for learning. Unfortunately, many professors do not use technology in their teaching (Parker, 1997) and, therefore, do not effectively model technology use for preservice teachers (Moursund & Bielefeldt, 1999). At the same time, many teacher educators do not intentionally use technology in ways that are supportive of cultural diversity. It is not surprising then that most recent teacher education graduates do not feel prepared to integrate technology in their curriculum (U.S. OTA, 1995) nor in culturally diverse classrooms.

Faculty Modeling

In order to increase the number of teacher educators who model multicultural technology integration, we must first identify those factors which may increase the likelihood of faculty modeling of multicultural technology integration. We speculate that faculty members' world views and teaching approaches may influence their selection and management of technology applications in the classroom. In an exploratory study of 157 technology-using teacher educators, Robin and Harris (1998) found that those surveyed showed a tendency toward learner-centered teaching. Those who preferred learner-centered teaching approaches were more social and indicated a preference for highly participative educational activities.

Similarly, cultural preferences and beliefs play an important part in how technology-using educators organize classroom learning activities. Chisholm (1998) identified six culturally supportive teaching elements for technology integration: cultural awareness, cultural relevance, culturally supportive environment, equitable access, instructional flexibility and instructional integration. A case study by Stafford-Levy and Wiburg (2000) found that the six elements fit a constructivist instructional approach and foster minority students' learning by creating a culturally supportive, challenging environment.

Facilitating Transfer of Learning

Not only must there be thoughtful planning of faculty instruction for multicultural technology integration, but the physical layout of classrooms also needs careful planning. Transfer of learning is facilitated when the environment in which material is learned is similar to the environment in which the learner will later be expected to demonstrate the learning (Woolfolk, 1995). Preservice teachers should learn about the integration of technology in university classrooms that mimic the K-12 classrooms in which they will teach. Those classrooms typically do not have one computer per student, but rather to four computers that students share. We might assume that institutions preparing new teachers would hold classes in facilities that mirrored the typical placement of computers in K-12 schools. However, in a recent study of four colleges of education considered exemplary for their integration of technology in teaching, Struder & Wetzel (1999) found that they did not have teaching facilities that mirrored the placement of computers in many K-12 classrooms.

By the same token, preservice teachers should learn about multicultural integration of technology through participation in learning activities that model effective instructional practices. The successful integration of technology in culturally diverse settings requires implementation of appropriate multicultural teaching practices, as well as relevant, productive applications of technology. However many teacher education faculty are unsure of how to integrate multicultural elements into their courses or see it as something more to add to an already full curriculum. Consequently, preservice teachers may not link how faculty model technology use or instructional practices to their application in multicultural settings.

The Study

Purpose

The purpose of this study was to explore the pedagogical beliefs of five teacher educators who use technology in their teaching. These faculty members were early users of one of two computer classrooms, called Smart Classrooms, that in fact mirror the configuration found in many local schools The researchers wished to know their reasons for booking the classroom and their cultural preferences in designing instructional activities. Teaching approaches that involve cooperative learning, students' learning styles, and individual cultural preferences may influence faculty selection and use of technology. Thus the researchers sought to understand the possible link between the faculty's teaching philosophies and instructional activities with their use of technology in teaching.

Methodology

The researchers created a set of questions to guide interviews with these five subjects. The data consist of interview transcriptions and responses to written follow up questions. The five interviewed were the only teacher education instructors, aside from those teaching educational technology, who used the Smart Classrooms. The interview protocol included questions such as: a) What is your teaching philosophy? B) In what ways is your course student-centered? c) do you address the teaching of diverse populations? If so, how? and d) Describe some of the instructional activities you have conducted in this room.

Setting and Sample

The College of Education at a western upper division state university has established two computer Smart Classrooms that in fact mirror the configuration found in many local schools where teachers have a limited number of computers in their classrooms. The Smart Classrooms have eight networked computer student stations and a central area for 25-30 students made up of seating at 24 movable tables. Each student workstation contains one recent model computer and two monitors allowing 3-5 students to work together.

The five faculty interviewed were the only users of these classrooms from the College of Education. They were all female and represented the following programs Bilingual Education, Educational Administration, Elementary Education, Secondary Education and Special Education. One is Full Professor, three are Associate Professors and one is an Assistant Professor. Their experience in higher education ranged from 31 to 5 years with a mean of 14 years.

Data Analysis

Using the constant comparative method (Strauss, 1987), data analysis began as data were first collected and continued throughout the study. Each researcher independently read the transcripts and identified patterns and questions. Subsequently, they met to discuss patterns they observed in the data and questions that arose after the readings. Together they created follow-up questions and emailed them to the subjects. After collecting this data, the researchers re-read all transcripts and re-categorized the data. The themes that emerged were: beliefs, learning activities and technology fit, management of technology, student-centered approaches, learning activities, assesment of teaching, and multicultural teaching. One researcher used the interview data and follow-up questions to create mini-cases which each professor read and indicated that it represented them accurately. Member checking was also employed as a draft of the full study was sent to the informants to check for accuracy of data and feedback on our analysis. None of the findings were disputed or questioned.

Findings

The researchers found that the faculty chose to use a Smart Classroom because it matched their teaching methods. They valued collaborative student work groups and the eight computer stations made it easy to arrange projects for their students. Although the faculty studied were not formally aware of the six elements of multicultural technology integration, our analysis showed that the faculty designed some activities and made some choices that were resonant with them. Though four of the five faculty thought they were not technology experts, their expertise was sufficient to give them the confidence to try a new teaching environment. Four of the five faculty booking this classroom had designed their own web pages and although their web pages varied in content and complexity, they often included two or more of the following: course syllabi, listserves, on-line journals, and Internet sites related to course content and classroom activities. Similarly, a critical mass of the students had sufficient levels of technology skills to allow the group work to focus on meaningful course outcomes, not just technology skills. Three of the five faculty members assigned a student computer expert to each group. This structure encouraged learning from peers.

An analysis of the interview transcripts revealed no mention of the issue of technology support by central campus computing. This is important because adequate technology support is a key to inducing faculty to use technology in the classroom (Strudler & Wetzel, 1999). Classroom technology support appears not to be an issue for the faculty studied.

The faculty interviewed had developed a variety of meaningful technology uses for their students. These faculty knew what to do and had the technology expertise to make it happen. In their teaching, they addressed many aspects of the six elements of multicultural integration.

Implications and Questions

The findings from this study have implications for faculty development. Faculty will model multicultural technology integration when they see a direct link to their course content, teaching goals, and instructional style. Hence, faculty development activities should provide examples of technology use in specific courses and offer support in faculty planning to integrate technology. Further, teacher educators may frequently apply multiculturally appropriate strategies to technology integration, but not necessarily with an intent to model multicultural integration. Awareness of the multicultural elements and their relationship to their own teaching may expand their repertoire of culturally supportive strategies.

The current study raises the following questions for further study: Why don't other teacher education faculty don't choose to use the Smart Classrooms? Do faculty chose not to use the Smart Classrooms because their teaching methods may not match the Smart Classroom design? Do faculty not feel sufficiently confident in their technology skills? Do faculty not have a vision of meaningful and compelling use of technology in their areas? If the obstacle is technology expertise, what level of technology expertise will faculty need to feel comfortable using technology in teaching? If the obstacle is vision, what uses of technology are compelling for faculty in their specific content areas? What experiences will help them develop personally compelling uses of technology in teaching? Perhaps more difficult is the issue of developing culturally appropriate uses of technology in teaching. How do we model the six multicultural technology integration elements in faculty training?

References

Chisholm, I. M. (1998). Six elements for technology integration in multicultural classrooms. *Journal of Information Technology for Teacher Education*, Cambridge, England, 7(2), 247-268.

Huang, S. (1994). Prospective teachers' use and perception of the value of technology. In J. Willis, B. Robin, D. Willis (Eds.), *Technology and Teacher Education Annual*, 61-66. Charlottesville, VA: Association for the Advancement of Computing in Education.

Moursund, D. & Bielefeldt, T. (1999). *Will new teachers be prepared to teach in a digital age? A national survey on information technology in teacher education*. Milken Exchange on Education Technology: Santa Monica, CA.

OTA (Office of Technology Assessment).(1995). *Teachers and technology: Making the connection*. Washington, DC: Government Printing Office.

Parker, D. (1997). Increasing faculty use of technology in teaching and teacher education. Journal of Technology and Teacher Education. 5(2-3) 105-115.

Robin, B. & Harris, J. (1998). Correlates among computer-using teacher educators' beliefs, teaching, and learning preferences, and demographics. *Journal of Educational Computing Research*, 18(1)15-35.

Stafford-Levy, M. & Wiburg, K. (2000). Multicultural technology integration: The winds of change amid the sands of time. *Computers in the Schools Quarterly*, 16 (3-4), 121-134.

Strudler, N. & Wetzel, K. (1999). Lessons from exemplary colleges of education: Factors affecting technology integration in preservice education. *Educational Technology Research and Development*. 47(4) 63-81.

Strauss, A. (1997). Qualitative analysis for social scientists. New York:Cambridge University Press.

Woolfolk, A. (1995). Educational psychology. Sixth Edition (p. 316). Boston: Allyn and Bacon.

From Programs to Pedagogy: Facilitating Professorial Change Through Technological Collaboration

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Abstract: The goal of the "Preparing Tomorrow's Teacher to Use Technology" grant awarded to the University of Houston College of education is to encourage the integration of technology into courses taught by education professors. This modeling of an appropriate use of technology by the university professors is intended to help pre-service teachers acquire proficiency in the use of technology for curricular purposes. To accomplish this goal, many changes had to be implemented, the most challenging of which was to assist professors to move toward pedagogical change through the fusing of technological resources and activities with their curricular objectives. Using an action research model, a collaborative community was developed between professors and the grant project members. The resulting increased interest and excitement of the professors was reflected in their communication with colleagues, their use of electronic communication with their students, and their growing integration of technology into their curriculum.

Introduction

The ultimate goal of a recent "Preparing Tomorrow's Teachers to Use Technology" grant awarded to the University of Houston College of Education is to encourage the use of appropriate technology in the future K-12 population taught by our graduates. Appropriate use of technology is associated with a student's active participation in the learning process and increased approaches to problem solving. To meet this goal, pre-service teachers must gain confidence and proficiency with using and integrating technology into their pedagogy. Providing models of instruction that integrate technology and counter years of traditional classrooms allow students to have alternative models of effective teaching (Duffield, 1997).

Problem

If it is true that beginning teachers teach as they were taught, one hindrance to meeting the goal of appropriate technology use by our pre-service teachers is that higher education faculty prefer to rely on more traditional methods for delivering instruction (Spotts & Bowman, 1995). Therefore, it is imperative to the success of this project to change the way that many college professors currently teach. Change can be hard for many people, and it can be especially hard in a population of people who are considered experts in their field. Professors need to be guided to recognize and accept that technology is not a replacement for the content of the disciplines that comprise their curriculum, but an extension that can complement that content (Willis, 1997).

Action research involves constant change and therefore is the appropriate methodology to meet the goals of this project (Stringer, 1999). The community-based action research model - look, think, act - is a cyclical set of activities involving observation, reflection, and action. Contact with faculty has paralleled on a lesser scale the action research model of the entire project.

Project Design

The three-year project entitled "Action Communities for Teaching Excellence" is designed to reach the grant's ultimate goal from several angles including: (1) providing the diverse urban student population with a supportive, consistent environment and convenient computer access, (2) converting the currently required technology course for education majors into a series of lab courses which will more closely address the various needs of education students, (3) bridging campus- and field-based experiences and resources using technological solutions, and (4) helping the faculty gain confidence and proficiency with using and integrating technology into required course instruction. Since number four involves changing the actions of people, it is the most challenging and perhaps the most rewarding of all. It is recognized that teacher educators must first acquire basic technology skills and be able to model effective presentation skills before they can enable future teachers to use technology to provide meaningful learning experiences for their students (Rodriguez, 1996). The key is how to facilitate this change.

The original plan for interacting with the fifteen professors who teach the eight targeted courses included: (1) dividing the courses among the grant project members, based first on matching the content knowledge of the course with the project member's areas of expertise, and second by the previous relationship, if any, with the specific professor, (2) contacting professors by telephone to set up appointments, and (3) reading the course syllabus before the first meeting. In fact, many of the grant project members had no previous knowledge of the professors with whom they worked. Attempting to contact by telephone often led to completely useless rounds of phone-tag, and project members discovered that many of the course syllabi were unavailable. Project members found that matching professors by course content and personality with the project team and making effective use of e-mail were useful tactics when making the first contact.

The grant project team decided that it would be best not to talk about the role of pedagogical change at the first meeting with the professor for fear of being politely dismissed. Instead, the plan for the first meeting was to (1) meet with the professors one-on-one, (2) explain the ultimate goal of the grant, (3) determine the professor's current teaching practices, (4) determine if and where instructional technology is used in the course presently, (5) explain the role and availability of technical support from others working on the grant, (6) establish an agenda for the following meeting, and (7) establish a positive relationship with the professor.

Project Implementation

There were some obstacles to overcome in the implementation of the project as originally conceived. Though some meetings did take place on campus in faculty offices, the project team had to be flexible enough to meet with professors at their convenience and at a location which they chose. For some adjunct professors who have full-time positions off campus, that meant meeting at their off-campus office or even in their home at a time convenient for them. At the first meeting, team members had not planned to discuss increasing the use of technology in the actual practice of the professor. However, it was found that many people pushed for an answer to the question, "How does your grant involve me?" This led to answering truthfully about the present use of instructional technology (IT) in their classes and possibilities for increased future use of technology. Rather than obstruct interaction with them, it freed the conversation. Several people expressed that they had little time for this grant project in their busy schedule; therefore, they wanted project members to be brief. Helping professors save time through the use of technology in support of their teaching frequently piqued the interest of a professor who was at first resistant to or skeptical about the project. It was often this hook, the intense desire to make the best use of time, which opened conversations that quickly expanded to other types of technology uses by instructors.

At this initial contact with each professor, one of the tasks of the project team was to attempt to ascertain the level of engagement of the professor. Stringer (personal communication, Aug. 15,2000) proposes that there are four levels of engagement in persuasive arguments: resistance, apathy, interest, and excitement. The experience of the team as they worked on this project led to the addition of another level, skepticism, which was placed between resistance and apathy.

An informal analysis of the professors' levels of engagement at onset identified 64 percent at the apathetic, skeptical, or resistant level. Two months later, 100 percent were at the excited or interested level. The professors' movement through the levels of engagement was reflected in their increased willingness to meet with members of the grant project, their personal initiation of meetings and communication, and the gradual incorporation of technology into their teaching practices and assignments.

Levels of Engagement	Numbers of Professors (n=15)	
	1st Meeting	2 Months Later
Excitement	3	10
Interest	3	5
Apathy	2	0
Skepticism	4	0
Resistance	3	0

Table 1. Professor's Level of Engagement

The actual method of accomplishing movement through the levels of engagement was a combination of awakening enlightened self-interest on the part of the participants and developing a collaborative relationship between the professors and the members of the grant project team. With the initial purpose of the grant expressed by the grant team members as supporting professors' use of technology and increasing their efficient use of time, the stage was set for professors (1) to be validated in their curricular choices, (2) to be assisted in the actual technical underpinnings of a basic use of technology, such as an Excel spreadsheet/grade book, and (3) to be primed for their self-actualization as technology users through the availability of one-on-one assistance.

Professor voices changed with their exposure to team members and with tailored responses to their individual needs. One professor ended a brief meeting by swiveling around in his chair to check his e-mail while commenting, "Well, my classes are set. I don't know how your program can help me, but come back next week if you want."

A visit to the professor's class allowed two team members an opportunity to come to the next meeting with suggestions for making the professor's lecture more accessible to the 150 students in his class. That professor spent three weeks with a technical assistant developing PowerPoint presentations to facilitate his discussions. He looked forward to each lesson as he quickly saw the benefit of PowerPoint over writing on an overhead. His students, who had expressed difficulty in reading his handwriting, gave him positive feedback on his utilization of PowerPoint for his classes. In his most recent interview, this professor voiced a desire to integrate technology into students' projects to deepen his students' use of the computer as a tool for learning and for teaching their future students.

Due to the importance of the collaborative relationship between grant team members and faculty, attention was paid to both the selection of initial contact personnel as well as technical assistants. The technical assistants conducted tutoring sessions, set up grade books, put quizzes on-line, coordinated the creation of listservs, and monitored hardware and software set-ups for various purposes. Just as both curriculum expertise and personality had been factors in the selection of initial contact personnel, technical expertise and personality qualities were also relevant to the pairings of the professors and technical assistants. A professor who felt technologically deficient was paired with an experienced, patient technology assistant who could create lessons personalized to that professor's needs. Additionally, a professor who already used PowerPoint in lectures was paired with one who could proceed to digitizing video for insertion in these presentations.

One adjunct professor had an entire dissertation stored only on the desktop of a laptop computer, as she did not know how to save a backup to a disk. This same professor is now using an Excel spreadsheet for a gradebook, creating PowerPoint presentations, and looking for ways for students to create required projects by utilizing technology.

As the professor and the grant team members gathered around a computer, the common purpose led to easy conversation and collaboration. Although skills were ostensibly the focus, growing familiarity and mastery of a tool, the computer program, led to the desire to utilize it. As a result, professors spontaneously thought of classroom applications and student endeavors that could be enriched through the use of the technology.

One professor who was already a proficient personal user with lectures utilizing PowerPoint, highly developed word processing skills, and e-mail communication with students found that required reflections could be posted to a hypergroup which the grant team set up for her. A hypergroup is a specialized web site where a question or assignment is posted and students may post their replies. It can also be utilized as a listserv if students are required to join.

As the instructor became more familiar with the hypergroup, she began to use its Internet capabilities by having students post the addresses of sites that were applicable to the course so others could access them as well and share the information that had been discovered.

This desire to share their new knowledge extended to their colleagues. Faculty members who generally were isolated from their peers due to schedules, workloads, or habit became curious about their instructional counterparts' use of technology. If the grant project member was working with two different professors who taught the same course and mentioned a resource that had been effectively employed by another, a connection was made between the two professors. If one professor's hypergroup site was shown to another professor as a demonstration of various ways to employ a hypergroup to meet curricular goals, insight into both process and product was possible. Although the grant project members came from outside the community of professors, their contact with the instructors increased the intellectual communication between the professors.

As the interest grew, the grant group offered workshops in beginning PowerPoint that were open to both students and faculty. The participants expressed interest in returning for intermediate and advanced workshops. They also began requesting the use of labs or rooms with projection capability for PowerPoint presentations. In response, the grant team canvassed other departments as to their lab facilities, their use of projection devices, and the number of existing rooms with built-in equipment beyond just an overhead projector.

As more professors began integrating technology into their assignments, the question of student access was ameliorated by the reorganization of the previous course for technology in the classroom. This class was restructured into labs to allow students to address their individual technology levels. These courses provide assistance to the students in completing assignments from their education courses. They become familiar with the use of a hypergroup, are introduced to the most commonly used programs such as PowerPoint, Word, and Excel, and may work on education assignments requiring the use of technology.

Like the metaphorical World Wide Web that expands exponentially by creating connections, the grant project members are becoming links between departments within the university, between computer labs serving various departments, between professors and their colleagues, and between professors and their students. While facilitating adoption of technology into the instructors' individual pedagogy, the grant project members are becoming facilitators of change as they interact with the professors and diverse areas of the university. One surprising discovery of the team is the myriad issues that frequently impact on the education of pre-service teachers and generally have not been addressed by current procedures. This outside view of the "bigger picture" can only lead to a greater understanding of the needs of the pre-service teacher and the resources available to meet these needs.

Conclusion

Pedagogical change is the outgrowth of both the integration of technology and the development of the collaborative community created by the project. The integration of technology that provides for active participation in the learning process encompasses instructors, grant project members, and students in the process of change. Through this collaboration, the grant project members have found that many instructors of future teachers have become eagerly engaged in learning to integrate the appropriate use of technology into their teaching. By modeling technological integration and the concomitant pedagogical change, these professors are helping the future students of these pre-service teachers acquire the technical integration skills critical to success in the 21st century.

References

Duffield, J.A. (1997). Trials, tribulations, and minor successes: Integrating technology into a preservice teacher preparation program. *Tech Trends*, 22-26.

Rodriguez, S. (1996). Preparing teachers to use technology: Issues and Strategies. *Tech Trends*, 18-22.

Spotts, T.H., & Bowman, M.A. (1995). Educational technology research section: Faculty use of instructional technologies in higher education. *Educational Technology*, 56-64.

Stringer, E.T. (1999). *Action Research, Second Edition*. Thousand Oaks, CA: Sage Publications.

Training Tutors Online: Three Challenges, Three Solutions, and Voices from the Other Side of the Whiteboard

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Introduction

If Socrates and Plato were alive today, would they still meet in the streets of Athens to probe topics with questions, or would they meet online to do so? Consider another legendary tutor Annie Sullivan, who held Helen Keller's hand under a running faucet to teach the word "water". How would Sullivan promote this type of concrete understanding online? The stories of these legendary tutoring relationships endure because they model two of the most powerful principles of learning: from Socrates, we learn that good instruction teaches students to ask the right questions; from Sullivan, we learn that meaning is constructed through first hand experience. The crescendo of the distance education movement compels us to examine the application of these theories to new, online learning environments. To that end, educators must ask: do our most cherished teaching and tutoring principles transcend the vehicles in which those principles are delivered?

By separating the face-to-face dimension from one-to-one instruction, distance educators wage unprecedented challenges to entrenched assumptions about effective learning relationships. Invoking "the human touch", opponents of distance education remind us that powerful tutoring interactions are founded on face-to-face engagement. Skeptics decry *tutoring at a distance,* and this skepticism naturally extends to *training tutors from a distance.* The virtual relationships afforded by the Internet, they argue, are inherently diluted; compromised learning, they conclude, is the logical result. Quite contrary to warnings of diluted experiences, advocates of tutoring at a distance cite inclusiveness, accessibility, personalization, scalability, and, most importantly, opportunities to build powerful learning relationships that, by subtracting the miles that separate two minds, are otherwise impossible.

This presentation focuses on challenges and solutions that emerged in the development of a distance training program for online instructors. We divide the challenges and solutions into three areas -- pedagogy, content, and relationship. We present observations from the analysis of authentic online training interactions. Our observations suggest that cherished learning principles can endure if reinterpreted within a new framework of teaching and learning.

A. Training Context: The Provider and the Technology Platform

This case study focuses on the training program provided by a for-profit organization called SMARTHINKING, Inc. SMARTHINKING's primary innovations are (1) 24/7 real-time tutor training service, provided by experts, designed to supplement collegiate-level coursework; and (2) training professors and exemplary graduate students to tutor online (we call these tutor trainees "e-structors").

The technology platform used to conduct training is an interactive whiteboard with web-based materials. An interactive whiteboard is an Internet communication tool that graphically simulates the type of whiteboard one finds in a conference room or classroom. It enables real-time and simultaneous communication via text, color, and drawing tools.

The context for this case study is the experience of training a team of psychology instructors who tutor in a faceless, interactive whiteboard environment. This presentation explores what we observed when we hired experts in the domain of psychology and asked them to use their expertise in a new environment.

B. Three Challenges: Pedagogy, Content & Relationship

Three observations – one, that online, one-to-one **pedagogy** can lapse into a fact-finding service; two, that experts who tutor in a rapidly evolving domain (like psychology) will know different and sometimes dated **content** knowledge; and three, that tutor training happens "in **relationship**" – fuel the skepticism directed toward training tutor trainees at a distance, and engender the three challenges we frame as generative tensions:

- **The Pedagogy Challenge: Training Tutors to be Cyber Librarians or Model Thinkers?**
- **The Content Challenge: Is Providing Consistent Tutoring Possible with Inconsistent Professional Profiles?**
- **The Relationship Challenge: How Can the Affective Dimensions of Face-to-Face Interactions Transfer to One-to-One Interactions?**

D. A Case Study of Solutions: Examining the Development of a Distance Training Program for Psychology E-structors

Our training program has theoretical underpinnings: our pedagogy is informed by research from fields that study *how we know* (cognitive science) and *how we grow* (developmental psychology) in educational contexts. Trainees learn by doing through interactive real-time (synchronous) and self-paced (asynchronous) activities. The online tutor trainee training and evaluation processes are comprised of 20 hours of web-based modules. Training involves six hours of real-time practicum exercises with a live trainer, 14 hours of self-paced exercises, and three hours of assessment.

A Pedagogy Solution

Let's suppose a student is studying neuropsychology. Sophisticated, three-dimensional graphics of virtual brains are mere keystrokes away if one has access to the internet. There is a danger, we believe, that a tutor will become a cyber librarian who searches well, but does not teach well.

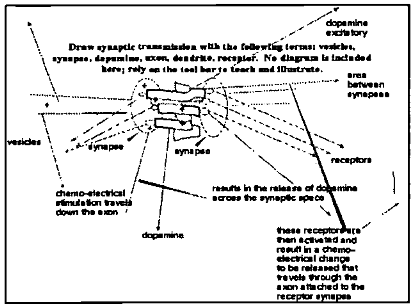
To devise a solution to the pedagogy challenge (How will we train tutor trainees to be model thinkers, not cyber librarians?), we asked: How can a training interaction simulate a good tutoring interaction so that it metaphorically gets the trainee's hand wet, as Annie Sullivan did with Helen Keller?

Thus, we set the expectation that tutor trainee trainees must *create*, not merely search for pre-packaged information. We predicted that tutors who respond to questions like cyber librarians, i.e. by doing Internet searches in order to help, would not earn intellectual trust from the students. This prediction informed our training protocol, and we developed slides we could load onto the interactive whiteboard that not only presented content, but more importantly modeled how we wanted that content delivered. Consider the following two training exchanges from our archives. Each tutor trainee was shown a training slide with the same task: "Draw synaptic transmission with the following terms: vesicles, synapse, dopamine, axon, dendrite, receptor. No diagram is included here; rely on the tool bar to teach and illustrate." By asking the tutor trainee to create something from nothing, we eliminate the option of doing a search – being a cyber librarian – and we set high expectations for how tutoring exchanges should ensue.

Archive #1 offers a lens into Tutor trainee MK's approach to an open-ended task. For this analysis, whether he offers reliable information in this diagram of synaptic transmission is almost irrelevant, for there are a number of visual and verbal *representation weaknesses*. First, the information is eclipsed by a disorganized approach to the task. To any viewer, the chaotic arrows are abundant and distracting; to the neuropsychology student, the multidirectional arrows obscure the unidirectional flow of electricity that characterizes synaptic transmission. Furthermore, the labels are poorly placed, too far from their referents, and too scattered to show the sequence in which neural functions unfold.

Second, key information represented in the diagram and text is not accurate (i.e. two synapses cited instead of one; receptor not accurate shape; dendrites ignored etc.) Moreover, in terms of modeling good thinking, this tutor trainee does not reveal how to approach this task in an organized sequence of steps. Although he is encouraged to ask for help, he feigns knowledge he does not possess. Finally, he does not demonstrate the humility of an "I don't know" that tends to engender trust and risk-taking in students.

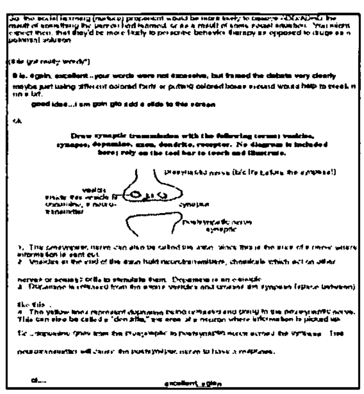
Archive 1: Tutor Trainee MK



In Archive #2, by contrast, tutor trainee AG demonstrates her expertise by delivering accurate information in a methodologically sound manner. She begins with a simple picture, not text. The picture, however, is not simplistic; she categorizes and combines labels when appropriate. For example, on the left side, her labels group the terms vesicle, dopamine, and neurotransmitter to demonstrate how the terms relate to and define one another. On the right side, her labels offer a 'big picture' by summarizing the sequence of synaptic transmission. The result is a clutter-free visual representation of the components involved in synaptic transmission.

After her picture is complete, she supports this diagram with text. Her clear prose explains the split-second process of synaptic transmission by breaking it into a sequence of steps. By choosing to number the steps, she models how to think sequentially. Finally, she concludes the interaction by summarizing the process with a single sentence. This progression – from picture to text to summary –was AG's intuitive solution to an open-ended task. Unlike the previous archive, she uses her on-command representation skills and knowledge base to create something from nothing (at least nothing more than a few terms), and thus engenders intellectual trust in the student while modeling an organized approach to the task.

Archive 2: Tutor Trainee AG



Thus, to meet the pedagogy challenge, we eschew glitzy images, for training should model what can be easily created while tutoring.

A Content Solution

Since we offer specialized assistance to students struggling through difficult college courses, we hired professional tutors, most of whom have doctorates in the academic subject they tutor. To devise a solution

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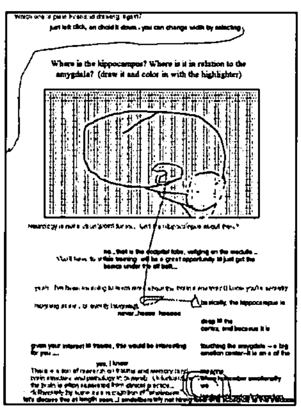
to the content challenge (How can we provide consistent tutor training despite inconsistent professional profiles?), we asked: given the variation among the education of professionals/academics, how can we compensate for the relative strengths and weaknesses of tutor trainees in subject areas so that the content-related knowledge base of tutors exists at a uniformly high caliber? We achieved this through a two-part solution: (1) top-down assessment, then (2) bottom-up training.

Top-down Assessment

In the domain of psychology, being well established professionally tends to also mean being out of graduate school for a long time. We found that a well-published scholar, in spite of an impressive resume and a thorough interview, may not have training that coincides with the revolutionary interdisciplinary changes the field of psychology is experiencing. Thus, part of our training protocol was designed to identify content weaknesses in our psychology tutor trainees.

Archive 3 shows one such interaction. The slide asks a basic brain question: "Where is the hippocampus? Where is it in relation to the amygdala?" Tutor trainee KP gives an incorrect answer in terms of shape (the hippocampus is a small tilted "U", not a large golf-ball) and location (it is in the temporal lobe, not the occipital lobe/medulla, as the trainer notes in black text). However, Tutor trainee KP prefaces her guess (red text) by explicitly identifying her academic weakness: "Neurology is not a strongpoint for me." The trainer then engages in dialogue that draws the parts correctly, explains the significance of this brain architecture, then – and most importantly – relates the significance to the tutor trainee's professional bent and clinical experience. Finally, having assessed the content area in which KP needs more extensive training, the trainer can proceed to the second step of our content solution – bottom-up training.

<u>Archive 3: Tutor Trainee KP</u>



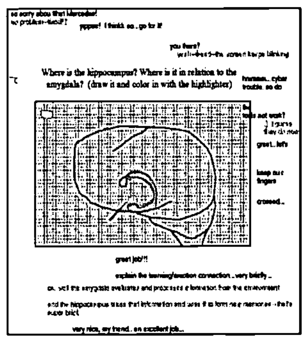
Bottom-up Training

Hiring academic and professional psychologists promotes the development of a cyber think tank; we use this intellectual power to enrich and customize training. In psychology, we made hiring decisions based on a "mapping strategy" so that training, and then tutoring, includes depth and breadth of content.

By mapping well, we engage in bottom -up training in several ways. In this discussion, we look at ***strategic pairing***. Who would be a good match for tutor trainee KP? Let us contrast Archive 3 with Archive 4 below, which was completed by tutor trainee MW. In presenting this slide to tutor trainee MW, she draws both brain shapes quickly and, with accurate shape and location, has created a colorful diagram in seconds. Ostensibly, this demonstrates mere exposure to content and memorization skills. But the trainer pushes the interaction with MW, asking her to explain the significance of these adjacent brain parts, the hippocampus and the amygdala and (black text): "explain the learning/emotion connection ...very briefly". Tutor trainee MW (red text) answers accurately, sequentially, and without hesitation. The trainer is confident tutor trainee MW will be a good match for tutor trainee KP, and in this strategic pairing, tutor trainee MW will play the role of tutor trainee when dealing with neuropsychology content, but will play the role of student/learner when dealing with trauma content, which is tutor trainee KP's area of strength.

In addition to leveling the knowledge base of our tutoring team, **strategic pairing** also builds online dialoguing skills, forges relationships, augments a sense of teamwork, and makes training adaptive.

Archive 4: Tutor Trainee MW

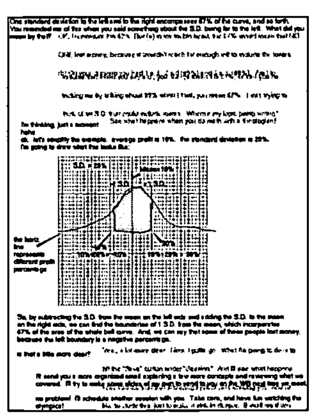


A Relationship Solution

If learning is emotional, can you create the affective dimensions of the living, breathing space shared by two people in face-to-face learning experiences?

Of the three challenges we explore, this third challenge is the most important because it addresses the conditions that drive the first two challenges – that is, teaching with sound approach (pedagogy) and sound information (content). When we communicate online, we forego the intangibles of traditional tutoring, like limbic messages, gesticulations, facial expressions, cadence, and intonation. Moreover, knowing how to promote student risk-taking without these nonverbal cues and mechanisms makes forging supportive relationships, especially in a new learning environment like a whiteboard, even more difficult. Archive 5, however, shows how this is possible.

Archive 5: Tutor Trainer FF and Tutor Trainee PC



Archive 5 shows a training interaction between tutor trainer FF, who has expertise with social science statistics, and tutor trainee PC, who never encountered statistics while earning his Ph.D. Though tutor trainee PC has over twenty-five years of teaching experience and is several decades older than tutor trainee FF, in this training session he is placed in the position of the learner.

This problem-solving dialogue opens with confusion and closes with clarity. How does this happen? When we analyzed this interaction, we realized that the psychology discussions are framed within very personal comments that share background information, feelings, and even fear. For example, PC and FF open the overall tutoring session (which includes eight slides on several topics) with some "cyber humor" as they joke about finicky Internet connections and their tutoring locations:

PC: Frank, my line's misbehaving. Be patient.
FF: No problem – we're communicating halfway across the globe after all!

We see this structure occur within the overall session, too. For example, tutor trainee PC prefaces an answer (one which reveals his limited understanding of standard deviation) with a self-deprecating comment: "In my feeble head..." After four sentences about standard deviation, he ends his explanation with a self-effacing joke that reveals his background: "See what happens when you do math with a theologian?"

Tutor trainer FF's response follows a similar framing structure. Translating emotional reactions and nonverbal actions into text, tutor FF "laughs" at PC's joke ("[H]a ha"), then pauses for reflection: "I'm thinking, just a moment." After this pause, he offers a technical diagram and explanation, invites PC's feedback, but still closes with a personal comment -- one that reinforces his awareness of PC's home near Australia, site of the summer Olympics: "Have fun watching the [O]lympics!"

The interaction, therefore, does not confine itself to the learning topic – in this case, the technicalities of standard deviations. Self-deprecating remarks, humor, and pauses, then, are not inefficient or tangential; rather, they are essential for establishing rapport and promoting learning.

F. Concluding Remarks

Our analysis of these challenges begins to reveal the complexity of our initial question: Can good teaching principles transcend the vehicles in which those principles are delivered? Although this case study brings us a step closer to understanding the ways in which online interactions can help learners ask good questions and construct meaning through first-hand experience, the analysis provides no definitive answers, and in fact raises more questions. Future research might focus on the following:

- How, during online synchronous interactions, do individuals convey thoughts that are typically internalized in face-to-face environments?
- Does the nature of a dynamic, synchronous interaction change once it is archived? If so, in what ways?
- Are students learning in these online environments? If so, how are they learning, and to what extent is this learning different from traditional face-to-face environments?

While we are not in a position to quantify or qualify the nature of learning that transpires in these new interactive online environments, we can make one distinction – that is, the opportunity to *return*. The essence of this opportunity is captured in the closing remarks trainee PC to trainer FF (Archive 5): "What I'm going to do is hit the "Save" button under "Session" and I'll see what happens...I'd like to study this, just to make it *sink in deeper*."

Changing with the Times: The Evolution of a Faculty and Staff Web Development Program

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Abstract: Educational institutions have a responsibility to provide faculty and staff adequate training in web development so that faculty, staff and the institutions they represent can communicate their ideas, information, course content and activities over the Internet. The key to successful implementation is to deliver the training in such a way as to make faculty and staff want to participate in the training, as well as to make the training relevant, and to encourage continual development once the training has been given. St. Philip's College has structured its curriculum to facilitate the adult learner in such a way as to remain flexible enough to meet the emerging needs of each individual interested in pursuing web development. Discover how the web development program at St. Philip's College has changed with the times, and has evolved to remain relevant and valuable to those it serves.

TEACHING WITH TECHNOLOGY: STAFF DEVELOPMENT THROUGH A TURNKEY TRAINER MODEL

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ABSTRACT

Using a PowerPoint presentation, the Associate Superintendent, a fifth grade teacher and a high school English teacher will demonstrate the key ideas and themes of the staff development Turnkey Trainer Model and its applications and benefits within the school district. We will discuss the "administrative" role of the model (*budget, implementation of the turnkey trainers—choosing the "Teacher Technologists"*) and will present the ***trainers in action.*** We will explain how the staff development sessions are conducted; how encouraging reluctant staff builds trust and willingness to try and learn; how continuous support and growth enable cooperation among faculty, as well as between buildings. All presenters will discuss obstacles, challenges and strengths of implementing technology into a school district. The discussion will be supported with handouts of successful staff development workshops. A question and answer period will follow the presentation.

DESCRIPTION

Continuous training has been the key to keeping up with the advancements and changes with technology in the education field, especially with the inclusion of the Internet in many of the new learning standards. The needs of the teachers must be met if a district wants to successfully implement the use of technology. The Turnkey Trainer model, which supports the technologies and has continual training, can only lead to successful teaching and learning in the classroom. Staff development can make a powerful difference for students and teachers alike. Although districts may have different demographics, the problems facing districts, in regard to staff development and technology, remain the same. Effective teaching with technology can only be accomplished if districts devote money, time and opportunities for further training of the staff.

OBJECTIVES

The presentation will provide an overview of a staff development model that supported a district wide implementation of technology in our school system. Turnkey Trainer Representatives (**K-12**) and the Associate Superintendent for Personnel and Technology will explain the model. Issues such as: *linkage to curriculum, budget, and variance in teacher technology skills* will be addressed. Other issues that will be discussed are: how staff development activities, in-service programs and summer technology academies increased the skills and use of technology in the classroom by integrating the technology, in particular the Internet and intranets, as tools into lessons. This interactive session will allow for discussion among presenters and participants—the best way to learn about implementing technology and teacher training is to discuss various models and methods that have proven effective.

ACKNOWLEDGEMENTS

The presenters wish to thank the following: the West Babylon Board of Education; Superintendent of Schools, Mr. Mel Noble; the West Babylon faculty and administrators, and the West Babylon Community for their support in bringing technology to the children.

The Carrot or the Stick: The Development of Faculty Technology Competencies

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Abstract: The School of Education at Indiana State University put forth a requirement that all faculty who requested new desktop computers must meet a set of established faculty technology competencies. The goals were to use a velvet glove in order to ensure that faculty can perform the same technology competencies as students, ensure new technologies are used to their fullest, identify those persons who needed training and assistance, and build departmental awareness of potential technology mentors. The competencies are a work in progress that have been ratified by SOE governing bodies, but are still working toward true implementation.

Background on Faculty Competencies

As technology advances, it also advances on the educational community. Reflective in this movement is the development of technology standards for many in education. For example, the International Society for Technology in Education (ISTE) has developed the National Educational Technology Standards for K-12 Students (ISTE 2000a) as well as the National Educational Technology Standards for Teachers (ISTE 2000b). The State of North Carolina has led the way by the creation of a list of basic and advanced technology competencies for professional education faculty and students. Using this core list of competencies, UNC-Charlotte's College of Education developed a set of assessments, formative evaluations, and feedback for their education faculty (Algozzine et al 1999). Given the backing and encouragement of state mandates, this full process worked well for UNC-Charlotte. However, given the pressing demand of standards for our teachers and other students, and a lack of state guidance, Indiana State University's SOE ITAC embarked on a new venture to develop its own faculty competencies.

Creating the Technology Competencies

The reasons for the establishment of faculty technology competencies were fourfold. First, a number of student competencies for undergraduate, masters and doctoral students had been passed by a variety of governing bodies on campus. For pedagogical reasons, it was important to know that faculty could achieve the same level of competency as their students. It is a commonly accepted truth that teachers teach as they themselves have been taught. Therefore, to have graduates that can successfully integrate technology into their classrooms or professional lives, they must first have effective models of technology integration in their faculty.

Despite the best intentions behind the pedagogical reasons for technology competencies, the efficient use of new technology purchases was the reason that "sold" the idea behind the development of faculty competencies. Faculty and staff throughout the SOE were frustrated at seeing high-end technology sit unused on faculty desks, or worse, being used merely as a high-end typewriter or solitaire partner. As technology dollars continue to diminish in relation to need, it seems prudent to assure that technology expenditures go where the needs are the highest and/or individuals are willing to improve skills.

Third, if we truly want to improve skills, then we need to target the deficient skills of individuals. Since the technology competencies are essentially a self-assessment of skills, individuals (in conjunction with their department head) can identify deficiencies in their technology skill set. This information, which is then passed on to ITAC, is crucial in creating targeted training.

Finally, greater awareness of where a department's technology "strengths" might be will encourage individuals within a department to seek peers for assistance. Being able to turn to a colleague for just-in-time assistance lessens the demand upon IT support staff and provides potentially more immediate, and relevant response.

During the Spring of 1999, each department was requested to develop a set of competencies for their faculty and staff. When faculty/staff from that department requested a new computer, the department would need to provide documentation to the technology committee that identified the specific competencies the faculty/staff member had and what specific skills they needed assistance in achieving. Faculty/staff do not need to be fully proficient in order to receive a new machine; rather, the goal was to be able to identify departmental-specific skills needed to help plan for professional development workshops and training. Documents were created and collected from each department by departmental representatives on the technology committee and forwarded on to the Dean for approval. By the end of the academic year, the Dean approved all departmental documents, and they were placed on the SOE website (http://soe.indstate.edu/itac/).

Reflection on the Process

As stated earlier, the competencies have the power to help bring about true technology literacy by placing standards on faculty similar to those expected of students. The "carrot" of a new computer is merely an incentive to encourage faculty, staff, and department heads to work with technology competencies. When the process is taken seriously, everyone can benefit – the departments, faculty, the school, students, etc. However, this process is seen by some to be one additional hurdle that must be surmounted, one way or another, in order to achieve the prize of the new desktop computers. To make the process work, and to make it palatable to everyone involved, academic integrity is a key element. Unfortunately, some ITAC members know of instances where faculty competencies were signed off upon without any intention of enforcing the spirit of the competency guidelines. Since little direct evidence exists, ITAC continues to work on this issue to ensure that faculty technology skill continues to increase in order to meet the needs of our students.

Conclusion

This process has been in place in the SOE for only one year. As this paper is being written, the process of certifying technology competencies is about to begin again. Through the lessons learned the first time around, ITAC is working to improve the process. One way is by sharing some of the more efficient, streamlined competency documents with other departments. Another way is by finding better ways to ensure that competencies are met, and ensuring that as the existing and required skills of our students increase so do faculty skills. The SOE is committed to the knowledge that having strong technology skills in our faculty will have ultimate benefits to our greatest asset, our students.

References

Algozzine, R.F., Antonak, R., Bateman, L.R., Flowers, C.P, Gretes, J.A., Hughes, C.D. & Lambert, R. (1999). A process of developing technology competencies in a college of education. *Contemporary Education, 70*(4), 26-31.

ISTE (2000). *National Educational Technology Standards for Students: Connecting Curriculum and Technology.* Eugene, Oregon: International Society for Technology in Education.

ISTE (2000). *National Educational Technology Standards for Teachers.* Eugene, Oregon: International Society for Technology in Education.

Empowerment of Personnel to Survive in an IT-enabled Organisation and an e-World. (A South African Perspective)

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1 Introduction

In this dynamic decade, a University that is successful in future will be one that has planned for the future early enough to have been able to change its strategies, business and operations according to the demands of the country and the people (clients) at that point in time. It will continuously envision its future in such a way that it will keep adapting its strategies to profit optimally from the technological and learner-related developments of the present and future ages in order to remain a viable institution.

In practical terms it means that the successful University of 2005 will have envisaged the driving forces of the e-world, globalisation and life-long learning. It will have changed its strategies, business and operations in good time, and keep adjusting them in such a way that the University will also prosper in the long term.

One of the most important success factors of the e-enabled University is IT-skilled faculty and staff. IT alone won't do the job. It needs to be placed in the hands of knowledgeable, skilled and creative people with a clear focus on their job. This applies to both faculty and staff, and not only to IT staff. Personnel need to have general as well as specialised skills, appropriate to their specific roles in the enterprise. Without these skills, technology is often blamed for failures, and the enormous investment in IT will be wasted. Without a paradigm shift in the appreciation and role of technology, it will simply become part of the problem of rising costs, instead of becoming part of the solution.

2 Technology trends

The global trend towards e-business is fuelled by dramatic technological improvements and a shift in business economics. The extremely fast pace of technology development and product evolution is also stimulated by increased competition in the IT industry. The pervasive use of especially the microcomputer for business as well as leisure and entertainment is creating huge markets for the IT industry. Any business that wishes to survive and thrive in this new cyber era will have to take serious cognisance of these developments. Trends like

- the internet and World Wide Web
- affordability and power of the workstation and laptop
- penetration of technology in the everyday life
- the human/computer interface
- real multimedia
- knowledge management
- the dominance of Microsoft
- licensing of application programs
- virtual support
- technology based learning
- collaboration (partners, components, etc.)
- personalization

- technology in the library
    - electronic journals
    - databases
    - conglomerates

create lots of opportunities, but without a solid base of IT-skilled personnel, universities will experience these trends as threats.

3 Penetration of IT in Universities

	The good old days (Only 10 years ago?)	The technology enabled university in an e-world
Faculty	• Board and chalk • CBT or Computer Based Training was mainly text based and not widely used . • All pre-graduate full time students were on campus. • Research were characterised by books, papers, hand experiments and computers were mainly used for statistical analysis, word processing, simple simulations and some email. • The typical secretary used a computer mainly as an intelligent typewriter. • Meetings were scheduled by hand and very little email was used to communicate and pass information on.	• The focus is not on teaching any more but on learning. Self-paced and self-managed learning is common. • Lecturers make more and more use of technology to enrich the sessions they have with students. • Students are on campus as well as off campus, some in very remote sites. Our university has over 50 remote sites and study centres at the moment. • PC's are everywhere: in hostels, PC labs, homes, etc. • Web enabled courses are available. • Lectures communicate with their students via email and discussion groups. • The Internet is indispensable for research. • Knowledge can be managed and is easily available. • The research process is automated. (Research Toolbox). • Rich documents are created and almost immediately available worldwide. • Secretaries keep themselves busy with Document imaging and Document management. • Secretaries keep electronic diaries and schedule meetings with large groups within seconds. • Secretaries use the web to make reservations.
Support	• The IT department supported only basic accounting, personnel and student administration systems, used by only a selected few. • On the PC side DOS applications were used and there were little integration and other potential complexities between	• We deal with complex integrated business systems interactively used by everyone • Applications run under Windows 95, 98, NT, 2000, Linux, Unix • The LAN is used extensively by everyone.

	applications. • The mainframe computer was still up and running, there were one or two Unix boxes and the LAN was quite small. • In 1990 our University only had two PC laboratories with 30 PC's in total. PC's were only used by computer science and engineering students.	• Four hundred PC's in 10 PC lab's used by students in all faculties
Other	• Student registration at the start of the semester was a painful process and took days. • The library had a very basic catalogue system and some search facilities. • Student cards were still "dumb"	• Intelligent student cards used for access control as well as a debit card. • Web application and registration. • E-Library. • Video/data operated security gates. • E- access control in every building.
Management	• Management information was prepared by skilled IT staff and reports were produced only on paper. • Top management was computer illiterate. • IT did not influence strategic decisions and directions.	• Accessible knowledge databases. • More computer literate and active users of notebooks, internet etc. • IT is represented at top level.

IT is everywhere - On campus, in the hostel, at home, overseas.

IT is used by everyone - From the gatewatchmen to the Principal

IT can be used anytime all the time - 24*7*365

One of the most important success factors of the e-enabled university is IT-skilled faculty and staff. IT alone won't do the job. It needs to be placed in the hands of knowledgeable, skilled and creative people with a clear focus on their job.

4 Empowerment of personnel

4.1 Scope

To optimally utilise the potential of communication and information technologies, whether primarily on-campus or at a distance, requires high-level relevant skills. Three types of skill sets are necessary for personnel:

- **A sufficient level of technical and manipulative ability** to be efficient and comfortable with the operation of a networked PC and software applications (refer to levels 1 and 2 in the diagram below)
- **High-order pedagogic skills** for faculty (this skills set constitutes level 3 in Figure 1)
- **Skills of university management** which is aimed at heads of departments, deans etc. (level 4 in diagram)

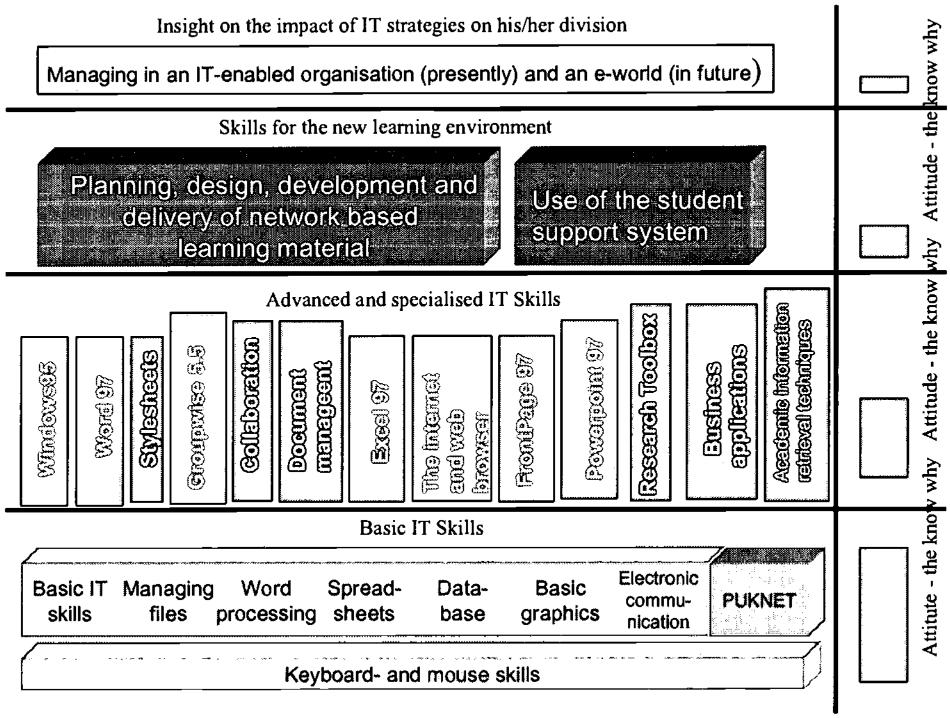
4.2 Objectives

The objective of this project is to enhance the IT skills of all personnel members, but more specifically of faculty, in order to empower them to work effectively in the new flexible learning environment.

4.3 Strategies

4.3.1 The four-level approach (WHAT)

Figure 1: The four-level approach



It is very important to start with basic skills. Whenever one wants to develop network based learning material and deliver it in the student support system you have to be able to use Word 97. To be able to use Word 97 one at least has to have keyboard and mouse, basic IT, management of files, stylesheets and PUKNET (University local area network) skills. Depending on the material, you probably need to know how to work with spreadsheets and basic graphics. Just to prepare very simple learning material you need to be skilled in at least 5 areas on level one and at least 2 areas on level 2. To be able to deliver this course in the student support system you need to know how to plan, design, develop and deliver network based learning material, what the student support system offers you and how does it work, how to work with email, the internet, a browser etc. Thus to deliver a course you need basic, advanced and specialised IT skills as well as skills for the new learning environment.

Parallel to this it is very important for personnel to know why they are doing all this. Why is it important to use the intranet and internet to deliver courses, why do I need the skills, how does my profile look, etc. We intend to develop courses in this regard starting from level one.

The fourth level of the model is aimed at heads of departments and deans. It is important for them to have insight on the impact of IT strategies on his/her division.

Other areas we feel it necessary to be skilled in over and above the ones I have mentioned is the following:

- Document management – Just about all documents and therefore learning material are produced using a computer. The knowledge of the university is contained in these documents and it is therefore important to manage it. Documents need to be stored centrally and managed accordingly.
- Research Toolbox – This is a product we use to make sure that a standard basic research process is followed and it is especially used by first time researchers. It also gives a research director easy access to all his/her research projects.
- Business Applications – The student support system will be tightly integrated with the business applications and therefore allow a student to access his/her exam results, financial information etc. through the student support system. Faculty and administrative staff will be faced with questions in this regard.

- Academic Information retrieval techniques – there are a wide world of information at your fingertips. You need to know where and how to search for these information.

The actual skill profile of various staffmembers will differ but it is important to mention again that every staffmember, from the gatewatchmen to the Principal, need to be skilled to survive in an e-world and ride this new wave.

4.3.2 Implementation strategy (HOW)

4.3.2.1 Phased implementation

4.3.2.1.1 Phase 1

Implementation of levels 1 and 2 of the model.

4.3.2.1.2 Goals

1) To be learner-centred 2) To start the profiling process 3) To include assessment as part of the learning process 4) To be able to have management information at hand timeously 5) To register the courses with the South African Qualifications Authority.

4.3.2.1.3 Progress made

We have outsourced most of the level 1 and 2 courses to a private company called Boston Business College. We allocated our IT training room and all the equipment in that room for this purpose. In exchange for that Boston Business College offers the courses to university staff and faculty at a very low price.

At first we used a central budget to finance the project but after two or three months we decided to pass on the costs to the departments. Since May 2000 when the project was officially launched, 903 courses have been enrolled for. This is at least three times more than in the past.

The huge success of phase 1 is partly because learners receive a nationally accepted certification after successfully completing the course and because they can learn at their own pace, whenever they want to. At this stage learners still have to physically go to the training room but all the outsourced courses will be available on our intranet in the 2nd quarter of 2001.

4.3.2.1.4 Phase 2

Implement level 3 and the Attitude part of the model.

We are still busy planning this phase and have not really started any structured course. The planning, design, development and delivery of network based learning material is the responsibility of the Bureau of Academic support services and they plan to implement a course 3rd quarter of 2001. At this stage they help faculty on a one on one basis.

The student support system, which we developed ourselves in association with a private company, will be ready for implementation early in 2001 and therefore we will start the course only in 2001.

4.3.2.1.5 Phase 3

Implement level 4 of the model.

We are still busy planning this phase and have not really started any structured course. We are still not sure what the format of this course should be. It will probably be a combination of material, information sessions, discussion groups, etc.

It is important to notice that it is not only the IT department who is involved in the implementation of this model but also Academic Support Services and the HR department.

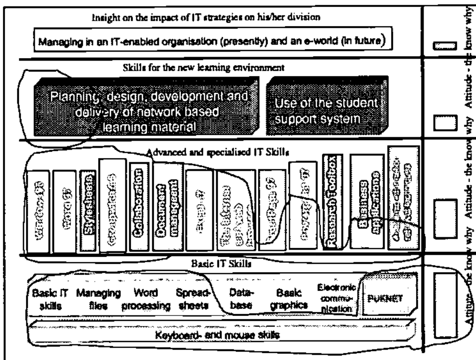
4.3.2.2 Faculty and Staff Skill Profile

The model focuses on all personnel and not just faculty, but the third level is mainly focused on faculty. We are aiming to have an IT skills profile per post. For example, a faculty secretary will have a profile that will include level 1, certain skills on level 2 and perhaps skills on level 3, whereas a staff secretary won't need skills on level 3.

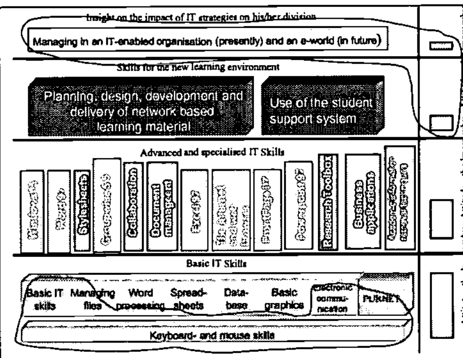
It is very important to work closely with the human resources department as well as directors/managers to define these profiles. As the requirements change, so will the profiles.

These profiles will also form part of the appointment process of personnel and the yearly performance evaluation.

Figure 2: Typical profiles.



Example of a "Secretary profile" who assist faculty to deliver courses in the student support system



Example of a "Dean Profile"

4.3.2.3 Assessment

Assessment and certification is a very important aspect of this model. This is the only way in which one can measure skills. It is not necessary for anyone to attend a course. If the learner thinks he/she has enough knowledge, he/she can write a pre-test or do the formal test without doing the course.

4.3.2.4 SAQA and NQF accreditation

The new South African constitution provides for a structured approach to education and training of employees. Each organisation has to report to the South African Qualifications Authority (SAQA) regarding in-house courses for personnel, courses (in-house and external) personnel has finished over a period of time, cost etc. What is important for us is to register all our courses with SAQA. This is the only way in which the university can claim back a percentage of the funds it has paid over to SAQA.

Although this report back every month is a lengthy process, it force you to evaluate the training of personnel every month. In a certain sense it was much easier for us to implement this IT-Skills model within the broader framework of the NQF (National Qualification Framework) because they have already set the table.

4.3.2.5 The Budget

Although we started off by allowing anyone to register for any course for free, we quickly realised that this was the wrong approach for the longer term. But for a start it was easy to get personnel involved and excited about the project.

There is a central budget approved for 2001 but we will only subsidise departments. In the longer term when the profiling has being done each department will have its own skills development budget because they will know exactly what their needs are.

4.4 Statistics (The past and the present)

In seven months 903 courses have been enrolled for, compared to approximately 400 per year in the past. This is significantly more and can be ascribed to:

- The fact that learners can learn at their own pace, at their own time as long as they want to.
- Assessments and certification
- Good marketing strategy of the outsourced company
- Central budget

Figure 3: Number of personnel enrolled for different courses

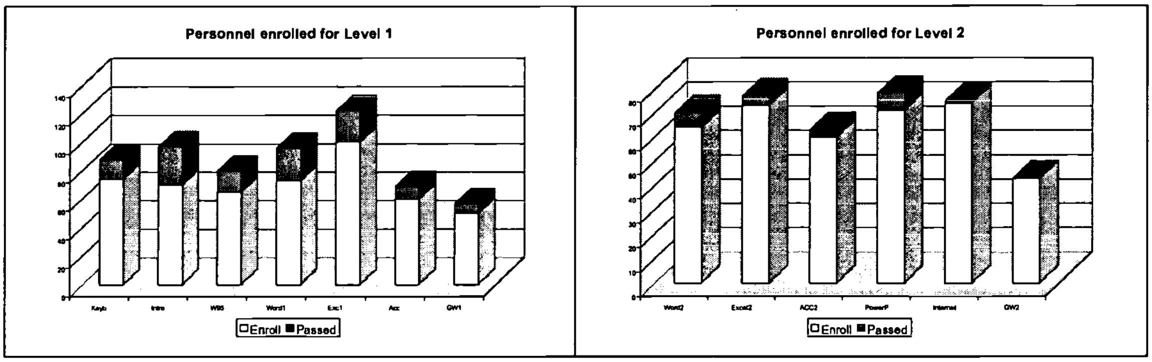
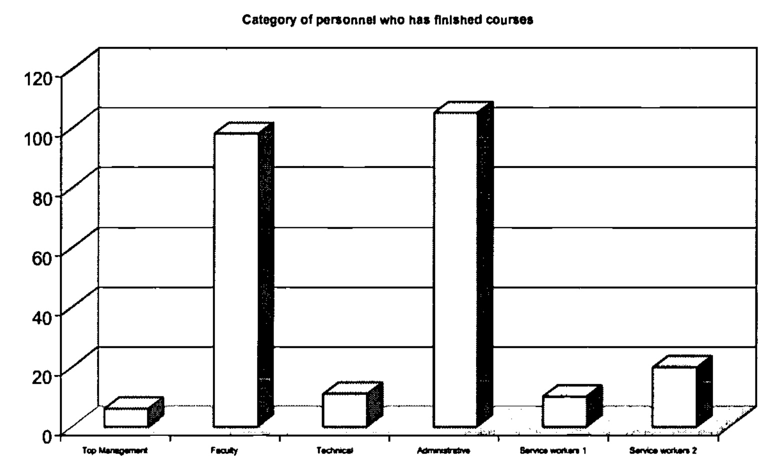


Figure 4: Occupation category of personnel who has finished courses



Just to repeat what I said in the beginning: The skill development model was not aimed to accommodate just a specific group of people. Although Faculty and Administrative staff make out most of the learner population, top management on the one side and service workers on the other side are also involved.

5 The future

We are planning to give more structure to the project in 2001 by:

- Formalising the profiling in co-operation with the HR department.
- Work out strategies to integrate personnel training and performance evaluation.
- Implement Levels 3 and 4, the attitude courses and the others which we haven't implemented yet.
- A secondary objective of the project was to relieve some pressure off the IT Help Desk. We will evaluate that.
- Adopt the model as time change.

Articulating Technology Needs To Administrators And Policy Makers

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Abstract: There is a continuing disconnect among those who recognize the value and growing needs associated with technology-related innovation and campus administrators and policy makers who are in charge of overall budgeting and resource allocation. How does one communicate effectively within the context of the administrative framework of a college or university? When making funding requests to those who may be less familiar with specific aspects of information technology issues, one should 1) make data-based requests, 2) speak from a global perspective, and 3) consider administrators' priorities.

Introduction

There is a continuing disconnect among those who recognize the value and growing needs associated with technology-related innovation and campus administrators and policy makers. These needs may involve instructional and information technologies as well as needs involving personnel, equipment, space, line-item budget support, and numerous other issues that involve communications among technology personnel and administrative and policy leaders who are responsible for the allocation of resources. There are varying levels of technology sophistication among administrators and vastly different levels of economic and priority interests existing on college and university campuses. The following information is provided to assist faculty and staff in preparing funding requests when the technology experts are not necessarily those in charge of overall budgeting and resource allocation.

How does one communicate effectively within the context of the administrative framework of a college or university? As a practical consideration, keep in mind the serious challenges that higher education is now facing. Institutions are in a perpetual financial vice (Selingo, 2000) with tuition rising along with increasing financial needs. Many of these financial needs are technology related (Market Data Retrieval, 1999). Imbedded within economic and quality issues is the need to consider three areas when developing requests for technology resources. When justifying requests requiring new or redistributed resources it is important to 1) make data-based requests, 2) speak from a global perspective, and 3) consider specific priorities of busy administrators.

Make Data-Based Requests

There is a tendency for many administrators to become consumed by details involving accreditation, system reporting, performance and enrollment data, student and faculty concerns, and other daily occurrences. Funding requests that do not provide specific detail are often lost in the daily "shuffle." It is important to approach administrators with meaningful data to explain or support innovative ideas and concepts (Bradford & Duncan, 2000; Hafner & Oblinger, 1998). It is essential to use specific information to support a particular funding request. When appropriate, information from system, state, regional, or national data makes an excellent basis for explanations and comparisons. The constant evolution of instructional technology guarantees that the pressure to spend will continue to rise. Examples that include references to peer institutional group data will help make particularly compelling arguments in support of specific requests.

One excellent source for such information is provided by the COSTS project (McCollum, 1999). The project provides detailed data from a survey of 100 colleges and universities. The survey gives useful descriptions concerning what peer institutions are doing with technology budgets. This data allows administrators to see technology costs as compared with comparable institutions. This data is useful to administrators who must justify their budgets to supervisors who may not have a clear sense of how much technology should cost. Such data allows administrators to put spending requests into perspective.

Speak From a Global Perspective

Policy makers operate within an environment that usually includes multiple interests that compete for attention, resources, and priority within the institution. In this context, a global perspective may mean considering ideas, plans, and projects that appeal to or address needs across a region or state. However, thinking from a more broad-based perspective is also helpful for campus-wide efforts. Technology needs can easily drift beyond college or departmental boundaries. Focus on ideas that will benefit multiple groups (students, alumni, faculty, staff, other institutional partners, etc.) and future efforts. Requests that have potential benefits for more than one department or college or community agency increases the overall value and appeal of a request. Link requests to university or departmental or college mission statements and technology plans whenever possible.

Consider the Administrator's Priorities

One of the least understood and often overlooked considerations involves numerous, frequently unspoken factors that are generally recognized within administrative ranks, but are not always apparent to faculty, staff, and others who operate outside the administrative circles. Consider the time pressures under which most administrators operate. When meeting in person, use a written agenda and keep within the time scheduled for your meeting. Demonstrate an organized approach that reflects a serious, planned presentation. Be prepared to describe your successful experience with related projects. Frequently, the best predictor of future behavior is past behavior. Give the administrator a reason to believe you will be successful with the proposed project.

When scheduling appointments to discuss funding requests, pay attention to situations that may divert an administrator's attention away from your needs. Time sensitive conditions exist for campus leadership and these can cause delays or less than full consideration of requests. Be sensitive to issues and deadlines that could cause an idea or request to receive less than adequate attention.

Provide an executive summary of your request that provides enough detail without creating an additional time burden. Written material should be as concise and as free of jargon as possible. The language of technology can be unclear to those not as familiar with a particular topic. Do not camouflage good ideas among the jargon of the latest innovation. Use bullet points, charts, and graphs to reflect important concepts. Clearly describe the group to be served by the project, the importance of the project, the results you anticipate, and provide a specific breakdown of the funds requested.

References

Bradford, R. W., & Duncan, P. J. (2000). *Simplified strategic planning: A no-nonsense guide for busy people who want results fast!* Worchester, MA: Chandler House Press.

Hafner, K. A., & Oblinger, D. G. (1998). Transforming the academy. In D. G. Oblinger & S. C. Rush (Eds.) *The future compatible campus: Planning, designing, and implementing information technology in the academy* (pp 3-4). Boston, MA: Anker Publishing Company.

McCollum, K. (1999, February 19). Colleges struggle to manage technology's rising costs. *The Chronicle of Higher Education*, *45*, A27.

Market Data Retrieval (1999). *1999 Higher Ed Technology Survey Findings*. Retrieved November 27, 2000 from the World Wide Web: http://www.schooldata.com/datapoint43.html

Selingo, J. (2000, September 22). Tuition surges at public colleges after years of modest increases. *The Chronicle of Higher Education*, *47*, A30.

Faculty Development in the College of Education

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Abstract: Faculty development in the college of education has changed and evolved over the last several years. In the beginning, faculty received technical help from the technical support staff, but had little support at the curriculum integration level. In the fall of 1999 the College of Education embarked ou a technology training program. This program was offered to all faculty and after completing 16 hours of training the participating faculty members received a laptop computer. This training program was offered through the ceutral academic computing center, a university-wide ageucy. This program was deemed a great success and the faculty left happily with their new computers. But, what really happeued? We found that the faculty did not learn as much as we thought and they thought. A second program was developed. Similarities and differences between the two programs are discussed. Hopefully the experiences and development in this program will help others in the area of faculty development to better train and educate their faculty in technology and enable faculty to embrace technology in new ways.

Background

Faculty development in the college of education has evolved over the last several years. In the beginning, faculty received technical help from the technical support staff, but had little support at the curriculum integration level. In the fall of 1999 the College of Education embarked on a technology training program. This program was available to all faculty. The faculty partipants, after completing 16 hours of training, received a laptop computer. This training sessions were offered through the central academic computing center, a university-wide agency. This program was deemed a great success and the faculty left happily with their new computers. But, what really happened?

Phase I

For discussion purposes, this program is referred to as Phase 1. The major emphasis of Phase 1 of this program was on the skills level. Courses were offered in webpage development, Adobe Photoshop, PowerPoint, etc. Faculty registered for these workshops based, not on knowledge of the capabilities or the relevance of the software, but on the title of the session, and scheduling convenience. Consequently, although the faculty successfully completed these workshops, they had little understanding of how to apply these skills to their teaching and little connection actual needs in their classroom. At the time of the training, faculty seemed pleased with what they had learned and gave very positive reviews of the program and the sessions. Now, just a few months later, we are questioning what the faculty really learned. A review of Phase 1 training concluded that:

- Many participants stated that they don't remember anything that they had learned in the training
- Some participants still need support in areas in which they received more than 12 hours of training.
- More consultations needed to be done with faculty to ensure they were enrolling in a workshop relevant to their skills level, and contextual needs.

These observations and others forced us to rethink our faculty development program, and led to additional questions. Were they using their newly acquired hardware in innovative ways? Did this change the way they teach or at least provide a convenient way for them to use technology for administrative purposes? Not really. Some of the laptops remain in their cartons. Why did this happen when the program seemed so successful? This remainder of this paper describes an alternate program currently being offered and explains the differences and why it has the potential to be more successful. This program is called Phase 2.

Phase 2

When trying to understand why a group of people adopt technology at different rates, we look to the research in the field. According to Everett Rogers, in his book Diffusion of Innovations (1983), there are four components of innovation diffusion: the innovation itself, the time-frame for adopting the innovation, the social system within which the innovation is diffused and the communication of the innovation from one individual to another. Rogers defines individuals on a continuum from innovative to laggard, and classifies them into five different adopter groups. The classifications are: innovators, early adopters, early majority, late majority, and laggards. The faculty of the College of Education can be placed in each of these classifications. The innovators and early adopters have been using technology for years before organized training took place. Since the entry-level training workshops probably didn't meet the needs of these groups, they were given the option of learning something new on their own in order to obtain a laptop. The faculty development programs were primarily targeted at the early majority, late majority, and the laggards. Phase 1 met the needs of the first three groups, the innovators, early adopters, early majority, but the last two groups were left on their own.

According to Hall and Loucks (1978) Staff development can best be facilitated for the individual by use of a client-centered diagnostic/prescriptive model. Too many in-service training activities address the needs of trainers rather than those of the trainees. Based on what we learned from faculty coupled with the research on change, and innovation diffusion we evaluated Phase I and made some necessary changes to the program.

Similarities exist between Phase I of the technology training program and Phase II. For example, faculty completing 16 hours of technology training will receive a laptop computer, all workshops are done in a hands-on environment where faculty sit at the computer and work. Both Phases consisted of workshops that are independent of each other, usually covering one topic at a time and spans either one session or two.

The way in which the workshops differ are many, and profound. First of all, a smaller group of professors participated in Phase 2 and received more individualized attention. Before the training began, each participant had an initial consultation to determine exactly what the professor was interested in learning and how they would like to use technology in their teaching. Their specific needs determined which classes would be taught and in what order. Participant feedback was extremely important in the formation of the program and in workshop development.

Another significant difference between the two is in the instructional delivery mode. Phase 1 consisted of a "watch and then do" model. "Click on File, then open." Instruction consisted of learning the different menus and how the software worked. Phase 2 is less structured and more hands-on. The participants were given a project or problem that they had to work on and figure out how to use the software for the project. Of course, some guidance was given. The focus was taken away from the specific software application and put on using the software to solve the problem at hand. The goal was to teach the participants how to "tinker" with software and find what they are looking for, instead of every action being dictated to them. This teaches the participant to learn how to use the software instead of learning to follow a recipe or follow simple instructions. This isn't always an enjoyable way to learn, but in the end the participants did feel like they were learning something.

Every workshop in Phase 2 focuses on creating a meaningful project that is contextual to the needs of the participants. Every participant did not walk away with the same thing. For example, some professors created web pages for their courses, others created a personal web page. This made the workshops more meaningful to them and more applicable to their needs. We believe another significant reason why the content of the workshops is better is that the teachers and developers of Phase 2 are from the College of Education, not a central university agency. This is important because the trainers are more familiar with the type of teaching that occurs in this college.

Conclusions

At this time, Phase 2 is still being implemented, therefore long-term outcomes cannot be measured. However, a follow-up plan has been developed to see how the workshops have changed the way the professors use technology personally and in their teaching over time.

The purpose of this paper is to help others in the area of faculty development to better train and educate their faculty in technology and get the laggards to embrace technology in new ways.

References

Hall, G. & Loucks, S. 1978. Teacher Concerns as a Basis for Facilitating and Personalizing Staff Development. Teachers College Record.

Rogers, E. 1983. The Diffusion of Innovations 3rd ed.). New York: The Free Press division of Macmillan Publishing Co., Inc.

Introducing Tutor Professor to Online Distance Education: By Online course

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Abstract

This paper discusses the development of tutoring guidelines for tutor-professors in the Virtual University of Monterrey Institute of Technology (ITESM). The purpose in discussing these guidelines is that they may be relevant to teaching in any online environment. We also developed an online course for tutor professors considering these guidelines.

First, we developed a tutoring guide because our instructors were not used to teaching online. We feel that our experience in designing this guide could be useful for others working in technology-based distributed learning environments. This guide is not a "recipe", but a set of recommendations that we hope tutors will use as a reference and apply appropriately to their educational context.

We created these guidelines and recommendations, so the tutors can use it and perhaps they could save time and resources, and focus their functions in accordance with the institutional philosophy, course learning outcomes, and technology use, etc. because they will be more involved with many ideas suggested here and these ideas could help them to achieve these advantages.

It is important to consider how well prepared new professors are for online teaching when they begin their teaching duties because they may not be familiar with the ITESM context. We need to provide guidance for them to review deeply some premises or assumptions. For instance, are they familiar with our institution and its mission and philosophy? Are they

aware of the different cognitive strategies that can be used to facilitate students' knowledge acquisition. Do they know how to use Web-CT, Learning Space, etc.? (the web-based course development and delivery environment). We developed these guidelines and recommendations to improve online teaching at ITESM by making it consistent with the institutional philosophy, course learning outcomes and technology use.

In an attempt to improve tutor performance in online teaching we produced an online course where professors could live this experience and also could be prepared in their duties as a tutors in this kind of distance education model.. This online course was developed by searching different bibliographic references and through discussions with experienced online tutors.

The course includes topics related with Distance Education, learners in this context and also different *Recommendations for Tutor Professors in the Virtual University.* It is our hope that after taking this course the tutor professors will achieve the following objectives:

1. Know and understand the Monterrey Institute Technology mission;
2. Review and apply the Virtual University policies;
3. Work collaboratively (with the team who designs and develops the course);
4. Learn how to use technologies (Training);
5. Manage their time effectively as tutor professors;
6. Plan their courses effectively, considering virtual environment conceptualization, satellite sessions/videoconferencing with UBC, learning approaches, online activities, evaluations and special projects;
7. Incorporate instructional strategies in order to follow the ITESM mission;
8. Know how to create a communicative environment with their students;
9. Manage and control the course administrative affairs;
10. Motivate their students by creating affective links, and performance awards;
11. Give meaningful and timely feedback;
12. Know how to moderate online discussion forums;
13. Evaluate the learning-teaching;
14. Stay up to date in their professional field;

15. Foster and develop research projects to enhance distance learning environment.

The online course will be updated regulalry with tutors' experiences in order to stay abreast of this rapidly changing field.

On the other hand, we design an online learning environment –training area- so tutor professors can acquire knowledges, but also develop the necessary skills and attitudes. This virtual learning environment was developed considering the guidelines for tutor professors and we would promote interaction amongst tutor professors, and also foster practice. In this way, tutor professors are having a similar learning experience as their students. This online course is offered right now in the Virtual University, ITESM for all the tutor professors and this course belongs to the formal training program for new tutor professors who use technologies in their learning and teaching processes, specifically in the Virtual University.

References

- Linda Harasim, Starr Roxanne, Lucio Teles, Murray Turoff. *Learning Networks*. The MIT Press. Cambridge, Massachussets London, England 1995
- Janes, D. *Faculty Guide to Online Teaching*. UBC, Vancouver, B.C. January 6, 1999.
- Salinas, V. Tesis *Modelo para desarrollar/diseñar estrategias instruccionales en la modalidad ofrecida a través de medios virtuales.*
- *Six steps to making a treasure's life easier.* Corporate EFT Report; Potomac; May 26, 1999;
- Haughey M. Anderson, T. *Networked Learning. The pedagogy of the Internet.* Cheneliere/McGraw-Hill. Montreal-Toronto. 1998.
- Michael G. Moore, Greg Kearsley. *Distance Education A systems View.* Editorial: Ewadsworth Publishing Company

Student Expectations of Distance Educators: Instructor Roles in an Interactive Televised Classroom

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Abstract: An ethnography of graduate education students in interactive video-based classrooms provided the data for the exploration of student perceptions of the instructor's role in the technologically mediated learning environment that is set forth in this paper. Data suggest students assigned new responsibilities to the instructor and expected the instructor to bridge the distance gap between the classrooms, clarify new rules for classroom behavior, and maintain a focus on course content despite of the instructor's added technology related duties.

Introduction

Traditionally the classroom has been the teacher's domain (Barr & Dreeben, 1983). Students came to the teacher's classroom, took grades home that the teacher gave, and studied what the teacher said to study (Jackson, 1968). The teacher was in place to control social interaction (Borman, 1978; Shultz & Florio, 1979), to direct classroom organization (Dickinson, 1985; Shultz, Florio, & Erickson, 1982), and to guide learning activities. The teacher was the authority that held power in the classroom (hooks, 1994). In most classrooms this is still true today. Students still look to the instructor for guidance in the classroom, accept his/her evaluation of their performance, and expect him/her to carry a level of expertise in the subject matter that far exceeds their own.

However, there is also a longstanding relationship of trust between teachers and students. They "understand each other's behavior as directed to the best interests of what they are trying to do together and how they can hold each other accountable for any breach of the formulated consensus" (McDermott, 1977, p. 199). The form of trust that McDermott (1977) refers to is dependent upon interaction between the learner and the instructor and requires effort on the part of both to maintain it (McDermott & Church, 1976).

Distance education literature establishes the importance of creating classroom environments that provide the connectedness that instructors and learners need in the absence of face-to-face interaction to maintain their trust relationship (Boone, 1996; Garland & Loranger, 1996; Grasha, 1996). In the distance environment, however, more effort is required on the part of the students and instructors to maintain the traditional trust relationship, as well as to accomplish other traditional classroom responsibilities (Moore & Kearsley, 1996).

Our recently completed ethnographic research of interactive video-based classrooms suggests that before students entered their distance learning environment for the first time they were not prepared for the different roles that either they or the instructor would encounter. Their expectations were rooted in their traditional ideas that the physical presence of the instructor would allow that instructor to lead, guide, direct, teach, moderate, and have a particular awareness of students as individuals. When the technological mediation of the classroom interrupted the expected roles and behavioral patterns for classroom participants, students subliminally assigned new roles and expectations to their instructors and felt uncertainty about their own role. The data suggest that the inclination of students was to place the responsibility for the success of the added classroom elements on the instructor.

In this paper we will consider what students said about their expectations of the instructor and how those expectations influenced students' adaptation to their new classroom environment. An examination of student expectations provides insight that can inform distance educators who are in the planning phase about learner needs, can increase veteran distance instructors' sensitivity to students who are new to the environment, and can prepare new distance educators for scenarios they may encounter when they begin their distance teaching experiences.

The Study

The data that served as the basis for this paper was gathered during a one-year ethnographic case study of 13 graduate education classes that took place in an interactive video-based classroom that was officially named the Interactive Distance Learning Studio (IDLS) (Clevenger-Schmertzing, 2000). Students participated in class simultaneously from two different locations. Courses included in the study varied significantly in teaching style, course objectives, course content and student responses. Traditional ethnographic and qualitative research methods facilitated data gathering and analysis (Agar 1996; Maxwell 1996). Data gathering involved more than 400 hours of participant observations in classrooms, formal interviews and informal conversations with students and faculty, weekly e-mail correspondence, open-ended surveys, focus group interviews, and video of all classes. Thematic coding, frequency counts, and frequent debriefings between ethnographers L. and R. Schmertzing contributed to interpretation and ongoing analysis of the data (Spradley & Mann 1975). Throughout the ethnography hundreds of students expressed ideas, concerns, and thoughts on their distance learning experiences. Comments included in this paper are representative of themes that surfaced repeatedly in conversations, interviews, and survey data.

The Students' Voices

During the course of our study, students often voiced concerns that related to style of instruction, content of the course, class management, and learning style preferences. A major them that emerged from these discussions related to the individuality of instructors and the significant role they played in facilitating positive experiences in both traditional and distance classrooms. A student at the remote site said, "I think the technology works. I think it is a good method. I think it depends so much on the instructor" (RFt M FG 0i0.87). Another student, a host site student, said something very similar, "If [my instructor] had been someone else who couldn't do that [keep class discussion going across sites], it [class] would be a flop, I mean, the instructor is the key point in there (HFt F I v05.1251). Students were clear that, "The teacher is the most important thing. If the teacher is prepared and excited and cares, [...] then you are getting what you need to get" (HFt M I s11.8.1694).

Students depended a great deal on their instructor to make their distance learning class a success, as they would in a traditional classroom. The difference, however, was that as students tried to understand the new technologically mediated environment they also developed new needs and consequently had new expectations of the instructor. Our data suggest that the inclination of students was to place the responsibility for the success of the added classroom elements on the instructor.

As students adapted to their distance-learning environment, they made assumptions that the instructor would guide them through the uncomfortable spaces in their distance education experience. They expected the instructor to provide guidelines for adjusting to that experience. Many students assumed that the instructors would offer new rules for classroom behavior, that they would build a bridge that eliminated the distance between the two sites, and that they would have the ability to maintain a focus on content rather than on technology. The way the instructor handled these matters alongside his/her traditional classroom responsibilities had significant impact on the ways in which students adapted to the environment and changed the way they interpreted their own role in the classroom.

On Providing Rules

As a result of the absence of the instructor at one site and the breakdown in the rule system associated with traditional classrooms, researchers witnessed adult students reverting to immature classroom behaviors similar to those that one might expect to find in grade school. One student said it was because, "the feeling of someone being there of authority [was missing]" (RFt F I s10.4.153). Some adult graduate students actually admitted the need for instructors to control the class and to remind them of the rules. Marybeth was one such student.

> Like don't talk when someone else is talking. You have to revert back to the first and second grades because we act that way with the [instructor at the other site]. I just think a lot of people don't realize that when the instructor is at the other site you think that they don't hear you or see you. So, I think that a lot of people just need to be aware of that. If you [the instructor] have to tell them or write it up on the board, I think you need to do that. (RFt F I s10.4.1051)

Students feelings of personal disconnectedness lead them to forget that they were visually and audibly linked to people at another site and consequently to behave inappropriately. Marybeth knew the behavior was inappropriate and felt that it happened because students had not come to a clear understanding of what was going on with the technology in the classroom. Her inclination was to expect the instructor to do what was necessary to get the situation under control.

Some graduate students wanted the instructor to propose other types of rules. Maylee felt it was the responsibility of the instructor to force the student's use of the technology.

> For some people it would take a little longer, but I think once you [the instructor] put your foot down and say, "Okay, let's go back to elementary school here. These are the rules. And to be a part of this class, this is what I need you to do to make it work." So, yes, there it is, "I need your participation [beyond] your comments or your working in this group. I need your participation in ringing this bell because those people over there are a part of this group, as well. So I need your participation, to help me as a professor make them feel like they are really a part of this group, because that's important to me as a professor. Those people over there need to feel just as important and that they are as much a part of this group as you are." (HP F I p4.28.1050)

Maylee had classes in the distance classroom every semester during the course of this research and her suggestion is actually based on a clearer understanding than most students had of the importance of connecting across campuses and what it took to accomplish that. For instance it meant using microphone controls to participate in class and Maylee firmly believed students needed to do it whether they wanted to or not. She also believed it was the instructor's responsibility to make that happen.

In the traditional graduate classroom it is not the norm to verbalize the traditionally unwritten classroom rules that address social structure and classroom interaction. However, knowing the rules of engagement in an environment like distance learning classrooms has been shown to enhance learners' use of the technology and, in turn, improve interactions between students in the classroom (Herrington & Rehn, 1993; Martin & Bramble, 1996; McCabe, 1998). The point remains that many students want to rely on the instructor to not only make the rules, but also to make other students follow the rules.

On Bridging the Gap

In addition to the uncertainty students experienced in relation to the unwritten rules of the classroom and how the instructor handled those rules, students also spoke of uncertainty related to bridging the distance across sites. In general, students did not initially take on the burden of connecting the two sites themselves, rather they expected the instructor to make the connection. "Somehow that instructor is going to have to pull both groups together" (RFt F I v811.1694).

In the classroom where everyone shares the same physical space, classroom participants learn to read body language (Barr & Dreeben, 1983; Mehan, 1980). Instructors and students alike fuel their understanding of situations and each other, not just with what is said, but to a great extent through issues of immediacy; things like behaviors, gestures, and subtleties of space and time that signal connection (Comstock, Rowell, & Bowers, 1995; Shultz et al., 1982). This physical proximity adds a dimension to the way students understand their instructors that is difficult, but not impossible to achieve in the distance environment.

Minnie, a remote student noticed her instructor's body language and how it functioned as a communication tool.

> I think that she [the instructor] encourages us. I just think that she has open body language and she's got a way of communicating. I don't know if she has practiced this because I could see where it would be real easy for a professor to focus in only on the class that she is in and kind of ignore the people that are in the other area that are the distant learners. And, I think that she has been able to bridge that, I've been real impressed. (RFt F I v104.491)

For Minnie, the instructor's overall demeanor, openness, and the apparent ease with which she traversed the separate sites through the technology allowed Minnie to feel connected to the instructor. Students looked to the instructor to help them understand what was going on in the classroom and how to deal with being separated. The modeled behavior of the instructor influenced the way the student herself approached the distance between the sites (Ben-Peretz & Halkes, 1987; Comeaux, 1995).

Even when students thought the instructor was doing a good job, they often had suggestions for how she could do better. Molly shared one of her suggestions with me.

> I think that she does a good job with what she is doing. The only suggestion I think I would do, is to call on people that are being quiet, and just get them started saying anything, even if it is one sentence. That would bring those people in. It would help those people to see that they are not being ignored. That, we know they are there. And I think it would be better if some of the people who speak a lot were not necessarily called on because they want to speak. (HFt F I v111.737)

Essentially, Molly clarified her understanding of some of the instructor's role by adding the expectation that the instructor should know and watch out for the students who may hide behind the technology and not get engaged in the class. Madge stated her support for the same idea. "I think the professors are going to have to be very well aware of coming back and forth between the two [sites] and not letting somebody get left out there, like the forgotten child and that could easily happen. For if they [the classes] get too big you could just sit there and well, you can sit quietly in the corner and do your reading" (HFt F I v14.1693).

Once again, the student placed the responsibility on the instructor to draw students into the class. It is worth noting that students might say things that sound similar to things that they say about the instructor's responsibilities in a traditional class, like "call on people that are being quiet," but in this research data show that the situation is magnified and the statements are made with more urgency. Not all students in the environment placed so much responsibility on the instructor. Many did however, especially students who were in their first course in the distance environment and/or early in the courses for their graduate programs.

The traditional expectation that the instructor be attune to most of what is happening in the classroom does not seem unreasonable to students, yet it is something that appeared to be quite difficult to achieve. I asked Mel about it.

> Intrvr: Did you feel like she was aware of the atmosphere in your classroom?
>
> Mel: Uh uh, no. And I don't think that was any fault of her own, I think that we were just so far away from her that she didn't realize what was going on in that room. She didn't realize, you know, that some people never did any of the work, they just asked to copy it. You know, I don't think, she had no way of knowing it. There was just no way. (RFt F I v8)

Though Mel might have felt that the instructor needed to be more aware of things that were going on in the remote site, she did not blame the instructor for not knowing. She excused the instructor because of the distance classroom. Heimlich and Norland (1994) report that adult students inherently want to cling to the traditional ways of respecting the teacher. This may partially explain why many students in the IDLS gave the instructor latitude and blamed the distance environment when things seemed difficult for the instructor. "They are trying to watch two classrooms and that's kind of hard" (RFt F I s10.4.60.a). A host student had the same type feelings, "Well, I'd say I am in here, and if she's here teaching us, you could read, or she could read your facial expression. But if she's in the TV, it's hard, oh she cannot read what your facial expression is" (HP F I p201.317). Students varied significantly in the degree of tolerance and understanding they showed for the instructor as the instructor attempted to adjust to the technology in the IDLS.

On Focus

The preconceptions with which adult students entered the classroom were based, in part, on the pedagogical experiences of their past which generate the image that the instructor is the embodiment of what they are to learn (Heimlich & Norland, 1994). The instructor then becomes the visual focal point upon which the student centers his/her thoughts on the course content. In the IDLS, when the attention of instructors was divided between their traditional responsibilities and the technology, students like Melody expressed concern, not simply because of the time it took, but also because it disrupted their thinking and learning processes.

> [The instructor] is there and she is worrying about the cameras and getting the tape recorders going and getting this going and getting that going. She is busy focusing on setting up the classroom rather than on kind of interacting with us. At the time when she would walk in and put her notebook up and say,

whatever, you know, that time of interacting. Instead she is putting on her microphone and adjusting the cameras and making sure they are all up and running. I think that is a big difference. (RFt F I v14.1393)

Melody sensed that the technological demands of the IDLS kept her instructor from "interacting" with students at a time that was traditionally time "for interactions with us."

The perception that the technology required a piece of the instructor's attention, which students were not accustomed to sharing, varied among students. Malcomb, one of the military men who was a student in the IDLS at the time, had an interesting way of expressing the complications that instructors had to handle to keep class running smoothly.

> A professor can't do it all by himself. As a pilot for 24 years, I flew fighter type aircraft, F-4's, A-10's and that sort of thing, but I spent some years as an instructor pilot as well. [...] I can remember writing, scripting and doing everything for a formation video, [...] and I'm sitting there, and I'm flying the airplane. [...] and I'm coming in on the re-join, I'm talking about the procedures, and then I'll click another button so that I could talk to the guy who is sitting next to me with the camera and direct his view, and the point is, I guess what I'm getting at is, you in fact, you can do all that but you can't do it the first time. (HP M I v12.20.827)

This student put the instructor task into perspective by equating it to his own experience of trying to teach, direct, and manipulate technology all at the same time. He, like many of his peers, was empathetic in his recognition of the complexity that had been added to the instructor's job.

The impressions other students had of the same complexity caused more personal complications for them in relation to their focus in class. Misty was significantly bothered by the instructor attending to technological glitches.

> The instructor has got enough to do, they've got to teach a class and that requires full attention, especially at this level. It is not something that you can just do. [...] If the instructor is even the slightest bit distracted with something technical going on, both sides, the one where the instructor is and the other side starts to resent the fact that they are in a distance learning lab and they have to deal with this technology garbage because we don't really like it to begin with and if any little thing happens that demands our instructor's time and attention, we get, I get, very resentful of that. And it makes you remember that you are in a distance learning lab. You might have forgotten for a second and lost yourself in the moment of the class and you're engaged in the subject matter and you're forgetting that you're watching a monitor but then, all of a sudden, when the instructor is fumbling with microphones or needs to deal with something that a facilitator could handle, himself or herself, it's a problem. (RFt F I v107.835)

Misty used the instructor as a guide to keep her own attention focused. When the technology demanded the time and attention of the instructor, Misty had difficulty staying focused. She also raised another issue that went beyond her difficulty with focusing on course content. She got "resentful" of the technology and the methods used in the IDLS. Her resentment disrupted her attempt to adapt to the classroom and actually jarred her thinking, causing her to think about the "technology garbage" that was interfering with her learning experience.

Although the instructor may not have held the same physical position in the IDLS that she did in the traditional classroom, she still was to be the focal point for many students. In the traditional classroom when focus is interrupted, students may get distracted or even irritated, but the problem that caused the interruption is usually removed and does not recur. In the IDLS, not only can the interruption be recurring, but the thing that students sensed was causing the problem, the technology itself, continues to be something that students need to feel comfortable with and positive toward in order to get the most out of their learning experience. The way students adapt to these interruptions is vital for their overall well-being in the IDLS.

Conclusion

The instructor in the IDLS had a different physical presence from an instructor in a traditional classroom setting. In the home site she was encumbered by technology and at the remote site she was on TV. Nevertheless she was still the focal point for many students. Moreover most students, following the pattern of traditional classroom culture where they expect the teacher to be responsible for resolving issues and controlling interaction, expected her to do the same in the distance classroom. Thus the instructor's role, in the distance classroom is complicated and compounded. On the one hand she must be aware and reflexive about the way technology is changing her performance and the way students perceive her. On the other hand she must take on the added burden of resolving not only those crisis issues that would occur in any classroom but also the additional ones related to establishing new classroom rules, bridging the distance between sites, and maintaining a content focus in spite of the technological mediation.

References

Agar, M. H. (1996). *The professional stranger* (2nd ed.). San Diego, CA: Academic Press.

Barr, R., & Dreeben, R. (1983). *How schools work.* Chicago: The University of Chicago Press.

Ben-Peretz, M., & Halkes (1987). How teachers know their classrooms: A cross-cultural study of teachers' understanding of classroom situations. *Anthropology and Education Quarterly, 18* (1), 17-32.

Boone, W. J. (1996, August). Developing distance education classrooms. *T.H.E. Journal, 24* (1), 61-63.

Borman, K. (1978). Social control and schooling: Power and process in two kindergarten settings. *Anthropology and Education Quarterly, 9* (1), 38-53.

Clevenger-Schmertzing, A. L. (2000). *Graduate student perspectives on an interactive distance learning studio: Culture and adaptation in technologically mediated classrooms.* Unpublished doctoral dissertation, University of West Florida, Pensacola, FL.

Comeaux, P. (1995). The impact of an interactive distance learning network on classroom communication. *Communication Education, 44* (4) 353-361.

Comstock, J., Rowell, E., & Bowers, J. W. (1995). Food for thought: Teacher nonverbal immediacy, student learning, and curvilinearity. *Communication Education, 44* (3), 251-266.

Cross, K. P. (1981). *Adults as learners.* San Francisco: Jossey-Bass Publishers.

Dickinson, D. K. (1985). Creating and using formal occasions in the classroom. *Anthropology and Education Quarterly, 16* (1), 47-62.

Garland, V. E., & Loranger, A. (1996). The medium and the message: Interactive television and distance education programs for adult learners. *Journal of Educational Technology Systems, 24* (3), 249-257.

Grasha, A. F. (1996). *Teaching with style: A practical guide to enhancing learning by understanding teaching and learning styles.* Pittsburgh, PA: Alliance Publishing.

Heimlich, J. E., & Norland E. (1994). *Developing teaching style in adult education.* San Francisco: Jossey-Bass Publishers.

Herrington, J., & Rehn, G. (1993). Presentation techniques. In J. Herrington (Ed.), *Using television and videoconferencing: A WADEC guide* (pp. 67-84). WADEC: Western Australian Distance Education Consortium.

hooks, b. (1994). *Teaching to transgress.* New York: Routledge.

Jackson, P. W. (1968). *Life in classrooms.* New York: Holt, Rinehart and Winston.

Martin, B. L., & Bramble, W. J. (1996). Designing effective video teletraining instruction: The Florida teletraining project. *Educational Technology Research and Development, 44* (1), 85-99

Maxwell, J. A. (1996). Qualitative research design: An interpretive approach. In *Applied Social Research Methods Series (41).* Thousand Oaks, CA: Sage Publications.

McCabe, M. F. (1998). Lessons from the field: Computer conferencing in higher education. *Journal of Information Technology for Teacher Education, 7* (1), 71-87.

McDermott, R. P., & Church, J. (1976). Making sense and feeling good: The ethnography of communication and identity work. *Communication, 2,* 121-142.

McDermott, R. P. (1977). Social relations as contexts for learning. *Harvard Educational Review, 47* (2), 198-213.

Mehan, H. (1980). The competent student. *Anthropology and Education Quarterly, 11* (3), 131-152.

Moore, M. G., & Kearsley, G. (1996). <u>*Distance education: A systems view.*</u> Albany, NY: Wadsworth Publishing Company.

RFt F I v104.491 (1999). R-remote student, Ft-location code, F-female, I-interview data, v-transcription code, 104.491-location of statement within transcription.

Shultz, J. J., & Florio, S. (1979). Stop and freeze: The negotiation of social and physical space in a kindergarten/first grade classroom. *Anthropology and Education Quarterly, 10* (3), 166-181.

Shultz, J. J., Florio, S., & Erickson F. (1982). Where's the floor? Aspects of the cultural organization of social relationships in communication at home and in school. In P. Gilmore & A. A. Glatthorn (Eds.), *Children in and out of school: Ethnography and education* (pp. 88-123). Washington DC: Center for Applied Linquistics.

Spradley, J. P., & Mann, B. (1975). *The cocktail waitress: Woman's work in a man's world.* New York: Wylie.

Organizational Learning: the Venue for Institutional Change with Online Technologies

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Abstract: As educational institutions envelop technologies to include online course components from the distributed model to complete anywhere/anytime online programs, faculty and student mental models of teaching/learning must change. The change can be slow as the face-to-face model of teaching/learning evolves into with the new model. How can institutional professional developments programs provide the new teaching model for faculty with no experience using online technologies? Faculty need to know both how these new technologies work and how they might implement these technologies to facilitate learning. How does the institution ensure that its professional development programs are not individually targeted but rather grow individual learning into organizational learning?

Daniel Kim, of the Senge Learning Organization, has provided a model for linking individual change to organization change. This paper will present the rationale and the model to effectively link individual learning to organizational learning. In addition, two case studies will be provided during the face to face presentation.

Introduction

In a fashion likened to the internal combustion engine, information technologies are "shaping the transformation of higher education" (Matthews 1998). Higher education seems to be rallying some of its forces to respond to this change, yet in many instances, the response is merely surface response to just the technology and the infrastructure. However, the Peter Senge learning organization philosophy is catching on at least in theory in many campus strategic planning sessions offering the hopes of facilitating change from the top down and the bottom up. Organizational learning, according to Zederayko and Ward (1999), takes deliberate and ongoing effort.

Institutional strategic planning may help produce new institutional mental models, yet changing the mental models in regard to teaching and learning will not be easy, for in the traditional model of education, "learning" has not been the primary mission of universities. According to O'Banion ("A Learning College"). "Ask any educators what the purpose or mission of a university is and they respond: research, teaching, and service." "No one ever . . . asked me for information regarding my teaching ability, much less data about the kind or quality of learning I had helped my students achieve" ("A Learning College"). Stigler and Hiebert (1997) addressed teaching itself in this new model and stated that the "biggest long-term problem is not how we teach but that we have no way of getting better. We have no mechanism built into the teaching profession that allows us to improve gradually over time."

In addition to lack of mechanism for improvement, Cravener (1998) reported that

> A proposal to a professional educator that he or she needs to adopt new media for teaching is a potential threat: the implicit assumption is that the old way was somehow inadequate, insufficient, or not optimal. Feeling even marginally incompetent is anxiety-provoking; people continually defend themselves against the experience. These affective factors often raise active resistance to distance

learning paradigms and the faculty development programs associated with them, predisposing faculty to avoid or reject learning to use educational technologies.

The lack of time and incentives for professional learning are significant impediments for developing a learning organization. It is difficult for teachers to be members of learning communities or learning organizations without time for regular reflection, research, collaboration, and innovation. Dr. Terry O'Banion contended that unless faculty are trained in non-traditional teaching styles, environments, and pedagogies and unless learning institutions become learning organizations, information technologies "have great potential to expand really bad teaching and really bad educational models. . . . " ("A Learning College," 1998).

What appears evident then is that untrained and unsupported faculty could be considered the weakest link in new teaching and learning environments, i.e, in potentially successful online learning programs. Strengthening that link requires well-developed professional development programs with appropriate faculty incentives for moving into the new mental model of teaching and learning.

If teachers need to be lifelong learners, if our teaching focus needs to shift to a learning focus, and if learning institutions need to become learning organizations, education faces many challenges. Perhaps the first challenge is to disconfirm the "fragmented learning styles of individuals and spread the learning throughout the organization" (Kim 1993). This educational paradigm shift for learners inherently includes how the organization that facilitates the learning, i.e., the learning institution, shifts its practices and policies regarding how it constructs, encourages, and applies its own learning.

Learning Organization

How do learning institutions become learning organizations – or communities with an enhanced capacity to learn, adapt, and change? Senge (1990) presented a model for the learning organization and included five new "component technologies" that "provide a vital dimension in building organizations that can truly 'learn,' . . . and enhance their capacity to realize their highest aspirations": systems thinking, personal mastery, mental models, building shared vision, and team learning. The institution of higher learning that facilitates learning must itself become a learning institution [organization]. In a "learning college," learning is the mission, the purpose, and the core value for administration, faculty, staff, as well as students.

Daniel H. Kim (1993) from the Centre for Organizational Learning at MIT Sloan School of Management presented the OADI-IMM model for individual learning that included: Observe, Assess, Design, Implement --- a process that would develop an Individual Mental Model (IMM). Senge (1990) described mental models as deeply held internal images of how the world works and stated that our individual mental models have a powerful influence on what we do because they also affect what we see. It would seem that if the new technologies draw teaching/learning into the constructivist mode, then faculty steeped in the traditional teaching model need to create a new individual mental model of "learning space" and "learning process." The movement from sage-on-the-stage to guide-on-the-side needs to be observed (experienced) and assessed (considered for incorporation into the individual's mental model). The observation and assessment of Information Technology's impact on learning must come first in order to shape personal mastery and a new mental model.

Hierarchical constraints run contrary to shared mental models and organizational learning. O'Banion articulated the Fordist hierarchical model of promotion in a university stating the highest reward is the distinguished research chair with promotion through professional ranks based on juried articles and books published. The notorious tenure track system of job security and status that rewards research and publication and does not recognize or reward the development of new teaching styles prevents many faculty from aligning themselves with innovative teaching/learning strategies. Coupled with the research/publication requirement is the need for community service and campus committee obligations that further that tenure process.[1] Once tenured faculty have become part of the guard, they have vested interest in the notion that research, scholarship, and publication are the gatekeepers to the attainment of that academic security blanket. The system replicates itself and the loop closes to the recognition of innovative teaching/learning environments. Gatekeeping controls access with the word *control* fundamental here.

Higher education is synonymous with hierarchy: president, vice presidents, deans, division chairs, department chairs, faculty (full professor, assistant professor, associate professor, instructor, adjunct, teaching assistant). We have a classical system of management with the attendant values of continuity, certainty, and control. Fitzgerald ("Living on the Edge") stated that education "remains mesmerized by the Newtonian promise of certainty that has taught us to do nothing until we are absolutely certain we know what will happen in detail if we do anything." Nobody likes to be in error, least of all people in positions of influence who "for their entire careers have claimed to know it all, to be 'learned' rather than a learner" (Fitzgerald, "Mindful Chaos").

Kim's OADI-IMM model that links individual learning to organization learning echoes Fitzgerald's theory. Organizations learn through individual members and thus are directly or indirectly affected by individual learning. The cycles of individual learning affect learning at organizational level because individual mental models influence the organization's shared mental model. Organizations can learn only through their members but are not dependent upon any specific members. This understanding led Kim to link individual learning to organizational learning by moving OADI – IMM to OADI-SMM (shared mental model). Why put so much attention on mental models? "Because the mental models in individuals' heads are where a vast majority of an organization's knowledge (both know-how and know-why) lies" (Kim 1993).

Into his organizational learning model, Kim incorporated the Argyris and Schon concept of double loop learning which involves individual mental models challenging deep-rooted assumptions and norms of an organization to affect organization action. Kim indirectly incorporated Senge's five disciplines: a shared vision, personal mastery, team building, mental models, and systems thinking. The facilitation of personal mastery shapes an individual's mental model that with team building becomes a shared mental model. If individual mental models are created, and if those individual personal mastery skills in the new arenas are honed, then self-organizing systems evolve that shape the shared vision and lead to systems thinking.

Three levels or orientations of learning are identified: individual, team or group, and organizational. A learning organization's vision, strategy, leaders, values, structures, systems, processes, and practices all work to foster people's learning and development and to accelerate systems-level learning. Organizational learning occurs in increments or as transformation with skill development focus on individuals and/or groups (Gephart, et al., 1996) In learning organizations, leaders and managers at all levels provide critical support to the learning and development of individuals and teams by

- modeling learning behavior
- providing systems that facilitate learning
- encouraging people to contribute new ideas
- ensuring the dissemination of knowledge and learning
- freeing resources in order to signal the organization's commitment to learning
- sharing leadership

Leaders and managers who lead with knowledge of the learning organization and chaos and complexity theory recognize that they have considerable power to create an effective learning environment by providing the systems that encourage learning. They enable the development of employees' knowledge, skills, and abilities through personal development plans and cross training. Learning organization managers encourage the exchange of ideas, creativity, and suggestions while leaving room for the making of mistakes.

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[1] A. W. Bates, Director of Distance Education and Technology, Continuing Studies at the University of British Columbia, presented the June 199, 1999, keynote address at the First Annual WebCT-ULT conference in Vancouver, British Columbia, "The Impact of WebCT on the Design of Teaching in Higher Education."

A professional development plan must revolve around a gradual increase in faculty skill and confidence with online technologies and pedagogy while at the same time assist with the immediate implementation of these skills in traditional courses with subsequent implementation into online components. Empowering the faculty will empower the students and amount to no less than restructuring the university.

In order to transform individual mental models and subsequently the institutional mental model, the professional development plan needs to be grounded in the most powerful process in complexity theory: the micro level – the people relationship dimension. In 1978, James MacGregor Burns introduced the concepts of transactional and transformational leadership highlighting three characteristics of transformational leaders:

- Set high standards of conduct and become a role model gaining trust, respect, and confidence from others
- Articulate the future desired state and a plan to achieve it
- Question the status quo and continuously innovate, even at the peak of success; energize people to develop and achieve their full potential and performance (http://cls.binghamton.edu/mission.html)

Regine (as cited in Santosus, 1999) articulated similar leadership characteristics for success in a complex environment:

- Be accessible
- Respond immediately to others
- Acknowledge and value people's contributions at all levels
- Create opportunities for people
- Take time to build trusting relationships and to walk the talk

Kim (1993) defined individual learning as "increasing one's capacity to take effective action." The Kim OADI model relates to individual learning and stands for observe, assess, design, and implement. Kim turned to Argyris and Schon (1978) to understand how individual learning can affect organizational learning. "Organizational learning is not merely individual learning, yet organizations learn only through the experience and actions of individuals." Based on Argyris and Schon observations, Kim noted that an organization learns through its individual members and therefore is affected neither directly or indirectly by individual learning. Argyris and Schon argued that organizational learning takes place through "individual actors whose actions are based on a set of shared models." With this understanding, Kim added SMM (shared mental model) to the OADI model (OADI-SMM) linking individual learning to organizational learning and thus effecting the change in the organizational mental model that is required for organizational learning. Let's look at the OADI-SMM model as it applies to the strategic plan to embed online technologies into the traditional campus.

Observe	Faculty will participate in an online course that teaches about online technologies and pedagogy and promotes participant interaction on topics of online learning through the use of an electronic bulletin board and chat sessions.
Assess	Participants will assess a traditional class's adaptability to online environments. Participants will write the purpose of the class, the global objectives, and assess which online environments would work for the course. Participants will share assignments in the online bulletin board moving individual models closer to the shared model concept.
Design	After assessing a traditional class for adaptability to online technologies, participants will design one lesson as the lesson structure framework for the entire course. This lesson, created in a web editor and uploaded into the online bulletin board, will be shared with others.

Implement	The last lesson will ask participants to post a mail message to the online instructor detailing which environments they would like to build into their traditional course and determine a time when the instructor can visit their office to assist them with required technology. The lesson will include the assurance that the instructional design staff will assist with the first lessons in the computer lab and provide assistance with design and will be available for participation in the course's introductory hands-on lessons using the technologies.
Shared Mental Models	Instructional design staff will provide online and face-to-face group activities to promote the shared mental models. Individuals building confidence and competence with online technologies will self-organize and begin to share mental models.

According to Kim, as individuals learn, the individual mental models (IMM) affect learning at the organizational level and become shared mental models (SMM). Organizational learning is dependent on individuals improving their mental models, and emphasis is placed on mental models because the "mental models in individuals' heads are where a vast majority of an organization's knowledge lies." Kim's OADI-SMM model incorporates Argyris and Schon's concept of single and double-loop learning where double-loop learning involves challenging deep-rooted assumptions and norms of an organization.

Two case studies of the OADI-SMM model include the professional development program at a small four year liberal arts university in the Midwest and the other the model for online course management trainer certification through WebCT. Both models place participants into an online learning course (observe) that requests
participants submit assignments that involve assessing and sharing of their learning and its application to online learning in a variety of forms (assess). In both models participants design an online learning lesson and share it with other participants in the online environment (design) while they are encouraged, nurtured, and supported in both an online and a face-to-face format as they grow in confidence and ability with their new mental models (implement). In both models, participants are then brought into a face-to-face environment where they share their new mental models and support and encourage each other in the continued development and implementation of this new model. Both models have been effective as reported in qualitative feedback via online surveys. A formal study has not occurred.

Conclusion

Traditional mental models of teaching and learning have existed for decades. Most educators tend to facilitate teaching and learning in the same model in which they learned, even if they may have found that teaching and learning to have been ineffective for them. Peter Senge's learning organization philosophy discusses changing mental models for new paradigms; Daniel Kim presents the model for linking individual mental models to institutional mental models. Higher education institutions would be enriched by consideration of the Kim OADI-SMM as the foundation for their professional development initiative.

References

Argyris, C. (1997). Initiating change that perseveres. American Behavioral Scientist, 40, (3), 299-309.

----- (1993). Education for leading-learning. Organizational Dynamics, 21, 5 – 17.

Bates, A.W. (1997, June). Restructuring the university for technological change. http://bates.cstudies.ubc.ca/carnegie/carnegie.html [May 17, 1999].

Cravener, P. (1998, November). A psychosocial systems approach to faculty development. Horizon: Faculty and Staff Development – Technology Source [On-line]. Available: http://horizon.unc.edu/TS/development/1998-11.asp [May 28, 1999].

Fitzgerald, L. A. (1994). Living on the edge [Online]. Available: http://www:orgmind.com/living.html [1999, April 28].

------ (No date). Mastering the new realities: Chaos, complexity and change that never stops [Online]. http://www.orgmind.com/mastering.html [1999, April 28].

------ (1995). Mindful chaos [Online]. http://www.orgmind.com/mindful.html [1999, April 28].

------ (No date). What is chaos? [Online]. http://www.orgmind.com/whatis.html [1999, April 28].

Gunter, H. (1995). Jurassic management: Chaos and management development in educational institutions. Journal of Educational Administration, 33, (4), 5 –20.

Kim, D. H. (1993). The link between individual and organizational learning. Sloan Management Review, 35, 37 – 50.

"A learning college for the 21st century – an interview with Dr. Terry O'Banion." (1998, April). Horizon: Faculty and Staff Development – Technology Source http://horizon.unc.eduTS/development/1998-04.asp [May 29, 1999].

Matthews, D. (1998, May). Policy Insights. Reinventing higher education finance: The impact of information technology. Boulder, Co.

-------- (1998, October 15). Reframing higher education financing: Transition strategies for a period of transformation. Paper presented to Western Cooperative for Educational Telecommunications, Reno, Nevada.
Santosus, M. (1998, April 15). Simple, yet complex. CIO Enterprise Magazine.[Online]. Available: http://www.cio.com/archive/enterprise/041598_qanda_content.html (Accessed June 5, 1999).

Senge, P. M. (1990). The fifth discipline: The art and practice of the learning organization. New York: Doubleday.

Senge, P. Reflections: Accomplishments and challenges in developing the Center for Organizational Learning. [Online]. Available: http://www.orglearn.nl/Archives/RSM_Book/senge.html
(Accessed June 15, 1999).

Stigler, J. W. & Hiebert, J. (1997, September). Understanding and improving classroom mathematics instruction: An overview of the TIMSS video study. Phi Delta Kappan.

Zederayko, G. E., & Ward, K. (1999, February). Schools as learning organizations: How can the work of teachers be both teaching and learning? NASSP Bulletin, 83, (604), 35+.

Summary Technology Institutes: Overcoming Barriers to Technology Integration in Higher Education

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Abstract

As the century begins, the need for K-12 students to be technologically literate grows more urgent every day because of the rapid expansion of information. If the potential benefits of this information revolution are to be realized in schools, the teachers of today must be prepared to use modern technology as educational tools. Today's classrooms demand that beginning teachers possess the necessary skills to integrate technology into the curriculum. As the first step in the change process, the teacher educators needed to be retooled and retrained. In the summer of 2000, three Summer Technology Institutes for faculty at the University of the Incarnate Word were developed and implemented. The purpose of these institutes was to help faculty develop technology skills to aid in the improvement of their classroom teaching.

Need for Faculty Development

In 1996, President Clinton launched a national mission to make every person technologically literate by the 21st century. He recognized that technology can help expand opportunities for American children to improve their skills, maximize their potential, and ready them for the 21st century. As the century begins, the need for K-12 students to be technologically literate grows more urgent every day because of the rapid expansion of information. If the potential benefits of this information revolution are to be realized in schools, the teachers of today must be prepared to use modern technology as educational tools. Today's classrooms demand that beginning teachers possess the necessary skills to integrate technology into the curriculum (Marker and Ehman, 1989).

In recent years, there has been growing recognition that teacher preparation programs must prepare their preservice teachers to teach in tomorrow's classrooms. However, there is also recognition that while many teacher preparation programs provide some computer training for preservice education, many of the university faculty, both inside and outside of the School of Education, do not have the technology expertise needed to develop well-prepared technology-proficient teachers. The concerns about preservice teacher education and faculty development in technology is well documented in the research (Persky, 1990, Bruder, 1993, White, 1994). This daring challenge for universities requires a realistic evaluation of where teacher preparation programs are today, where they are headed, and how they intend to get there.

Hoadley, M.R., Engelking, J. L. & Bright, L.K. (1995) maintain that in order for teacher preparation programs to be successful, it must be recognized that faculty need training, support, and time for reflection to integrate technology into the curriculum. The Summer Technology Institutes, developed as part of faculty development at the University of the Incarnate Word, provided the teacher preparation faculty as well as other university faculty with the needed training, support, and time for reflection that was needed.

Vision

The vision of faculty involved in teacher preparation at the University of the Incarnate Word is to produce quality teachers who are well-versed in innovative instruction, skilled in technology and prepared to serve the multicultural and diverse student populations of South Texas. We believe that future teachers should learn with modern technologies integrated into the postsecondary curriculum by faculty who are modeling technology-proficient instruction, particularly in courses where they acquire subject area expertise.

However in a realistic evaluation of the effectiveness of the technology component of the University of the Incarnate Word's teacher preparation program, most faculty are neither modeling the use of technology nor requiring students to use technology. The results of an Instructional Technology Needs Assessment survey of the UIW faculty in 1998 reveal that 51% of the faculty use technology in their instruction only once or twice a semester and 47% of the faculty require students to use computers only once or twice a semester. Most of the instruction in technology at UIW involves teaching about technology as a separate subject, not teaching with technology by integrating it into other coursework to provide a model for instructional use. The lack of modeling, a very powerful teaching strategy, creates major gaps in regards to technology of our future teachers.

In order to make the vision of our faculty in teacher preparation become a reality and to adequately train future teachers to use technology, we realized that technology must be integrated into all aspects of the teacher preparation program. Genuinely integrating technology into the preservice teacher preparation program at the University of the Incarnate Word would require system-wide change, initiative, and time.

As the first step in the change process, the teacher educators needed to be retooled and retrained. In the summer of 2000, three Summer Technology Institutes for faculty at the University of the Incarnate Word were developed and implemented. The purpose of these institutes was to help faculty develop technology skills to aid in the improvement of their classroom teaching. The content of the institutes included study of the instructional design process and the principles of graphic design, hands-on practice with multimedia presentation and web editing packages. Participants in the institutions learned to use digital imaging tools and worked with digital sound.

During the Institute, faculty developed a project relevant to courses that they taught. Some faculty developed PowerPoint presentations while other faculty, at higher levels of technology proficiency, developed web pages for their courses. At the end of the two-week session, each faculty had their projects placed on the STI Web site for others to view. Upon completion of the training, each faculty received a stipend of $1000 as well as gifts of hardware and software.

In addition, all fulltime university faculty who participated in the Summer Technology Institute program were eligible to submit a proposal to become a Technology Fellow during the next school year. This unique program enables three faculty members to become technology resources for other faculty at the university. The proposals submitted by the faculty outlined a project that integrates technology into their classroom instruction. The Technology Fellows will receive one course release time for the fall or spring semester to work on the project. The fellows will also be asked to do two presentations of their final project to the university community.

As is true with many institutions, University of the Incarnate Word is embracing new technologies to fulfill preservice teacher's changing needs. The Technology Summer Institute project is an example of professional development in technological literacy that focuses on individual faculty needs and levels of expertise. Clearly, a major priority for the university is to impacted teaching and learning in the university classroom through the Summer Technology Institutes.

References

Bruder, I. (1993). Redefining science. *Electronic Learning*, 12(6), 21-24.

Hoadley, M. R., Engelking, J. L., & Bright, L.K. (1995). A model for technology infusion in higher education. In J. Willis, B. Robin, & D. A. Willis (Eds.), *Teacher and Teacher Education Annual, 1995: Proceedings of STATE95-Sixth Annual Conference of the Society for Technology and Teacher Education* (pp. 410-413). Charlottesville, VA: Association for the Advancement of Computing in Education (AACE).

Marker, G. & Ehman, L. (1989). Linking teachers to the world of technology. *Educational Technology*, 29(3), 26-30.

Persky, S.E. (1990). What contributes to teacher development in technology? *Educational Technology*, 30(4), 34-38.

White, C.S. (1994). Technology in restructured preserice education: School/university linkages. *Journal of Technology and Teacher Education*, 2(2), 119-128.

A Study of Faculty Perceptions to the Integration of Systems Thinking in the Teacher Preparation Program at Northern Arizona University

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Abstract: This paper is a report on a study done at the Center for Excellence in Education at Northern Arizona University. In 1984, the Center was created on a concept of moving away from the typical hierarchical structure of a college of education toward a matrix. The matrix was designed to help create a community of people in a diverse organization and move away from the "turf" concept of departmentalization. A concept that was to be verbalized by Peter Senge (1990) in his book on learning organizations. By the fall of 2000, the Center has deteriorated back to a hierarchical, departmentalized college of education. Senge (1990) identifies 7 organizational learning disabilities that are typical in organizations that are not learning organizations. This study was a survey of the faculty of the Center to help gain a better understanding of where we are in terms of suffering from these 7 learning disabilities.

Introduction

We, especially those who are the product of the Western logical scientific mind-set, are taught to break complexity and complicated subjects into manageable tasks. But in doing so we pay a hidden, enormous price. We lose our intrinsic sense of connection to a larger whole and can no longer see the consequences of our actions. When we try to reassemble the fragments to see the "big picture" it is similar to trying to reassemble the fragments of a broken mirror in order to see our true reflection. What all to often happens is that we develop mental models of the world that it is composed of separate, unrelated forces. In 1990, Peter M. Senge published *The Fifth Discipline: The Art and Practice of The Learning Organization*. Senge states the tools and ideas presented in the book are for the purpose of destroying this illusion that the world is created of separate, unrelated forces. He contends that when an organization gives up this illusion that what can result is a learning organization where the people of the organization continually expand their capacity to create the results they truly desire. He goes on to state that it is no accident that most organizations learn poorly. "The way they are designed and managed, the way peoples' jobs are defined, and, most importantly, the way we have been taught to think and interact (not only in organizations but more broadly) create fundamental learning disabilities," (Senge, 1990, p. 18). Within an organization, these disabilities operate despite our best efforts and what learning that does occur within an organization takes place despite these learning disabilities. The reason is that they permeate all organizations to some degree. Senge (1990) identifies seven organizational learning disabilities.

The first learning disability is, "I Am My Position." As members of an organization we are conditioned to be loyal to our jobs, so much so that we confuse them with our own identities. Most people see themselves within a "system" over which they have little or no control. Thusly, they tend to concentrate their "work energies" within self-defined limited boundaries of their position. When asked what they do for a living, they will respond by giving the task they perform every day, not the purpose of the greater enterprise in which they take part.

The second learning disability Senge calls, "The Enemy is Out There." In all human beings, there is this self protection mechanism that entices us to find someone or something outside ourselves to blame when things go wrong. Within an organization this "Thou shalt always find an external agent to blame," is often raised to a commandment level. This syndrome is a by-product of "I Am My Position." When we focus only on our position, we do not see how our own actions extend beyond the boundary of that position. When those actions have consequences that come back to hurt us, we misperceive these new problems as externally caused.

The third organizational learning disability is "The Illusion of Taking Charge." Leaders within an organization frequently proclaim the need to take charge in facing difficult problems. They proclaim it is time to stop waiting for someone else to do something, they then roll out the latest program that they have designed to face up to difficult issues and solve the problems. All to often, this "proactiveness" is reactiveness in disguise. These "programs" are in reality a more aggressive way of fighting the "enemy out there." They are a form of reacting – regardless of what it is called. "True proactiveness comes from seeing how we contribute to our own problems. It is a product of our way of thinking, not our emotional state" (Senge, 1990, p. 21).

The next organizational learning disability is called, "The Fixation On Events." We are conditioned to see life as a series of events, and we believe that for every event there is one obvious cause. Focusing on events leads to what is called "event" explanations. Such explanations may be true as far as they go, but the reality of the situation is that they distract us from seeing the long-term patterns of change that lie behind the events and from understanding the causes of those patterns. Senge (1990) states that the irony is that in today's society the primary threat to our survival, both as organizations and as societies, come not from sudden events but from slow, gradual process like the arms race, environmental decay and the erosion of a society's public school system.

The fifth learning disability is "The Parable of the Boiled Frog." If you place a frog in room temperature water and gradually begin to heat the water the frog will do nothing and will eventually sit there and boil. Why? Because the frog's internal apparatus for sensing threats to survival is geared to sudden changes in his environment, not slow, gradual changes. We as human beings have the same problem. We will not avoid the same fate of the frog until we learn to slow down and see the gradual processes that often pose the greatest threats. Learning to see slow, gradual processes requires slowing down our frenetic pace and paying attention to the subtle as well as the dramatic.

The sixth learning disability is "The Delusion of Learning from Experience." When our actions have consequences beyond our learning horizon, it becomes impossible to learn from direct experience. Herein lies the core learning dilemma that confronts organizations. We learn best from experience but we never directly experience the consequences of many of out most important decisions. Cycles are particularly hard to learn from, especially if the cycles last for several years. Traditionally, organizations attempt to deal with this problem by breaking the decision making process up into components. They institute functional hierarchies that are easier for people to manage. What nearly always happens is that the hierarchies grow into fiefdoms which eventually cut off contact between functions and separate the decision makers even farther from the full impacts of their decisions.

This brings us to the last organizational learning disability identified by Senge (1990), "The Myth of the Management Team." Standing forward to do battle with the dilemmas and disabilities of an organization is the management or administrative team. Together, they are supposed to sort out the complex cross-functional issues that are critical to the organization. All to often these teams tend to spend their time fighting for turf, avoiding anything that will make them look bad personally, and pretending that everyone is behind the team's collective strategy – maintaining the appearance of a cohesive team. If there is disagreement, its usually expressed in a manner that lays blame, polarizes opinion, and fails to reveal the underlying differences in assumptions and experience in a way that the team as a whole could learn. Historically, most management or administrative teams function quite well with routine issues but break down under pressure. Only to be replaced by another team

Brief History of The Center for Excellence in Education

In January of 1984, the then Governor of Arizona, Bruce Babbitt, recommended that the Arizona Board of Regents and the state Board of Education begin to explore alternatives to colleges of education. Responding to that pressure, in the fall of 1984 the traditional College of Education at Northern Arizona University was disbanded and the Center for Excellence in Education was created. The concepts of departments were done away with and a non-hierarchical matrix was put into place. A Director and Associate Director replaced the traditional Dean and Associate Dean. This was far more that just a name change. Within the matrix concept, the directors became part of a team that over saw the day-to-day operations of the Center. The other members of this team were the Director of Research, Director of Educational Services, Director of School Services and Director of Professional Programs. Each Director handled specific tasks within the Center, but were responsive to the Center as a whole. The faculty then became a single unit that had direct contact with all of the Directors and their expertise was then channeled to where it was the most effective. There was open communication between all the faculty and the faculty had direct access to all the directors. This allowed a creative energy to appear that lead to some of the most innovative programs that had ever been developed in Arizona.

The diversity of programs created a problem of coordination. To assist in the coordination of these programs and to help open channels of communication between programs, in 1987 the matrix was adapted to include the concept of areas with area chairs. Each faculty member was assigned to an area, but both the area chair and the faculty through negotiations was still free to apply their expertise where they felt it was needed most. Most important was that the budget was not under the direction of the area chair. Budget allocations were made public and the distribution of those funds was determined by input from the team of directors, area chairs, and faculty committees. The primary function of the area chairs was to help coordinate the many different programs.

In 1997, a new Director was hired by the Center. This director immediately began to disassemble the concept of the matrix and reinstate the hierarchical university concept of a college. The name of the office was changed from Director back to Dean. All budgetary matters were placed the direct control of the Dean. All Associate Directors were removed and Associate Deans put in their place. By the Spring of 2000, departmentalization was reestablished with department chairs. Faculty governance was isolated to trivial matters and faculty had no input on budget items. By the Fall of 2000, the Center for Excellence in Education was for all practical purposes a typical college of education.

Faculty who had experienced the concept of the matrix and shared governance appear to be very discouraged. Airs of negativism and dissatisfactions seem to be growing within the faculty. Disputes and "turf" battles appear where little or no conflict had occurred before. To quote a senior faculty, "I was astonished when I was chewed out by a department chair for 'stealing her faculty' when I asked another faculty member from her department if they would be interested in teaching a course in our department. This never occurred before."

The Study

Several faculty members were very aware of the work of Peter Senge (1990, 1994, 1999, 2000). The Educational Technology Faculty had received a grant to conduct professional development with a local school district based upon systems thinking and the *Fifth Discipline* (Senge, 1990). Also, through a National Science Foundation grant, the Northern Arizona Leadership Institute was created within the Center. This Institute began working with the superintendents of several Phoenix area school districts. Much of this work had as its foundation the five disciplines. Due to this understanding, combined with the changes that had occurred within the Center for Excellence in Education it was decided to see how the faculty related to the seven organizational learning disabilities identified by Senge (1990). Questions were designed based upon the seven disabilities. The questions were placed on the web so that faculty and staff could take the survey anonymously from their office or home computers.

Findings

Within the Center for Excellence there are 93 full time and part time faculty members. The number that responded to the survey was 24 which represents a 24% response rate.

The first learning disability is, "I Am My Position." When members of an organization are asked what they do for a living, they will respond by giving the task they perform every day, not the purpose of the greater enterprise in which they take part. The people of the Center were asked to classify themselves as an (assistant, associate, or full) professor, or a staff member, or an administrator. This would be considered as an indicator of "I Am My Position." They were also given the choice to classify themselves as a member of a Department or as part of the Center for Excellence in Education. This would be indicators that they viewed themselves more in terms of the greater enterprise.

Viewed themselves as professor, staff or administrator	92%
Viewed themselves as a member of a department or CEE	18%

Another indicator of the "I Am My Position." is that the individuals see themselves within a "system" over which they have little or no control. The survey gave them a series of tasks that most are involved in and asked them to rate the tasks as: 1. Any effort in that area would be useless, 2. I have control in a few areas so I work in those areas and don't bother with the rest, 3. In that area I can make changes but within the Center what I do has little or no effect, 4. Somewhere between 3 and 5, and 5. I can make changes and those changes can result in changes within the Center. Below are the results:

Modifications in a syllabus	1: 0%	2: 0%	3: 17%	4: 25%	5: 58%
Modifications in programs	1: 8%	2: 25%	3: 13%	4: 42%	5: 12%
Creating changes in structure of the Center	1: 33%	2: 33%	3: 8%	4: 25%	5: 0%
Creating changes in operations of the Center	1: 38%	2: 29%	3: 17%	4: 17%	5: 0%
Creating changes in their area	1: 0%	2: 41%	3: 13%	4: 33%	5: 13%
Creating changes through committee work	1: 17%	2: 29%	3: 29%	4: 17%	5: 8%
Creating changes how courses are taught	1: 4%	2: 8%	3: 8%	4: 29%	5: 50%
Creating changes in what courses are taught	1: 13%	2: 20%	3: 25%	4: 21%	5: 21%
Having input on administrative changes	1: 57%	2: 22%	3: 4%	4: 13%	5: 4%
Helping facilitate the Center mission	1: 13%	2: 29%	3: 13%	4: 20%	5: 25%
Providing quality learning environments	1: 4%	2: 4%	3: 25%	4: 25%	5: 42%

The second learning disability is "The Enemy is Out There." When people focus only on their position, we do not see how our own actions extend beyond the boundary of that position and when those actions have consequences that come back to hurt us, we misperceive these new problems as externally caused. What is not perceived is that "out there" and "in here" are part of a single system. The faculty was as to use the following rubric to react to some issues that face us: 1: I am not sure what the cause is, but I feel that change can happen, 2. There is a cause, I just don't know how to create change, 3. I know the cause and if I can just work harder and smarter I can create change, 4. The primary cause is the leadership of the Center, 5. The primary cause is outside the Center caused by pressure from the university, state and/or national political structures. Below are the results:

Most teacher prep programs have little effect	1: 29%	2: 8%	3: 41%	4: 8%	5: 13%
Morale in the Center is low	1: 8%	2: 4%	3: 16%	4: 66%	5: 4%
State tests keep students from being teachers	1: 29%	2: 0%	3: 33%	4: 0%	5: 38%
Successful faculty in the Center are leaving	1: 21%	2: 8%	3: 16%	4: 50%	5: 4%

People in the Center feel powerless	1: 21%	2: 13%	3: 13%	4: 50%	5: 4%
People of the Center do not express concerns	1: 26%	2: 9%	3: 13%	4: 52%	5: 0%

The third organizational learning disability is "The Illusion of Taking Charge." All to often, this "proactiveness" is reactiveness in disguise. True proactiveness is a product of our way of thinking and comes from seeing how we contribute to our own problems. In the survey the participants were given some possible changes that concerned faculty satisfaction. They were asked to rate the change using the following rubric: 1: I believe that this action is the solution, 2. This action maybe part of the solution, but other actions will be necessary, 3. I might prefer or not prefer this action, but it will create no lasting change until I change, 4. I believe that this action will have no effect on the problem or make the situation worse, 5. I have no thoughts on this action. Below are the results:

Remove the Center's Administrative Team	1: 17%	2: 49%	3: 4%	4: 17%	5: 13%
Remove State's Education officials	1: 4%	2: 52%	3: 4%	4: 26%	5: 13%
Create change in The University Administration	1: 8%	2: 49%	3: 13%	4: 22%	5: 8%
Create more effective faculty governance	1: 13%	2: 65%	3: 8%	4: 13%	5: 0%

The next organizational learning disability is called, "The Fixation On Events." We are conditioned to see life as a series of events, and we believe that for every event there is one obvious cause. Focusing on events leads to what is called "event" explanations. The participants were asked to think of something that recently happened in the Center that directly affected them. They were then asked to use the following rubric to describe how they felt about that event: 1. I know exactly what caused the event, 2. I have a basic understanding of the cause, 3. There were complex causes, but I understand them fairly well, 4. There were complex causes and I understood a few of them, 5. I have no clue to the real cause. Below are the results

Best describes how you feel about the event	1: 10%	2: 10%	3: 29%	4. 38%	5: 14%

The fifth learning disability is "The Parable of the Boiled Frog.". We as human beings will not avoid the same fate of the frog until we learn to slow down and see the gradual processes that often pose the greatest threats. The participants were asked to view the changes that have occurred in the Center over the past few years and asked to use the following rubric to describe their feelings: 1. I am not sure how the Center got where it is today, 2. I can identify certain changes in our organization that have resulted in the Center being where it is today, 3. I can identify two or three specific decisions that were made that resulted in the Center being where it is today, 4. I can pinpoint the exact decision that resulted in the Center being where it is today, 5. I have not been at the Center long enough to accurately answer this question. Below are the results:

Why the Center is where it is	1: 13%	2: 30%	3: 17%	4: 8%	5: 30%

The sixth learning disability is "The Delusion of Learning from Experience." When our actions have consequences beyond our learning horizon, it becomes impossible to learn from direct experience. Herein lies the core learning dilemma that confronts organizations. The participants were given the following statement: Having experienced the changes that have occurred in the Center in the past few years, which statement best describes how you feel. They were then given the following rubric: 1. I certainly learned from these experiences and now I know what to and not to do, 2. I now have a better understanding of the consequences of my decisions and have a basic understanding of what to and not to do, 3. The whole situation is so overwhelming I really don't care anymore, 4. I want to do something, but the organization of the Center is so complex that I am not sure I understand what to do or not to do, 5. I have not been part of the Center long enough to have an opinion. Below are the results:

How do you feel about the changes	1: 5%	2. 36%	3. 5%	4: 27%	5: 27%

The last organizational learning disability identified by Senge (1990) is "The Myth of the Management Team." This team is supposed to sort out the complex cross-functional issues that are critical to the organization. The participants were given he lead statement: I feel that if we can ever get the proper administrative team in place. They were given the following choices: 1. They will begin to solve the problems of the Center, 2. They will create new plans that will begin improving the situation, 3. They will not solve the Center's problems because we are replacing one system of control with another, 4. The only way that they can begin to solve some of the issues of the Center is by listening to faculty, 5. The only way solutions can be found to the problems I see is for me to work closely with this Team. Below are the results:

Getting the proper administrative team in place	1: 4%	2: 4%	3: 17%	4: 40%	5. 35%

Summary

When asked to define themselves 92% of those surveyed defined themselves in terms of their position, not as a member of the Center. One of the symptoms of the learning disability "I am my position" is that individuals see themselves in a system over which they have little control. When the responses were analyzed it showed that the participants viewed themselves having a high degree of control over those things that involved directly the classroom. However, 48% felt they had little or no control over things that affected the Center as a whole. When it came to administrative decisions, 79% felt that they had little or no influence. A polarization of the faculty appeared when it came to the higher aspirations of the Center. This was shown when 45% felt that they did have the potential to influence achieving the Center mission, but 45% felt that they had little or no control. When evaluating the perception of the participants concerning "The enemy is out there," the results indicate when examining issues outside of the Center only 30% had the attitude that there was a external cause over which they had little influence. However, when it came to issues within the Center, 58% of the responses indicated that there was a perceived "enemy" that caused the problem. Concerning the disability of taking action against a perceived enemy, 57% of the participants believed that taking a proactive stance against issues outside the Center was a good idea. Within the Center, 72% felt like taking charge and being proactive against the perceived "enemy" was something that should happen. When it came to fixation on events, I am not sure the way the survey was written really addressed this issue. When the responses were tabulated, 49% gave responses that might indicate they were fixating on events, and 52% saw issues to be so complex that they could not fix on any particular event. Due to the gradual changes of the Center from a matrix system to a typical hierarchical college of education, faculty were more perceptive to the fact that slow changes are the biggest threat. Those that were aware that slow change is the biggest threat to an organization was 41%. Also, 41% thought that they could learn from experience and make better decisions in the future. The encouraging result centered around the myth of the administrative team. Only 8% felt that getting the right administrative team in place would solve many of the problems of the Center. A large majority, 75%, felt that the only way positive change was going to occur was if they themselves were involved in the solution. It is our feeling that this is the result of being involved in a system where each member of the faculty was a vital part Having experienced that capability, they have an insight that others who have not had that experience may not have.

The Center for Excellence in Education is a typical college of education today. This came about after having experiencing an organization that is very different. What we are observing is that we as an organization are moving farther and farther away from the concepts of a Learning Organization as described by Senge (1990). Senge (2000) in his new book *Schools That Learn: A Fifth Discipline Fieldbook for Educators, Parents, and Everyone Who Cares About Education*, states that "It is becoming clear that schools can be re-created, made vital, and sustainably renewed by fiat or command, and not by regulation, but by taking a learning orientation," (p. 5). The Center for Excellence in Education at one time was moving toward this learning orientation, but lost sight of its vision. What this study indicates is that we as an organization are more and more moving into a organizational learning disability mindset. It also indicates, that we have to potential to stop this deterioration if we only will.

References

Senge, P. (1990). *The fifth discipline: The art and practice of the learning organization.* NY, NY:Currency Doubleday.

Senge, P., Camgron-McCabe, N., Lucus, T., Smith, B., Dutton, J. and Kleiner, A. (2000). *Schools that learn: A fifth discipline fieldbook for educators, parents, and everyone who cares about education.* NY, NY: Doubleday.

THE FACULTY RETREAT—A TOOL FOR TECHNOLOGY ENHANCEMENT AND TEAM BUILDING

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Abstract: Explore innovative methods to advance your program's technology initiative and staff development for all faculty—full-time and adjunct, on-campus and on-line.

One effective way to advance your program's technology initiative and enhance team building is through the use of a one-day faculty retreat. Most programs have several sections of its introductory courses, with a narrowing enrollment in upper level courses. It is important that there be uniformity in the standards and content of course offerings and that the National Educational Technology Standards for Students be incorporated into all courses, from the elementary to the advanced.

In advance of the retreat, participants are expected to read a great deal of material and come fully prepared, so that the time at the retreat can be used to maximum advantage. Also, select a location where small groups can break out and use technology, yet easily come together to share results.

Expected outcomes of the faculty retreat can include updated courses, new approaches to student assessment; a list of skill sets that each student should have when entering and exiting each course; and creating an on-line student tutorial. Working from the perspective of Standards and Goals, using NETS as a guide, participants work in small groups on updating each course.

Keeping courses updated is a primary concern for all technology programs and a key project to be accomplished at the retreat should course updating, especially if courses were designed before NETS. Participants should be grouped by the course they teach and, at the end of their session, share ways of up-dating and improving that course. A second key element should be to create a list of skills sets students need when entering and leaving courses. Third, a program should have standardized assessment techniques, especially when courses are offered in different teaching modes—on-campus, on-line, and off-campus. A sharing of these techniques helps faculty look at different ways of assessing student performance and enables the chair to set standards.

As far as team building, it is important that all the faculty—especially the adjuncts—understand the policies and procedures of the program, have access to all of the resources that are available to full-time faculty, and feel part of the team. Guest speakers should include those people who support and enhance the program, such as the directors of the library, academic computing, graduate study, and evening student services; deans; and, if possible, invite the president of the university to attend as well.

Minutes should be taken and shared with the participants. A program book is an excellent reinforcement tool, not only for those faculty who attend the workshop but also for those who teach on-line courses and live far distances. In addition, the program books serves as a readily available orientation tool when new faculty are hired.

Including adjuncts, especially those who teach on-line and off-campus, in faculty meetings is not a common occurrence, but it is a critical element in developing a department that is well-motivated and delivers a standard level of service.

During this presentation the audience will have an opportunity to plan a faculty retreat and write the agenda for the meeting.

TECHNOLOGY STAFF DEVELOPMENT AT AN URBAN PUBLIC UNIVERSITY

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Abstract: The Instruction and Technology Initiative at New Jersey City University, an Hispanic Serving Institution, was designed to increase the capacity of faculty to foster instructional innovation via educational technology, both within the University and to reach teachers on the local and the statewide level. The Initiative is designed to fuse technology education with the specific learning needs of students through one-to-one and small group faculty training, and that full-time personnel staff the Center, serving as in-house consultants to the faculty.

The Center, designed to give faculty a central place to work and share ideas with colleagues, consists of a centrally located lab complemented by smaller labs at two other sites on campus and houses state-of-the art instructional technology for faculty use. In addition to computer/multimedia workstations, the Center has interactive media equipment such as CD-ROMs, audio/video editing tools, CD-ROM writers, laser printers, presentation technology, scanners, laser discs, and digital photographic technology.

Key elements in this initiative that make it different from many others are that the Center is designed to fuse technology education with the specific learning needs of the NJCU student population through one-to-one and small group faculty training, and that full-time personnel staff the Center, serving as in-house consultants to the faculty. The Center curriculum has three components. The first is technology training, which includes Creating Multimedia-based Presentations for Classroom Instruction and Multimedia Equipment Training. Because most NJCU faculty, like those at so many other universities, were never formally trained in the field of education, yet are involved in teacher preparation, the second component is The National Educational Technology Standards and Its Integration into the NJ Core Curriculum. The third module is specialized workshops on The Cultural Aspects of Teaching/Learning Styles and The Learning Styles of Older Returning Students.

Faculty have the ability to create multimedia materials using a variety of delivery modes including CD-ROM media that students can view at home or in a lab. For both students who are using the campus data network as well as the students who access the resources from anywhere in the world via the Internet, faculty are able to utilize several methods of delivering interactive material via the World Wide Web and the Internet. Examples include: full motion video segments, interactive quizzes that can be either practice or timed, live chat sessions with faculty to discuss problems without traveling to the campus, and the ability for the instructor to really see what the student is doing via collaborative technologies.

To insure that the technology is utilized to maximum advantage, the Instructional Technology Committee, made up of faculty selected from each of the three divisions, coordinates activities. Two full-time people are available support the faculty: the Multimedia Curriculum Specialist and the Multimedia Technician. The Multimedia Curriculum Specialist is responsible for training faculty in the "translation" of curriculum from traditional formats to multimedia format; evaluating currently available multimedia curricular materials and training faculty to conduct such evaluations; and facilitating faculty use of distance learning methods to deliver multimedia instruction. The Multimedia Technician is charged with ensuring that equipment operates properly and that faculty are trained on the equipment. The technician also oversees equipment installation, preventive maintenance, vendor liaison, software installations, and upgrades.

The Curriculum Specialist routinely conducts seminars on the integration of learning and technology as well as the needs and abilities of diverse and remote learners. These workshops illustrate to faculty how non-traditional, student-focused, interactive instruction helps multicultural students successfully learn and take an active interest in their education. In addition, the Center conducts small group and departmental work sessions to provide specific assistance to faculty to incorporate successful strategies into their courses.

As one of the original nine public colleges, New Jersey City University is the only institution that has remained in a densely populated urban setting. It serves students who, overwhelmingly, are the first generation of the family to seek a college education. It represents a path toward opportunity for an economically poor constituency, most of who are highly motivated, academically underprepared, and upwardly mobile.

During this presentation the audience will explore a range of alternative methods of using educational technology that have proven to be successful with diverse and under-prepared learners.

Faculty Training - Lessons in a "Flash"

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Abstract: This paper is an examination of current literature identifying factors affecting faculty use of technology for instruction. One of the key research findings identifies training as an essential element in the success of faculty use of technology. This paper describes one solution being evaluated by the faculty development center that has shown great potential for providing training to numerous full-time and adjunct faculty members who are widely dispersed on multiple campuses by delivering the training online.

Introduction

With ever-increasing demand from college administrators and students, faculty members are being encouraged to embrace technology as a way to increase the number of students served, improve the quality of their instruction, better prepare students for the workplace and reach students not previously served by traditional classroom instruction. This paper will examine factors reported in the literature as causes of college faculty reluctance to use technology as well as factors that help promote its increased use. The types of technology used by faculty for instructional purposes will also be reviewed.

While the use of technology is rapidly increasing in the business world, the use of technology in academia is still not widely accepted (Okpala & Okpala, 1997; Spotts & Bowman, 1995). With the need to expand the use of technology increasing, it is important for colleges and universities to recognize the critical issues that impede growth in the use of technology by instructors and address them if their goals are to be met. Identifying incentives and motivational factors that will help expand the use of technology by college faculty will be beneficial to institutions of higher education. Understanding the need for support systems will assist colleges and universities in planning for the infusion of technology in teaching.

This paper is not an exhaustive review of the literature but was prepared to establish a foundation for planning and implementing faculty and staff development programs in the use of technology as a tool for instruction. Understanding how faculty use technology, their concerns about technology and factors that help produce positive acceptance by faculty members are keys to successful instructional technology implementation and expansion projects.

Factors Negatively Affecting Use of Technology by Faculty

Several contributing factors were identified in the literature as causes of faculty reluctance to adopt technology. Among the most common reasons cited in these studies were factors related to deficiencies including lack of training, lack of support, lack of equipment, limited access to hardware and lack of funds (Spotts & Bowman, 1993; Roberts & Ferris, 1994; Okpala & Okpala, 1997; Novek, 1999; Dickson, 1999; Quick, 1999).

Other difficulties such as time requirements and availability of equipment were also identified as usage barriers. Spotts and Bowman (1993) found that over 50% of their 306 survey respondents reported that the time required to learn and use technology was the major contributing factor to its low level of acceptance by faculty. Quick (1999) also reported lack of time available to learn how to use technology as a major impediment to faculty use.

Novek (1999) reported that faculty in her study had several fears about the use of instructional technology. The first fear was about the devaluation of their role as instructors and possibly the loss of employment as technology use increased. A second concern expressed by the respondents was their fear that expanded use of technology in teaching would dehumanize the instructional experience for students and result in their alienation. Although most of their fears were related to the use of distance education technologies, the faculty saw the increased use of technology as a threat to their livelihood. This perception of technology would certainly have a negative effect on their willingness to participate in its usage. College administrators must be sensitive to these concerns when considering the use of technology for distance education.

A faculty's attitude about the importance of technology in their instruction was another factor that seemed to determine the extent to which technology was used. Okpala & Okpala (1997) took a random sample of faculty members from three Historically Black Colleges and University Institutions in the South. Their study found that 38% of the respondents indicated that they felt technology was not important to their instruction. Most of the instructors in this group also indicated that they did not use instructional technology in their courses.

Positive Factors Influencing Use of Technology

Several of the studies identified important factors that influenced the faculty's positive attitude towards instructional technology. Equipment availability ranked highest in importance (Spotts & Bowman, 1993; Nantz & Lundgren, 1998; Groves & Zemel, 2000). Improved student learning was also ranked highly in importance. (Spotts & Bowman, 1993; Groves & Zemel, 2000).

Several other positive factors reported include funds to purchase materials, advantages over traditional methods of teaching, ease of use, compatibility with subject matter, release time to learn technology, and availability of training. These studies suggest that for a program designed to increase faculty use of technology to be successful, program developers must be sure that the technology is readily accessible. Time must be made available for faculty to experiment with the technology and training must be provided to support them in their efforts.

Dusick & Yildirim (2000) found a high positive correlation between ownership of a home computer and computer competency. The study also found that computer competency was a predictor of instructional use of computers. The researchers concluded that use of a computer by faculty at home has a positive effect on their use of computer technology for instructional purposes.

Faculty Use of Technology for Instruction

Several studies (Okpala & Okpala, 1997; Inman & Mayes, 1998; Taber, 1998; Groves & Zemel, 2000) reported on the types of technology used by college faculty. Understanding existing faculty use of technology is extremely important in planning training and staff development programs (Inman & Mayes, 1998).
All of the studies reviewed found faculty use of word processing and e-mail was common. Most also indicated that the use of multimedia and distance learning technologies was very low. Mitra, Steffendmeier, Lensmeier & Massoni (1999) found that the traditional use of computers for programming and data processing has shifted to the use of computers for communication.

Taber (1999) found the use of presentation software ranked very high (90% or higher) among the technologies used. Groves & Zemel (2000) also reported high (70%) usage of presentation software. This conflicts with the findings of Okpala & Okpala (1997) who reported low (12%) usage for presentation software. These differences, from data reported in different yet well designed research studies, illustrate the importance of understanding the distinct characteristics of the faculty needs in each college or university before embarking on development of technology training workshops.

Use of the Internet for instructional purposes ranked high in a number of the more recent studies (Inman & Mayes, 1998; Taber, 1999; Groves & Zemel, 2000). Older studies did not report such findings. Recent widespread expansions in Internet access at colleges and universities is the mostly explanation for the differences in the findings.

Inman & Mayes (1998) and Taber (1998) found frequent usage of computer-based instruction reported by their respondents while Groves & Zemel (2000) and Okpala & Okpala (1997) reported low usage of those technologies. These apparent conflicts in reported information reinforce the notion that a local needs analysis is critical to meaningful staff development planning.

Incentives for Faculty to Encourage Use of Technology

Learning to use new technology clearly takes time. Many of the studies found it was extremely important to provide incentives to faculty to make appropriate use of the available technologies for instruction

(Spotts & Bowman, 1993; Inman & Mayes, 1998; Nantz & Lundgren, 1998; Miller & Husmann, 1999; Taber, 1999; Padgett & Conceao-Runlee, 2000). As one might expect, monetary rewards, stipends, tenure and promotion credits, and release time were commonly reported incentives.

A very interesting finding about faculty motivation was uncovered in two of the studies. Spotts & Bowman (1993) found that the most frequently reported incentive for expanding the use of technology was evidence of improved student learning. Miller & Husmann (1999) found it was not external rewards such as merit pay or release time but internal rewards such as self-fulfillment and enjoyment of teaching that motivated faculty to participate in technology use. Respondents reported that observing increases in student motivation and student performance were more important incentives to increase the use of technology than were financial rewards to the faculty for participating in the use of technology.

The Role of Training

Faculty training is a critical component to successful integration of technology in higher education.

> The critical role of teachers in effective learning means that all must have training, preparation, and institutional support to successfully teach with technology … . Few teachers have had either teacher education or field experiences that enable them to be effective distance education teachers or successfully use technology in their own classroom. (Office of Technology Assessment, 1989, p.17)

Although the quote above is more than ten years old, the essence of its message has not significantly changed. In a recent survey of community colleges, Milliron and Leach (1997) reported that the training structures for developing the technology skills of faculty members are still not in place and yet training is viewed as an essential ingredient in keeping their faculty current.

The importance of understanding technology use and faculty needs in training is an extremely important issue in staff development planning.

> Assisting faculty in developing the skills and knowledge to make use of this technology will become a critical issue in program and faculty development. However, without research to determine what kinds of training and technology are in use and are needed at a particular college, university, or system, efforts to train faculty will not reach their full potential. (Inman & Mayes, 1999, p. 20)

For a staff development program to meet the needs of the faculty, it is critical that the trainers understand the specific type of technology being used by the faculty and what new technologies may also be useful. Inman & Mayes (1999) suggest that training programs must be designed to allow for multiple training experiences. They found that as faculty become more familiar with technology, their need for additional training in other technologies is likely to increase.

Inman & Mayes (1999) also suggested that there should be a distinct separation of general education and hardware training from advanced training in more sophisticated technologies. Dusick & Yildirim (2000) also found the need for separation of users and nonusers in training. Experienced users were focused on improving their existing skills through specific training. Nonusers preferred short personal training sessions or in small groups.

Dusick & Yildirim (2000) found that computer competency and prior computer instruction were significant predictors of the use of computers for instructional purposes by faculty. It is evident from the study that training is an important positive factor in expanding faculty use of computer technology.

Candiotti & Clarke (1998) and Dusick & Yildirim (2000) also found that support for faculty while they are learning new technology is critical. Both studies suggested that a modest investment in support staff yields far higher returns in increased faculty use.

The Problem

A major problem faced by the Center for Teaching and Learning with Technology was how do you train countless numbers of faculty members who are geographically dispersed on three main campuses and numerous remote satellite locations and all have conflicting time schedules. Several options were considered. The most obvious was to schedule training sessions at varying times and locations to try to accommodate the variety of needs of our faculty. This, of course, is time-consuming and expensive.

A Solution

Since one of the major goals of the Center is to encourage the use of technology by faculty to enhance teaching and learning and provide them with the support to make that happen, it was logical for the Center to investigate the use technology to help solve this problem. The College already had its own web servers and internet connections to the majority of faculty offices as well as to numerous locations throughout our campuses. So instead of bringing the faculty to a single location for training, it was decided to try to bring the training to the faculty through the internet wherever they are.

The first task was to identify what media elements would be necessary to do the most common types of training that faculty requested. Interactive video would certainly be helpful but production is expensive and time-consuming and was not really necessary for most applications. Video over the web is greatly improved but still problematic for most low-bandwidth users. Screen captures of program screens for demonstration purposes were useful in traditional instructor-led training sessions and certainly seemed appropriate for online delivery. Audio instructions also proved effective to support instruction. Animating illustrations of items such as pulldown menus, button selections, and other features was also desirable if they would not take a long time to develop.

Macromedia's Flash was selected as a primary online training development tool. It supported the media elements required by the Center for producing effective training tutorials online. Flash's built-in tutorials made learning to create media-rich, interactive instruction on the web fast and easy. Files sizes were lower than comparable HTML pages would have been so there are no long delays waiting for new images to appear. Audio tracks stream well even over low bandwidth connections. Reusable models were created to cut development time for new training projects. The latest version of Macromedia Flash even comes with a library of learning interactions that speed up the process of creating online training for faculty. Flash is supported by most of the common browsers.

Although at the time of this writing no significant data collection has taken place, anecdotal reports from faculty members who have used the online tutorials found them helpful and much more convenient than traditional instructor-led training sessions. A more formal evaluation is planned for the end of the semester.

Conclusions

Increasing college faculty use of instructional technology takes careful planning and ongoing support. Before a college or university undertakes a program to increase the use of technology, it is critical that factors which may cause faculty resistance to technology are identified. The research suggested that many of these negative factors are due to deficiencies that can often be overcome by careful advance planning and preparation.

Conditions that encourage faculty acceptance and use of technology must be in place for programs aimed at increasing technology integration to be successful. Availability and easy access to hardware and software are vital components of a successful technology expansion.

Ongoing training and support for faculty also plays a critical role in the expansion of technology use. Trainers must be aware of the types of technology that are available and those currently in use in order to create training programs that will be beneficial and relevant to faculty.

The use of the internet to provide training to faculty any time, in virtually any location, shows potential for solving a number of faculty training issues. A rapid development tool such as Macromedia Flash makes it possible to create web-based training applications without a prohibitive expenditure of time and effort.

References

Candiotti, A., & Clarke, N. (1998). Combining universal access with faculty development and academic facilities. *Communications of the ACM*, 41(1), 36-41.

Dickson, R. (1999). The changing role of community college faculty: Implications in the literature. *Community College Review*, 26(4), 23-37.

Dusick, D., M. & Yildirim, I. S. (2000). Faculty computer use and training needs: Identifying distinct needs for differing populations of community college faculty. *Community College Review*, 27(4), 33-47.

Groves, M.M., & Zemel, P.C. (2000). Instructional technology adoption in higher education: An action research case study. *International Journal of Instructional Media*, 27(1), 57-65.

Inman, E., & Mayes, L. (1998). Educational technology: A survey of faculty use and need. *Journal of Staff, Program, & Organization Development,* 16(1), 15-20.

Miller, M.T., & Husmann, D.E. (1999). Faculty incentives to participate in distance education. *The Michigan College Journal*, 35-42.

Milliron, M.D., & Leach, E.R. (1997). Community colleges winning through innovation: Taking on the changes and choices of leadership in the twenty-first century. *Leadership Abstracts [Special online edition]*. Retrieved August 14, 2000, from the World Wide Web: www.league.org/leadabccwi.html.

Mitra, A., Steffendmeier, T., Lensmeier, S., & Massoni, A. (1999). Changes in attitude towards computers and uses of computers by university faculty. *Journal of Research on Computing in Education*, 32(1), 189-202.

Nantz, K.S., & Lundgren, T.D. (1998). Lecturing with technology. *College Teaching*, 46(2), 53-56.

Novek, E. M. (1999). Do professors dream of electronic students? Faculty anxiety and the new information technologies. Paper presented at the Eastern Communication Association Annual Meeting, Charleston, WV. (ERIC Document Reproduction No. ED 429 582).

Office of Technology Assessment (1989). Linking for learning: A new course for education. Congress of the U.S. (ERIC Document Reproduction No. ED 310 765)

Okpala, A.O., & Okpala, C.O. (1997). Faculty adoption of educational technology in higher education. *Journal of Instructional Psychology*, 24(4), 262-267.

Padgett, D.L., & Conceao-Runlee, S. (2000). Designing a faculty development program on technology: If you build it, will they come? *Journal of Social Work Education*, 36(2), 325-334.

Quick, D. (1999). Community college faculty development: Bringing technology into instruction. *Community College Journal of Research & Practice*, 23(7), 641-653.

Roberts, N., & Ferris, A.(1994). Integrating technology into a teacher education program. *Journal of Technology & Teacher Education*, 2(3), 215-225.

Spotts, T.H., & Bowman, M.A. (1993). Increasing faculty use of instructional technology: Barriers and incentives. *Educational Media International*, 30(4), 199-204.

Spotts, T.H., & Bowman, M.A. (1995). Faculty use of instructional technology in higher education. *Educational Technology*, 35(2), 56-64.

Taber, L.S. (1998). Faculty development for instructional technology: A priority for the new millennium. *Journal of Staff, Program, & Organization Development*, 15(4), 159-174.

Justification of Technology Teacher Training From Human Performance Perspective

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Abstract: Technology teacher training is one of the most preferred methods in schools and other educational institutions to close the gap between teachers' expected level and current level of technology use in the classroom. The purpose of this paper is to investigate, based on Mager and Pipe's (1997) performance analysis model, if technology teacher training is the only solution to improve teachers' performance in using technology in the classroom. First, a literature review on technology teacher training will be provided and then the performance analysis model will be used to evaluate the necessity of the training.

Introduction

The literature has much information about different views on technology teacher training programs designed to improve teachers' performance in integrating computers into the classroom. However, human performance specialists advocate that training is not always the solution to tackle with low human performance. Non-instructional or management solutions would be applicable to certain situations (Rothwell&Kazanas, 1998).

The purpose of this paper is to investigate, based on Mager and Pipe's (1997) performance analysis model, if technology teacher training is the solution to improve teachers' performance in using technology in the classroom. First, a literature review on technology teacher training will be provided and then the performance analysis model will be used to evaluate the necessity of the training.

Literature Review

The literature indicates that lack of educational technology training prevents teachers from the use of computers in schools (Scheffler, 1997) and an appropriate training increases teachers' comfort level, enthusiasm, confidence and skills to use technology (McNamara, 1995). Hardy (1998) says that seven-year continuous training and experience are necessary to become a comfortable and confident user of educational technology. Of the seven years, teachers need five years to get used to the technology and then they start expending the use by adapting some computer applications, such as tutorial programs and drill and practice software.

Several training programs have been tried out and discussed by researchers. McNamara (1995) depicts a training program that is composed of three levels: Awareness, development of skills and applications of knowledge. In the awareness stage, the training focuses on basic knowledge about computers. After that, equipment operation and the use of computer applications should be taught. In the last stage, applications of knowledge, the main theme should be integrating computers into the curriculum and using the computer for classroom management.

In another approach, the training is designed such a way that teachers consecutively become technology assistant, technology teacher and technology leader. Thc technology assistant is capable of manipulating computer hardware and running computer applications at least with the help of the manuals. Technology teachers are able to evaluate educational software and integrate them into the curriculum without supervision. Technology leaders can use the technology with different pedagogical approaches, such as cooperative learning and constructivism, and use advanced multimedia and Internet applications (Guffey, 1998).

Siegel (1995) proposes a three-level teacher-training program. At the end of the first level, teachers become familiar to some specific hardware and software. During the second level, teachers learn evaluating educational software to implement in the classroom. In the last level, teachers become capable of producing ideas on the technology integration.

After training, teachers should gain several competencies important for the technology adaptation in education. Teachers should be a competent computer user (McNamara, 1995; Guffey, 1998; Siegel, 1995; Hardy, 1998; Walters, 1992, Willis, 1994). That includes understanding and operating of major computer parts such as monitor, modem and sound card as well as major computer peripherals including printer, scanner, cameras etc. Software competencies are installing and running operating systems, educational software and tool software, such as word-processing, spreadsheets, presentation and database (Guffey, 1998; Siegel, 1995; Willis, 1994)

Besides computer and software skills, teachers should be trained on the pedagogical issues and classroom management. Teachers have to be knowledgeable about instructional design models, integrating computers into the curriculum, computer assisted instruction and evaluating educational software to use in the classroom (McNamara, 1995; Forcheri, 1986; Siegel, 1995; Walters, 1992). Also, teachers are able to use the computer as a classroom management tool, such as keeping journals and reports about students and taking attendance (Hardy, 1998). Programming and Internet are other important competencies for teachers to learn (Becker, 1994)

The literature proposes the following tips and strategies to improve the effectiveness of a teacher training program: The training priority should be given to volunteer teachers; the training should be given by experienced classroom teachers or teacher trainers; the training should provide teachers with practical examples and extensive hands-on experiences with computers; the teachers should instantly use new technology skills in their classes; and teachers should be provided follow-up support after the training. (Heidi, 1999; McNamara, 1995; Wetze and et al, 1996; Siegel, 1995; Gilmore, 1995; Tally, 1995)

Technology Training and Teacher Performance

Are teachers really employing computers effectively in the classroom? Is there a difference between how they should utilize computers and how they are currently using them in the classroom? Those questions are concerning about teachers' performance to adapt computers into curriculum. Human performance technologists employ systematic models to identify deficits in human performance, investigate their causes and bring solutions.

Mager and Pipe's performance analysis flow chart can be used to investigate if training is necessary for teachers to successfully implement computer-based activities in classroom. The performance analysis flow diagram focuses on three issues: Identifying performance discrepancies and determining their importance, considering alternative solutions for those discrepancies and considering training solutions.

Teachers' Performance Discrepancy in the Use of Educational Technology

In the last 20 years, the numbers of computers have increased significantly in schools. However, significant percentage of new teachers has not used computers for instructional purposes (Wild, 1996; Hardy, 1998). On the other hand, even though some teachers try to adapt the computer in their lessons they are not able to achieve an appropriate integration (Dunn & Ridgway, 1991). Most of the time computers are employed in an unproductive manner and isolated from the classroom. For instance, they are substituted for paper-and-pencil individual worksheet activities and used as a tool to reward and punish students due to their behaviors (Becker, 1992). In high schools only 31 percent of the student computer time is devoted to the support of academic subjects (Fostering the use of educational technology). So, "computers should be further integrated into the actual curriculum" (Heidi, 1999).

As can be seen from the information above, teachers do not utilize computers at the expected level. What are the consequences of teachers' performance gap in using technology in classroom? This is a controversial issue among educators. Some believe computers are not able to provide a significant improvement in students' learning (Cormack, 1995). On the contrary, it is advocated that well designed technology supported lessons are able to improve students' learning performance and decreases the learning time. Students' attitude towards learning is increased, as well (Dusic, 1998). Looking at the issue from educational system change perspective, Branson (1998) assigns an important role to technology to carry out the transition from current teaching-centered educational system, which is considered to reach its final efficiency limits and does not become better, to new learning-centered education system.

Training Solutions to Close the Gap

According to the Mager and Pipe's performance model training can be considered as an appropriate solution for low performance if one does not have enough job related knowledge and skills. In connection with this, if teachers have lack of the knowledge and skills to adapt technology in the classroom training can be helpful. So the question is "do deficits in the technology knowledge and skills prevent teachers from employing technology to teach?"

Walters (1992) indicates that only 20 percent of new teachers believe that they were prepared to use computers in instruction. Even though having positive attitude towards technology, very high percentage of teachers, around 90%, even is not confident about their computer literacy skills and knowledge (Dupagne, 1992). Moreover, student teachers do not know the basic computer skills and designing computer-supported lesson plans (Cormack, 1995). Usually, they have not been educated about and exposed to systematic ways to integrate technology during their educations because collages of education have not fully adapted technology courses into their programs, not met student-teachers' computer education need (Pugalee, 1998) and the faculties in those colleges lack the expertise in both technical and pedagogical skills in educational technology. (Hardy, 1998; Wild, 1996). This limits the prospective teachers' competencies and knowledge of integrating technology in the curriculum.

The information above coming from the technology teacher training literature apparently says teachers often lack the skills and knowledge in using technology. There is a considerable need to provide teachers with training in how to appropriately design and deliver instruction that incorporates technology (Pugalee, 1998). Usually exemplary computer using teachers work in school districts that heavily invest in staff development program and they have more formal training in using and teaching with the computer (Becker, 1994). Supporting this judgment, many technology experts agree that an ongoing barrier to implementing technology in schools continuous to be the lack of appropriate training for teachers (Hardy, 1998). If they are provided with time and support for in-service training they may gain positive attitudes towards technology and easily learn planning and using the computers, so that technology integration can be successfully achieved in school (Dupagne, 1992; Sheingold & Hadley, 1990).

Alternative Solutions

Technology teacher training, alone, is not capable of solving the multidimensional problems related to technology integration in education. Besides the training need there are several other obstacles preventing teachers from successfully using technology to teach. Mager and Pipe in their performance analysis flowchart first systematically examine alternative solutions to training. They consider four factors that may cause low performance: Unclear performance expectations, inadequate resources and feedback, punishing desired performance and rewarding poor performance.

As far as clear expectations are concerned, the technology integration is still a vague concept. Having done many studies about technology and education, researchers have failed to put out common, concrete and practical criteria with regard to the best ways of using computers in classroom and teachers are not provided with clear-cut expectations to successfully implement the technology.

In spite of big investment in purchasing hardware and software in schools, even more than the amount spent for the staff training and professional development, teachers complain about inadequacy of technology equipment and resources. There might be several reasons of that: The current average computer/student ratio (even though increased significantly in the recent years to 1/9) might be still a low proportion; many broken and malfunctioning computers are sitting in classrooms or computer labs due to lack of technical support; and the compatibility between new and old technologies is lost due to the rapid growth in the computer technology. Old computers do not support new versions of software and hardware. The last two reasons may indicate that, even though significant number of computers appears in the inventories of schools they are practically not useable. (Wetzel and et al, 1996)

Feedback is an important mechanism to improve human performance. Behaviorist psychologists have done significant number of research on feedback and how to provide it and when. However, the educational technology literature lacks information about how effective feedbacks should be provided with teachers upon their technology integration practices in the classroom and who should do it. Technology coordinators would do that but few schools have fulltime technology coordinators and they are overloaded with many different tasks including teaching computer literacy, maintaining computer lab etc. Basically, they are not able to allocate time to observe and provide feedback for the teachers.

One of the most controversial issues in education is student evaluation. In many states, students are required to take standardized performance tests and teachers are held accountable for the students' scores. Researchers indicate that different learning processes require different evaluation procedures. For instance, standardized tests are usually associated with instructivist /behaviorist type of teaching. Yet, the literature shows that teachers prefer to use technology in a more student-centered/constructivist way that is not properly evaluated by performance tests. So, evaluating computer-supported instruction through an inappropriate means and holding computer-using teachers accountable for students' low scores based on an inappropriate evaluation technique would be punishing the computer-using teachers as well as rewording the non-computer using teachers because their students have a greater chance to show better performance on standardized tests.

Conclusion

According to the literature, teachers do not have enough competencies to integrate computers in the classroom and they do not get sufficient in-service training. Pre-service teachers also graduate from colleges of education with a very little exposure to and knowledge about educational technology. There is a substantial need to provide teachers with educational technology training.

However, the training should not be considered alone. Teachers have to be provided with additional assistants such as job aids and EPSS supporting the training. Moreover, there is a need to develop a school/district (or broader) level system or policy that coordinate and manage the technology integration and implementations in schools. This system or policy should define what is expected from educational technology and how it will be judged, how teachers have to employ technology in classroom, what technology and non-technology resources will be available for teachers and what incentives will be given to them.

References

Becker, H. J. (1992). Top-down versus grass roots decision-making about computer acquisition and use in American schools. (ERIC Document Reproduction Service No. ED356769)

Becker, H. J. (1994). How exemplary computer-using teachers differ from other teachers: Implications for realizing the potential of computers in schools. *Journal of Research on Computing in Education*, 26(3), 291-321

Branson, R. K. (1998). Teaching-centered schooling has reached its upper limit: It does not get any better than this. *Current Directions in Psychological Science*, 7(4), 126-135

Cormack, V. M (1995). Training pre-service teachers in applying computer technology to lesson planning as a component of the elementary school methods curriculum. (ERIC Document Reproduction Service No. ED382190)

Dunn, S. & Ridgway, J. (1991). Computer use during primary school teaching practice. A survey. *Journal of Computer Assisted Learning*, 7(1), 7-17

Dupagne, M. & Krendl, K. A. (1992). Teachers' attitude toward computers: A review of the literature. *Journal of Research on Computing in Education*, 24(3), 420-429

Dusick, D. M. (1998). What social cognitive factors influence faculty members' use of computers for teaching? A literature review. *Journal of Research on Computing in Education*, 31(2), 123-137

Forcheri, P. & Molfino, M. T. (1986). Teacher training in computers and education: A two-year experience. *Computer Education*, 10(1), 137-143.

Gilmore, A. M. (1995). Turning teachers on to computers: Evaluation of a teacher development program. *Journal of Research on Computing in Education*, 27(3), 251-169

Guffey, S. J. et al (1998). Curriculum and technology: Integration through modeling. (ERIC Document Reproduction Service No. ED418075)

Hardy, J. V. (1998). Teacher attitudes toward and knowledge of computer technology. *Computers in the Schools*, 14(3/4), 119-136

Mager, R. F. & Pipe, P. (1997). *Analyzing performance problems*. CEP: Atlanta

McNamara, S & Pedigo, M. L. (1995). Development of an individualized computer training model for classroom teachers. (ERIC Document Reproduction Service No. ED384596)

Pugalee, D. K. (1998). Te study of the impact of teacher training in using internet resources for mathematics and science instruction. *Journal of Research on Computing in Education*, 31(1), 78-88

Rothwell, W. J, & Kazanas, H. C. (1998). *Mastering the instructional design process: A systematic approach*. Jossey-Bass Inc.: San Francisco

Scheffler (1995). The identification of computer competencies needed by public school teachers. Unpublished Dissertation

Sheingold, K. & Hadley, M. (1990). Accomplished teachers: Integrating computers into classroom practice. Center for Technology in Education. Bank Street College of Education

Siegel, J (1995) The state of teacher training. *Electronic Learning*, 14(8), 43-50

Tally, B. (1995). Developmental training. *Electronic Learning*, 15(1), 14-15

Walters, J. T. (1992). Technology in the curriculum: The inclusion solution. (ERIC Document Reproduction Service No. ED350281)

Wetzel, K. et al (1996). Innovations in integrating technology into student teaching experience. *Journal of Research on Computing in Education*, 29(2), 197-214

Wild, M. (1996). Technology refusal: Rationalizing the failure of student and beginning teachers to use computers. *British Journal of Educational Technology*, 27(2), 134-143

Willis, J. E. (1994). Technology and Teacher Education Annual, 1994. Proceedings of STATE 94-Annual Conference of the Society for Technology and Teacher Education. (ERIC Document Reproduction Service No. ED392388)

Increasing the Use of Computers in Early Childhood Teacher Education: Psychological Factors and Developmental Appropriateness

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Abstract: This paper examines the case of one urban early childhood teacher educator's increasing use of computers in early childhood (PK-3) curriculum courses, over a period of one year. The paper describes the both the obstacles to such increased computer use and the factors related to this increasing integration of computers. The case is analyzed from the perspective of the early childhood concept of developmental appropriateness, and with respect to the motivation and learning required of the teacher educator.

Data

Data for the case included the teacher educators' reflective journal entries, and descriptions of the integration of computers into class activities and student assignments. Data also included reflections on the course activities in which computers, early childhood software, and net searches were integrated into the course.

Obstacles to Increasing Computer Use

There were numerous obstacles to either any increased utilization of computers for instruction, or increased attention in the courses to issues of computer use in early childhood education. These included obstacles often found in teacher education--the teacher educator's modest computer skills and lack of knowledge of current uses of computers in schools. One more area-specific obstacle was the teacher educator's set of concerns about the developmental appropriateness of computer use in early childhood education. However, the most significant obstacles seem to have been psychological--the teacher educator's ambivalence about increased use of computers, related to various psychological and technical obstacles to using computers in his urban teacher education setting.

Factors Underlying Increased Computer Use

The factors underlying success in increasing computer use included the availability of a second grade teacher who modeled successful use of computers in her classroom. Important in this case was the fact that this teacher's utilization of technology was not overly complex in nature, and seemed within reach of the teacher educator's own level of computer skill. Another factor was the public expectation that the teacher educator would at least give increased computer use a chance, as part of his involvement in a technology grant. An important aspect of this motivating influence was the degree of flexibility afforded the teacher educator in terms of how computers or other technology were expected to be used. A third factor was adequate technical support at the university. However, the most significant factors seem to have been psychological. These included the teacher educators' reinterpretation of three things--his modest use of computers in instruction, his own relationship to technology, and his feelings of teacher efficacy regarding using computers in his teaching.

Analysis and Discussion

From the perspective of early childhood teacher education, this case reveals in greater depth some of the concerns about the developmental appropriateness of computers in classrooms for very young children. However, it balances these concerns with the teacher educator's discovery of evidence of some of the developmental benefits of such computer use.

The case was analyzed using three important aspects of motivation theory--teacher efficacy, self-regulation, and achievement goal theory. In particular, the adoption of a particular alternative perspective on teacher effectiveness helped the teacher educator persist in attempts at increased computer use. This alternative conception, which differs from traditional conceptions of teacher efficacy, was used by the teacher educator for self-regulation of his own motivation and learning. In turn, this alternative perspective of teacher efficacy was only possible by adopting the kind of "learning orientation" discussed in goal theory.

The case study presented here does not represent a case of exemplary computer use in teacher education. Indeed, the discussion of the case stresses the importance that less-than-exemplary models have for the success of any changes in schools and teacher education--whether that change is integration of technology or any other reforms. These points are discussed in light of the research by Zimmerman, Bandura and others on mastery models versus coping models.

Educational Significance

This case is significant because it is one example of what is necessary for widespread increases in the integration of computers and technology into teacher education. That is, it represents one pathway for gradual, incremental increases in computer use among somewhat skeptical teacher educators with only modest technology skills. In doing so, it highlights crucial psychological processes for supporting teacher educators' learning about and use of computers in instruction, especially for teacher educators who are <u>not</u> at the cutting edge of technology use.

References

Ames, C., & Ames, R. (1984). Goal structures and motivation. *Elementary School Journal, 85*(1), 39-52.

Bandura, A. (1997). <u>Self-efficacy: The exercise of control.</u> New York: W. H. Freeman.

Bredekamp, S., & Copple, C. (1997). *Developmentally appropriate practice in early childhood programs* (Rev. ed.). Washington, DC: National Association for the Education of Young Children.

Enochs, L. G., Riggs, I. M., & Ellis, J. D. (1993). The development and partial validation of microcomputer utilization in teaching efficacy beliefs instrument in a science setting. *School Science and Mathematics, 93*(5), 257-263.

Ross, J. (1995). Strategies for enhancing teachers' beliefs in their effectiveness: Research on a school improvement hypothesis. *Teachers College Record, 97*(2), 227-250.

Wolcott, H. (1994). *Transforming qualitative data: Description, analysis, and interpretation.* Thousand Oaks, CA: Sage.

Wheatley, K. F. (2000, April). *Interdependent teaching efficacy: A pivotal concept for understanding and promoting educational reform.* Paper presented at the Annual Meeting of the American Educational Research Association, New Orleans.

From Theory to Practice - Practical Use of Classroom Technology

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Abstract: The 21st Century is here. This brings new opportunities and challenges as businesses seek more technology skills for their future labor force. At the same time groups are looking at the welfare young child and call for reductions of computer time. Teachers find themselves in the middle of the 21st century needs and the issues around standards, assessment and developmental levels of children. This is often interpreted as a need to do an either or approach. The technology pyramid, multi-media planning guide and rubrics demonstrate ways for the teacher to provide for the needs of all of the groups with a balanced approach thus meeting the needs of all learners.

Introduction

In October of 2000 the Alliance for Childhood presented a report called, "Fool's Gold: A Critical Look at Computers in Childhood" (Cordes, 2000). The report takes educators, curriculum developers, and technology advocates to task concerning the use of technology at the elementary school level. The authors mention their concern for the health of our children, the lack of positive personal connections between children and adults, the lack of physical play and activity to which technology contribute, and the lack of stimulation brought about by using technology in the classroom (Cordes, 2000).

Advocates of student use of technology might find these concerns over reactive (Vaille, J., 2000) (Thornburg, 2000). Technology supportive educators would talk about the child's motivation to learn using computers. Educators would answer that if kids are sitting in front of computers six hours a day this report should be focusing on parenting and not on the educational system. (Schmidt, 2000) "Fool's Gold" poses questions which educators, must examine thoroughly if we are to make the educational experience of our students one in which the whole child grows in a proper developmental manner.

Early childhood educators, parents, and technology advocates can meet learning needs and help the young child grow in an appropriate developmental manner while using technology. If that is to happen, however, the adults must continue their learning and understanding in applying the concepts of learning theory to the proper use of technology in the classroom. Learning theories brought to educators by Piaget, Hunter, Bloom, and McCarthy need to be explored and applied if we hope to use technology in a manner that is conducive to constructivist education.

Learners of all ages need experiences that will prepare them for their future. This means different activities and opportunities based on student readiness and abilities. Learning theories developed to assist teachers in the delivery of a curriculum. In 1956, Benjamin Bloom first shared one theory still quoted by educators today. Bloom's Taxonomy of Critical Thinking and Problem Solving focused on the cognitive domain (Allen, 1998). Bloom's Taxonomy placed a ranking on the types of questions and learning opportunities asked of the learner. The lowest level considered factual recall. The difficulty rises with each of the six levels ending with evaluation. To assist the educator in identifying the level or developing questions for a specific level of difficulty collections of verbs provide assistance (Lane, 2000).

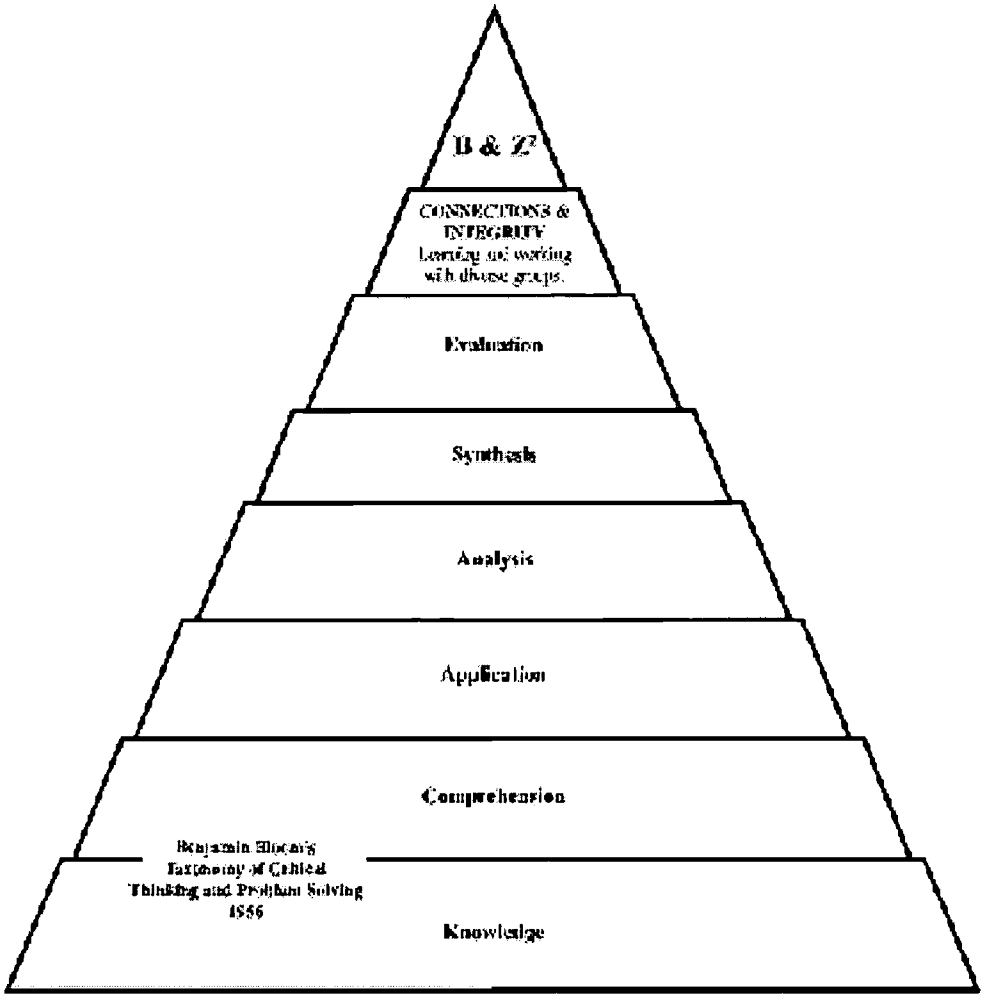

Figure 1, Benjamin Bloom's Taxonomy of Critical Thinking and Problem Solving with B & $Z^{2'}$ added level of Connections and Integrity.

The pyramid represents Bloom's Taxonomy (Burch, Ziegler & Ziegler, 2000). Fig. 1 Common practice in schools places the most time to the lowest levels with decreasing time spent on each of the higher levels. The B & Z^2 pyramid adds another level onto the taxonomy. The "Connections and Integrity" level seeks to identify the thinking needed to understand self and to work with diverse groups.

Madeline Hunter presented a Direct Instruction Model in 1967. Hunter's work eventually became know as ITIP - Instructional Theory Into Practice. Hunter's first model identified 9 steps that may be included in an effective lesson (Allen, 1998). The Hunter Model continues to be identified as a planning tool for developing lesson plans and supervision of instruction (Wolf, 1987).

Efforts such as Bernice McCarthy's 4Mat (Butler et al., 1997) and the Cooperative Teaching Model (Johnson, D., Johnson, R., 2000) are additional educational models seeking to improve learning opportunities for students.

These models, in combination with other education research seek to enhance delivery of instruction with the purpose of providing more effective learning experiences for students. With the advent of the personal computer in 1978, educators faced new opportunities and challenges. Computers continue to accelerate in speed and memory capacity while the cost continues to decline (Yang, 2000). Software continues to change at an alarming rate. Students and teachers can now edit full motion video on a desktop computer with titles and special affects galore (Steinberg, 2000). The Internet moved from a system of connecting through e-mail into a World Wide Web full of information that once only the most learned in the largest cities could access. These factors bring are changing learning opportunities.

Studies are show advances in student learning. Katie Herrick summarizes nine articles and reinforces the importance of using word processing constructively (Herrick, 2000). Experiences such as Australia Quest are taking students across the world to experience and problem solve issues that previously were only viewed by a handful of explores and researchers (Buettner, 2000). The world is expanding for learners of all ages.

Unfortunately, the benefits of these advancements are not enjoyed by all. A "digital divide" exists (Milken, 1998 & Lemke, 1999) that is preventing students from accessing these experiences. The present divide results from lack of access to the technology and the mindset of the teachers in the classroom. The department of labor observed this concern in 1991. The Secretary's Commission on Achieving Necessary Skills (SCANS) called on the American educational system, from pre- school through post-graduate, to attend to the responsibilities graduates assume as workers, parents, and citizens. Asserting that there is more to life than earning a living, SCANS also insisted that the following set of foundation skills and competencies are essential for all in the modern world. (United States Department of Labor, 1992)

Two additional models help show where the students are functioning as they use technology. The Technology Hierarchy, developed by Nancy Sculla, (Sculla, 1999) shows levels of technology use and complexity. The NETS project by International Society for Technology Education (ISTE) identifies levels of competency for students. A Nebraska Department of Education task force aligned Nebraska competencies with the NETS project. Both of these models can be adapted and applied to Blooms taxonomy. Again, the B & Z^2 pyramid adds another level onto the taxonomy. The "Connections and Integrity" level seeks to identify the thinking needed to understand self and to work with diverse groups.
Fig 2
Figure 2. Technology standards for students as developed in 1998 with the Nebraska Student Essential Learnings & Technology (1999) matched to the six levels of Bloom's Taxonomy. At the top of the pyramid is the B & Z 2 level for Connections and Integrity

In a time when groups are concerned about lack of interaction with other children and/or meaningful adults, the Connections and Integrity level becomes of crucial importance. When a person knows who they are, they are more willing to reach out and meet or work with someone else. Integrity is knowing personal values and matching behavior to those values. Integrity is important for students to allow them the understanding that they have something to offer to others and to gain from others. Thus the effort to identify their multiple intelligences and provide them with life skills in the form of a value system such as the Eight Keys of Excellence (DePorter, Reardon, & Singer-Nourie, 1999).

QuickTime™ and a
GIF decompressor
are needed to see this picture.

Connections can occur using technology. E-mail, video-conferencing, web pages and cooperative projects using programs such as iMovie and HyperStudio allow for connections and interactions to occur. Consider one such technology opportunity. Under the direction of Nancy Bellows, Judy Brumbaugh, Tricia Hirschfeld and Kym Lucas, fifth students from York Elementary School, York, Nebraska, created connections each week as the fifth grade students, School News 2000. This 15 minute broadcast featured school events, classes, books, staff members and numerous topics of interest. Along with learning and applying basic skills, the fifth graders problem solved, worked in cooperative groups and extended themselves to apply traditional classroom skills to a real world activity of broadcasting. (Bellows, Brumbaugh, Hirschfeld and Lucas, 2000). Students of all grade levels looked forward to the production and airing of these weekly shows. This simple multimedia activity generated connections and a feeling of community for the entire school. While the computer, VCR, TVs, digital camera and iMovie made this possible, the real success of this activity came from the students identifying and using their skills while connecting with students throughout the school. These types of opportunities empower the learner and prepare them for life in their future.

Activities such as School News 2000 are possible in many schools. Lacking for many teachers are tools to help them plan and manage the development of the multi-media activity and an effective way to assess the final product. Tools such as the multi-media planning guide divide

the project into manageable steps for the student, teacher and parent (Burch, Ziegler & Ziegler, 2000). With dates and check off boxes to track progress. Along with the planning guide are age appropriate rubrics to help the students know what they can strive to accomplish and their product will be measured.

Opportunities to prepare students for their future are a necessity. Congress recently authorized the 21st Century Workforce Commission. In June of 2000, this commission released their findings. Their conclusions began with, " The current and future health of America's 21st Century Economy depends directly on how broadly and how deeply Americans reach a new level of literacy – "21st Century Literacy" – that includes strong academic skills, thinking, reasoning, teamwork skills and proficiency in using technology. Educators have a challenge to move beyond TTWWADI (That's the way we've always done it) syndrome (Jukes, 2000). It is time to prepare students for their future rather than our past. We must look to the developmental needs of the learner. Determine ways appropriate use and selection of technology that move the students up the levels of Bloom's Taxonomy for Critical Thinking and Problem Solving. Finally, we must provide teachers with resources to help them access how they are teaching and what they can do to become a more affective teacher in this 21st century world.

References

Allen, T. (1998). The taxonomy of educational objectives. (On-line). Available: http://www.humboldt.edu/~thal/bloomtax.html.

Allen, T. (1998). An outline of direct instruction. (On-line). Available: http://www.humboldt.edu/~thal/hunter-eei.html.

Bellows, N., Brumbaugh, J., Hirschfeld, T., & Lucas, K., (2000) School news 2000. [Video tape], Available from York Elementary School Media Center, York Elementary School, 1501 Washington Ave., York NE 68467-4700

Buettner, D., (2000) Australia quest. (On-line). Classroom Connect Available: http://quest.classroom.com/australia2000/.

Burch, S., Ziegler, R., & Ziegler, W. (2000, November). Technology and Multiple Intelligences. Paper presented at Nebraska State School Boards Conference, Omaha, NE.

Butler, J., Cheatwood, D., Cramm K., Hewett, K., & Sherrill, C., (1997). Four.....three.....two.....one approach.....with style! (On-line). Available: http://www.cca.cccoes.edu/fsod2/oneapprc.htm.

Cordes, C., & Miller, E., (2000). "Fool's gold: A critical look at computers in childhood." (On-line). Alliance for Childhood. Available: http://www.allianceforchildhood.net/projects/computers/computers_reports.htm.

DePorter, B., Reardon, M., & Singer-Nouire, S., (1999). Quantum teaching – Orchestrating student success. Needham. Heights, MA: Allyn and Bacon

Herrick, K., (2000). Word processing and its effect on the writing process. (On-line). TechLearning, Available: http://www.techlearning.com/db_area/archives/WCE/archives/herrick.htm

Johnson, D.,. Johnson, R.,. & Stanne, M., (2000) Cooperative learning methods: A meta-analysis (On-line). Available: http://www.clcrc.com/pages/cl-methods.html.

Jukes, I., (2ooo, February). New schools for the new millennium. Paper presented at the Educational Technology 2010 – Preparing Learners for the 21st Century Conference, Grand Island, NE.

Lane, C., (2000). Distance learning resource network's technology resource guide. (On-Line). Distance Learning Resource Network's Technology Resource. Available: http://www.dlrn.org/library/dl/guide4.html.

Lemke, C., (1999). Transforming learning through technology – policy roadmaps for the nation's governors, Santa Monica, CA: Milken Exchange on Educational Technology.

Meeder, H., (2000). A Nation of opportunity – Building America's 21st Century Workforce, Washington, DC: U.S. Department of Labor.

Milken Family Foundation, (1998). Digital divide [Video tape], (Available from Milken Family Foundation, 1250 Fourth Street, Fourth Floor, Santa Monica, CA 90401-1353

Schmidt, D., (2000). Quality and balance are key in early childhood technology discussion. Nebraska Educational Technology Association Newsletter, Nov. 2000.

Sculla, N., (1999). Technology hierarchy, [On-Line]. Available: http://www.idecorp.com.

Steinberg, G., (2000). Apple imovie 2.0.1, (On-line) CNET Review, Available: http://www.cnet.com/software/0-6306-8-2810622-2.html?tag=st.sw.6306-8-28010622-1.DIR.6306-8-2810622-2.

Thornburg, D., (2000). Should young children use computers. (On-Line) PBS Teacher Source Available: http://www.pbs.org/teachersource/thornburg/thornburg1000.shtm.

United States Department of Labor (1991). What work requires of schools. A SCANS report for America 2000. Washington D.C.: U.S. Government Printing Office

Vaille, J., (2000). ISTE Responds to alliance for childhood report. (On-Line). Available: http://www.iste.org/news/sep_25_alliance/response.html.

Wolfe, P., (1987). "What the 'Seven-Step Lesson Plan' Isn't," Educational Leadership, pp. 70-71, Feb. 1987. As cited Allen, T. (1998) (On-line). Available: http://www.humboldt.edu/~thal/hunter-eei.html.

Yang, D., (2000). Leaving Moore's Law in the dust Three technologies break the speed barrier, (On-line). U.S. News, Available: http://www.usnews.com/usnews/issue/000710/moore.htm.

GRADUATE & INSERVICE

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The appropriate integration of technology into today's learning environment remains a predominant area of importance within the areas of graduate and inservice. Research focused upon face-to-face, Internet-assisted and Internet-based learning environments has expanded imperative theoretical and application-based discussions. The appropriate and successful integration of technology within the learning environment is the focus of the outstanding articles within this section. The authors offer the latest research and theoretical issues through which the future of face-to-face and distributed learning environments will emerge. For ease of discernment, the following research paper summaries are presented in alphabetical order by the author's surname.

Arango-Montero, Asse, Aughey, Betancourt, Goller, Naranjo, Olmedo, Sanchez and Thirunarayanan examine the initial year of the Master of Science in Urban Education degree program with a specialization in Learning Technologies. A discussion surrounding an overview of the program and student comments is presented.

Braboy and Trivette offer a discussion of a project that aids educational endeavors related to analyzation techniques. This specific project focuses upon analyzing historical documents while focusing upon emotional and intellectual Socratic questioning methods.

Brownell and Brownell present the experiences and reflections associated with the design and development of a graduate-level course entitled EDTL 630 Media Literacy Across the Curriculum. Discussion surrounds the design and development of the scope and sequence for the course, equipment viability and availability and future development of the course.

Burnett, Bonnici, Dresang and Thomas provide information concerning the Web-based opportunities for contextual learning. Their efforts are focused upon school library media specialists.

Cakula focuses upon the Latvian need for inservice professional development opportunities for educators. An examination of the design, development and implementation of an interactive course with Swedish and Latvian educators is presented.

Cheeks presented a summary of program evaluation research surrounding a graduate School Library Media Program. Radical changes in school library media services necessitated the evaluation, which focused upon the elimination of the disparity between job competencies required by the specialists and job competencies within the School Library Media Program.

Civiletti and da Silva analyzed data pertaining to a social-international and constructivist emphasis within the attitudes and pedagogic practices of educators. The Brazilian "Computer Course Applied to Education" was the focus of the study.

Coombs examines the International Society for Technology in Education (ISTE) five-step curriculum standards outline that is focused upon all advanced programs in educational computing and technology. A discussion of each of the five steps suggested by ISTE includes a suggestion for future graduate-level course interpretation.

Cooper and Hirtle call for a reprieve from the disparities between the learning and the technology integration in the K-12 environments. A focus upon the curricular scope and sequence, as well as the course instructional design, is emphasized.

Dailey, McNelis, Struck and Wall address the shortage of secondary special education professional development schools (PDSs) within the professional education of teacher candidates and inservice teachers. A case study of Townson University is presented.

Engel and Sparrow focus upon the online Educational Technology Master's degree program at Florida Gulf Coast University. Further, rationales for decisions made within the program structure, students and program evaluation techniques are discussed.

Ertmer, Johnson and Lane reflect upon a teacher development tool that is designed for scaffolding technology integration within a learning environment. The engagement of educators as well as the inclusive reflective activities facilitates the expansion of the teacher's ability to integrate technology within a learning environment.

Figarella presents a case study of technology integration within elementary-level learning environments. The initial semester of the case study is the focus of the paper.

Fourie explores the world of distance education as it relates to the education of graduate-level teachers who are focused upon electronic information research skills. The author notes that considerable success was achieved for all students, even those who dismissively labeled themselves as "computer illiterate".

Franklin, Duran and Kariuki examine the collaborative use of graduate Instructional Technology students as mentors for inservice elementary educators. A discussion surrounding just-in-time (JIT) learning, professional development opportunities and possible alternative assessment methods are discussed.

Gibson presents a discussion surrounding the impact and results associated with the integration of the ISTE foundation standards within the teacher candidate education program at Wichita State University. An examination of the resulting benefits to the involved entities is also presented.

Goss, Kinslow and Welsh describe the development of a graduate-level teacher certification program for "Teaching and Learning with Technology". The program matrix with NETS-T performance indicators is clearly articulated.

Grandy, Strickland, Sammons and Strickland focuses this study upon the planning, administration and follow-up of a junior high Earth Science Program that focused upon the appropriate and successful integration of technology. Findings from attitude surveys are included.

Gunter presents a study that focused upon the integration of technology within specific classroom curriculum while taking an online graduate-level educational technology course that was focused upon K-12 educators. Quantitative as well as qualitative data were obtained and presented.

Heath, Dimock and Burniske reflect upon a program that provides focused professional development opportunities and information services to teachers and administrators. The focus is to support and focus upon learner success.

Hornung and Bronack describe a partnership that focuses upon the appropriate and successful integration of technology within learning environments for preservice and inservice educators. A discussion surrounding the successful scope, sequence and scheduling of professional development opportunities is emphasized.

How explores innovative aspects associated with the integration of technology into a classroom-based learning environment. The paper revolves around the specific Web site developed by How.

Hughes and Walker discuss a United Kingdom-based professional development scheme that attempts a university response to K-12 educators' needs. The integration of technology as educational aids within the online environment is discussed.

Hung, So and Pow offer an exploration of a project-based approach towards the development of a learner's conceptual framework through a multimedia teaching resource bank. The rationale, concept, description of the four stages of development, outcomes and limitations are presented.

Iran-Nejad, Xu and Venugopalan present a study concerning wholetheme learning through an Internet-based community. The results of the initial aspects of the study are positive and encouraging.

Irvine, Larkin-Hein and Prejean focus upon middle school science classrooms and the learner's construction of knowledge networks. The integration of technology, curricular developments and questionnaire results are shared.

Jenson, Lewis and Smith offer innovative models of professional development opportunities for inservice educators, focused specifically upon instructional technology. The authors move beyond the workshop environment to examine an often-overlooked implementation strategy.

Kennedy presents a framework through which to design professional development course opportunities within the specialization area of Instructional Technology. The focus is on meeting the needs of individual educators.

Kibben, McDonald, Tangney and Holmes explore the first-year teacher candidate's attitudes concerning the role of technology within a classroom environment. Two graduate-level students were focused upon as the case study reviewed the attitudinal shifts over their initial year.

Kitchenham outlines a professional development model concerning the implementation and integration of technology within an educational environment. The preliminary results of an analysis are presented.

Klein-Wohl describes the design of an Internet-based methodology course for inservice educators. The perspective of the paper is from the designer's point of view and includes discussions surrounding the learning potential of the instructional model within the distributed learning environment.

Kortecamp examines qualitative data concerning teacher's perceptions of himself or herself as they proceeded to learn new technologies for implementation within the classroom environment. The emergence of common themes is fully discussed.

Kylama and Silander emphasize the pedagogical revolution that is afoot. The emphasis upon shifting pedagogical practices must begin with the whole school community.

Lambert provides a report of a pilot study findings related to the understanding, conceptual understanding and integration of technology into a teacher's classroom environment. Several strategies that may support the teacher's learning curve are discussed.

Lare offers a qualitative study on the impact of Internet-based learning environments on teacher candidates. The interesting results obtained from the study are discussed.

Lee and Lo present the findings of a study focused upon the integration of instructional technology within a Taiwan Junior High School's English classroom environment. Three major findings are presented.

Lehman, Ertmer, Keck and Steele report on the professional development opportunities focused upon inservice educators. The subject matter of the professional development opportunities is the support towards the problem-based integration of technology within a classroom environment.

McCauley, Porter, Tuinmann and Donkers describe a technology-focused online professional development opportunity program for teachers. This program meets international standards and focuses its efforts on addressing key aspects in ITC training.

Marcovitz describes a pilot project's results concerning teachers who were enrolled in the Multimedia Design in the Classroom course at Loyola College in Maryland. The use of multimedia software applications and Visual Basic for Applications (VBA) were emphasized.

Mullick and Sarner document a two-year period surrounding technology-integrative professional development opportunities. The results indicated that one-year and two-year longitudinal results were positive.

Norton and Farrell reflect upon the question of attitude and classroom practice shifts surrounding the integration of technology within a learning environment. A summary of data is examined from the 1999-2000 time period.

Norton and Schell offer an introspective question associated with many facets of the educational process and then offer results from a research study comparing teacher certification and graduate degree options for teacher educators. Questions surrounding what is the impact of technology, and how many classes must a teacher candidate or inservice teacher encounter to impact the appropriate and successful integration of technology into the classroom environment, are explored.

Papdopoulos, Karamanis, Ioannou and Houssou document the Hellenic Pedagogical Institute's implementation of a teacher-focused professional development opportunity project. The design principles and implementation processes of the project are described.

Reynolds and Morgan explore the inservice teacher's attitudes towards professional development opportunity. Numerous positive and opportunities for further delineation of professional development opportunities are offered.

Sammons reflects upon online asynchronous experiences, as associated with personal cooperative videos. A multimodal distance learning experience is documented.

Shih and McLaughlin present the curricular scope and sequence of the Web-based Masters of Science in Agronomy program at Iowa State University. A discussion of formative evaluations and a summative evaluation of the course content is also presented.

Tamashiro, Reitinger and Lewis provide a discussion surrounding the innovative aspects associated with online teacher education. Program design and instructional methods implemented within the online environment are examined.

Tu and McIsaac offer an innovative analysis of strategies associated with communities of practice that are focused upon the enhancement of mentoring situations. Mentoring models associated with doctoral students are discussed, as well as the Communities of Practice (CoP) model is presented.

Whipp and Schweizer explore strategies that students implement and foster to succeed within an online educational environment. The metacognitive, motivational and social strategies that the students implement towards a successful online course experience are examined.

Williams, Burns and Oostenink describe initiatives surrounding professional development opportunities in which teachers, curriculum specialists and administrators focus upon aspects of an engaging learning environment. Further, the impact of technology is discussed.

Yildirim, Kocak and Kirazci document a Turkish study that focuses upon the teachers' competency associated with technological aspects of the learning environment. Further, recommendations towards successful and effective technology-related professional development opportunities are offered.

Graduate and inservice theoretical discussions and research that impact the learning environment are imperative to the ever-expanding conceptual framework. Pertinent theoretical issues surrounding graduate level and inservice teacher professional development must be carefully considered and are imperative as technologies become more available within learning environments. The authors within this section have presented rigorous research, contemplative theoretical discussions and thoughtful reflections that exemplify the cutting edge of the world of instructional technology.

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Democracy in America: Rural America Takes an Adventure Through the American Mind

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Abstract: The use of electronic primary sources provides authentic pieces of the past for students and teachers alike, but these primary sources pose a new challenge for teachers. Teachers need to be trained in techniques for analyzing historical documents and strategies for raising the intellectual and emotional questions that will draw the students' interest. Misuse of electronic primary sources can create a greater distance between students and learning if the teacher is not prepared in both technology, primary source evaluation, and their integration into the curriculum. The "An Adventure of the American Mind" project is the first to meet this challenge head on.

Introduction: In Experience and Education (1938), Dewey defined education as the process of continuous reconstruction of experience with the purpose of widening and deepening its social content while helping the individual to gain control of the methods involved. Dewey used terms like democracy, interest, and growth without giving them precise meanings. Former North Carolina governor, James Hunt, reflected his opinion of education by arguing that the real function of schooling is to make technologically literate citizens. While many philosophies of education disagree with Hunt, the current demand for technology literacy in the classroom requires teachers to teach beyond the basic skills. Teachers and students must master the three C's: communication, collaboration, and creative problem solving. Education's challenge is to transform all formal institutions of learning, from pre-K through college, to insure that we are preparing students for their future not our past.

(Photo taken from ***American Memory http://www.loc.gov***)

The Project Initiative: A major USA initiative in our field, "An Adventure of the American Mind" continues in rural western North Carolina. In October 1999, the project began recruitment of local area in-service teachers to participate in a graduate-level course in Spring 2000. Collaborating with Mars Hill and Brevard College, Montreat recruited 48 teachers to be the pilot group for the program. The graduate course began in January 2000 with 28 teachers traveling to Montreat College and 20 traveling to Mars Hill College. Laptops were given to each teacher to provide them with the basic technology resources they would need. The teachers were introduced to the Library of Congress' website American Memory, which contains over three million digitized items from the Library's collection, and built interactive lessons using these primary sources and Microsoft PowerPoint and FrontPage.

After completing the course in May, 20 teachers applied for and attended an intensive four-day summer institute at the Library of Congress in June. They were given tours of the rare books, maps, and photograph collection areas, and the archivist met with the teachers and explained the collecting and digitizing process. Those teachers who were unable to attend the institute in Washington, D.C. attended a three-day summer institute at Montreat, Mars Hill, or

Brevard College. The local institute also was made available to teachers not participating in the program and the response was incredible. Sixty-four in-service teachers attended.

The laptops have proven to be a beneficial asset to the project. Most schools in rural western North Carolina are without funding for technology; in some cases, the laptop is the only computer in the school. The graduate course provides the time teachers need to search for online materials and build lessons integrating the highly demanded technology. The project provides technical and curriculum support up to one year for the teachers participating in the project.

Findings: Issues did arise in the first year of the project. Some of the schools had limited Internet access and some had none. To combat this issue, the teachers were introduced to Juno, a free email and Internet access provider, and shown how to use a phone jack to dial in. Another issue was Internet filters. Some schools could not access American Memory due to some of the primary source materials contain politically incorrect terms. This proved to be the most difficult issue to resolve due to this being out of the scope of the project. The project could only suggest to the schools' network administrators that the American Memory site be allowed through or a different filter be used. Most schools were able to gain access to American Memory.

Conclusions: In its second year, the project will be reaching over 300 in-service teachers in 15 counties covering the western part of the state. The pilot group of 48 teachers is in phase two of their participation and are mentoring other teachers from their schools, which is doubling the number of teachers being trained. Two universities, Western Carolina and Furman, have been added to the project; thus, the area being reached has been enlarged to include western South Carolina.

The initiative has brought much excitement to students as the teachers involved have "brought to life" historical, primary resource documents and photos. Teachers and students of all ages have found working with and manipulating these primary resource documents a valuable, authentic learning tool. Through the integration of the laptop with the primary resources, students are making personal connections with their own learning.

References:

Dewey, J. (1938). Experience and Education. Macmillan Publishing Co. New York, N.Y.

After the Pilots: Media Literacy Across the Curriculum

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Abstract: This paper traces experiences in the development of EDTL 630 Media Literacy Across the Curriculum through three pilot offerings. The course is now a part of an M.Ed. in Classroom Technology program and an elective in an M.Ed. in Teaching and Learning program. Differences in the two target populations are identified and discussed. A detailed schedule/activity-set for the course is presented. Equipment availability issues, course coverage, the importance of course topics, and further development, are also covered.

Introduction

Media literacy is well established as a curriculum component in every major English-speaking country in the world, except for the United States. Fortunately, in the last several years, that has begun to change in the U.S. (Tyner, 1998; McBrien, 1999). Media Literacy, defined as the ability to access, analyze, evaluate and produce communication in a variety of forms (Aufderheide & Firestone, 1993) has begun to be addressed in state standards, the KÐ12 classroom, and teacher education. (Kubey and Baker, 1999; Hobbs, 1998).

In an earlier paper (Brownell & Brownell, 2000) we discussed the development of a masterÕs level graduate course, ÒMedia Literacy Across the Curriculum.Ó This paper reports on experiences in teaching three pilot offerings of the course to two different populations.

Two pilot offerings were taught to students enrolled in a MasterÕs of Education in Classroom Technology program. This program, which follows national guidelines developed by the International Society for Technology in Education and adopted by the National Council for Accreditation of Teacher Education, offers teachers the opportunity to gain in-depth knowledge and experience with technology as applied to K-12 education. It also prepares graduates to serve as technology integration specialists in their building or district.

One pilot offering was taught to students in a MasterÕs of Education program in Teaching and Learning. This program is designed to offer teachers an opportunity to gain in-depth understanding of the teaching and learning process, including relevant aspects of modern curriculum studies as well as aspects of various instructional techniques. Students apply this understanding, on a practical basis, to their professional experience in their chosen area of education.

Basic Principles

There are several basic principles and ideas that form the basis for this course. First, regarding media messages, key concepts of media literacy have been identified as follows: 1) All messages are constructions; 2) Messages are representations of social reality; 3) Individuals negotiate meaning by interacting with messages; 4) Messages have economic, political, social and aesthetic purposes; and, 5) Each form of communication has unique characteristics (Hobbs, 1997). Second, the course is taught using the acquisition model of media literacy, wherein media are viewed as opportunities to explore and gain skills to process such constructions in a mindful way, rather than as products that manipulate individuals and groups (Desmond, 1997). Third, a hands-on component to the course is essential so that media literacy concepts can be better understood. By producing media, we can gain a better understanding of the sea of media in which we swim daily. Additionally, producing media is beneficial in that it is a powerful, empowering experience. Fourth, media literacy is viewed as a set of concepts and techniques that are integrated into the existing curriculum - media literacy is not taught as a separate subject. Fifth, such a course offers an important opportunity to view technology beyond just the computer - for example, still cameras, camcorders, stand-alone DVD players, audio recording devices in various formats, etc. Sixth, media literacy allows people to begin to understand the many literacies we actually need to develop to fully function in modern society (Tyner, 1998; Considine and Haley, 1999). Such literacies include alphabetic literacy, visual literacy, technological literacy, and so on. These literacies do not exist, or function, in isolation. Multiliteracies are prevalent and powerful in our society and attention needs to be paid toward developing all aspects of the various literacies needed to function in our society. Seventh, and most important, media literacy offers a new way to see the world. Media, especially in our society, are everywhere, to the point of being such a part of our lives that we rarely notice them, let alone break them apart and analyze them as constructions. This is important also because as increasingly powerful technologies such as the web and digital, interactive TV become more widespread, they need to be understood as the powerful constructions they are. This is essential if they, and other media, are to be useful and used by society, rather than allowing such media to be used for the manipulation of individuals and groups. As participants start to see media as constructions they gain a new view of their daily experiences. This can be a truly amazing, transformative experience.

Since the principles and concepts above include some production experience, the practical issue of equipment must be addressed. Ideally, each participant will have his or her own set of equipment including, but not limited to, a computer and appropriate desktop video software, a digital camcorder with an assortment of associated external microphones, necessary blank media, an instant, film-processing still-camera, and a minidisc or cassette portable recorder. In our case, we were able to obtain five sets of equipment which we use in-class and which are signed out to self-selected groups of students to use outside of class. Fortunately, the learning curve for the iMovie software is not steep and students can readily learn the skills needed with the software in order to apply the concepts covered in class. In the future we intend to both increase the number of sets of equipment available to students for check-out as well as upgrade the computer labs and camcorders, etc., available on-campus.

Experiences: M.Ed. in Classroom Technology Groups

Experiences in the pilot courses offered to students in the M.Ed. in Classroom Technology program have been insightful. Comments such as the following are common from participants: "I now see the news and TV in a new way and see why my students need this content and these skills," and, "I never considered the amount of media I'm exposed to everyday and that they are constructions that can have a wide variety of purposes."

It is obvious to us that participants see the need for the course and for media literacy across the K-12 curriculum. Participants have said, "This is exactly what this program needed!" In one of the two pilots cited here, and in another currently being taught, a number of students who completed the M.Ed. program and graduated, have returned to take this course immediately after graduation. It is also obvious that, especially because of participants' interest and background in technology, the technical skills required are easily learned with little direct instruction in-class. Once the background technical skills and relevant concepts are operative, a process of production, group analysis, and more practice takes the students a long way into successful work with video as stand-alone movies on tape, via the web, and as clips within presentation software. Further, this production aspect complements the other content in the course and opens ever increasing doors to integrating media literacy into the curriculum.

Experiences: M.Ed. in the Teaching and Learning Group

The M.Ed. in Teaching and Learning group provided insights for which we were not prepared. First, albeit they were a self-selected group, their ability and previous experience with technology was at a much higher level than expected. This made the hands-on portion of the course flow effortlessly. They were fluent with technology and applied that fluency to those aspects of the course. Second, their understanding of the scholarship and intellectual underpinnings for media literacy was exemplary, as was their facility (and excitement) in finding ways to integrate media literacy into the curriculum. Upon reflection, given the focus of their M.Ed. in Teaching and Learning program this should have been expected. (Their program is designed to offer an opportunity to gain inÐdepth understanding of the teaching and learning process, including relevant aspects of modern curriculum studies and various instructional techniques.) In any event, it helped to make the course a success for all concerned. The course is now regularly offered as an elective for the M.Ed. in Teaching and Learning program.

Sample Tasks

The following are tasks that are part of the course. Each is briefly annotated to give a sense of the activity. Obviously, students receive written and verbal instruction and clarification for each task prior to commencing work on the given activity. Also, activities are sequenced to occur after relevant content has been covered in the course and all tasks are approached from a media literacy perspective.

Discussion Sheet I & Discussion Sheet II - Each student, per specified criteria, prepares one discussion sheet for each of two chapters in the main text used in the class (currently, Tyner (1998), and then leads (along with a partner if so assigned) a discussion on the content in that chapter. A variation of this activity is sometimes used to conduct the discussion via the group's listserv as either a structured or an unstructured discussion.

TV ad assignment - Each student tapes and presents a current TV ad which is analyzed by the group.

TV analysis assignment - Each student, per specified criteria, analyzes and presents that analysis of a TV show of any type (sitcom, drama, talk show, news, documentary, etc.)

In-camera edited Video/Curriculum Creation - After learning and practicing in-camera editing techniques, participants design an assignment integrated into some area of their current curriculum that incorporates the camcorder and in-camera edited techniques.

iMovie creation #1 and iMovie creation #2 - After a tutorial on iMovie, for #1 students create a movie on a topic of their choice that is shared with and analyzed by the group. For #2, students create an ad using iMovie that is shared with and analyzed by the group.

Web-site analysis - Participants 1) identify and provide an annotated list of web resources on media literacy; and, 2) choose either a self-promotion site, an advocacy site or a city site and analyze the site per media literacy concepts.

Major Project - Students choose an area of the curriculum and devise ways to integrate media literacy concepts and techniques into that area of the curriculum and either: 1) present a product demonstrating such potential integration in the future, with an explanation regarding media literacy concepts; or, 2) present material as in number one, plus present student products from implementation of the integration of media literacy into the existing curriculum.

Sample Schedule

Two of the three pilots have been taught using an alternate week format. In this format, students meet in the evening for five hours once every two weeks throughout the semester (including a brief dinner break). The following detailed schedule is offered to give a feeling for the flow of the course. (Time for each activity is approximate.) It is offered with the usual qualifications: 1) the course is always changing (materials, currency of topics; etc., 2) "flexible purposing," is readily employed, i.e., if something of great educational benefit develops during a session, it is explored and exploited. For example, during the 2000 presidential election, unforeseen but beneficial experiences regarding media literacy were readily followed as they appropriately arose. Also, note that each section had the video equipment available for one-half of the course. Since the course is designed to be approximately 30% hands-on, this presented no problem.

Meeting #1

I. Course Introduction -

Syllabus and Introduce Discussion Sheets/Sign-up for two chapters (30 minutes)
Intro to Media Literacy (70 minutes) - Brief Slide Show plus Renee Hobbs tape
II. In Camera Editing
Terminology/Concepts - slide show (30 minutes)
In-Camera Editing Activity (60 min. - planning/shooting)
In-Camera Editing Activity - Share/discuss/analyze and Equipment Check-out (80 minutes)
Assignment for next class in two weeks - Read Chapters 1 & 2 of Tyner. Locate a place in the curriculum to integrate an in-camera edited assignment - write-up a 1 - 1.5 page description/debriefing questions, shoot the video as if you were the student. Submit in VHS format!

Meeting #2

I. Discussion of Tyner Chapter 1 (30 min.) and Tyner Chapter 2 (30 min.)
II. Submit in-camera edited video assignment/share/analyze/discuss (60 min.)
III. Video Editing on the Computer and Equipment Check-out (2.5 hours)
Assignment for next class in two weeks - Read Chapters 3 & 4 of Tyner. Play with the digital camcorder and the iMovie software and prepare a brief product (your choice) and a 1 - 2 paragraph description of your product. (May be done in pairs and/or one triplet.) Bring your product for the next meeting, on VHS tape!

Meeting #3

I. Discussion of Tyner Chapter 3 (30 min.) Tyner Chapter 4 (30 min.)
II. Share/analyze/discuss iMovie product (60 minutes).
III. Photography -
Still Images - Concepts for Analysis (10 minutes)
Tell a story in images (Use Polaroids) (50 minutes)
Share photographic story/Photography in the Classroom Ideas and Resources (Brainstorm) (30 minutes)
Photography in America - Depth and Perspective (1 hour video)
Assignment - Read Chapters 5 & 6 of Tyner. Create a video ad using iMovie. Generate a shot list, shoot and edit the video. Bring your product for next meeting, on VHS tape!

Meeting #4

I. Discussion of Tyner Chapter 5 (30 min.) Tyner Chapter 6 (30 min.)
II. Share/analyze/discuss iMovie ad creation (45 minutes)
III. Equipment Check-in! (15 min.)
IV. TV in the culture and the classroom
TV viewing survey (30 min.)
TV as Curriculum (Video, handouts and discussion/ resources/activities re/ TV in the classroom - 90 minutes)
Introduce final project assignment (30 minutes)
Assignment for next class in two weeks - Read Chapters 7 & 8 of Tyner. Watch one TV show of one of the following types - sitcom, drama, talk show, news, documentary, or other of your choice, and answer the relevant (supplied) media literacy questions (and others you may generate) and devise one strategy for integrating the show you watched into the curriculum. (Note: Center for Media Literacy, and medial listserv.)

Meeting #5

I. Discussion of Tyner Chapter 7 (30 min.) Tyner Chapter 8 (30 min.)
II. Share TV show assignment (60 min.)
III. Ads and advertising
"The Ad and the Ego" video/discussion (90 min.)
"Production Notes"/discuss OR Analyze current ads activity (60 minutes)

Assignment for next class in two weeks - Read Chapters 9 & 10 of Tyner. Tape one TV ad you either love or hate. Bring the tape (VHS format) to class next week and be prepared to discuss: 1) why you love/hate the ad; and, 2) how you might integrate it into the curriculum. (You may want to look at the "AdCritic" web site or a similar resource for background.)

Meeting #6

I. Discussion of Tyner Chapter 9 (30 min.) Tyner Chapter 10 (30 min.)
II. Share/analyze TV ads (45 minutes)
III. Introduce web site analysis assignment (15 minutes)
IV. "Reading the Movies" Concepts/Activity (150 minutes)
Assignment for next class in two weeks - Complete the web site analysis (from a media literacy perspective) assignment.

Meeting #7

I. Share and discuss the web site analysis (from a media literacy perspective) assignment. (60 minutes)
II. "Reading" the News activity (30 min.)
III. "Reading" the News - video, discussion (90 minutes)
IV. Music Videos and Messages (90 minutes)

Meeting #8

Final Project Presentations/Closure

Conclusion

In consulting with a national figure in media literacy during course development, we were warned that very quickly we would see the need for additional courses in this area. That has been our experience, exactly. In this one particular offering there is always a feeling that more time is needed. (Not uncommon for any instructor in any course!) However, given the positive student response across both programs, the wide range of media literacy topics, the many appropriate opportunities to integrate media literacy into the K-12 curriculum, and the exciting possibilities with digital camcorders, especially when paired with desktop video, we are now investigating the development of a second course in this area. In the current course, with a mix of 70% concepts and 30% hands-on experiences, students gain a firm grasp of the scholarly issues and research supporting media literacy, solid technical skills, and awareness of various opportunities for the practical application of media literacy in the curriculum. One possibility we are considering is flipping course content in a second course to yield a mix of 70% hands-on experiences (developing increased, inÐdepth facility with desktop video) and a 30% concepts portion developing an increased understanding of issues, research, scholarship, and applications in the curriculum. Whatever happens next, we are off to a good start and look forward to more positive experiences with future participants in the existing course.

References

Aufderheide, P. and Firestone, C. (1993). *Media literacy: A report of the national leadership conference on media literacy.* Queenstown, MD: The Aspen Institute.

Brownell, G, and Brownell, N. (2000). Media/Digital literacy in an M.Ed. in Classroom Technology. In *Technology and Teacher Education Annual, 2000,* Willis, Jerry, et. al., editors, Charlottesville, VA: Association for the Advancement of Computing in Education.

Considine, D. and Haley, G. (1999). *Visual messages: Integrating imagery into instruction (second edition).* Englewood, CO: TeacherÕs Ideas Press.

Desmond, R. (1997). Media literacy in the home: Acquisition vs. deficit models In R. Kubey (ed.). *Media literacy in the information age.* (pp. 323-343). New Brunswick, N.J.: Transaction Books.

Hobbs, Renee (1998). The seven great debates in the media literacy movement. *Journal of Communication* Winter, 1998, 16-32.

Hobbs, Renee (1997). Literacy for the information age. In James Flood, Shirley Brice Heath and Diane Lapp (eds.), *Handbook of research on teaching literacy through the communicative and visual arts.* International Reading Association and Macmillan Library Reference: New York.

Kubey, Robert, and Baker, Frank. (1999). Has media literacy found a curricular foothold? *Education Week,* 10/27/99.

McBrien, J. L. (1999). New texts, new tools: An argument for media literacy. *Educational Leadership.* 57(2), 76-79.

Tyner, Kathleen. (1998). *Literacy in a digital world: Teaching and learning in the age of information.* Mahwah, New Jersey: Lawrence Erlbaum Associates, Inc.

Contextual Learning: Learning About Information Technology through Information Technology

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Abstract: The purpose of this institutional session is to acquaint the audience with the opportunities for contextual learning through web-based instruction for school library media specialists by the Florida State University School of Information Studies. It includes a justification of need and an overview of the certificate and degree programs that meet these needs. The web-based interface and tools employed are demonstrated and their pedagogical framework is discussed. Finally, specific examples of the ways that contextual learning principles are incorporated into a sampling of four of the courses included in the program is provided.

Introduction

Contextual learning through web-based instruction for school library media specialists has been a goal of the Florida State University School of Information studies for four years. In this paper, we provide a justification of the need for such an approach, and an overview of the certificate and degree programs that meet this need. The web-based interface and tools used by the School to deliver all of its degree programs are introduced and the pedagogical framework is discussed. Finally, specific examples of the ways that contextual learning principles are incorporated into a sampling of four of the courses included in the program is provided. These courses include the Instructional Role of the Information Specialist, Information Needs of Young Adults, School Media Collection Development and Management, and Design and Production of Network Multimedia. Each course demonstrates a unique approach to incorporating context into pedagogy and learning.

Justification of Need & Overview of Certificates and Degrees

In many areas in the state of Florida, as well as in other parts of the United States, there has been a critical shortage of school media specialists for a number of years. In addition, school media specialists who have been successfully working for years find themselves faced with new opportunities and responsibilities related to the rapidly changing information landscape of the past decade. One solution to meeting the needs of both these groups is to provide learning in context. Recent developments in web-based Internet technology make it possible to support learning about information technology and its use through information technology.

Preparation of the school library media specialist is normally accomplished through the completion of the forty-two hour master's degree in library and information studies. Students may opt for a certificate that requires just thirty credit hours, but do not receive the monetary rewards that many districts provide for those who complete graduate degrees. For those students who currently hold a master's degree in another area, the post-master's specialist in education degree, also thirty credit hours, is an option for preparation that often brings with it the monetary rewards that accompany the completion of an advanced graduate degree.

The Florida State University School of Information Studies has developed web-based distributed learning degree programs to serve certificate, master's and specialist students regardless of their physical location.

The delivery interface has been custom designed and the support tools carefully selected to support contextual learning principles. Students learn about information technology both formally in the two production courses required by the state, and informally through using the technology to support their own learning.

Interface and Support Tools

The interface used to deliver all courses was developed in-house and has been widely recognized both nationally and internationally. The development of the interface included a conscious application of contextual learning principles. At each stage of development, focus group interviews and usability testing were conducted. Informal feedback, in the form of unsolicited email messages, "Tell the Dean" sessions and exit interviews, was also collected. There have been four major revision cycles that have occurred based on the analysis of the formal and informal data.

The current version of the course website makes use of a database backend and ColdFusion technology to power its operations. The interface incorporates HTML frames to create a consistent "window frame" through which students view the course. This window frame includes a set of navigational buttons that enable the student to move easily through the different elements of the course, including the calendar, syllabus, resources, discussions, assignments, announcements, communication, help and home. When the student first logs on to the website, and until s/he acknowledges that the syllabus has been read, the syllabus appears in the main window. Once this acknowledgement has been recorded, the student's primary view of the course is through the course calendar.

Custom-designed support tools support both the students' learning and the faculty's teaching needs. Tools to support two formats of communication—synchronous and asynchronous—are included in the course websites. Synchronous communication is handled through the incorporation of a commercial product known as *ichat,* while asynchronous communication is handled through a home-grown threaded discussion tool originally written in PERL. Discussion boards are organized into three major functional groupings: The Faculty Office, The Technical Discussion Area, General Discussion Area, and Special or Small Group Discussion Areas.

Also integrated into the course websites are tools to support learning assessment. These include the capability to compose, deliver, provide feedback, and automatically grade multiple-choice and true/false tests; track attendance and participation in the synchronous communication sessions; deliver, submit, and grade assignments online; as well as an electronic gradebook that may be maintained throughout the course and enables the student and the instructor to receive both interim and final grade reports. The assessment tools are fully customizable to suit pedagogical styles and objectives.

The most recent developments in the interface relate to support for research. The interface was modified to conduct a delphi study on leadership characteristics in the library and information studies field in 2000. Logging of interaction files, including synchronous and asynchronous communication, has provided the basis for a pilot study on interaction in distance learning that was conducted in 2000. A coding scheme for analyzing the content of these interactions was developed during the pilot and will be incorporated into the website in 2001.

Integration of Contextual Learning in Four Selected Courses

Teaching Information Literacy by Becoming Information Literate: The Instructional Role Context of the Information Specialist

Paul Zurkowski, the president of the Information Industry Association, first used the term "information lliteracy" in 1974 (in Loertscher and Woolls, 1999, p. 1). He described information literates as 'people trained in the application of information resources to their work...They have learned techniques and skills for utilizing the wide range of information tools as well as primary sources in molding information-solutions to their problems." (Zurkowski, 1974, p. 6).

The American Association of School Librarians, in *Information Power: Building Partnerships for Learning* (AASL, 1998) identifies four roles for the school library media information professional: teacher; instructional partner; information specialist; and program specialist. In addition, the organization promotes nine information literacy standards for student learning, with attendant indicators for each standard. By incorporating the use of computer, telecommunication, and graphic technology along with standards for information literacy into each assignment, students learn contextually or by application.

The Instructional Role of the Information Specialist is a course designed to promote the use of a process approach to teaching and learning. The course website directs student attention immediately to the textual course introduction, as well as the Asynchronous Activity Real Audio/Power Point presentation. Using *Information Power* as a course text, and information literacy standards as a theoretical basis for teaching and learning, students are guided through the completion of seven assignments that reflect information literacy standards. All assignments may be submitted electronically directly to the course website, depending upon the presentation format selected by the student as being appropriate to the individual assignment.

In the first assignment, for instance, students are required to complete a survey form in which they provide information relating to previous, current, and hoped for career employment and interest areas. This brief assignment is designed to assist in meeting the instructor's need for information – i.e., the various levels of experience, background, and career direction of class members, in order that course work and assignments can be individualized to the greatest extent possible. Two other assignments direct students to locate, examine and analyze information from a variety of sources and in a variety of formats as a prelude to assignments that follow. Students are directed to web locations, electronic databases, and print resources at which teaching models, instructional models and lesson plans can be found. Students select eight plans or models that are pertinent to their area of interest, and document their selection by means of an annotated bibliography or webography, which is submitted electronically to the course website.

After defining the need for information, determining possible sources for that information, locating and evaluating the information, students then begin to use the information they have located by designing their own teaching unit or instructional model, incorporating information literacy skills into that unit. The completed unit is submitted electronically to the course website. After the unit is evaluated and approved by the instructor, the student then proceeds to deliver or present the teaching unit or model, documenting the delivery either by video taping the presentation and mailing the video tape to the instructor (students are permitted to "send" the video tape via the course website if they have the appropriate technology available) or by creating a Real Audio/Power Point presentation, submitted electronically via the course website. Two additional assignments require that students prepare and present a lecture/demonstration of an electronic database, computer program or other instructional technology, and a lecture/demonstration or written material promoting or publicizing an event or service offered by their institution or organization, using appropriate technology to deliver their presentation to the instructor. Students generally prefer either video tape or Real Audio/Power Point as delivery mechanisms.

By integrating information literacy and technological literacy skills into each assignment, students become adept at locating, preparing and organizing information from a variety of sources for presentation to others. They are encouraged to work collaboratively with subject area specialists (classroom teachers) in the preparation and delivery of the teaching unit or lesson. While assignments are designed for individual student completion, class discussion, or IChats, are frequently organized in small group format to enable students to more easily synthesize, analyze and assess or evaluate the discussion topics (information).

Understanding the Information Needs of Students: The Young Adult Context

Information Needs of Young Adults is a course required for all school media candidates, but the course enrollment includes a variety of others students, including those intending to become library administrators or public library children's specialists. A few students enroll out of personal interest. The course is an overview of the characteristics and the information needs of young adults and the resources and strategies that may assist adults and youth in meeting these needs. Five developmental stages of young adults are taken into consideration in understanding their information needs: intimacy, intellect, independence, identity, and integrity. The course starts with a historical overview of resources, after which four weeks are spent identifying the information needs of young adults ages 12 – 18. The remainder of the course explores resources categorized by both genre and developmental stage to meet the identified needs. Numerous strategies and employed in the course to assist the students to advance their skill in employing technology in the context of learning. Assignments and discussions capitalize on web resources.

Students are asked to read articles about the information needs and resources for young adults. A number of these students are available through a virtual library – consisting of either article for which permission has been sought and granted or links to articles from the reading list that appear in various places on the web. The advantage of reading the articles on the web is that links to other related articles are embedded. The content of the article is greatly enriched because of other sites. For example, a web-based article on graphic novels for teens might link to other bibliographies, conventions, essays, news groups, and reviews; to information on legal issues in graphics publishing; or to critical information on both the art and the business of comics publishing for more than 20 years, all within easy reach of the reader.

Numerous young adult novels and non-fiction books are assigned for reading during the semester. Students submit a read and react on a web-based form that is available for other students to read. Links to these reactions are posted in the windows in the synchronous discussions "rooms," and serve as the basis for group analysis of the readings. Each week there are both small group and large group discussions of the week's readings in chat rooms. To supplement this photos of young adults and interviews with them are posted on the web site, and teens are invited to participate in at least one online session with class members. Interviews by experts in the field of young adult resources are interviewed and visit live chats also. These exercises emphasize using the web as a communication tool.

The mid-term consists of a booktalk by students. Two methods are given for submitting the audio portion of the booktalk. Students may record it on an audiotape and mail it to me or they can send it as an audiofile. Other students are required either to read a written form of the book talk submitted via the web (required of all regardless of the audio format) or to listen to the audio file if it is posted on the web. They meet in groups to discuss and critique the booktalks submitted by others in their group and in the class as a whole. Once again the submissions are posted in the ichat windows (and in the assignment index) for others to read. The web technology allows students to easily see what their classmates have done without endless (and really impossible) paper duplication. The web technology extends the efforts of each class member and makes the teaching of critical evaluation skills easier and more authentic.

The final assignment is to read five books written a winner of the Margaret A. Edwards Award for Young Adult Literature given annually by the Young Adult Library Services Association of the American Library Association and to read literary critiques of their works and to relate biographical information about the authors to their writings. This leads the students into rcsearch using the web, as they turn first to web resources for the listing of the award winners and their books, for the availability of the books in online catalogs to which they have access, for the critical reviews of their books, and for biographical information on their authors. In the course of doing the assignment they hone their searching techniques and their evaluation of resources on the web. Each student writes a summary of his or her paper that is posted for other students to read and discuss during the last night of class. Students are allowed to request electronic copies of their classmates' papers.

School Media Collections in the Information Age: The Collection Development and Management Context

School Collection Development and Management is required for all students seeking school media certification. Many of the class are working either as classroom teachers are in school media centers with out-of-field certification. Occasional other students, particularly those who will work with youth in public libraries or those focusing on collection development and management take the course. The course is an introduction to the principles, policies and applications of collaborative school media management, including the national, state, community and school contexts that affect a media specialist's selection, evaluation, acquisition, access to, and maintenance of resources in a school media program. The assignments in this course are particularly conducive to contextual learning.

The students are asked to sign up for three electronic discussion and news groups during the first month of the course, to monitor them, participate in them only if they have professional questions or items to add (not as a student assignment), and then to prepare an analysis of their experience, including the usefulness to a practicing school media specialists. The first of the three groups is *AASLNews*. This is a read only and only moderately active news sources that comes from the American Association of School Librarians. It is particularly useful for information regarding legislation, grants, conferences, and publications relating to school media center resources. The second is *LM_Net*, a listserv that has more than 12,000 participants involved in school media work. It is available in digest form which I advise the students to use because of the overwhelming nature of the information, much of which relates to collection development and management issues. This is the electronic resource that the students find most useful because of the vast array of professional knowledge on virtually any related topic that is available to them. Most say they plan to continue their subscription. The last source is *Education Week* which using push technology sends a summary of the week's news in education to those who sign up with links to the full text publication and articles of interest. This provides context for the students as they student the many issues affecting collection development in media centers. I also ask the students to explore the AASL site as it has links to curriculum connections and numerous other types of resources.

The other two major assignments relate to the collection development and management policy of the Bellingham Washington Public Schools, an exemplary but not perfect district policy in a state that also offers important guidelines. In one of the assignments, the students focus in on the Instructional Materials Selection Policy of Bellingham and compare it to the American Library Association guidelines, also online at the ALA site, critiquing its inclusion and omission, based on what they have learned in class and from their textbooks, readings, and lectures. The second assignment asks them to look at the extensive collection management document (more than sixty pages if printed) and to analyze it from a number of different angles. Between the time I taught this course in the summer 2000 and in the fall 2000, the Bellingham Public Schools had updated their document, so it is a "living resource" that again brings authentic learning through the web to the students and alerts them to the vast resources available.

Because many students in this class are already somewhat knowledgeable in their topics and many have school experience, asynchronous discussions using a web board feature on the class site allows in depth sharing of professional knowledge. One such assignment asks the students to discuss experiences with or questions about censorship. Part of the discussion has them analyze two of six censorship cases studies in an interactive mode. The second asynchronous assignment asks them to read one research article from *School Library Media Research*, an online research journal, and from *Knowledge Quest* or *School Library Journal* (more practitioner oriented journals) and to discuss them on the web board. There are specific guidelines for the expected form and amount of participation and both discussions last a week and require a culminating "what I learned" statement from the students. Students identify this as one of the most valuable activities of the course. It allows them to capitalize upon the expertise within the class with guidance from what they have learned through the course work. This emphasizes the web as both a source of information and an extraordinary medium for communication. Synchronous discussions are held also.

Mirror to Glass: Reflections the Web as an Information Context

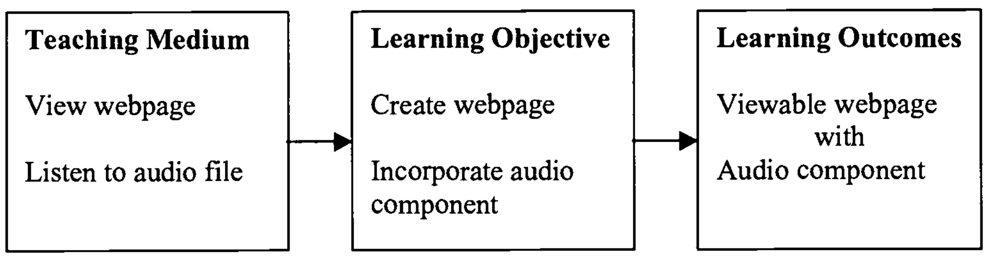
Logging into the Design and Production of Network Multimedia course website, Florida State University, School of Information Studies students are automatically directed to the course calendar. New to the world of designing and developing products for the Web, the students' conceptual understanding is limited to what they see within a web-page document. Thus, their understanding of a web-based multimedia document is surface-level. Unfamiliar with the intricacies of technology such as HTML, Metadata, CGI, graphic and audio files, the webpage at the students' current level of understanding is like a mirror reflecting back an image of the information presented.

Using the web as a teaching medium, enhanced with synchronous and asynchronous communication formats, the students and instructor work in a collaborative fashion to learn web-based multimedia technologies. Two assignments are submitted with students working individually to produce a product. Simultaneous to the learning of the specific technologies presented in the course, students are introduced to the methods of group work processes. Assigned to groups, students work in collaborative teams to design and develop a prototype product for a specific client.

The course commences with HTML as the primary topic. Using visual presentation format such as PowerPoint slides in conjunction with the National Center for Supercomputing Application's Beginner's Guide to HTML website, students embark on an adventure in learning to create web-based documents. Using the hand-tagging method, by the end of the third class session each student has created a simple yet complete webpage. The product is a resume contributing to the development of their professional portfolio.

Building on the foundation of knowledge in HTML, students continue learning technologies that enhance the basic website. Students are introduced to Unix, metadata, CGI, graphics and audio allowing for the incorporation of interactive components that enhance the transfer of information via a web-based document. Particularly interesting is that the teaching of these technologies utilizes the media as a tool of instruction. For example, the audio portion is taught by presenting a webpage produced by the instructor. Students are directed to this website from the Ichat room. Once at the site the students will find a brief textual introduction followed by a button labeled "sound byte." Students proceed to listen to a brief audio lecture of the instructor explaining how to incorporate a sound file into a web document. At the end of the sound byte students are directed to view the code for the webpage and note the HTML code used to present the sound file. Essentially, the instructor is using network multimedia as a vehicle of instruction and as a teaching tool to demonstrate to students how to create network multimedia products.

Figure 1: Utilizing the Media as an Instructional Tool



As a result of the instructional process outlined above, the students' understanding of the technologies used to present information on the web is raised to a level where they know how a webpage is produced. Thus, students move from viewing a webpage as a reflection of content to seeing through the page to the intricacies of multimedia used to present information. In a sense, the webpage becomes transparent allowing for a better understanding of the best methods to use in the provision of information via the Internet.

Conclusions

Each of the four courses examined in this paper: *Instructional Role of the Information Specialist, Information Needs of Young Adults, School Media Collection Development & Management*, and *Design & Production of Network Multimedia*, provides an important role in the successful web-based delivery of contextual learning to school media library specialists. Through participation in this program, potential school media library specialists learn to teach information literacy while becoming information literate themselves; expand their understanding of the information needs of different populations while learning about the information needs of young adults; learn the principles of collection development and management in the dynamic and sometimes volatile context of the World Wide Web; and are empowered to see through the mirrors of information contexts through participating in the process of designing and building information contexts themselves. School media library specialists are empowered to lead their schools into the 21st century through contextual learning on the World Wide Web.

References

American Association of School Librarians. (1998). *Information Power: Building Partnerships for Learning*/prepared by the American Association of school Librarians [and] Association for educational Communications and Technology. Chicago, IL: American Library Association.

Loertscher, D.V. & Woolls, B. (1999). *Information Literacy: A review of the research: A guide for practitioners and researchers*. San Jose, CA: Hi Willow Research and Publishing.

Zurkowski, P.G. (1974). *The information service environment relationships and priorities*. Washington, D.C.: National Commission on Libraries and Information Science.

Information Technologies in Teacher Education

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Abstract: Despite of immense and positive changes in schools in Latvia over the past years, the school situation is still characterized by various difficulties. There is clearly a need for in-service training in a modern, non-soviet and democratic way for teachers in the region. Our idea is making an interactive course including combination of Computer Science Didactics, attitudes – Values and Teaching methods. We have international group of Swedish and Latvian teachers who finished first part of this course.

Introduction

European scientists as one of the general targets in higher education for 21st century set that education should be more elastic to divide resources and reshuffle potential accordingly requisition which related with enlarge area of using new technologies (Teichler, 1996). Social function of education is to organize all-rounded personality development with recent knowledge in determined profession. At that moment exist some objective contradictions:

1) between individual intellectual and physical potential from one side and limited time and economical facilities from other side,
2) between tendency to independence in selection of knowledge and existing professional forms and methods of processing new specialists now,
3) between quantum of information and superficial knowledge from one side and quality of practical acquirement in teacher profession from other side.

Perpetual problem of existing teaching system in former soviet countries is expeditious and factual moral aging of acquired knowledge apropos of dynamic technological and organizational process oriented to west countries. In process of acquiring education go awry combination of values and norms with knowledge, skills and mind development in whole which could ensure harmonic and humane development of personality. The dominant of education content is far from function unity (Karpova, 1994). Many psychologists and educationalists have a view that the information technologies (IT) is the beginning of radical upturn in the education. There is a way for free education and we need to talk about social dimension in learning process using IT.

An information system of Latvian education is currently being implemented in Latvia which will be a substantial input in the improvement of the technical facilities of the school, and training the teachers to work with the new information technologies (IT). As the majority of the presently working teachers have never worked with the computers and on the Internet before, this will be a crucial turning point in the development of education in Latvia. However, short courses for teachers are not effective to implement IT into practice, neither will they help to solve many other problems arising in the schools in connection with IT.

Pedagogical practice constitutes a complex web of relationships between teachers and pupils and the social contexts that they represent. It is through the pedagogical action of teachers and pupils that knowledge development in a wider sense - the development of knowledge, attitudes and values - can come about in these social contexts. Today, there is general agreement in pedagogical research that pedagogical action essentially consists of communication. While many appreciate pedagogical action as an influential process centered on individual knowledge development directed towards a defined goal, others see pedagogical action as communicative. To take a double societal perspective as a starting point means that pedagogical practice can be understood in both perspectives.

The study.

Before starting teacher international in-service course we research the situation in Latvia and Sweden and select general aspects and necessities for both countries. The present situation can be characterized in the following way:

- shortage of teachers in certain subjects;
- incompetence of teachers in using IT;
- lack of new practical teaching methods;
- unequal professional level of teachers in social sciences;
- shortage of teachers with professional pedagogical education.

What knowledge would be most necessary for teachers?

- Psychology (contact, empathy, self-evaluation) because there is a big routine in every day school life.
- Sociology, how society developments are interlinked for evaluating school programs.
- Pedagogics and didactics for teachers with special subject education.
- Teaching methods using new informatic technologies.
- Integrated teaching subjects and selection of useful material which supplement several subjects.
- Interactive teaching, group work and project as a method.
- Analytical and reseach skills, foreign languages (especially English), computer Science basic skills and work with the Internet, use of special computer programs in certain subjects, awareness and use of possibilities.
- Distance education, life long learning through IT, skills and knowledge to non-stop improve one's life quality (physical, mental, moral, material).
- Value orientation (I – the environment – the world), health education (dependence from various drugs, violence, rest).

A teacher in-service course had been developed. Main theories connecting with this course are democratic principles of education (Dewey 1994), philosophical action theory (Kagan 1974, Kvetnoj 1974, Leontjev 1977) and learning theory as a cognitive approach which connected to meaning and content significance of the information, logical arrangement of learning materials – construction theory (Bruner 1961,1990, Piaget 1964, 1976).

Many changing proceses are going in our society and in the result the goal of education becomes not to get a large base of knowledge but more important how to get knowledge. It changes learning process from illustrative and demonstrative (give knowledge in complete form) to problem oriented process (to get knowledge in incomplete form). When knowledge is incomplete, experimentation takes place to discover new knowledge about a particular domain. It means to develop research method in studying process. Research method contains identification of the problem, imagine the solution, realizing the research, evaluating the result and modification it in praxis (McNiff, 1993). This is the purposing process and studying at all is purpose oriented action (Eric de Corte, 1996).

Knowledge become more deeper and developing of skills more larger as a result of group work because students take part in studying process more dynamic. "Collaborative learning makes public our own learning, learning of others and learning of the group" (Manjanovic, 1999, p.130). It is also social and democratic process. Popular is face-to-face group work but it has some failings. Students who want to dominate enchain others to their ideas. International groups better exchange with ideas but they have more problems with language. It is possible to involve students in learning process more productively using the new information technologies and problem solving. The course is focused to using information technologies and problem solving in teacher in-service education.

It is famous to use the computer in learning process as a tool. One of most effective tasks in learning process are research task. It could be used in individual work searching for information, making papers, using practice programs to developing special knowledge and skills. Recent interest to learning suggests the possibility of integrating sociological and psychological approaches around a notion of learning as activity

(Lave and Wenger, 1991). IT here could be not only as information source but also to make interactive collaboration computer – student or student – computer – student (Light, Light, 1999). When students solve a problem together in pairs or small groups they think more effectively than when they work alone (Kruger, 1993). In group work in place to write an essays computer could be use as a tool for produce multi – media presentations involving graphics, sound and text, for produce a resource (as example data file) to be used by other students or for produce a learning pack for their peers. These new goals are too great for any one student to meet, but cooperative work is essential if we are to take opportunities on offer with classroom computers (Underwood, 1999).

Sometimes IT is seen as threatening to cut learning off from the interpersonal context which give it meaning and utility. A counter-argument that might be offered is that the community practices of student life are actually more threatened from other directions. Some of more interesting applications of information technology in education are those involving computer – mediated communication. This technology affords a possible means of providing for interaction between tutors and students and between students themselves (Light, 1999). The term 'co–operative learning' refers to learning environments in which small groups of students work together to achieve a common goal. It can be differ in two ways. The members of the group may choose to take responsibility for sub-tasks and work co-operatively or they may collaborate by working together on all parts of the problem. If the learners collaborate and share in the decision–making process the level of social interaction is necessarily high but it is not so necessary for co-operative workers. There are some positive effects in group work can be that learning under positive contact conditions can facilitate interpersonal relationships which may in turn have positive effects: on student motivation, self–esteem, academic learning. Some collaborative groups may be efficient because of conflict based mechanisms as Piagetian model (Piaget, 1985) and others due to co–constructive processes (Vygotsky, 1978). Howe develops Piagetian model, that when pairs of students differ not only in their predictions about problem outcomes but also in their underlying conceptual understanding then collaboration facilitates learning. O'Malley (O'Malley 1992) has shown that when a computer program makes different predictions then the human learner is more likely to show evidence of conceptual change than they do when that program either makes similar predictions or show similar conceptions. Learning in groups and with peers may be a more effective way of achieving some educational goals that individualize instruction especially in work with computers but here the important role play discussion. There are some researches which explore whether individual learning is facilitated in computer environments by interaction between students whose conceptions differ and whether the benefits are directly attributable to interaction. (Howe et al.,1992, Howe et al., 1995). There are also some concepts that the computer may facilitate productive interaction in a way that other media cannot, by dint of its capacity to maintain a clear task structure and to provide feedback. However, the studies also showed that in some contexts interaction may be of marginal significance, with shared action being crucial instead. It would appear that such context may be defined by a variety of factors, not all of which are readily controllable. It is though that the computer may still have a central role to play. Main factors which determine productivity of learning process are individual differences (gender, ability, thinking and practice skills, needs) and differ of the environment (group size, kind of task and organization, working room and environment, direction of study). Unified model of productive group work might need to establish how to promote shared action in more positive fashion and how to integrate it with interaction. It need to take both social or contextual factors and individual processes of cognition. Social exchange and joint action are crucial to group performance and individual learning, but at the same time individual perceptions, reflections and knowledge are key determinants of how interaction proceeded and what results it has.

In Latvia we have some problems in pedagogical work. Many teachers don't have an updated pedagogical education. There are many teachers that are incompetent in using IT. In some schools there is a negative atmosphere and attitudes between teachers and pupils are not very sound. Several schools have shortage of teachers in certain subjects. There is a lack of new and practically oriented teaching methods. The professional level of schools and teachers is very uneven, especially when it comes to social sciences. Vidzeme University College in serving as the main institution of higher education in the region of Vidzeme in close cooperation with Växjö University (Sweden) and Educator Training Support Center at the Ministry of Education and Science of the Republic of Latvia have decided to build up teacher education at Vidzeme University College. The emphasis is put on in-service training. The best solution for our courses we find the problem-based learning using IT.

Outcomes.

The main target group of students are teachers in primary and secondary schools in the region of Vidzeme and Vaxjo that have a need for updating their skills and knowledge. Each school makes a team of 4 teachers who works together on one problem. In first turn there are 8 Latvian and 5 Sweden schools with their small teams. The teaching staff will be made up of teachers already employed at Vidzeme University College and Växjö University. The first course started in November, 1999. The courses offered at Vidzeme University College was in the initial phase be taught jointly by Latvian and Swedish teachers. That is; during each class there are 1-2 Latvian teacher(s) from each part (values – attitudes, teaching methods, computer didactics) and 1 Swedish teacher in the classroom assisting each other. Such an approach secure an open dialog giving the teachers a very practically oriented way of learning from each other as well as comment on each other's performance following the lectures. The Latvian and Swedish teachers do not teach only groups in Latvia. They do jointly teach groups of Swedish students (teachers wanting to upgrade their skills and knowledge) in the same subjects as taught in Latvia. That is; 1 Swedish teacher and 1 – 2 Latvian teacher(s) assists each other in teaching in classrooms at Växjö University. Such an approach opens up new and more practically oriented ways of educational cooperation based on comparative thinking.

The selection of study programs have been based on several factors:

- written recommendations made by teachers and school directors from schools in all parts of the region of Vidzeme;
- conversations between representatives of Vidzeme University College and Växjö University on the one hand and teachers and school directors at schools in Vidzeme on the other hand made during visits to schools in Vidzemes augstskola;
- observations made by representatives from Vidzeme University College and Växjö University;
- questionnaire conducted among teachers at schools in Vidzeme by teachers at Vidzeme University College.

The language of teaching during the courses in Latvia will be Latvian and English. The language of teaching during the courses in Sweden will be Swedish and English.

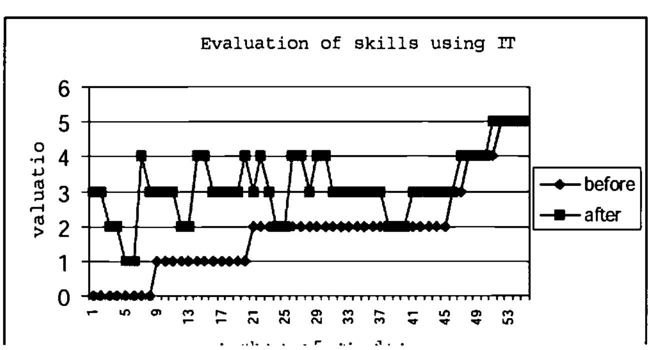
The course have the following content:

Computer Science and Computer Science Didactics develops basic skills using computers and work with Internet, awareness of use of possibilities (use of special computer program in certain subjects, distance education, life long learning through IT).

Attitudes – Values have orientation on values in the society, dilemmas of marked orientation, child and their development, gender equality, democracy, comparative analyses of equal/elite schools, attitudes towards drugs, alcohol and smoking, integration of pupils with social/mental and physical handicaps.

Teaching methods deals with integrated teaching subjects, interactive teaching, subjects methods, selection of material, project as a method and group work, teaching with integration of pupils with social, mental and physical handicaps (dyslexia). These three courses are linked towards each other.

There are 4 face-to-face two-days sessions for each group Latvian and Sweden when students have some lectures, practical works and group work. Two sessions are together for all participants (1 session in Vaxjo and 1 session in Valmiera) when students work in more larger groups – one or two schools from Latvia side and 1 school from Sweden side. All the time teachers organize and help the student learning. During the time behind sessions students cooperate using e-mails and small group work inside the school. Each session have been finished with a questionary about course evaluating, problems and benefits. One of the benefit is



rising teacher's skills using IT.

Table 1: Evaluation of student's skills using IT before the course starting point and after last session.

Conclusion.

As a result of questionaires we found some general inferences which can divide in two groups: student and teacher perspectives.
Student perspectives: 1)positive experience (learning becomes engrossing), 2)develops problem solving skills, critical thinking and cooperative learning, 3)in international groups language problem becomes inconsiderable, 4)if students take part in prepearing process then cooperative tools and communication becomes clearer, 5)students emphasize other learning tools not only books, 6)increase studying quality and versatility.
Teacher perspectives:1)learning process is going in both directions, teacher can teach and learn in the same time, 2)in preparing process all should be planned more detailed, 3)cooperating using IT shoud be test in various directions.
Vidzeme University College and Växjö University are open for cooperation with other universities; especially with existing universities and colleges involved in the two institutions' Nordplus and other European networks.

References

Bruner, J. S. (1961). *The act of discovery.* (pp 21 – 32) Harward Educational Review, 31.

Bruner, J., Wood, D., Ross, G. (1976). *The role of tutoring in problem – solving* (pp 89 – 100) Journal of child psychology and psihiatry 17.

Bruner, Jerome S. (1990). *Acts of meaning.* Cambridge, MA. Harvard University Press.

Dewey, John (1994). *The democratic conception in education* Chapter 7 of Dewey's classic *Democracy in Education*, New York: Macmillan. 1916 , HTML markup copyright 1994 ILT Digital Classics.

Erik de Corte (1996). *New Perspectives of Learning and Teaching in Higher Education* In Arnold Burgen (Ed.), *Goals and Purposes of Higher Education in the 21st Century.* (pp.112 – 132). Jessica Kingley Publishers, London.

Howe C., Tolmie A., Anderson A. and Mackenzie M. (1992). *Conceptual knowledge in physics: the role of group interaction in computer-supported teaching* (pp.161-183). Learning and Instruction 2.

Howe C., Tolmie A., Mackenzie M. (1995). *Computer support for the collaborative learning of physics concepts;*, in V. O'Malley (Ed.*), Computer - supported Collaborative Learning,* Berlin: Springer Verlag.

Karpova, A. (1994). *Personality and individual style.*(latv.) Riga. Monograph..

Kruger, A. C. (1993). *Peer collaboration: conflict, co-operation or both?* (pp 165 – 182). Social Devepment 2.

Lave, J., Wenger, E. (1991). *Situated Learning: Legitimate Peripheral Participation.* New York: Cambridge University Press.

Light, Paul, Light, Viviene (1999). *Analysing asynchronous learning interactions. Computer – mediated* *communication in a conventional undergraduate setting.* In Karen Littleton, Paul Light (Ed.), *Learning with computers: analysing productive interaction* (pp 162 – 177). Routledge, Great Britain, USA.

Manjanovic, O. (1999). *Learning and teaching in a synchronous collaborative environment.*IN Lewis (Ed.), *Journal of Computer – assisted Learning* (pp 129 – 138), vol 15, n 2, june 1999.

McNiff, Jean (1993). *Teaching as learning an action research approach.* London Routledge.

O'Malley, C. (1992) *Designing computer systems to support peer learning.* (pp. 339 – 352) European Journal of Psychology of Education 7.

Piaget, J. (1964). *"Three Lectures."In Piaget Rediscovered.* In R.E. Ripple and U.N. Rockcastle (Ed.), Ithaca N.Y: Cornell University Press.

Piaget, J. (1976) *The Affective Unconscious and the Cognitive Unsconscious.* In B. Inhelder and Harold H. Chipman (Ed.), *Piaget and His School* (pp 63 – 71). A Reader in Developmental Psychology. New York Heidelberg Berlin Springer – Verlag

Piaget, J. (1976). *Piaget's theory.* In B. Inhelder and Harold H. Chipman (Ed.), *Piaget and His School* (pp.11-23). A Reader in Developmental Psychology. New York Heidelberg Berlin Springer – Verlag.

Piaget, J.(1985). *The Equilibration of Cognitive Structures.* Chicago, University of Chicago Press.

Teichler, Ulrich(1996). *Higher Education and New Socio – Economic Challenges in Europe* In Arnold Burgen (Ed.), *Goals and Purposes of Higher Education in the 21st Century* (pp. 96 – 111) Jessica Kingley Publishers, London.

Underwood, Jean, Underwood, Geoffrey (1999). ***Task effects on co-operative and collaborative learning with computers.*** In Karen Littleton, Paul Light (Ed.), *Learning with computers: analysing productive interaction* (pp.*10-23)* Routledge, Great Britain, USA.

Vygotsky L (1978). *Mind in Society: The Development of Higher Psychological Processes.* Cambridge, MA: Harvard University Press.

REFORM IN GRADUATE SCHOOL TECHNOLOGY PROGRAMS

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Abstract: This paper presented a summary of research that was collected over a two-year period for the purpose of evaluating a graduate School Library Media Program. Reform in professional education programs that train school library media specialists provides opportunities to eliminate the disparity between job competencies taught and job competencies required by school library media specialists in their jobs. Because school library media services radically changed its emphasis at the end of the second millennium, from focusing on resources to students to creating a community of lifelong learners, it is essential that professional programs that train school library media specialists keep pace with current job demands. Program evaluation that lead to a redesign model which prepares graduate students for their roles as leaders and directors in today's technology-centered schools was needed.

Introduction

The changes that have occurred in society and the pervasiveness of technology during the past decade have resulted in massive changes in education and school library media programs. The functions of school library media specialists have been influenced by an emphasis on students and their learning. K-12 students look to their school for the content of knowledge and ways of accessing it made possible by advances in information technology. The American Association of School Librarians and the Association of Educational Communications and Technology advocated the creation of a community of lifelong learners that utilizes information literacy – understanding how to access and use information-- as the core element for achieving lifelong learners. Their model, *Information Power*, identifies three elements needed in library media programs: 1) learning and teaching; 2) information access and delivery; and 3) program administration (1998).

In a 1995 study (Karp), competencies needed by media specialists in media centers were summarized. Curriculum reform involved a systematic process of evaluation and redesign, which included an examination of the catalyst for change, an instructional model used to collect information on the existing program, data analysis and curriculum construction. The standards recognized nationally for school library media programs are *Information Power*. The current edition of *Information Power* (1998) identifies three major elements of the library media program reflective in the library media specialist's role: learning and teaching, information access and delivery and program administration. Included in Information Power is the Information Literacy Standards for Student Learning and serves as the foundation for effective library media programs. These Standards firmly establish the library media specialist as an essential partner in fostering student learning. The role of the professional is one involving collaboration, leadership and technology—the unifying themes for partnerships in the information age (Maney, 1998).

The question that we asked ourselves was to what extent was our professional program preparing our graduates to assume the partnership roles in learning that *Information Power: Building Partnerships for Learning* identified? Woodruff (1994) suggested that school library media specialists who had been out of school for longer periods of time than recent graduates needed more up-to-date competencies on the job more often. Were we producing graduates who could fulfill the role of partner in teaching and learning, information access and delivery and program administration? Where in our program could we document authentic experiences that would allow students to observe and model the necessary knowledge, skills and abilities?

The research described in this paper sets out to evaluate our current program using a collaborative perspective. It further details the methods used to collect and analyze data from our major stakeholders throughout the state. And finally it presents a curriculum design model for our school library media program that will support our national and state standards, and therefore provide the foundation for building and sustaining partnerships for learning.

Background of the Study

The Graduate Program in School Library Media is currently the largest provider of certified school library media specialists in the state. The program attracted excellent student graduates who now serve as leaders in their schools, districts, and in the state. Because the program began in 1974 and had not undergone systematic revision, this evaluation was warranted. New courses have been however, instructional design principles have not been applied across the board. A total redesign was needed to meet the needs of school library media leaders for the 21st century. The program needs to provide the foundational, technical and instructional knowledge that graduates will need to continue to be leaders across the state. Based upon the model recommended, graduates will be able to effectively shape schools for the next generation of students in K-12 settings.

The goal of this project was to evaluate the current graduate program in School Library Media and to revise it based upon evidence from the data collected. To accomplish this goal several steps had to be undertaken: 1) an analysis of the current program; 2) data collection from the primary stakeholders reflecting their job performance of SLM specialists; 3) an analysis of the data; 4) a re-evaluation of the program in light of the data analysis; 5) implementation of recommendations as a redesign of the curriculum.

Research Methods

There are early indications that establishing collaborative teams can have great potential for affecting change in the way we introduce innovation to the system (Wagner, 1998). To begin the process of evaluation of the program, faculty in the Instructional Technology Program examined the objectives of each course and identified *The Information Literacy Standards for Student Learning*, which were evident. These standards were promoted in course syllabi, official documents and the faculty/college web sites, along with the core standards of other departments (Wolcott, et al. 2000). This process was completed during our preparation for NCATE 2000 accreditation.

The next step was to seek the expertise assistance of an instructional developer who provided guidance in instrument development and selection, data collection samples, and data analysis. The instructional designer tested and validated the Holland Priorities Model (HPM) Instrument (Holland, 1996) to identify specific workplace abilities performed by school library media specialists.

Three major stakeholder groups who benefit from the knowledge, skills and abilities of job competencies performed by school library media specialists were identified as samples for administering our instrument. They included: principals from school systems who hire our graduates, school library media supervisors who train, manage and evaluate our graduates, and our graduates themselves who have studied, graduated and have accepted professional positions as school library media specialists across the state.

The first sample consisted of school library supervisors who have the primary responsibility of providing leadership for school libraries across the state. Their expertise and reputation within the field made them primary candidates to serve as panel members of the School Library Media program design advisory committee.
They were informed that our goal was to totally redesign our program. The instructional designer served as facilitator for the sessions because she was not known to any of the panel members and could be less subjective in her presentation.

They were invited to our campus to spend a day meeting with our team of investigators. The first task assigned to these experts was identifying workplace abilities and skills exhibited by current employees in school library media centers. This was an individual activity performed by each participant. This activity was followed by a briefing provided by each panel member based upon his or her responses on the *HPM Workplace Abilities Instrument* (1996). This activity was followed by the identification of topics and issues that are apparent in school library media programs and services. Two other surveys were administered and generated data: a *Workplace Attributes Survey* and a *Grass Roots Panel Identification Survey*. These surveys allowed the panel to list attributes they had observed performed by media specialists as well as to identify outstanding administrators who have collaborated with school media specialists and could provide another perspective on the job competencies performed by media specialists. All of these instruments provided qualitative data that was analyzed in the study.

The second sample included graduates of the program (alumni) who are now practicing school library media specialists in K-12 settings across the state. This sample provided an insider's perspective on the program that reflected knowledge, skills and abilities gained while in the program. The same data collection format that was used for the first panel was also used here.

The final sample was made up of superintendents, principals, assistant principals and supervisors from across the state. The results of a study reported by Wolcott (1999) concluded that pre-service teachers place more emphasis on those functions associated with information access and delivery than those related to learning and teaching. Veltze (1992) suggested that programs that prepare principals should include information on school library media programs in order to change negative attitudes of principals concerning libraries. This sample was selected because of their participation in the Maryland Technology Academy, Summer 2000 program, and their support and interest in technology in schools and libraries. The same procedure used on the two previous samples was used here.

At the conclusion of the session each panel member provided an evaluation of the session. They were asked the following questions: 1) How would you rate the value and quality of the session? 2) What are your ideas on how the session could have been of higher value/quality? 3) What was the most valuable or important aspect of the session? 4) What would you say was the least valuable or important aspect of the session? 5) What are your ideas on how we could better match students' abilities with workplace needs? 6) Would you want to be involved in future initiatives with our institution?

Discussion

The responses from the HMP Workplace Abilities Instrument are currently being analyzed using Microsoft Excel software to determine the abilities, which had the highest priority among all panel members. The topics and issues are being analyzed to determine commonalities that may suggest priority competencies, which should be included in the program. These topics and issues may also suggest units of instruction that should be added to courses or new courses that will need to be designed to meet workplace demands and/or national standards.

Based upon the analysis of this data, the current program will be evaluated to determine what abilities and skills are evident in current course offerings. Courses, which are not currently providing these abilities and skills, will be targeted for deletion and revision. Topics and issues will be identified as a method of determining what new topics should be included in the curriculum as well as those that were not identified as relevant. From this evaluation a new program model will be recommended, developed and implemented.

References

AASL & AECT (1998). Information power. Chicago: AASL.

Holland, Gloria (1996). HPM Workplace Abilities Instrument. Baltimore, MD.

Karp, Rashelle S. and Allen, Tonya (1995). Education for leadership: a survey of the literature, 1988-1995. *Education Libraries*. v 19 n3 p. 13-25.

Maney, J. et al. (1998). Using telecommunity to develop a K-16 approach to education technology adoption. Proceedings: SITE '98: Society for Information Technology & Teacher Education International Conference. 9th Washington, DC: march 10-14, 1998.

Veltze, Linda (1992). School library media program information in the principalship preparation program. *School Library Media Annual (SLMA)* v10 p.129-34.

Wagner, M. (1998). Change as collaborative inquiry: A "constructivist" methodology for reinventing schools. *Phi Delta Kappan*, 79 (7), p. 512-517.

Wolcott, Linda L. (1999). Assessing per-service teachers' beliefs about the role of the library media specialist. In: Unleash the poserl knowledge – technology – diversity: papers presented at the third international forum on research in school librarianship, annual conference of the international association of school librarianship (IASL) (28th, Birmingham, AL, November 10-14, 1999).

Woodruff, Laura C. (1994). *Assessments by selected school library media specialists of required job competencies as compared to learned competencies.* Dissertation. Michigan: Wayne State University.

Brazilian National Computer Program for Education and its Contribution to a Constructivist Educational Process

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Abstract: The current study aimed to evaluate the 'Computer Course Applied to Education' addressed to teachers from Brazilian public schools and offered by PROINFO (National Computer Program for Education). The analysis was developed through a case study model and the used research technique was 'Illuminative Evaluation' (Parlett, 1990). Three categories (Cooperative work, Autonomy and Suitability) and their indicators were separately observed and evaluated throughout the three stages of the course. The analysis of frequency evolution throughout the course demonstrated a progressive rise of category occurrence. "Cooperative work" was identified in 75% initial observations and 91.6%, towards the end. The same happened to "Autonomy", increasing from 59% to 91.6%, and "Course suitability", from 70.3% to 94.4%. Through the analyzed data, it was attested that the educational computer course offered by PROINFO in NTE II/RJ could stimulate the adoption of a social-interact ional and constructivist attitude by the teachers, concerning their pedagogic practice.

Introduction

The current study aimed to evaluate the 'Computer Course Applied to Education' addressed to teachers from public schools and offered by PROINFO (National Computer Program for Education), attempting to promote a social/interact ional and constructivist teaching-learning attitude.

PROINFO intends to begin a process of generalizing the use of technology in the Brazilian public school system. In order to assure that the significant sum invested will be efficiently applied, it is necessary to emphasize human training that comes before hardware installation. Demanding physical structure and technical support for running the equipment are also required.

The training of public school teachers in Brazil has happened through NETs (Educational Technology Nucleus), which are decentralized structures to support the process of computer implementation with their basic functions described in the principles of PROINFO.

A profile of how a teacher, trained by the NETs, should be was defined as: autonomous; cooperative; creative and critical; committed to constant learning; more concerned in teaching the students how to learn than merely taking care of didactic matters; engaged in forming individuals prepared to deal with the complexity of taking decisions and the consequent responsibility; able to establish a pleasant relationship with interchange practice (Ministério da Educação e do Desporto/ Secretaria de Educação a Distância , 1997, p.12). These goals are based on theoretical constructivist and social-interact ional preconceptions, assuming that if a teacher can experience these concepts during his/her formation, it will enable him/her to incorporate them in education praxis.

According to Piaget, knowledge cannot be conceived as a predetermined matter since birth (innatism), neither as the result of simple records of perceptions and information (emmpirism). It results from actions and the interplay between the subject and the surrounding environment. Knowledge is a construction that begins during childhood, through the interactions between the subject and what he/she wonders about, both from the physical and cultural world.

Therefore, knowledge is never a passive copy of reality. Intelligence develops through action and the teacher should promote and nourish this progress by the creation of suitable opportunities, and not by teaching methods that tells you what to do and learn. Knowledge results from an inter-relation between the subject that knows and what is been investigated (Macedo, 1994).

There is an active subject, during all ages of life, who searches to know and comprehend the surroundings. Nevertheless it does not happen immediately, through simple contact with the objects. Its possibilities come from what Piaget called of assimilation or action (agitate, suck or rock) schemes; or even mental operations (gather, separate, classify, establish relations), which are actions as well but take place in the mental plane.

Piaget classified as accommodation the mechanism of rising or modifying of an assimilation scheme. The assimilation and accommodation contents will vary during the process of cognitive development, however the intelligent activity is always an active and organized process of adding what is new to what have been already built up, and vice-versa.

On the other hand, the adapting process is completed by successive approaches, connecting assimilations and accommodations. After each adaptation, the new assimilated scheme becomes structured and available for the subject to accomplish other accommodations and, so on.

The central concept of constructivist theory, called the "balancing process", is what promotes this movement.

Facing a challenge, an incentive, a lack in the knowledge, the subject becomes intellectually uneven, gets curious, motivated and, through assimilations and accommodations, tries to establish a dynamic balance for it is achieved by physical and/or mental actions (Piaget, 1990).

According to Vygotsky, we are able to identify three central ideas: (a) the psychological processes have their origin in social processes; (b) the mental process may only be understood through the comprehension of the used mediators; (c) the belief in the genetic or evolutionary method.

It is important to remark that the author does not study the human development separated from its social-interaction's environment. Therefore he integrates social, semiotics and psychological phenomena in one concept. Besides, he accomplishes the analysis of the origins and the process that leads to a determined subject state, which is always dynamic.

Vygotsky remarks the complex transformations that structure human development such as appropriation and transformation of culture and defines the individual ontogenesis as a sequence of important events that happen simultaneously and as a result of social life. Throughout the process, the main concern is to explain the psychological phenomenons as consequences of genetic changes during child development, and therefore considering social environment and culture as foundations. According to the social-interaction's perspective, child development process is placed on the interface (border, boundaries) and convergence of cultural and maturing processes existent in this development, as the subject psychological system becomes the environment where biological adaptations turn to social relations. The individual is born in a cultural context historically structured, with artificially incentive meanings and complex social relations that mediate the active development during interactions. Vygotsky states that subject development is the product of social institutions and educational systems, such as family, school, church, which help to elaborate his/her ideas/thoughts and discover the meaning of somebody's actions and his/her own.

People generally adopt the rule that learning should be even with the evolutionary level of the child, and in order to do so, several stages are established, for reading, writing, etc. There is also the supposition that the child's capacity does not go beyond of what he/she is able of doing by him/herself. However, Vygotsky says that, if we want to check the relations between the evolutionary process and the learning abilities, we must define at least two evolutionary levels: the "real development level", or the *"development level of child mental functions, established as the result of determined finished evolutionary cycles"*(Vygotsky, 1998, p.131), or in other words, what the child can do all by him/herself; and a second evolutionary level, the "potential development level", which is formed by the activities that the child can achieve only if helped.

Generally, tests that indicate child mental age relate to the real level, while Vygotsky affirms that what children are able of doing with the help of others may be more significant to their mental development than what they can do by themselves.

After establishing the two evolutionary levels, Vygotsky defines the "proximal development zone" as the distance between the real development level and the potential development level (determined by solving a problem helped by an adult or a more capable classmate).

While the real development level defines functions that are already mature, or the final products of development, the proximal development zone defines the "unripe" ones, the functions that are becoming mature and that will be completely structured in the future.

According to Vygotsky's theory, the mental development level of a person can only be determined if the two development levels are considered and cleared up: the real and the potential. Consequently, both the conception of comparing the development level and the learning process, and the idea that only what the child is able of doing by him/herself is indicative of mental capacity are denied.

The concept of proximal development zone must be highlighted as a significant intellectual tool, which allows the comprehension of personal inner development and also predictions of some functions that will be mature in the future. It is a conception capable of improving the use of diagnosis of mental development in educational problems.

We have arrived to the conclusion that, to Vygotsky, the *good learning process is the one that precedes the development* (Vygotsky, 1998, p.92), meaning that, evolutionary processes are not similar to learning processes, but the evolutionary process is stimulated by the learning one, which turns gradually into development. That is why internalization is the key-concept in Vygotsky's theory, which means that for a person to achieve his/her individual goals, it is necessary to go through a learning process that must be internalized. Therefore, the instruction on the proximal development zone stimulates the child's activity, prompting the whole development processes, which, after internalized, change the functions that the child is able to do by his/herself.

Based on the theoretical conceptions of these two authors, it is assumed that the students learn and develop as they elaborate suitable meanings about the contents of the school subjects. This construction includes the student active contribution; his/her availability and previous knowledge, taking place in an interactive context, in which the teacher acts as a guide, a mediator between the child and the culture. The success of the learning process will strongly depend on this mediation. The learning process is focused on relevant contents and also related to the student context and routine, considering that he/she has a previous knowledge, result of one's experience, which will be enriched with new contents.

The pedagogic praxis should then stimulate the student to product and think about his productions. Instead of answers, the teacher should propose questions that promote the student construction of his/her knowledge, experimenting and registering the results. The role of the teacher should be of a challenger and stimulator of new discovers instead of mere knowledge provider. It is not expected from the teacher to know all the answers, but to suggest ways to find them.

The challenge of rethinking the role of the teacher is related to redefining the computer role as a pedagogic device/tool, as an addition to create an environment that provides knowledge construction and creative activity of students and teachers.

Based on these indicators, we can state that changing the pedagogic practice depends on continued schooling (academic qualification), as well as on an interdisciplinary perspective in qualification services offered to educators. Through this new profile, the teacher will help the students to be creator agents, capable of abandoning passivity, not acting like simple knowledge receivers.

The academic qualification of the teacher should provide conditions for him/her to construct his/her own knowledge about computer techniques, to understand why and how integrate these methods to education practice and to overcome administrative and pedagogic matters. This practice promotes a transition from a fragmented school system to an integrationist approach of the contents, focused to finding solutions to specific problems relevant to the students, raising their interest. Finally, there should be conditions for the teacher to know how to contextually situate what was learned and experienced during his/her academic qualification to classroom reality, making the student demands and the pedagogic objectives of the teacher more compatible.

Considering how relevant and widespread PROINFO has become, it is really eminent to evaluate its results, verifying the attitude of the trained teachers.

Method

The simple consisted of eight public school teachers from the city of Rio de Janeiro, selected to be trained by the 'Computer Course Applied to Education', offered by NET II/RJ. There were teachers of different subjects in the class, promoting interdisciplinary.

The analysis was developed through a case study model and the used research technique was 'Illuminative Evaluation' (Parlett, 1990).

The procedure had the following stages: (I) "Immersion": the initial part, when the observer-analyzer immerses in the environment to be evaluated with two objectives: (a) acknowledge the different aspects and (b) obtain initial data for future indicators of changes that the program might promote; (II) "Dive": the collected indicators are now analyzed and verified their occurrence through behavior manifestations, called "impact evidences"; (III) "Triangulating": the information data, collected differently by the observers are then confronted.

Results

The data gathering and its organization occurred as it follows: (a) all indicators were registered; (b) indicators were grouped according to their nature (cooperative work, autonomy, course viability); (c) specification of "impact evidences"; (d) a table demonstrating the students performance; (e) analysis and discussion of the results.

The three categories and their indicators were separately observed and evaluated throughout the three stages of the course (40 hour length each).

Category I - Cooperative Work

It was detected when the group became united and active through sharing and participation. A few indicators were evaluated: (a) appreciation of group work; (b) student/student relationship; (c) appreciation of work in pairs.

Concerning "appreciation of group work", some small problems were observed right in the beginning but they were overcome and replaced by cooperation, respect and participation.

The "student/student relationship" showed that the pairs were quickly drawn. However, these pairs became stable which made the interchange of elements more difficult. Trading partners would allow a better interplay, although the stable pairs did not prevent the occurrence of interpersonal relationship involving the entire group.

A positive aspect of the indicator "appreciation of work in pairs" was the acceptance of challenges proposed by the other partner. Even if an element knew more than the other, it did not promote competition. On the contrary, it improved, enriched their work, acting on their 'Proximal Development Zone' (Vygotsky, 1998).

Category II - Autonomy

The indicators were (a) solving problems individually; (b) solving problems in pairs; (c) critical ability; (d) creation through *Logo*; (e) construction of texts.

Relating to the two first indicators, the group was able to solve their problems, both individually and with a partner, creating alternatives to figure out some questions, gather and analyze information, besides discussing suggestions brought up by the instructors.

According to Piaget (1977), in order to overcome heteronomy, which means acting or judging something without questioning its values and principles, a person needs to be encouraged to develop his/her own values. Concerning critical ability, it was observed that the teachers had the chance to gather, organize and evaluate relevant information, struggling to reach autonomy.

The indicator "creation through *Logo*" demonstrated that the childlike atmosphere, involved in this kind of activity, promoted some creative moments. Playing with the turtle, for instance, eased the learning process and the project construction, turning the natural fear to make mistakes into a feeling of challenge. The students' growth may be verified through the recorded programs, in which they were gradually able to create sophisticated drawings from rough sketches. The whole creative process that preceded the final product was even more pertinent to the project. According to Piaget, the main focus should be the action of discovering and thus the process much more valuable than the product.

"Text construction" showed that, through the discussions of different material, the students could relate what was being read to their pedagogic practice, improving the texts written by the group.

Category III - Course Viability

Three indicators were drawn: (a) suitability to constructivist principles; (b) acceptance of course proposal by the student-teachers; (c) gradual learning of the material.

In relation to "suitability to constructivist principles", the course allowed the students to evaluate the role of "errors" in the teaching-learning dynamics. It seems that a teacher's profile generally follows a pattern of strict responsibility, not admitting "attempts" or "mistakes". As errors were diagnosed and new tracks to the right answer were revealed, the belief of an autonomous an active subject was then adopted.

The indicator "acceptance of course proposal by the student-teachers" had a rather satisfactory response. Despite their initial ignorance of the course proposal, the students got really engaged in the activities, making suggestions and enriching their work.

Through "gradual learning of the material", it was observed that there was a substantial knowledge acquisition by the students, considering that most of them had never dealt with computers. Nevertheless, by the end of the course, they were able to understand the new language and could develop computer activities in a much more autonomous way.

During each stage of the course, eight teachers were observed through eleven indicators previously described (three from "Cooperative work" category, five from "Autonomy" and three from "Course Suitability"). The indicators were then evaluated according to their frequency: "often" (3), "not often" (1) and "never" (0). The performance of the teachers was calculated through pondered sum of each indicator which could reach a maximum of 24 scores, if all teachers received "often". Categories such as "Cooperative work" and "Course suitability" could have a maximum of 72 (24 x 3) scores and "Autonomy", a maximum of 120 (24 x 5). The following step was to calculate the percentage of the group for each category.

The analysis of frequency evolution throughout the course demonstrated a progressive rise of category occurrence. "Cooperative work" was identified in 75% initial observations and 91.6%, towards the end. The same happened to "Autonomy", increasing from 59% to 91.6%, and "Course suitability", from 70.3% to 94.4%.

Categories	Stage I	Stage II	Stage III
Cooperative Work	75%	86%	91.6%
Autonomy	59.7%	81.9%	91.4%
Suitability	70.3%	76.3%	94.4%

Table 1: Percentile evolution of the categories throughout the course

Conclusion

Through the analyzed data, which indicated a rise of some categories such as "Autonomy", "Cooperative Work" and "Suitability", it was attested that the educational computer course offered by PROINFO in NTE II/RJ could stimulate the adoption of a social-interact ional and constructivist attitude by the teachers, concerning their pedagogic practice.

Concluding so, we recommend the promotion and extension of similar training programs; the maintenance of training services for teachers; an annual diagnose of how the professionals are adapting to new working proposals and the development of researches about inserting new technology in the school environment.

Literature References

Macedo, L. (1994). *Ensaios construtivistas*. São Paulo: Casa do Psicólogo.

Ministério da Educação e do Desporto. Secretaria de Educação a Distância (1997). *Programa nacional de informática na educação: diretrizes*. Brasília.

Parlett, M.R. (1990). Illuminative evaluation. In: Walberg, H.L. et al. *The International Encyclopedia of Educational Evaluation*. Oxford: Pergamon Press.

Piaget, J. (1990). *Epistemologia genética*. São Paulo: Martins Fontes.

Piaget, J. (1977). *O julgamento moral da criança.* São Paulo: Mestre Jou.

Vygotsky, L.S. (1998). *A formação social da mente*. São Paulo: Martins Fontes.

Integrating ISTE & NCATE Standards into Educational Technology Masters Programs

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Abstract

Abstract: Educational Technology Masters programs are coming of age! The International Society for Technology in Education (ISTE) has published a five-step blueprint outlining the curriculum standards requirement for all advanced programs in educational computing and technology (ECT) leadership. This paper briefly examines these standards and explains how they've been recently interpreted for all future Ed. Tech.-related Masters courses at Sonoma State University (SSU).

The ISTE & NCATE Advanced Programs Standards

The National Council for the Accreditation of Teacher Education (NCATE) is a powerful body, which is influencing the design of most teacher preparation and professional development programs across the US. Many departments of education in individual States – including California – across the US have signed voluntary agreements with NCATE to recognize reform of their current programs' in-line with NCATE's standards. Within this framework NCATE has included a set of specific program standards for all educational computing and technology courses. These have been defined by the ISTE and adopted by NCATE for all courses intended for the initial and advanced preparation of teachers.

For advanced in-service teacher training leadership courses at the Masters level within the field of educational computing and technology literacy (ECTL) these standards have been summarized and abridged in Table 1. A good example of how these ECTL standards are manifested into the school curriculum and employed by students is given in the joint ISTE and Milken Exchange publication entitled: National Educational Technology Standards (NETS) for students. Both this document and another entitled National Educational Technology Standards (NETS-T) for teachers are available as PDF download files from the ISTE and NCATE Websites, which are given in the reference section at the end of this paper.

The ISTE advanced leadership standards for Ed. Tech. require completion of a five section syllabus. Sections 1 to 3 of this ISTE standards syllabus represent prior learning Ed. Tech. skills and experiences that need to be accredited before a candidate can proceed to sections 4 & 5. Sections 1 to 3 describe Ed. Tech. field practices that closely relate to the ECTL standards required by teachers achieving the NETS-T accreditation. Thus, sections 1 to 3 of ISTE's Ed. Tech. leadership curriculum could be satisfied by a pre-requisite qualification based upon the jointly accredited (ISTE/NCATE) NETS-T program. Ed Tech leadership Masters courses could then be designed upon sections 4 and 5 and the next section of this paper describes the current proposals being considered for implementation at Sonoma State University (SSU).

ISTE's 5 sections	Pedagogic abstract

1) Foundations – ECTL matrix	Prerequisite ECTL skills and knowledge must be both audited and provided for as a prior learning course.
2) ECTL Specific Content	Can also be audited against the ECTL matrix with coursework evidence demonstrating the use of technology to support other curriculum content areas.
3) Professional Preparation in ECTL	This requires candidates to be able to practically integrate ECTL pedagogic methodologies into the school curriculum.
4) ECT Leadership studies	Requires candidates to summarize ECTL-related pedagogic research and contemporary trends in schools. Candidates must also design an authentic research project that evaluates a specific technology used in a PK-12 environment. Candidates must also be involved in instructional design and courseware development using appropriate authoring and graphical software environments. Information and Communications Technology (ICT) environments are also to be explored, i.e. using the transmission of multimedia systems via institutional networks as a presentational tool. In addition to this, candidates are required to be conversant with stand-alone and networked operating systems and be able to identify/manage/troubleshoot suitable software and hardware procurements for both the classroom and administrative environments.
5) Professional preparation for ECT Leadership	Candidates require studies of and experiences with leadership, staff development and supervisory concepts and skills as they relate to the use of technology-based systems in PK-12 education. This will include the unique design of curriculum Ed. Tech. master plans and policy documents based on national/state/local guidelines along with policies related to resource management. Integration of technology tools into teaching must be demonstrated both personally and through the design of staff development action plans to achieve the same. A research project related to achieving and managing change within the school district is also required, as are field experiences that document the change-management process of unique ECTL reform programs.

Table 1: Interpretation of the ISTE advanced leadership standards for the educational computing and technology literacy (ECTL) matrix.

Interpretation of the ISTE standards for Ed Tech Masters Courses at SSU

At Sonoma State University it has been my task to interpret the ISTE standards and propose four new courses that can be offered as a 12-unit major, or emphasis, within the regular educational MA program in curriculum, teaching and learning (CT&L). The two key problematic issues identified that would affect the design of any Ed. Tech. Program at the Masters level were:

1. Prerequisite evidences and ECTL accreditation;
2. The clinical practice and community-based supervision and assessment requirements.

The ISTE organization requires that "As a prerequisite to the advanced program, candidates must document knowledge and competencies contained in the Educational Computing and Technology Literacy matrix." (see the advanced leadership guidelines on the Website reference given in this paper). The solution proposed at SSU in order to satisfy these prerequisite ECTL evidences cited in problem (1) was to develop the ISTE standards as a set of curriculum planning learning objectives within our own version of the ECTL matrix. From this matrix we can determine the prior learning entry-level qualifications of all candidates entering the Ed. Tech. Masters program. Previous Ed. Tech. related in-service training courses can be assessed and accredited against the matrix, with any identified deficits accounted for with specific top-up programs. Work is currently under way in developing a common-access transcript that automatically accredits all existing and new Ed. Tech. related staff development in-service training courses within the SSU district. Other Ed. Tech. related courses offered at the pre-service qualification level can also be accredited with the same standards. Indeed, the eventual goal is that all teacher trainees graduating from SSU meet the ISTE's ECTL matrix. A flowchart describing these various Ed. Tech. training routes for both pre-service and in-service teachers is given in figure 1 below.

Pre-service NETS-T accredited teachers at the end of first year of teaching.

In-service NETS-T accredited teachers, e.g. Intel courses.

In-service non-accredited teachers.

A 4-profile NETS-T transcript implies a waiver of the ISTE pre-qualification matrix, i.e. prior learning satisfied for parts 1 to 3 and a fixed ISTE pre-qualification matrix can be generated for all the NETS-T courses.

NETS-T equivalent service learning certificate needs to be completed as an Ed Tech Masters pre-requisite. A unique ISTE pre-qualification matrix needs to be generated for each candidate. Praxis-based accreditation needs to be coupled with instructional technology foundation courses except where waived by in-service equivalent experiences.

Access into an ISTE accredited Ed Tech Leadership Program at the Masters or Doctoral level.

A 5-part ISTE syllabus requires all program courses to be audited against the following areas:

1. **Foundations in Educational Computing & Technology Literacy (ECTL) [NETS-T].**
2. **Specialty content preparation in ECTL (i.e. Ed Tech concepts & skills) [NETS-T].**
3. **Professional preparation in ECTL (i.e. Ed Tech praxis integration, lesson plans) [NETS-T].**
4. **Specialty Leadership content for ECTL (research & pedagogic theories, instructional design & product development, information access & delivery, operating systems, evaluation and management of hardware & software.**
5. **Change-management practice (i.e. an Ed Tech action research field project).**

Figure 1: Flowchart for Ed Tech leadership courses with ISTE accreditation

The second big issue identified in problem (2) is to meet ISTE's practice standard, which envisages participants' engaging in technology-based educational research and curriculum development leadership programs within, say, a teacher's local school district. One way to deliver Ed. Tech. related clinical practice of this complexity is to go down the route of accrediting Ed. Tech. curriculum reform projects within an action research cycle and have these form the basis of a Masters dissertation project. Action research project management methods are considered to be a well-suited tool and approach for enabling authentic curriculum reform practice. Stenhouse (1975) argued that a curriculum was an attempt to communicate the essential principles and features of an educational proposal into a form that it is open to critical scrutiny while being integrated into practice. Indeed, Elliot (1991) corroborates with this view and tells us that action research is a good tool for professional personal development as it encourages us to reflect on our actions. Elliot interprets action research pedagogy as a set of practical steps that can guide teachers in transforming educational aims into classroom practice. The action research praxis and pedagogy appear to be in-tune with the ISTE aims for advanced leadership Ed. Tech. programs. In particular, the ISTE Ed. Tech. Leadership matrix in section 5 (See document on ISTE's Website) requires candidates to be involved in an assessment project that constitutes as part of an Ed. Tech. change-management process within an educational and/or training institution. The ISTE standard 5.6.3 requires all candidates to be involved in a practical Ed. Tech. field study evaluation project:

5.6.3 document and assess a significant field-based activity involving experiences in instructional program development, staff development, facilities and resource management, or managing change related to technology use in schools.

Given the above ISTE provisos and the criteria interpreted in Table 1, we are now developing the following range of ISTE-related courses as a special track within the Ed Tech major of the CT&L Masters program at SSU and these are summarized in Table 2 below.

Ed Tech area of emphasis (AREM)

Title	Units
Learning theories and the societal impact of technology	3
Organizational management of information and communications technologies across the curriculum	3
Instructional design & technology	3
Project management methods for Ed Tech professional development	3
Total:	**12**

Ed Tech ISTE pre-requisite qualification

Title	Units
Service Learning Certificate: NETS-T ISTE pre-requisite	3
Total:	**3**

Table 2: The proposed ISTE-related Ed Tech Masters courses at Sonoma State University

The first three courses will operate as traditional university-based courses; however, the aim is to develop the final course "*project management methods for Ed Tech professional development*" as both part-course and part of an action research field study dissertation project.

Conclusion

In conclusion I would recommend that all Ed. Tech. Masters program developers that wish to incorporate the five ISTE leadership standards from the ECTL matrix adopt similar pedagogic strategies to those being proposed at SSU with particular emphasis on the following:

1) An ISTE pre-requisite based upon the current NETS-T standards, which can be accredited against actual Ed Tech field practice and other relevant previous Ed Tech in-service training experiences.
2) A practical field-based work project and/or study based upon action research evaluation methods.

Recommendation 1 is targeted at all applicants wishing to join an ISTE accredited Ed Tech Masters program. An innovative service learning 3-unit accreditation course is being developed at SSU that aims to achieve the following goals:

⇒ accredit and validate all existing on-the-job (field-based) Ed Tech praxis and relevant in-service training experiences;
⇒ top-up any identified skill shortfall from the ISTE pre-qualification matrix (sections 1 to 3) with a tailor-made Ed Tech service learning program to be located within the candidates own place of work, i.e. school or any other training establishment deemed pertinent to developing leadership skills; and,
⇒ provide an interim SSU certificate granting completion of the ISTE matrix preparation areas, i.e. an official transcript accrediting the ISTE syllabus sections 1 to 3 in Table 1.

Recommendation 2 aims to give Masters thesis accreditation to Ed. Tech. management projects that stimulate change-management curriculum reform practice from within the candidate's field of work. This Masters program *real-life* design issue was also raised by Tom (1999), who reported that: "Teachers dislike these (Educational Masters) programs. They view them as detached from the daily practice of schooling" (p. 245). This suggests the potential professional merit of implementing a practice-based Master of Education and/or Arts Ed. Tech. program that addresses professional teacher development needs through accreditation of field-based action research curriculum projects.

References

Elliot, J. (1991). *Action research for educational change*. Milton Keynes, UK: Open University.
Stenhouse, L. (1975). *An introduction to curriculum research and development*. London, UK: Heinemann.
Tom, A. (1999). Reinventing master's degree study for experienced teachers. *Journal of Teacher Education*, *50*(4), 245 – 254.

ISTE Website URL (http://www.iste.org/standards/ncate/advanced.html).
Milken Exchange URL (http://www.milkenexchange.org).
NCATE Website URL (http://www.NCATE.org/standard/programstds.htm).

Growing the Learning Landscape: Experience in Environment and Process

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Abstract: Teachers are faced with implementing technology provided without consultation, often without consideration of the infrastructure, much less the technical or curricular training necessary to make full use of it. Too often we focus our attention on the Mountains of Technology forgetting that landscape is more than just the one prominent feature; it encompasses the Streams of Curricular Change, the Evergreens of Knowledge, the High Plains of Critical Thinking, the Safe Arbors of the Community. Through all this rich environment blow winds of administrative, political and social change that can make barren former gardens of thought and pile rich soil in new areas. Should we as teacher educators help them scale the mountain to obtain a different perspective or encourage them to skirt around, treating the intruder as a stumbling block to their journey and as eyesore that hides and overshadows part of the landscape? What follows is a descriptive case study that examines one university program's attempt to resolve apparent disparities between the learning and integration of technology into K-12 environments.

Genesis

Teachers are faced with a mounting dilemma in this rapidly evolving Age of Information. They are urged, cajoled, pleaded with and threatened to include technology into their curricula. Administrators, politicians, curriculum experts, scientists and corporate America rally around a range of beliefs that locate technology as a central piece in curing the ails of what-is-touted to be an intellectually and near economically bankrupt public education system. School districts open their curricular arms to embrace comprehensive programs of technology—often to the bewilderment and bemusement of in-service teachers who must integrate this technology into an existing curriculum that in some cases is already held together with string and sealing wax. Teachers know, because they live in a world becoming filled with ubiquitous technology, that technology is here to stay—it is changing the way the world communicates, transacts business, socializes, and expresses itself artistically. However, teachers are faced with implementing technology provided without consultation, often without consideration of the infrastructure, much less the technical or curricular training necessary to make full use of it.

Too often we focus our attention on the Mountains of Technology forgetting that landscape is more than just the one prominent feature; it encompasses the Streams of Curricular Change, the Evergreens of Knowledge, the High Plains of Critical Thinking, the Safe Arbors of the Community. Through all this rich environment blow winds of administrative, political and social change that can make barren former gardens of thought and pile rich soil in new areas. What we often perceive as static, unchanging and permanent is in actuality, constantly changing.

What value then teaching *current* technology skills for their own sake, in isolation, with no thought of need or purpose? How can in-service teachers learn current technology skills and the principles of their implementation, and how can those skills and principles enhance and expand and evolve public school curriculum. As teachers and students work together in growing a learning landscape how do they react to the sudden appearance of a mountain from without? Do they scale the mountain to obtain a different perspective or do they go around, treating the intruder as a stumbling block to their journey and as eyesore that hides and overshadows part of the landscape?

In a better model learners are in the center of a systemic developmental process in which they, their knowledge and knowledge of processes interact through the community—classroom, local and exponentially more global, informed through continuous ongoing feedback to provide a more organic experience. This model serves as a weathervane, informing principles upon which we can design, construct, and adjust to the changing environment of economic, social and political influences. They form, in a mutable world, constants. The guiding question is how do higher educators, who work with a pre and post service teacher population, provides an environment that exemplifies, illuminates and encourages transfer of this organic process?

Geology

In 1998, Sam Houston State University had in place an M.Ed. degree program with an emphasis in instructional technology. Several characteristics of the program conspired to keep the number of active interested graduate students lower than it could otherwise be including the course sequence, the dispersion of the graduate population through the program and the reliance on independent study with already overloaded faculty. In consequence those graduates enrolled in the program were subject to a particular instructional experience in which they functioned semi-independently of both the supervising faculty member and of other students in the program. With many graduate students also managing home, family and work responsibilities, the experience tended to be a lonely and isolated one with little opportunity for social and academic support.

In an attempt to manage the enrolment situation, the researchers decided to implement a cohort system for the program. The students would start the program together and progress through a predefined sequence as a closed community. Of course cohort members could still take courses through independent study if the need arose. Having made significant changes to the structure and sequencing of the program it became obvious that the nature of the student experience was going to radically change. This gave the researchers the opportunity to proactively engineer the student experience to enhance student performance, the education process, and the support system.

Geography

People learn by using existing schemas to construct new understandings by assimilating new ideas into existing schemas or accommodating existing schema to encompass concepts that completely alter their current conceptions. (Piaget) It becomes important for educators in the university environment to come to know the population they teach—their beliefs and the context of community and cultural values which encompasses those beliefs, so that they can illuminate existing student schema in order to build on students' strengths, shore up their misconceptions or weaknesses in order that they may construct new understandings. These understanding while examined in the relative isolation of the college classroom must be able to go into the schools and communities of the teachers and become part of an organic process of knowing theory, enacting theory into practice, reflecting on that practice, and reformulating theories are principles—praxis.

With a sense of praxis existing within teachers, they can not only extend what has been learned in one context to new contexts (Byrnes, 1996, p.74) but they have the ability to not only contribute to the practice that replicates the transfer of this knowledge, but to contribute to and or extend the theoretical principles which underpin it. It becomes imperative that pre and in-service teacher instruction in technology integration be learner centered, knowledge centered, supported by authentic assessment, and grounded in the context of the communities which it will be practiced.

This research is a descriptive case study that examines one university program's attempt to resolve apparent disparities between the learning and integration of technology into K-12 environments. Data sources which inform the researchers' understandings are: course syllabi, interviews with students and professors, threaded message boards from course work, class debriefings, and student projects and products and interviews with building principals from the informants' schools. The informants in this study include two university professors, eleven K-12 classroom teachers enrolled in the cohort masters in educational technology program, the university students' classrooms from the fall of 1998 through the spring of 2001.

Working from a problem-centered, real-world perspective integrating multiple forms of knowledge and knowing, the study attempted to use technology transparently, focusing on its value as a tool in the problem solving process rather than on technology as a body of extant knowledge.

This data, while purely descriptive, is analyzed for recurring patterns examining the organic process of how students assimilated/accommodated theory, enacted theory to practice inside the college classroom and then transferred or extended it into their own classrooms in communities. Information gleaned from examination of this descriptive analysis is meant to inform the professors in this study, and is brought to the larger academic community for further discussion.

Surveying the Terrain

Traditionally education has been representative of its geographic social, political and cultural environs. Also traditionally education has assumed there is a fixed body of knowledge that can be transmitted from educators to learners. More recent views [Vygotsky, Foucault, Berenfield] recognize that knowledge is transmitted, analyzed, and in many cases, transmuted so quickly that it is continually evolving. No longer, can knowledge be thought to be a static entity dispensed by educators. Instead now, many educators believe that thinking "takes place in communication, in an act of knowing in which the learner assumes the role of knowing subject in dialogue with the educator" (Freire, 1988, p.403-404). Learning is collaboration between students, educators, and professionals in a variety of discipline utilizing a wealth of informational resources, many of which are not limited by geographical time/space boundaries. Educators who use language to mediate problem solving through Berenfield's *Infosphere* have the ability to not only supply information through technological means but also the potential to impact the culture-- the values, ideologies and social context of the populations they serve.

Building the Team

The cohort system is more than a gathering of individuals. To be most effective we believe a community has to emerge from the process, one in which the group members can rely on each other for support, but one also where the individual makes a commitment to group maintenance.

As part of an instructional web site design process in the "Designing Instructional Materials for the Web" course, the cohort members were responsible for engineering the "look and feel" and the structural organization of a word processing site. Over a period of two three-hour brainstorming sessions, each of the students were responsible for managing the sessions, providing the ideas, identifying problems, areas of expertise, areas of needed research and mapping the ideas to an instructional model. Cohort members were rotated through roles and responsibilities to limit the potential for monopoly and their contributions and self imposed assignments were tracked. It became clear early on that the task was too big for one individual and that a cooperative effort was required. Cries of "Help me out here, Guys" and "Who's going to take this on" were the order of the day. Often one person could not complete his or her task without a finished product from someone else. Waiting on someone else was not an opportunity to relax, but an opportunity to pitch in and help. Not everyone picked up all the skills but all the skills were mastered. Not everyone completed their tasks but all the tasks were completed.

Mapping the Journey

We as instructors set the goals and or objectives

In the Spring of 2000, I "instructed" this technology cohort in Advanced Methods of Instruction. Since, the teachers in this cohort had, on average 12 years of experience, each, and because they had been together as a cohort for a semester, I eagerly took this opportunity to open the boundaries of their learning landscape by inviting them to "map their terrain." Together we defined the broad goals for the course juxtaposed against the landscape of their experience and the road of their teaching and learning needs. We identified three questions for the course, which would guide our inquiry:

- How do people learn?
- What are the pedagogical implications for brain research-based learning?
- How do those implications translate into a cyber-learning environment?

Each lesson that I then created was based on those guiding questions had been based on their input. In order that our learning community be able to think metacognitively about those questions, I posted an open threaded message board which would serve as an ongoing forum to express our thinking as we worked through each lesson.

Next, in my instructional decision making process was to choose texts. Because I wanted to model effective "advanced methods of instruction" and I felt this included the way we utilized technology to support our learning, I used a "cutting edge", theoretically, and delivery-system, online text, How People Learn: Brain, Mind, Experience, and School (Bransford, Brown, Cocking, 1999). In addition to this we used many web-based articles and research including but not limited to: Eric Chudler's Neuroscience for Kids (http://faculty.washington.edu/chudler/neurok.html); an overview of music and learning by Don Campbell and Chris Brewer (http://www.zephyrpress.com/, My thinking was that in order to think deeply about what advanced methods of instruction should look and be like, we needed to understand the latest theory that supported learning, and that we would simultaneously review literature on cutting edge technology and together as a class we process this thinking through five mechanisms:

- Reading
- Reflecting and responding in writing online to and with our learning community
- Taking a stance in writing-by-writing and publishing online short position papers.
- Contacting an expert.
- Taking an action.

Together we took these actions to process the text and online readings I assigned. Then each individual within our learning community began to focus on some specific aspect of brain research, pedagogy and cyber implementation. They read, identified focus topics and then began to construct a web-based project that integrated their findings about brain research, pedagogy, and cyber implementation. This project had to be able to be utilized by teachers or school-aged children. The students in our learning community used their experience, interests and curricular needs which were particular to their teaching experience to identify the topic of their inquiry and to guide them as the developed their learning project. Underlying these actions were the three guiding questions that formed the objective of their study as well as the framework of their assessment:

- How do people learn?
- What are the pedagogical implications for brain research-based learning?
- How do those implications translate into a cyber-learning environment?

However they get there is part of their journey, is part of their learning.

Notes from the Diary

The cohort experience was a positive experience, not only in terms of their coming to terms with both theoretical content and practical skills but most especially in terms of their application of those concepts and skills to their classroom and a wider context.

Student Empowerment:

Students took control over their learning environment by not only establishing their goals and objectives, and choosing the focus of their projects but by taking turns guiding, responding, and nurturing their learning community through their roles as weekly on-line facilitators. Students worked in pairs taking the leadership in this online responsibility. They monitored the boards to see who was responding and wrote and encouraged those who had not yet responded to begin to respond or to ascertain if they were having any technological or other problems which would keep them from responding. They at all times were polite and respectful in these areas and indeed many times did uncover areas in which they could support their colleagues. In this respect our learning community became a sustained support system empowering its members to rely on themselves and each other as they charted this territory.

Sense of Worth and Usefulness

Our learning community indeed began to understand the current state of their knowledge and to build on it, improve it, and make decisions in the face of uncertainty (Talbert and McLaughlin, 1993). With their experience, or as Dewey (1916) states, "records of previous cultural accomplishments" and with the "engagement in active processes, a tremendous sense of worth and usefulness developed as a result of engagement in this course

Students were actively processing theory and juxtaposing it against their prior knowledge and current experience. Becky Harmon chose to read in Neuroscience for Kids and article about the full moon's effect on learning. She relates this to current experience:

Agggghhhh!!! A lunar eclipse with a full moon all at the same time! I don't know about your students, but students at my elementary school were horrific yesterday and today. The hall outside the principal's/assistant principal's offices was lined with students who had been sent due to bad behavior. This afternoon, I had to stop an almost knock down drag out fight between two second graders while waiting for their day care bus. I've never had problems with them in the past. So when I saw this article, I just had to read what it said on the topic. Boy was I disappointed with their opinion. Read on to find out why.

> The article examined the results of studies done on the influence of the full moon on behavior. Most of the reported findings indicate that there is no direct correlation between the full moon and behavior. Only a few studies reported a positive relationship. The article went on to state that the results of the studies were very inconsistent as "some studies show that a particular behavior will occur more often during the full moon and other studies show no relationship between behavior and the full moon." The article stated that the inconsistent findings were, in part, due to inconsistent test situations. Some included behavior only on the day prior to a full moon, while others included behavior on days prior and following a full moon.

> I was so interested in the topic I read two related articles. One, "Human Aggression and the Lunar Synodic Cycle", used computer technology to study five aggressive behaviors as reported by emergency rooms in Dade County, Florida. The results indicated a "statistically significant clustering of cases around the full moon." The other article, "Lunar Cycles and Violent Behavior", studies the behavior of hospitalized psychiatric patients during a full moon. The results of this study indicated that there was "no significant relationship." Even the related articles were hard pressed to agree with one another.

> Regardless, my own experience in the teaching profession has led me to believe you ought to be prepared to deal with behaviors on or around full moons.

This student used her choice of reading, reading and processing to help resolve learning and teaching question she had. Her choice of topic and quantity of material to read did not limit her, but rather guided her toward meaningful instructional decision-making. Another student, Dennis Huff, wrote this response and took the following actions after reading

> I was very excited about some of the resources I found on Dr. Chudler's web site! I was so impressed that while I was looking it over I contacted my nephews here in Texas and my second cousins up in Maine and recommended that they take a look at this web site! I've also informed my brother who teaches at Eisenhower in Aldine ISD and my coworkers down at Conroe H.S. Although this is primarily a "science" web site, the applications across the curriculum are tremendous and limited only by a teacher's imagination (and I feel I have a very fertile imagination!) I have downloaded the "Web Page Evaluation" form, the" Brain Metaphor" and the "Brain vs. Computer" pages for use in my Introduction to Computers lesson. This way I can make analogies between the brain and a computer to help the students in activating their schema so they can better assimilate my lesson. I'm so happy!

Engagement with a larger learning community

Since part of our weekly assignment was to contact an expert, many of our students used e-mail to do this thus engaging in a dialogue with experts from the larger learning community. Dr. Eric Chudler was kind enough and responsive to answer several e-mails from our students. The following is an example of one of his responses:

> **Brenda:** Certainly helmets will protect the brain whenever there is an impact to the skull. However, Phineas Gage was subjected to an iron rod that pierced his brain...a different type of trauma than those students will ever experience (I hope!). However, here are some other ways to motivate students to wear helmets and to promote good "brain health":

Engagement with this and other expert gave our students a sense of taking part in larger, meaningful discussions from a learning community actively engaged in and disseminating research on learning. Our students felt their voices, questions, concerns, and responses became part of this ongoing body of evolving knowledge.

Modeling what we believe about teaching and learning.

We strongly felt, and my students came to feel that there are not set answers and strategies that make methods and instructions "advanced" but rather there in an understanding that learner-centered environments include teachers who are aware that learners construct their own meanings, beginning with the beliefs, understandings, and cultural practices they bring to the classroom. If teaching is conceived as constructing a bridge between the subject matter and the student, learner-centered teachers keep a constant eye on both ends of the bridge. The teachers attempt to get a sense of what students know and can do as well as their interests and passions--what each student knows, cares about, is able to do, and wants to do. Accomplished teachers "give learners reason," by respecting and understanding learners' prior experiences and understandings, assuming that these can serve as a foundation on which to build bridges to new understandings (Duckworth, 1987).

References

Berenfeld, Boris. (1996, April) Linking students to the Infosphere. *T.H.E. Journal*

Bransford, Brown, Cocking, (1999) How People Learn: Brain, Mind, Experience, and School.

Duckworth, (1987). "The Having of Wonderful Ideas" and Other Essays on Teaching andLearning. New York: Teachers College Press, Columbia University.

Foucault, M. (1971) The archaeology of knowledge and the discourse on language. Translated by A.M. Sheridan Smith. New York: Pantheon Books. In A.Petrosky,. *"Producing and Assessing Knowledge: Beginning to Understand Teachers' Knowledge through the Work of Four Theorists."* In NCTE (1994) Teachers thinking, teachers knowing: Reflections on Literacy and Language Education. T. Shanahan (Ed.) Urbana, Illinois:.

Freire, P. (1993*). Pedagogy of the oppressed.* New York: The Continuum Publishing Co.

Vygotsky, L. (1986). *Thought and Language.* Cambridge, Mass: The MIT Press.

Piaget, J. (1978) The Language and Thought of the Child. London: Routledge and Kegan Paul.

Talbert, J.E., and M.W. McLaughlin (1993) Understanding teaching in context. Pp. 167-206 in Teaching for Understanding: Challenges for Policy and Practice, D.K. Cohen, M.W. McLaughlin, and J.E. Talbert, eds. SanFrancisco: Jossey-Bass.

Designing Professional Development Schools at the Secondary Level: An Integrated Model

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Background

This paper addresses the critical shortage area of secondary special education by focusing on the development of the first secondary special education Professional Development School (PDS) model for Towson University. Specifically, this proposed PDS model will be used as a recruitment tool for the newly approved Bachelor of Science in secondary special education major at Towson University which was granted in July 1999. The creation of a PDS model in secondary special education will enhance the newly approved major in Secondary Special Education and further the *Redesign of Teacher Education in Maryland* by offering a year long internship in special education. The proposal is aligned with the Maryland State Department of Education (MSDE) recommendation that teacher candidates have a year long internship in specially designed professional development schools. Moreover, this model will include collaboration with the occupational therapy registered (OTR) program --- the only OTR program in Maryland. This proposed model will be the first of its kind within Maryland and possibly the country.

Towson University is well qualified to carry out such a project based on its recognition by the Association of Teacher Education (ATE) as the 1998 Distinguished Program in Teacher Education. This project would complement Towson's already acknowledged award winning status as an outstanding teacher education institution. Yet most importantly the creation and implementation of a secondary special education PDS model would fulfill a critical shortage need by preparing secondary special educators; this need is indicated in the Maryland Teacher Staffing Report for 1999-2001 which identifies the special education area of generic certification grades 6 -adult as a critical shortage area for FY 1999 and FY 2000 (see attachment C). Equally as important, this proposal addresses the chronic shortage of OTRs in Maryland's public schools. In conclusion, the PDS described in the proposal directly supports the *Redesign of Teacher Education*. It will provide school based professional training, give teacher candidates a chance to work with children from diverse backgrounds in diverse settings, and link teacher education redesign to school improvement efforts. Quite simply, it is win-win situation for all concerned.

Goals and Outcomes of the Project

- To develop and implement a secondary special education PDS model that provides coordinated, continuing professional development for all members of the school community which is targeted to the specific needs identified by each school
- To develop the internship in secondary special education to be part of the Bachelor of Science degree
- To provide a school-based setting for a collaborative internship experience for OTRs and secondary special education interns

Plan

Building upon the existing secondary education PDS model, we will adapt this PDS model to meet the needs of secondary special education majors. A unique feature of the proposed PDS model is the inclusion of OTR and secondary special education interns. This collaboration is congruent with best practice in the OT literature, but as yet has not been done. The internship experience builds upon knowledge, reflection, performance, and analysis, the four key learning domains of the Essential Dimensions of Teaching. Specifically , the secondary special education PDS experience will focus on classroom management & discipline, inclusion, collaboration, multicultural perspectives, reflection & program portfolio, and planning for teaching. Performance based indicators for student outcomes will be developed. This proposal will enhance preservice and inservice teacher development by providing a clinical laboratory experience or preservice teachers aligned with the recommendations of the Redesign of Teacher Education.

Project Timeline

In the fall, faculty in special education will shadow secondary education faculty at Wilde Lake High School and Harper's Choice Middle School in Howard County (This has been underway since September 1, 1999). During this period, we will observe and collect data and become familiar with the secondary PDS model. Simultaneously, we will modify the secondary PDS model for special educators, thus designing the special education internship. A course proposal for the internship will be written during January and undergo the curriculum review process during the spring semester 2000. The internship could begin as early as the fall 2000.

In the spring semester, special education and occupational therapy faculty will shadow secondary education faculty at Perry Hall Middle School and Owings Mills High School. The observational period will allow us to establish contacts within the schools in Baltimore and Howard County and elicit letters of support for the expansion of the PDS model at the schools to include special education. It should be noted that all of the above schools have ethnically diverse student populations. Baltimore County Public Schools is the fourth largest school system in Maryland serving over 105, 000 students in 161 schools; it was also declared in the Maryland Teaching Staff Report 1999-2001 as one of the jurisdictions which will experience a shortage of certified special education teachers, as was Howard County. Specific goals, milestones, outcomes and their expected dates of completion follow.

Evaluation Plan

The project, as a planning and developmental activity, will require formative evaluation of the process of model development as well as summative evaluation of its outcomes. Time logs, field notes, agendas of meetings, and notes of meetings will be collect by the project evaluator in order to monitor the process. Progress of the process will be monitored by the completion of the milestones. The primary goal of the project will be the development of the collaborative special education and OT internship. Status reports will be provided to the project team in the fall of 1999 and the spring of 2000. A final report in June will be issued in June 2000. Evaluation will include the performance outcome indicators completed by students in the internship and student evaluations of the internship experience. Interview data will be collected from students recruited into the secondary special education major. A survey of student and their supervising teachers' perceptions regarding the effectiveness of the internship in preparing them for student teaching will be conducted upon implementation.

An independent evaluator will monitor the progress. He will provide formative data to the project team during the fall and spring semesters. Evaluation instruments will be developed to accompany activities conducted in the schools. Consumer groups participating in the activities (Parents, students teachers, TU interns, students and staff will be queried as to whether activities have accomplished their stated objectives and have met consumer needs. Baseline observations will be used within professional development experiences to determine acquisition of content. Formative data will be used to report and modify the model. Qualitative data will include observations, interviews with PDS Site Coordinators, field notes, debriefing notes after meetings, notes from work sessions and curriculum development work sessions.

Impact

As part of its continuing efforts to help all students reach Maryland State content and student performance standards,Towson University continues to develop and disseminate innovative school-based professional development models and support school improvement and career-long professional development for all members of the school community. The PDS model emphasis the Essential Dimension of Teaching specifically dimensions 6, 9, and 10 "to organize and manage a classroom using approaches supported by student learning needs, research, best practice and expert opinion, to collaborate with the broad educational community including parents, businesses and social service agencies and to engage in careful analysis, problem solving, and reflection in all aspects of teaching."

In addition, many of the interns will engage in service learning projects which may involve tutoring students for Maryland Functional Testing, SAT & PSAT Preparation, Maryland Core Learning Goals, etc. Another of the benefits of this program will be using the portfolio assessment process for student interns as they are trained to master the Essential Dimensions of Teaching. All participants will be involved in a developmental process for assessing professional preparation practice, and progress.This proposal specifically proposes to implement the Redesign of Teacher Education which calls for reform in teacher education, Maryland's Core Learning goals. Towson University continues to develop and disseminate innovative school-based professional development models.

References

Berry, B. & Catoe, S. (1994). *Creating professional development schools*. In. L Darling-Hammond (Ed.), *Professional development schools: Schools for developing a profession* (pp. 176-202). New York: Teachers College Press.

Byrd, D., & McIntyre, D. (Eds). (1999). *Research on professional development schools: Teachers education yearbook VIII*. CA: Corwin Press, Inc.

Book, C. (1996). Professional development schools. In J. Sikula, T. Buttery, & E. Guyton (eds.), *Handbook of research on teacher education* (2nd ed.,pp. 194-212). New York: Simon and Schuster Macmilan.

Darling-Hammond, L. (ed.). (1994). *Professional development schools: Schools for developing a profession*. New York: Teachers College Press.

Holmes Group. (1990). *Tomorrow's schools: Principles for the design of professional d development schools*. MI: the Holmes Group, Inc.

Levine, M., & Trachtman. r. (Eds.). (1997). *Making professional development schools work: Politics, practice, and policy*. New York: Teachers College Press.

Maryland Higher Education Commission. (1995). *Teacher education task force report: Redesign of teacher education*. Annapolis, MD: author.

Maryland State Department of Education. (1998). *A review of professional development schools in Maryland: State teacher education council, 1995-1997 report*. Baltimore, MD: author.

VisionQuest©:
Teacher Development Model for Scaffolding Technology Integration

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Abstract: The professional development model proposed here builds on and extends the use of VisionQuest©, a CD-ROM teacher development tool designed to help teachers envision and achieve technology integration. The VisionQuest© model is based on the assumption that teachers are more likely to embrace pedagogical and classroom change if these changes address real issues they face in practice. Teachers are challenged to reflect on their current knowledge and classroom practices, relative to technology integration, and then, after observing exemplary models included on VisionQuest©, develop and pilot their own solutions to relevant classroom issues. By engaging teachers in reflective activities that nurture and sustain their professional development, VisionQuest© facilitates the growth of teachers' visions for teaching and learning with technology.

Introduction

Despite the fact that technologies have achieved substantial presence in schools (Education Development Center, EDC, 1996), teachers all over the country continue to grapple with both practical and philosophical problems posed by the integration process (Hadley & Sheingold, 1993). Currently, K-12 teachers are experiencing mounting pressures, both from within and outside the educational system, to demonstrate that the huge investments being made in technology are not being wasted. Yet, according to the National Center for Education Statistics (NCES, 1997), "relatively few teachers (20%) report feeling well prepared to integrate educational technology into classroom instruction" (p. 8). Although most teachers report that professional development activities are available to them and that they frequently participate in them (NCES, 2000), teachers continue to face significant barriers as they begin integrating technology within their classrooms.

Traditionally, technology courses for in-service teachers have focused on increasing teachers' technical skills and competencies for using specific software applications. Yet clearly, an increase in teachers' technical skills is insufficient to guarantee the effective use of technology in the classroom. Through previous research efforts (Ertmer, 1999; Ertmer, Addison, Lane, Ross, & Woods, 1999; Ertmer & Hruskocy, 1999; Hruskocy, Cennamo, Ertmer, & Johnson, 2000) we have identified a number of challenges that teachers face as they begin to integrate technology within their curricula. Besides a host of technical and logistical questions (e.g., How does this software package work? Where and when should we use computers?), more subtle issues, related to teachers' pedagogical visions and beliefs, as well as their perceived confidence for using technology, are also known to impede meaningful classroom use.

The VisionQuest© professional development model emphasizes building on teachers' current beliefs and practices. By starting with teachers' prevailing classroom needs, and acknowledging their current levels of self-efficacy, VisionQuest scaffolds teachers' development by meeting teachers where they are. In addition, this model emphasizes the role that teachers' beliefs play in the adoption and change process and specifically outlines how those beliefs might be addressed through teacher development efforts. While traditional staff development models have been aimed at eliminating first-order barriers (barriers that are external to teachers and include skills training and equipment needs), the VisionQuest© model focuses primarily on challenges presented by second-order barriers (barriers that are intrinsic to teachers and that challenge fundamental beliefs about current practice).

Teacher Beliefs

In summarizing research on teachers' beliefs, Pajares (1992) noted that "there is a strong relationship between teachers' educational beliefs and their planning, instructional decisions, and classroom practices" (p. 326). In particular, teachers' beliefs about their *ability to use computers* in instruction may be key, given the role self-efficacy is proposed to play in determining behavior. In a recent study by McKinney, Sexton, and Meyerson (1999), participants with lower efficacy beliefs expressed concerns typical of those in an early stage of change (self-concerns) while those with higher self-efficacy had concerns that were more characteristic of later stages of change (impact-concerns).

Self-efficacy refers to personal beliefs about one's capability to learn or perform actions at designated levels (Bandura, 1997). According to Bandura, self-efficacy is based, not solely on the level of skill possessed by an individual, but on judgments about what can be done with current skills. As such, self-efficacy is thought to *mediate* the relationship between skill and action. Simply put, without skill, performance isn't possible; yet without self-efficacy, performance may not be attempted. According to Bandura, "beliefs of personal efficacy constitute the key factor of human agency" (p. 3). Thus, teachers who have high levels of efficacy for teaching with technology are more likely to participate more eagerly, expend more effort, and persist longer on technology-related tasks than teachers who have low levels of efficacy.

So what does this mean to designers and others who are responsible for teacher development? How can we design professional development experiences that address teachers' second-order barriers, or more specifically, that build teachers' efficacy for using computers in instruction?

Given the long-term nature of the integration/adoption process, we recommend that staff developers/instructional designers meet implementation needs in a responsive fashion--that is, through "iterative interventions" (Frame, 1991) that meet and challenge individual teachers at their current levels of use. As teachers face changing needs, the strategies designed to meet them must also change. In addition, training strategies should be varied to meet the needs of teachers at different levels of technology use. Different strategies are likely to be more or less effective for teachers with different levels of confidence and skill (Snoeyink, 2000). For example, it is important not to discourage those who have low levels of confidence by surrounding them with others who are much more experienced and confident. By designing staff development programs that start with the real concerns that teachers have, and helping them experience success in solving their own problems, we have a better chance of making headway in the technology integration process.

The VisionQuest© Professional Development Model

VisionQuest© is designed to address teachers' second-order barriers, specifically their visions for, beliefs about, and confidence for teaching and learning with technology. This model (adapted from

NCREL, 1997) builds on, and extends, the use of the VisionQuest© CD-ROM teacher development tool, designed to help teachers envision and achieve technology integration.

VisionQuest© features the classroom practices and technology integration visions of six teachers and is designed to support users' reflections on both the underlying beliefs and classroom strategies that enable exemplary technology use in ordinary settings. Teachers, featured on the CD-ROM, share their ideas for classroom technology use and demonstrate how technology supports their fundamental beliefs about teaching and learning.

The VisionQuest© professional development model, which serves as the underlying framework for the CD-ROM, facilitates the growth of teachers' visions for teaching and learning with technology by engaging them in reflective and collaborative activities that nurture and sustain their professional development. The six-step model (Fig.1) facilitates reflection on, and the transformation of, classroom practice. Teachers are challenged to reflect on their current knowledge and classroom practices, relative to technology integration, and then, after observing exemplary models included on VisionQuest©, develop and pilot personal solutions to relevant classroom issues. Through a collaborative and reflective process, teachers gradually develop their own understandings about how to integrate technology in ways that address relevant curricular and pedagogical issues within their classrooms. Each step in the model is described below.

Figure 1: VisionQuest© Professional Development: Scaffolding Technology Integration

Reflect on Current Knowledge

In the first step of the model, teachers are encouraged to reveal the goals they want to accomplish in their classrooms, the barriers that hinder their work, and the instructional and/or administrative concerns they have, related to specific aspects of classroom practice (e.g., classroom organization, assessment practices). Teachers also are asked to reveal their beliefs about teaching as well as the incentives that motivate them to teach. At these early stages of technology adoption and use, the focus is not on specific technology skills or needs. Teachers are encouraged to consider their needs as both teachers and learners prior to considering their needs as technology users. Teachers and trainers work collaboratively to develop an individual teacher profile, followed by the development of an individual teaching/technology plan (ITP) in the next step. Thus, an individual teacher profile might include information about teachers' 1) classroom practices, 2) classroom context, 3) perceived issues and barriers, 4) beliefs about teaching, 5) motivation for teaching, as well as 6) preferred ways of learning and teaching. By beginning with teachers' perceived needs, we remove the focus from the innovation and place it instead on teaching practices and the important issues teachers face.

Observe Models and Cases

One of the most effective ways to help teachers move forward on their technology integration journeys is through the use of peer and exemplary models (Gilmore, 1995; Pintrich & Schunk, 1996) which are believed to lead to increased confidence and competence. During this step, pre- and in-service teachers observe teachers who use technology in their teaching. Web sites, videos, text materials, and the VisionQuest© CD-ROM are used to examine both the pedagogical beliefs and classroom practices of exemplary technology-using teachers. The CD-ROM is organized around the metaphor of a journey and is divided into three sections: Roadmap, Path, and Destination. Within these three sections key themes are addressed: Guiding Vision, Getting Started, Incentives and Barriers, Teacher and Student Roles, Classroom Organization, Curricular Emphases, Assessment Checkpoints, and Sample Student Products and Assessment Tools.

Reflect on Practice

During this step, teachers and staff developers co-develop an individual teaching/technology plan by considering various means for meeting specific needs identified in the teacher profile. That is, after reviewing the issues teachers face, staff developers help translate these important questions into technology-based learning opportunities. For example, if a teacher indicates that she would like to revise her assessment practices, staff developers might help her consider any of the following technology solutions: creating a grade book, determining weighted scores using a spreadsheet, or developing a rubric based on Internet samples. Depending on the type of support teachers request or require, different types of support should be offered (one-on-one consulting, just-in-time training, formal classroom training, peer collaboration and observation, etc.). Some strategies will work more readily and be more appealing than others, depending, at least to some extent, on the barriers teachers describe. Different barriers (e.g., lack of confidence vs. lack of support) typically suggest the use of different strategies. For example, if teachers mention not yet feeling comfortable with technology, they probably are not ready to begin using technology in the classroom. Instead, they need to increase their personal comfort through increased individual and personal use. By acknowledging and helping teachers work through specific first- and second-order barriers, we help them identify strategies that work for them and simultaneously build confidence in their ability to address future barriers.

Initiate Changes

As teachers test their ideas in their classrooms, they experience first-hand what works and what doesn't. As Maddin (1997) emphasized, "the real learning begins back in the classroom" (p. 56). Information obtained through direct experience is one of the most powerful means to shape future practice. Because teacher self-efficacy is a fluid construct, it changes with new experiences. While early success can raise efficacy, early failures may lower it. For this reason, it is probably important that reluctant teachers experience as much success as possible during their first attempts to use technology within the classroom. Additionally, teachers should set realistic goals for themselves since they will measure their success by how closely they meet the goals they have set (Pintrich & Schunk, 1996). It is not critical that reluctant teachers implement a highly sophisticated lesson with lots of bells and whistles. What's most important is that they are successful. Risk and surprise need to be eliminated, or at least greatly controlled.

Reflect on Changes

Kagan (1992) explained that changes in teachers' beliefs are rarely the result of reading and applying research findings. Teachers base most of their ideas on their own and others' experiences. In order to promote professional growth, Kagan recommended that teachers' awareness of their own beliefs be raised, followed by experiences that challenge those beliefs and promote integration of new ideas into current belief systems. Such reflection initiates the revision process. After implementing new ideas or tools in the classroom, the teacher takes time, with or without others, to reflect on the teaching/learning processes and outcomes achieved. Teachers consider how the teaching and learning that occurred compared to what was expected. As teachers realize that their "ability to successfully utilize technology has increased, they are motivated to attempt to learn more about technology, its uses, and benefits" (George & Camarata, 1996, p. 51). However, as with most teaching experiences, there are usually many opportunities for improvement. Teachers should be encouraged to focus their reflections primarily on what the students did or did not do in response to the lesson. Based on this information, teachers can consider what changes need to be made to facilitate the types of student performances or levels of thinking desired.

Modify and Extend Understanding

In this final step, teachers are encouraged to discuss their instructional changes with others and consider the overall usefulness and effectiveness of the changes they have initiated. Based on conversations with others, teachers are encouraged to outline their next steps for development. This may include implementing a revised version of the lesson, adding one more idea to the lesson, or reading relevant literature to examine what others have done. Revisions made after each iteration are not likely to be substantial; however, continual refinements, over time, can add up to noticeable differences. As teachers continue to converse with others about how they addressed a relevant issue in their classrooms, as well as the results they obtained, they initiate, in effect, new cycles of development.

Educational Implications

According to Fisher, Dwyer, and Yocam (1996), "The major challenge to supporting school learning with technology lies not with technology but with the professional development of educators" (p. 7). The success of our technology integration efforts will depend, ultimately, on the focus and effectiveness of our staff development efforts.

Traditional approaches to teacher development have typically employed a one-size-fits-all mentality. *Responsive professional development,* as represented by the VisionQuest© model, meets teachers where they are, yet moves them continually forward by engaging them in activities that explicate both their own and their students' *evolving* understandings. Recognizing that even "expert" teachers continue to evolve (and that expertise is emulated in a variety of ways), early professional development activities impel teachers to reveal, test, and refine current beliefs about classroom practice. As teachers engage in iterative classroom tryouts and collaboratively reflect on changes in students' thinking, they become more sophisticated at recognizing and assessing their own understandings and abilities. Through this ongoing examination of practice, teachers begin to construct deep understandings of how to translate reform-based pedagogy into practice. As initial questions (e.g., What makes a "good" activity?) lead to additional questions (e.g., How can technology support this activity? How do I assess students' work?), the VisionQuest© model has the potential to engender simultaneous changes in instruction, assessment, and teacher and program development.

References

Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York: Freeman.

Education Development Center (1996). *National study tour of district technology integration summary report* (CCT Reports, No. 14). New York: Center for Children and Technology.

Ertmer, P. A. (1999). Addressing first- and second-order barriers to change: Strategies for technology integration. *Educational Technology Research and Development,* 47(4), 47-61.

Ertmer, P. A., Addison, P., Lane, M., Ross, E., & Woods, D (1999). Examining teachers' beliefs about the role of technology in the elementary classroom. *Journal of Research on Computing in Education*, 32, 54-72.

Ertmer, P. A., & Hruskocy, C. (1999). Impacts of a university-elementary school partnership designed to support technology integration. *Educational Technology Research and Development*, 47(1), 81-96.

Fisher, C., Dwyer, D. C., & Yocam, K. (Eds.). (1996). *Education and technology: Reflections on computing in classrooms*. San Francisco, Jossey-Bass.

Frame, J. A. (1991). Moving toward a staff development model for computer learning. *Dissertation Abstracts International*, 52/03, 756A.

George, G., & Camarata, M. R. (1996). Managing instructor cyberanxiety: The role of self-efficacy in decreasing resistance to change. *Educational Technology, 36*(4), 49-54.

Gilmore, A. M. (1995). Turning teachers on to computers: Evaluation of a teacher development program. *Journal of Research on Computing in Education*, 27, 251-269.

Hadley, M., & Sheingold, K. (1993). Commonalties and distinctive patterns in teachers' integration of computers. *American Journal of Education, 101*, 261-315.

Hruskocy, C., Cennamo, K. S., Ertmer, P. A., & Johnson, T. (2000). Creating a community of technology users: Students become technology experts for teachers and peers. *Journal of Technology and Teacher Education*, 8(1), 69-84.

Kagan, D. M. (1992). Implications of research on teacher belief. *Educational Psychologist*, 27(1), 65-90.

Maddin, E. A. (1997). The real learning begins back in the classroom: On-the-job training and support for teachers using technology. *Educational Technology*, 37(5), 56-69.

McKinney, M., Sexton, T., & Meyerson, M. J. (1999). Validating the efficacy-based change model. *Teaching and Teacher Education,* 39(5), 37-43.

National Center for Educational Statistics. (1997). *Digest of Educational Statistics*. Washington, DC: U. S. Department of Education.

National Center for Educational Statistics (2000). *Public school teachers' use of computers and the Internet*. Washington DC: U. S. Department of Education.

North Central Regional Educational Laboratory (NCREL; 1998). *Learning with technology: Integrating new technologies into classroom instruction*. Oak Brook, IL. Also available online: http://www.ncrtec.org/pd/lwtres/npdm

Pajares, F. (1992). Self-efficacy beliefs in academic settings. *Review of Educational Research*, 66, 543-578.

Pintrick, P. R., & Schunk, D. H. (1996). *Motivation in education: Theory, research, and applications*. Englewood Cliffs, NJ: Merrill/Prentice Hall.

Snoeyink, R. (2000). *Experienced teachers' perspectives of learning and using computer technology.* Unpublished doctoral disseration. Purdue University, West Lafayette, IN.

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A Case Study of a Project to Promote the Integration of Technology in the Classroom at the Elementary Level

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"Abstract": This article examines a professional development project to promote the integration of technology into the classroom with teachers at the University of Puerto Rico Elementary School (UPRES). The purpose of this study is to learn how UPRES teachers learn about technology and on how to integrate this technology into their classroom. This report focuses on the first semester of the special project. In the study a qualitative approach was used for the collection and interpretation of data. The major source of data was the opinion of participants gathered through questionnaires, evaluation forms, and interviews. New practices to integrate technology into the classroom were evidenced and analyzed through participants' lesson plans. The study describes the stages of teacher learning computer technology, their learning needs and how teachers are integrating technology.

The University of Puerto Rico Elementary School (UPRES) is working on a technology plan to promote the integration of technology into the teaching and learning process. One of the components of the Technology Plan is the Professional Development Program (PDP) for the teachers. This component is considered to be the most important one because it could determine the effective integration of the technology in the classroom. Roblyer (2000) and other authors state that properly trained teachers make the difference between the success or failure of an integration effort. The UPRES started a special project to train the teachers in computers and to promote the integration of technology as a learning tool in the teaching and learning process in the classroom. The special project started in August, 2000 and will be completed in May, 2001. The project consists of workshops sessions, the design and implementation of lessons, and the publication and dissemination of the lessons implemented. The purpose of studying the first semester of the Project is to learn how UPRES teachers learn about computers and integrate them in their classroom. The study documents outcomes of the project and to understand more about the adult learning process. The study also revealed knowledge on the process of integrating technology in schools. The findings of this study are expected to be relevant for others schools involved in the similar initiatives.

The study consists of collecting data about the process and outcomes of the technology special project implementation during a four month period. The data was collected before, during and after the teachers participated in the Technology Professional Development Program of the technology special project in the UPRES. A qualitative approach for collecting and interpreting data was followed. The major source of data was the opinion of participants gathered through questionnaires, evaluation forms and interviews. New practices of participants as they integrate technology into the classroom evidenced with the lesson plans were also analyzed. The participants in the study are twelve elementary school teachers and two student teachers. To collect the data, the researcher used various instruments at different phases of the study. For the very beginning, the researcher used an adaptation of the instrument *The Stages in Learning New Technology* (SLNT) developed by Russell (1995). This instrument describes the stages through which teachers learning computers at the starting point of the project. A need's assessment survey was developed to understand the concerns of each teacher and to guide the design of the training sessions. For each workshop, evaluation forms were designed and interviews were carried out as the major sources for identifying the fundamental characteristics of an effective technology learning process and how participants are changing their perspectives on the integration process. The evaluation form measures four criteria: Utility of the software, user-friendly characteristics, effectiveness of the workshop and participants interest to use the software in the teaching-learning process. Also, lesson plans generated by teachers were analyzed to describe how teachers transfer learning to their teaching practice.

Findings: The results of SLNT instrument revealed that 35% of participants are at the basic stage, 24% are at a middle stage, and 41% are at an advanced stage. The need assessment shows that 100% of the teachers in basic level want to learn to use the computer. This information was used to decide to start with two basic sessions for the teachers who are in the basic level. Forty five percent (45%) of the middle and advanced stage teachers need to learn how to use only one computer in the classroom (at the UPRES there is one computer per classroom), and 64% of the teachers need ideas and programs to integrate computers in the classroom. For the first phase of the study, the researcher analyzed data of three workshops offered: Basic computer skills, Inspiration (graphics organizer) and "Erase una vez" (story maker). The participants (100%) who completed the evaluation form agree that the software and the workshops fulfilled the four evaluation criteria. The evaluation form includes questions about their ideas on integrating the software and how they are changing their perspective towards the integration of technology. Figure 3 shows the variety of ideas they expressed. It was interesting to find that all teachers identified different ideas of how to integrate the software.

Figure 3. Ideas of how to integrate the program or software.

Inspiration	"Erase una vez"
–To construct concept mapping (2/5) –To make brainstorming (2/5) –To organize ideas (2/5) –To create diagrams –To present connections between matters –To guide literature analysis –To make outlines –"Story mapping"	–To promote the literature creativity of the students, story making (2/4) –To motivate the students to write (3/4) –Reinforce basic skills in the reading and writing process

The twelve participants of the special project demonstrated they are using the technology for personal productivity. Samples of the kind of work they are doing are: writing/sending letters to parents, creating materials for the students, organizing and planning lessons, obtaining reference material, organizing information and preparing presentations.

Of the twelve teachers, only four teachers evidenced the integration of technology during the first semester of the project through nine lesson plans, which are classified as follows: Promoting writing skills (4); Finding information ; To learn vocabulary; To analyze and organize ideas and; To represent concepts with drawings and diagrams. The four teachers integrating the technology at this phase have between 12 and 15 years of teaching experience. Three of them are at the advanced level.

Discussions: The observations and data collected during the first semester of implementation helped to identify patterns that can be useful to enhance the project and the school technology plan. The next paragraph explains the found patterns. First, those who demonstrate interest in the technology project were at different stages in learning computer technology and have different learning needs. Having determined the stage in learning technology in which they are, and their learning needs, facilitates decision-making to respond to the different developmental stages of the teachers. There are seven (7/12= 58%) enthusiastic teachers that demonstrate motivations to learn more and apply what they have learned about technology. They are consistent in their attendance to workshops. There are five of the teachers (5/12= 42%) who participate in an inconsistent manner and do not demonstrate initiative to integrate the technology in the teaching-learning process. Few teachers aren't interested or had others priority. Second, the data of the evaluation form allows to conclude the following about the workshops: 1) The software selected for the workshops are teacher friendly (Inspiration and "Erase una vez"), 2) The software can be applied in the classroom, 3) The structure of workshops was very effective in teaching participants how to use the software; and 4) Teachers discovered different creative ways for using the software.

References

Russell, Al (1995). Stages in Learning New Technology. *Computers in Education* 25(4) 173-178.

Roblyer M.D. & Edwards, J. (2000). *Integrating Educational Technology into Teaching.* Columbus, Ohio: Merrill p. 33

Teaching Electronic Information Research Skills to Teachers

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Abstract: The University of South Africa offers a distance teaching module in electronic information research skills to teachers doing a master's degree. The module is highly practical and caters for different levels of computer skills. It involves the completion of a literature search, the design of a personal database, and the compilation of a bibliography. The study material includes a study guide, a tutorial letter with portfolio activities, CAI tutorials, and a web-site. Students attend a week-long workshop, or master the practical skills on their own. Portfolio assessment enables them to monitor their mastery of the practical skills and to reflect on their weaknesses and progress. Considerable success has been achieved, even with students who are computer illiterate. However, if students do not obtain access to computers and the internet they do not retain the information research skills, and also forfeit the lifelong skills benefits.

Introduction

In South Africa, as in many other countries, there is a growing interest in electronic information, access to the internet and information literacy. The ability to find, evaluate, analyse and use information is strongly associated with progress, prosperity and gaining a competitive edge. Bruce (1995, p.158) for example proclaims: "Effective research, learning, communication, decision-making and problem-solving, require individuals to be able to locate, manage, evaluate and use appropriate information from a wide range of formal and informal sources". The need for tertiary students to be introduced to research information skills can be summarised in Sayed's words (1998, p. x): "Information literacy is thus a "key skill" similar to other foundation skills such as mathematics, statistics, language and communication. The electronic world-brain of the twenty-first century will make information discrimination and handling skills more and more valuable."

Librarians have developed information handling and retrieval skills over many decades, but for many people information skills can open up a new world — especially if they have never even touched a computer before. It is therefore time for librarians to share their skills with people from other disciplines, such as teachers. The condition, however, is that information research skills should be linked to the students' curriculum content (Barry 1997; Oberman, Lindauer & Wilson 1998) and their immediate information needs and topics of interest. Since 1998 the Department of Information Science in collaboration with the Library Services at the University of South Africa (Unisa) has been offering a postgraduate module in Research Information Skills. The module is currently offered to students doing master's degrees in Chemistry Education and Environmental Education. The students are thus all teachers or lecturers — who are in excellent positions to share their newly gained knowledge and skills. Since the content of the module is generic, it can easily be offered to different target groups by simply changing the topics covered in the practical exercises and adjusting the level of assessment. It is thus potentially possible for teachers to share their knowledge with their pupils and colleagues without putting in considerable effort.

Unisa is a distance teaching university. Most of our students are therefore employed adults. They have fulltime jobs, families to take care of and community responsibilities. Furthermore they come from all over the country, from neighbouring countries, and even from Mauritius, the USA and Switzerland. At Unisa we follow a distance teaching model which relies mostly on printed tutorial matter, with no (or very little) compulsory class attendance. For the module in Research Information Skills we do, however, offer an optional one week workshop. Students who are not in a position to attend the workshop are expected to master the skills in their own time by using a variety of resources which are available from the module's web-site. Access to computers and the internet is then a prerequisite. The rationale behind the module is dealt within detail by Fourie and Ten Krooden (1999).

Purpose and Structure of the Module

The module aims at enabling students to do their own literature searches for the dissertation of limited scope which they complete as part of their studies, and to evaluate and organise the search results to support their research. Apart from clearly formulating a research topic and resulting information need(s), the students are expected to select suitable sources for finding information (eg bibliographies, printed indexes, databases, the library catalogue or an internet resource), formulate a search strategy, use various systems to find information (eg the library catalogue, the *ERIC* database or an internet search engine), evaluate the information sources, add relevant sources to a personal database and compile a bibliography as a starting point for their research project. The overall aim of the module is therefore for each student to develop the necessary skills for effective retrieval, evaluation, organization and use of information for research.

The expected outcomes for the module include understanding: the link between research and literature searching; the information industry and information infrastructure; computerized databases; the structure and nature of databases in order to apply this knowledge to information retrieval; how to formulate and adapt search strategies in order to retrieve the most relevant search results; the creation and maintenance of a personal database; what the internet is and how to find information through the different internet resources; and the importance of publishing.

It is therefore an extremely practical module, aimed at teaching a lifelong skill to enable students to keep up in a highly technological and information literate society. Since critical reflection and progressive improvement is a critical component of effective and efficient electronic information searching (also called online searching), the emphasis is strongly on practice, critical reflection, and the ability to spot problem areas and to suggest solutions to overcome these.

Content

Although students are introduced to the total information infrastructure, including printed resources, the emphasis is on the use of electronic information resources such as the library catalogue available via the internet, databases via the internet or on CD-ROM (eg *ERIC*), and other internet resources. The content is set out in a study guide. All students receive a printed copy of the study guide but can, however, also download an electronic version from the internet. The topics covered in the study guide include research and information, information sources, computerized information retrieval, database structures, search strategies, organization and maintenance of information in a personal database, internet navigation, and the use and publishing of information.

Student Population

The module has been designed to cater for the needs of Unisa students. Some of the teachers doing the module are highly computer literate; others have never touched a computer before. Some work in highly technological environments, while others come from rural areas or disadvantaged communities — often without electricity or telephone lines. In the end, however, they are all expected to use electronic information resources to search for literature to complete their dissertations. Additional arrangements therefore have to be made to cater for the needs of computer illiterate students, as well as for those who are highly computer literate and may be held back by an average workshop class. (More about this in a following section.)

It is important to bear in mind that the students are adults, and although they may be ignorant about information research skills, they are experienced teachers and often leaders in their communities. We found, for example, that the students in Environmental Education especially are very active in their communities. They initiate projects for environmental protection or informing the community on environmental hazards. They publish poems, organise prayer groups and offer social comment in their local newspapers. It is therefore essential to value their input as adults, to acknowledge their expectations of the module, and to have empathy with the difficulties they experience in a learning situation that demands computer skills. Some of them admit to being so nervous of using a computer for the first time that they actually shake! In addition to the normal burden (or challenge) of learning a new skill (information searching), they have to use a new tool (a computer) — and save face in the presence of their lecturers and fellow students. (In a separate section I shall deal with how we approach this challenge.) At this stage it is sufficient to acknowledge the truth in Malcom Knowles' (1990) theory of adult learners and andragogics. Most of the teachers take their studies very seriously. They set high expectations for their mastery of the skills involved. Some admit that it is *their* responsibility to put in the extra effort to gain computer skills; they are not satisfied with just following our guidelines in a workshop, but want to complete the information searches all on their own. Some are even prepared to voluntarily repeat the module to ensure that they meet with the standards they have set for themselves.

In general the students are prepared to make huge sacrifices to gain research information skills. They consider it as an important life skill, and are prepared to incur travel and accommodation expenses to attend the workshop, and to travel to the computer laboratories in the regional centres. In 1999 two Namibian students travelled over 2 500 kilometres to attend the workshop! It is of course then our duty to ensure that we offer the best possible learning opportunities.

Teaching Methods and Learning Events

The module is based on a study guide which includes the learning material, self-assessment activities and references to the portfolio activities. Students also receive a tutorial letter with the portfolio activities that need to be completed for assessment. This also contains the guidelines for compiling portfolios and the checklist with assessment criteria. It is important for students to have the latter before embarking on their portfolios.

Two computer assisted (CAI) tutorials are prescribed. They can be purchased from Unisa Press at very reasonable prices (between \$4 and \$7). One of the CAI tutorials covers the formulation of search strategies (including the selection of search terms, the combination of search terms, searching on word stems, and searching in selected fields only). It also includes numerous examples and questions for self assessment. The other tutorial covers the structure of databases, such as the fields that are included, how to use the fields to search for information, and how to use the information obtained from database records to design a personal database, or compile a bibliography. Students can work through these tutorials in their own time and at their own pace. This is, however, considered essential preparation for the workshop. Students who do not have access to computers therefore have to attend a training session prior to the workshop, or make use of the computer laboratories at the Unisa regional centres.

A module web-site offers links to additional resources and online training material (eg on how to search the library catalogue and how to use the internet). The web-site links to electronic versions of the study material that can be downloaded. It also offers links to supportive material such as selected search engines, information on discussion groups, relevant electronic journals, databases that are freely available, guidelines on evaluating and citing internet resources and the library catalogue.

The learning events also include a week long practical workshop during which students get to use a variety of electronic information resources, and to design their own databases. Since the course is offered through distance teaching, it is not compulsory for students to attend the workshop. If they do not attend the workshop, however, they are expected to use the module's web-site to learn more about the electronic resources that are covered during the workshop. Training manuals and access to the information resources are available from the web-site of the Unisa Library. As part of the workshop an additional session is offered for students who have not previously worked with computers. During the workshop students are taught how to search the library catalogue, a selection of databases such as *ERIC*, and how to use internet search engines and directories. They are also taught how to design their own personal databases. We use either a word processing program such as WordPerfect or MS Word to design the personal databases, or we use a commercial database programme, DB/TextWorks. We have permission to provide students with demonstration disks of DB/TextWorks. They can then use these to create a database that can store up to fifty records. Each student's database should be different, and based on the information they will require to write their dissertation.

Finally, students are also advised to view videos on online searching. These can be ordered from the Unisa Library.

Computer Skills

As mentioned earlier, we have students who are highly computer literate (especially the Chemistry students). A large number of students doing Environmental Education have, however, never touched a computer before. It therefore takes considerable effort and a special atmosphere to get them up to standard so that they can keep up with the rest of the group during the workshop.

Training sessions in computer literacy are arranged prior to the workshop. Students are given the opportunity to work through a CAI tutorial on computer literacy. The emphasis is on the mastery of keyboard skills. We feel that for the immediate purpose of the workshop this is sufficient. During the workshop they are then introduced to navigating the internet, and specific database programs — although they may work very slowly, they at least know where to find the appropriate keys. Students cope fairly well if given sufficient time. We can unfortunately not spend more than two days (eg the Friday and Saturday prior to the workshop) on this angle. Although we found that these students can manage, their slow typing speed frustrates the students who are highly computer literate. The fact that they are already anxious and very aware that they are holding up the group, also impedes their progress.

The ideal situation would be to assess students' computer skills and knowledge of information resources before they attend the workshop. They could then be organised in two groups so that the students with no prior computer skills can progress at a slower, less stressful pace. With sufficient practice and attention they could then master the required skills. We are thinking of developing an assessment instrument to allow students to test their own computer skills to ensure that they meet with our requirements for the workshop. We could also include advice on aspects that they still need to master (eg using the navigation buttons of a typical internet browser or menu driven database). The advantage of such a tutorial would be that it can be made available on the internet, and that students could assess their computer skills in their own time and without embarrassment. They could then work on their skills until they meet our entry requirements.

For a number of computer illiterate students, the workshop provided the impetus to make an effort to gain access to a computer or to purchase one. Since they have the opportunity to reinforce their skills, the module in Research Information Skills really opened a whole new world for them. Although students who do not have access to computers at their places of employment can pass the module based on what they learn at the workshop, they would soon forget the skills they mastered.

A separate workshop for computer literate students would be shorter and at a faster pace and include more advanced activities, such as designing a personal web-site.

Portfolio Assessment

Portfolios were selected as the assessment method since they are highly suitable for Information Research Skills and the reflective and critical thinking skills required by information searching and the design of databases. The reflective nature of search skills is also stressed by Barry (1997) and Fidel (1994). The students have to submit two assignments based on portfolio activities. The assignments are assessed according to a checklist with criteria, and guidelines are provided for improvement of the answers to the activities. For the first assignment we include a personalized letter, because we found that students make many mistakes since they are not familiar with electronic information retrieval. If we were to use the checklist at this stage, it would be too discouraging for them to be confronted with an average or below average rating.

The whole idea behind portfolio assessment is to allow students to make mistakes, to guide them in correcting their mistakes, and to encourage them to reflect on their own shortcomings and come up with suggestions for improvement.The assessment criteria therefore cover the students' learning experiences, the course outcomes, the presentation of the portfolio, the final product (which is the information search, internet search and personal database), and the completion of the self assessment activities. The examination portfolio is basically the improved versions of the two assignments and the final product. To ensure high standards, it is also examined by an external examiner.

Students' experiences

We have gathered data on students' experiences with portfolio assessment and their experiences of the module and workshop through focus group interviews, personal observations and the comments in their portfolios. We have established that the learning content and the portfolio activities must be formulated very clearly and completely unambiguously. Since the field is new to most of the students, they can easily be side-tracked, and they can also become very frustrated if they have to waste time on poorly formulated activities. The reason for including the activities must be explicitly spelled out so that students can link it to the end products they have to complete. (It should be remembered that the teachers are not librarians, and therefore the purpose and value of the activities will not always be obvious to them.) Students must also receive brief but very clear and explicit guidelines on how to compile their portfolios. It does not take much to get the teachers totally involved in portfolios *per se*, instead of focusing on search skills. A number of students mentioned that they learned a lot from portfolios that they can apply to their own teaching situations.

Portfolios are a new method of assessment to our students. It requires a complete change of mind-set and a very supportive and understanding atmosphere to convince them that they are allowed to make mistakes, that they will have the opportunity to correct their mistakes and that they may criticize the lecturer and course content (of course with the necessary substantiation). One student said: "The portfolio experience taught me that I can immediately give the answers, because I can always come back and improve or correct my answers".

Students need to learn that they can trust the lecturer to keep the promises of portfolio assessment. The need for such trust is clear from the following remark by a student: "Although I felt very uncertain in the beginning, I had enough trust in the lecturer to realize that she will not set unrealistic demands. She will not expect us to do something that is impossible". Portfolio assessment also requires a change of mind-set on the part of the lecturer, who needs to learn that the students have higher expectations and that they require more time and attention. Lecturers especially need to learn how to deal with criticism — which is actually invited by portfolio assessment. Fourie and Van Niekerk (1999) and Van Niekerk offer more detail on portfolio assessment (1998).

What Students Gained

The approach we follow in teaching Research Information Skills helps students to realise how they learn — it is not just about the end product: "I was concerned only about the end product, without considering the fact that the actual doing of something can also be a learning experience. We are too set on the end product, which can often cause our work to become very boring." Students also feel that they can apply the skills they have learned outside the immediate situation. They view Research Information Skills as a lifelong skill to share with their pupils, colleagues, and even family members. "I have really enjoyed this course and found that I can apply and share so much of the information and skills that I acquired. I think students need to have a paradigm shift to cope with this course especially with regard to reflective practice." Students felt that they can share their experiences with their fellow students and the lecturer: "The kind of learning that takes place in Research Information Skills, caters for sharing of the processing of constructing ideas instead of simply laboring individually. So everyone, both learners and lecturers, are viewed as resources." Another student proclaimed: "I have also developed as a person and understand that in life nothing is impossible. If you keep on practising and ask for help, you are bound to succeed".

Recommendations

Even though the module is presented through distance learning, students seem to manage well. They are also willing to attend the workshop. A web-site with more support, student interaction and interactive tutorial matter would, however, be of additional benefit. A lack of computer skills impedes students' progress, and since they are adults they may experience even more anxiety due to the need to save face. An electronic assessment instrument available through the web would support them in ensuring that their computer skills meet with our expectations. If not, they could put in more practice through the use of the CAI tutorials before attending the workshop. It should be explained to students that we can support them in mastering the basic information research skills even if they have no prior knowledge of computers. If, however, they cannot gain access to computers and the internet to reinforce their skills, the module would have little more effect than making them aware of the power and use of electronic information resources.

Students should also be provided with more direction on the variety of resources they can consult. This could be done by mapping the information infrastructure for the particular discipline (eg Environmental Education or Chemistry Education), or even building this into a subject portal. The emphasis would be on searching for information from these resources and evaluating the results. Furthermore, it would also be necessary to consider differentiated learning events for students who are highly computer literate, and who have access to the internet. This could include the development of personal web-sites to organise the results of their literature searches, and to offer links to their discussion groups and journals they need to consult regularly. It could also include links to the numerous current awareness services offered via the internet, and to an electronic portfolio. In future the main emphasis should be on developing opportunities for students who come from different communities: to offer sufficient support as well as sufficient challenges.

Once students from disadvantaged communities have mastered the basic skills, they should have the opportunity to work on more challenging tasks. Since students have to complete the module in one year, this is currently not possible.

References

Barry, C. (1997). Information skills for an electronic world: training doctoral research students. *Journal of information science*, 23(3), 225-238.

Bruce, C. (1995). Information literacy: a framework for higher education. *The Australian library journal*, (August), 158-170.

Fidel, R. (1994). Online searching styles: a case study-based model of searching behavior. *Journal of the American Society for Information Science*, 35(4), 211-221.

Fourie, I., & Ten Krooden, E. (1999). Providing learning opportunities for teaching research information skills. *Progressio*, 21(2). Available online: http://www.unisa.ac.za/dept/buo/prog ressio/index.html

Fourie, I., & Van Niekerk, D. (1999). Using portfolio assessment in a module in research information skills. *Education for information*, 17(4), 333-352.

Knowles, M. (1990). *The adult learner: a neglected species*. London: Gulf.

Oberman, C., Lindauer, B.G., & Wilson, B. (1998). Integrating information literacy into the curriculum: how is your library measuring up? *College & research libraries news*, 59(5), 347-352.

Sayed, Y. (1998). *The segregated information highway: information literacy in higher education*. Cape Town: UCT Press.

Van Niekerk, D. (1998). Putting a portfolio together — some guidelines. *Progressio*, 20(2), 81-101.

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Mentoring Overcomes Barriers to Technology Integration

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Abstract: This paper examines the use of Instructional Technology graduate students as mentors to K-6 elementary teachers in a rural community in the use of technology and the integration of technology into the daily curriculum. Mentors were able to support the elementary teachers in overcoming the barriers to technology use by modeling a *vision* for integration, just in *time* learning, *access* to equipment, *professional development* opportunities and methods for *assessing* student work involving technology use.

Introduction

As educational institutions acquire more sophisticated hardware and software, an overwhelming need arises for teachers to obtain the necessary skills to implement these tools into the classroom curriculum. To make effective use of these tools, teachers must redesign lessons around technology resources, solve logistical problems of how to teach a class of students with a small number of computers, and transform the role of teacher in the technologically transformed classroom (Maddux, 1997).

While teachers indicate they see value in students using computers, some are not able to make the connection to how the computer fits into the daily classroom. Common barriers to the use of technology by teachers include the vision, access, time, assessment, and professional development (Office of Technology Assessment, 1995). This study describes a mentoring relationship among elementary teachers in a rural school district and graduate students in Instructional Technology at a midwestern university in a College of Education.

The Study

This study investigates one-on-one mentoring as a means of professional development strategy for in-service teachers in using technology in the teaching and learning process. An elementary school in Southeastern Ohio was selected as the study site. The study included eight in-service teachers and eight doctoral students of instructional technology participating for 20 weeks. The participating teachers (*called mentees in this process*) were teachers in grades K-6. The mentors were 2nd or 3rd year instructional technology graduate students.

Data was gathered from multiple sources using multiple measures including a need assessment survey for teacher mentees, the journals of both teacher mentees and graduate student mentors, and focus group interviews with teacher mentees. Additional data was gathered via a review of print and digital documents and field notes taken by the researchers. The researchers conducted data analysis concurrent with data collection, in a cycle beginning with data collection, continuing through reflection and analysis and then looping back through more data collection. The number of data sources helped to triangulate the data during the research process.

Findings

With respect to the barriers to technology use, the mentoring process provided a model for overcoming these barriers. The barriers are provided below with examples of how mentoring transformed the barriers:

Vision. Mentors modeled integration of the technology in the teacher's classroom providing opportunities for the teacher to observe how technology can be used and managed in their own setting. Often it is not that teachers do not want to use technology but that they lack the ability to "see" and "manage" how technology can be used in the teaching and learning processes of the everyday classroom. Mentee elementary teachers indicated that the process of modeling the use of technology in real settings afforded them the opportunity to "see how it works" and that it is indeed manageable.

Access. Teachers needed help with technical support. Mentors provided the teachers with the needed support by showing teachers how to repair machines, load software, navigate printing problems, and locate needed hardware. This provided teachers with more access to the technology in their classrooms.

Time. Teacher schedules are very difficult to manage. The mentoring allowed the mentor and teacher mentee "just in time" learning. Teachers met in their own classroom, used their own equipment at the time the teacher wanted to work. In a focus group discussion, teachers echoed these sentiments stating," I want to learn how to use the technology myself, but having the mentor gave me the opportunity to learn it in my time frame and with the students."

Assessment. Teachers had an opportunity to use the experiences of the mentor to determine ways of designing and evaluating projects. Mentors provided lesson design opportunities to teachers in instances in which the evaluation of technology skills were desired by mentee teachers.

Professional Development. Mentoring allowed the teacher to examine ways of using computers within the curriculum and learning new skills. Mentoring helped the teacher to develop strategies for overcoming the barriers of vision, time, access, and assessment.

In general, the mentors often presented the elementary teacher with models for integration. It was observed that teachers used these models to redesign their lesson to incorporate the use technology into the lesson that was being taught at the time. Teachers did not create artificial lessons but instead followed their planned lesson and incorporated the technology to enhance the learning process. Some of the examples included following: 1) *Native Americans* – used a lesson plan on Native Americans to help students create a HyperStudio stack about Native Americans and to quiz the students on knowledge gained in the Native American Unit; 2) *Solar Systems* and *US Constitution* – worked with students to create two HyperStudio stacks, one on the solar system and the other on the US constitution; 3) *Class Homepage* using Communicator – with the help of the mentor worked with her students to create a class homepage; and 4) *Student Album* – worked with students to create a HyperStudio stack with pages for each student.

Conclusions

The mentoring involving the university instructional technology graduates and elementary teachers overcame many of the time and access barriers to technology integration in elementary classrooms. The mentoring provided vision to the teacher for designing lessons around technology-rich resources, the solving of technical support problems and motivation to use technology in the teaching and learning process. Comments from the teachers at the end of the 20-week period support the continuation of such projects in this elementary school and with others in the area.

The mentoring strategy is a promising means for obtaining professional development in schools for technology integration. Mentorship provides models of computer use to the classroom teacher and help in lesson plan design. This university/K-6 mentoring partnership supported the professional development of the graduate student mentor as well. Finally, in rural school districts that often have a difficult time obtaining substitute teachers, it provides a cost effective means for obtaining technical support and professional development in the use of technology.

References

Maddux, C. D. (1997). The newest technology crisis: faculty expertise and how to foster it. *Computers in the Schools*, 13 (3/4), 5-13.

Office of Technology Assessment. (1995 April). *Teachers and technology: Making the connection.* (OTA-HER-616). Washington, DC: U.S. Government Printing Office. [On-Line]. Available: http://www.wws.princeton.edu/~ota/ns20/year_f.

Integration or Inoculation?: Selected Large-Scale Professional Development Studies

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Abstract: This paper highlights a selection of research studies on multi-district professional development projects producing a clear call for more long-term involvement on the part of administrators and the intellectual, social and philosophical benefits for educators when using a mentoring system.

Teacher training theorists such as Darling-Hammond (1997) stress that traditional models of in-service training are simply not effective. While the literature abounds with research centered on the delivery of professional development (PD) in technology at the building or the district level, the same is not true regarding larger-scale (e.g. multi-district or statewide) research where descriptive models and suggested projects are most prevalent. The paucity of research in this area begs for aggregation. This preliminary literature review highlights a selection of studies that present a clear message to anyone undertaking a multi-district plan.

"Teacher expertise is the most important factor in determining student achievement," writes Linda Darling-Hammond (Darling-Hammond & Ball 97). Yet requisite technology training is not as widespread as such a strong statement would imply. A 1999 survey reported that only 29% of teachers had more than five hours of PD in technology curriculum integration in the past year (Fatemi 99). For various reasons, PD has not been the answer that educators seek; a national survey of teachers' technology use found that 93 % of teachers cited independent learning as their preferred mode of preparation, compared to professional development activities (88 %) and colleagues (87 %) (National Center for Education Statistics 00). Nor can we expect the passing of time (and subsequent retirement of untrained teachers) to be the panacea. Fatemi notes that "teachers who have been in the classroom five years or fewer are no more likely to use digital content than those who have been teaching for more than 20 years" (1999).

Griffin (91) defines professional development as "a serious and systematic effort to engage a group of professional educators who work together, a staff, in activities designed specifically to increase the power and authority of their shared work" (p. 244). For many individuals, the effective curricular integration of computers is predicated on a fundamental change in philosophy and pedagogy that must often unfold in the absence of a formalized, supportive culture. Further complicating the PD mix is the multitude of concurrent reforms in education. One pilot project and four peer-to-peer initiatives illustrate the search to extend skill and understanding of computer use for K-12 educators into technological praxis.

In search of formative data, a Louisiana collaborative targeted PD and curriculum integration as part of a statewide pilot study. The teachers involved in the university-run course and the 3-day workshop certainly offered a multitude of suggestions for future iterations but it was noted that they were impressively committed to the project and overwhelmingly enthusiastic about its potential (Whelan et.al. 97). The researchers found two vital characteristics of successful schools. First, these sites exhibited strong management teams with "a commitment to collaboration among partners within the district, including those at the local university and... others outside of education. Additionally the evaluation team found a high degree of commitment to ongoing staff development in successful projects and schools" (p. 418).

A highly successful mentoring project resulted from the collaboration between a technical college and educators from 14 school districts in New Jersey. For three years, monthly meetings and two-week summer institutes resulted in over 150 contact hours between mentors and mentees. By contrasting the most and least successful schools, Holahan and colleagues (00) found the most striking difference was "the extent to which administrators supported the mentor teachers in learning to use computers, developing curricular materials, and providing peer mentoring, as well as the extent to which administrators supported the mentee teachers" (p. 344). A similar program, Regional Educational Technology Assistance in New Mexico began in 1995 and continues today, thus proving the initiative's sustainability. Researchers Norton, & Gonzales (98) noted the acute need to involve administrators, and that the most useful aspect for participants was "the ability to network and share with colleagues... and the opportunity to learn and think about new curriculum and instructional ideas" (p. 44).

Mentor type programs are not only a phenomenon of the United States. As the capacity for large-scale PD emanating from Australia's Department of Education began to diminish, Williams (97) noted that professional organizations stepped in to support teachers as they assumed responsibility for their continuing education. She chronicles one such distance education project delivered that purposefully included face-to-face interactions. The planners negotiated two release days per month for each teacher to attend conferences, study or visit a mentor's classroom. A significant discovery in this research was that immersion within the technology also provided the conduit to professional relations with other educators. This reflective collegiality was a critical factor in deeper philosophical engagement for these educators. Although modest in scale (15 teachers per year) New Zealand sponsored two cycles of Facilitator Training. They handpicked teachers nationally for diversity in teaching experience, fluency with technology and geography (Compton & Jones 98). These teacher facilitators interacted with 355 others. Among the key findings was the value on embedded opportunities to network with colleagues.

These large-scale PD initiatives embody two consistent and key factors. The long-term commitment of administrators in the PD process leads to sustainable integration of technology. A "pre-packaged" inoculation fix solely mandated from above did not appear in this research; the capacity for customization based on the schools' needs, curriculum, existing expertise of teachers is absolutely essential. Furthermore, these successful programs manifested the recognition that learning takes time, practice and meaningful interaction with colleagues.

References

Compton, V., & Jones, A. (1998). Reflecting on teacher development in technology education: Implications for future programmes. *International Journal of Technology and Design Education, 8*. 151-166.

Darling-Hammond, L., & Ball, D. L. (1997). Teaching for high standards: What policymakers need to know and be able to do. Retrieved November 3, 2000, from the World Wide Web: http://www.negp.gov/Reports/highstds.htm

Fatemi, Erik. (1999, September). Building the Digital Curriculum: Retrieved November 24, 2000 from the World Wide Web: http://www.edweek.org/sreports/tc99/articles/summary.htm

Holahan, P. J., Jurkat, M. P., & Friedman, E. A. (2000). Evaluation of a mentor teacher model for enhancing mathematics instruction through the use of computers. *Journal of Research on Computing in Education, 32* (3). 336-351.

Griffin, G. A. (1991). Interactive staff development: Using what we know. In A. Lieberman & L. Miller. Staff development for education in the '90s: New demands, new realities, new perspectives. New York: Teachers College.

National Center for Education Statistics. (2000). Teachers' tools for the 21st century: A report on teachers' use of technology. Office of Educational Research and Improvement. Retrieved November3, 2000, from the World Wide Web: http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2000102

Norton, P., & Gonzales, C. (1998). Regional educational technology assistance initiative -- Phase II: Evaluating a model for statewide professional development. *Journal of Research on Computing in Education, 31* (1). 25-48.

Whelan, C. S., Frantz, C., Guerin, J., & Bienvenu, S. (1997). A qualitative evaluation of a statewide networking infrastructure in education project. *Journal of Research on Computing in Education. 29* (4). 403-422.

Williams, M. (1997, July). Connecting teachers - a professional development model in a distance education context. Paper to the EdMedia/Ed-Telecom 97 Conference in Canada. Retrieved November 4, 2000, from the World Wide Web: http://www.home.gil.com.au/~shellyw/mid_calgery.htm

Ensuring Technology Leaders in Classrooms and Beyond: Technology Training in a Graduate Teacher Education Program

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Abstract: This paper discusses the integration of the ISTE foundation standards into the Master of Education in Curriculum and Instruction teacher education program and the resulting impact on the teachers' acquisition of technology knowledge and skills, their classroom teaching, their students' learning, and in a broader sense their schools and districts. The program is described with particular attention given to the way in which students acquired and demonstrated technology knowledge and competencies. Successful integration of the ISTE standards into the program is viewed in terms of the quality and variety of products / assessment pieces using technology that have been generated by the students. Finally, the paper examines the resulting benefits to school districts that employ the teachers participating in this master of education program.

Introduction

The integration of technology into both undergraduate and graduate teacher education programs is one of the most critical issues in higher education today (Rogers 2000). Technology has become central to life in the second millennium. Research has shown that teaching and learning is enhanced by effective use of technology (Kauchak & Eggen 1998). Technology allows a more flexible, interactive, and creative educational setting that brings an immediacy to learning. It enables students to explore areas of interest and deal with real-life problems and issues (Knapp & Glenn 1996). Thus, technology knowledge and skills empowers teachers as well as students.

Undergraduate teacher education programs have embraced the demand for inclusion of technology into curriculum and instruction, with the result that students now are graduating from programs with the knowledge and skills delineated in the technology foundation standards developed by the International Society for Technology in Education (ISTE) (1997), and adopted by the National Council for Accreditation of Teacher Education (NCATE). However, many educators in classrooms gained their initial degree before technology became a component in undergraduate teacher education programs. Many have not participated in district staff development or college courses related to technology in education (McCannon & Crews 2000). Therefore, it is imperative that graduate programs provide opportunities for teachers to develop and enhance their technology competencies.

Background

The Master of Education (M.Ed.) in Curriculum and Instruction was designed to develop dynamic, reflective teachers with the abilities to develop, implement, analyze, evaluate and improve their own practices. The six program goals state that graduates of the program should be able:

#1 to identify, analyze, and explain (a) successful curricular models and instructional strategies and explore the basis for their success, and (b) curricular and instructional problems impeding the improvement of learning and teaching in classrooms and schools, and propose sound solutions.

#2 to monitor, evaluate, and suggest means to improve instructional practice, including the evaluation of educational outcomes and programs.

#3 to assume responsibilities for the development, implementation, evaluation, and revision of curricula or programs of study in particular disciplines and/or for particular populations.

#4 to locate, evaluate, interpret, and apply appropriate research and scholarship to the study and solution of practical educational problems in curriculum and instruction.

#5 to plan and conduct action research, using sound theory and appropriate research designs, to investigate educational questions related to the improvement of curriculum and instruction.

#6 to demonstrate professional leadership skills and continued professional growth in curriculum and instruction.

To achieve these goals the student must demonstrate the knowledge and effective use of skills including (a) communicating with students, colleagues, parents and the public; (b) making decisions; (c) solving problems; (d) collecting, analyzing, and interpreting data; *(e) selecting and using appropriate technology*; (f) working to resolve diversity issues; and (g) striving to continually improve instruction. The program uses the ISTE foundation standards to guide the development of the students' technology understandings and competencies. There are eighteen standards grouped into the three categories of basic computer/technology operations and concepts; personal and professional use of technology; and application of technology in instruction.

Master of Education students enroll in a two year core of 24 semester credit hours with a cohort of between 30 and 40 students. Now in the sixth year of operation, the site-based M.Ed. program has been made available to 18 different cohorts at 12 off-campus sites with 399 graduates as of the end of the Spring semester, 2000. Another 182 students are currently in the program with 90 scheduled to graduate by the end of Summer 2001.

Each site-based program is taught by three facilitators; one from the university, one from the host site and a third person from the field who complements the expertise of the other two facilitators. A major focus of the program is reflection on practice and action research.

Students work on projects for curriculum and instruction improvement at the classroom, school and district levels. Projects may be conducted by an individual, by small groups from the cohort, or by a collaborative group comprised of one or more M.Ed. Curriculum and Instruction student along with parents and colleagues such as teachers, principals, curriculum advisors, and school curriculum and instruction teams. Student-generated project topics focus on appropriate and effective ways to address needs, concerns and questions about personal classroom practice, school organizational patterns and school-community issues.

This paper examines ways in which the ISTE foundation standards have been integrated into the Master of Education in Curriculum and Instruction graduate teacher education program; and the impact of technology integration on the teachers' acquisition of technology knowledge and skills, their classroom teaching, their students' learning, and in a broader sense their schools and districts.

Technology integration into the Master of Education program

The Master of Education in Curriculum and Instruction program's constructivist approach to learning (Fisher, Dwyer & Yocam 1996; Kauchak & Eggen 1998) creates a number of opportunities in which students can acquire technology knowledge and competencies; and then requires their use to successfully complete assignments. In the first semester of the program, the instructional coordinator from the host district provides technology training as the students require it for the completion of research and presentations. During regular class time, students select labs to learn to use e-mail, the Internet, Microsoft Word, Excel, Access, PowerPoint, and HyperStudio. These lab training opportunities continue throughout the two year core program in addition to individual tutoring sessions as needed.

Students also go on campus to receive training in conducting electronic searches. The training is facilitated by library personnel at the main library at Wichita State University. The following week after this training, another class period is spent in the library where students research a self-selected topic for a literature review project. It is expected that they will put into practice the skills gained in the previous week to use available electronic search resources. Students continue to use these skills throughout their M.Ed. program, to complete electronic searches for other projects. After learning how to use the automated library system and gaining the skills of electronically accessing information, students research curriculum and instruction topics and issues relevant to their classroom practice.

The use of software such as Microsoft Word, Excel, and Access, is integrated into the students' action research projects as well. Students use these software programs to analyze, organize and report the data they have collected. With the software, students are able to make professional quality tables and graphs that are used for poster presentations, in research papers, or in multimedia presentations that they develop to share research findings.

Technology is integrated also into the communication procedures of the program. E-mail is used on a regular basis to communicate general course and program information to all students. An electronic newsletter is produced by the site facilitators approximately three times a semester and sent via e-mail. In between class meetings, students communicate by e-mail with course facilitators concerning course and program requirements; and with other students about projects being completed collaboratively.

Effects of technology integration on student products

Successful integration of the ISTE standards into the program is viewed in terms of the quality and variety of products / assessment pieces using technology that have been generated by the students. These products include poster projects, PowerPoint presentations, web site development, the use of BlackBoard for course communication, statistical analyses, and electronic portfolios.

Technology is viewed by teachers as a viable method to enhance the learning and teaching in their classrooms (Kauchak & Eggen 1998). In this program, teachers' action research projects focus largely on ways to better the education process for the students in their classrooms. Improving curriculum and instruction in any content area and at any grade level, often includes the integration of technology into existing curriculum (Knapp & Glenn 1996). Students conduct action research on technology integration topics such as using computer generated graphic organizers for reviewing and testing with elementary students; creating a Web site for the school district and community; and using the Internet to benefit students' learning. Research is also conducted on the use of technology to enhance home-to-school communication such as in the investigation of the use of BlackBoard to keep in daily contact with parents of high school chemistry students.

Technology has been integrated into student assessment in the program. Students are required to complete 3 projects in each of the four core semesters of the program. The presentation of all of these projects requires the use of various technologies, thus creating the context of performance assessment for every project.

Projects are reported in four different ways. Following the more traditional manner of presenting research, one project per semester is written as a paper. This requires the use of computer software such as Microsoft Word and Endnote to write and format the paper; and Excel and Access to organize data into graphs and tables for insertion into the paper.

A second way in which projects may be reported is through a poster presentation. Students use software to make graphs, tables, titles and labels for their poster. Some students use a digital camera to record events relevant to the project, and then print the photos to display on their poster. A requirement for the poster presentation is that a handout of some type with a summary of the information be available with the poster. This handout often takes the form of a brochure created with software such as Publisher98.

Students also present their projects orally. Many students use technology to create visual aides similar to what might be used in a poster presentation. Additionally, video clips, filmed and edited by the student, have been used to enhance oral presentations.

Finally, at least one multi-media presentation of a project is required during the four semesters of the program core. This requirement is usually completed during the third or fourth semester when students have acquired advanced technology skills. A student's ability to successfully complete a technology presentation depends to a great extent on his / her acquisition of the competencies set out in the ISTE teacher technology standards. To receive a satisfactory rating for the presentation, the student must (a) use two or more types of media in the presentation; (b) use the Internet as a resource and appropriately cite the information; (c) use the technology to complement not distract from the presentation; and (d) demonstrate organizational skills, such as the use of storyboards, in the planning of the presentation.

Benefits to school districts

As teachers have completed the program, a number of general benefits to school districts employing these teachers have become evident. The program has provided the opportunities for teachers to develop exceptional leadership skills in such areas as curriculum development, instructional strategies, educational research, student assessment, strategic planning, team building, facility planning, school improvement models, material selection, and staff development. These skills have resulted largely from the action research projects that the teachers have conducted and presented in the two years of their core course work.

Although expertise in these areas is impressive to employers, the technology-related benefits have been remarkable and gone beyond the districts' initial expectations. Teachers gain the knowledge to make informed decisions in the selection of hardware and software. Technology integration into the curriculum has been by way of various software packages, use of the Internet, and computer clusters. Teachers have set aside their overhead projectors and replaced them with laptops, LCD projectors and PowerPoint or HyperStudio presentations. Smart Boards, scanners, digital cameras, audio and video clips and CDs are used frequently in these teachers' classrooms. The impact of the program partnership between the host site districts and the university has provided technology competent teachers for the district as anticipated. What has been a surprise is the *extent* to which the teachers have integrated technology into their own classrooms and then, confidently led other teachers to do the same.

But the integration of technology has not been confined to classroom practice. Program graduates have demonstrated their abilities to use technology for school level and district level activities such as the presentation of Quality Performance Accreditation (QPA) reports; curriculum development presentations to school boards and communities; and in the production of school informational brochures, videos and PowerPoint presentations for parents.

Additionally, it has allowed the host district to create technology leader positions in each school. Technology leaders are paid a stipend to provide guidance to the building staff on successful integration of technology into the curriculum. They model teaching that uses technology and they conduct in-service training to increase staff technology knowledge and skills. Teachers wanting to serve in the position, complete an application and then demonstrate technology skills through various technology products. The products are often from assignments that have been completed by the teacher as part of the master of education program. The district has noted an increase in the number of teachers applying and qualifying as technology leaders, and attribute this increase to the teachers' participation in the Master of Education, Curriculum and Instruction program.

Conclusions

The successful integration of the ISTE foundation standards into the Master of Education in Curriculum and Instruction teacher education program has made a substantial impact on the teachers' acquisition of technology knowledge and skills. It has encouraged the integration of technology into their classroom practice, enhanced their students' learning, and contributed to greater technology integration in their schools. Benefits to the school districts that employ the teachers participating in this master of education program have also been noted. Districts benefit in that the teachers are more technology competent. Additionally, the program has allowed districts to create technology leaders in the district.

References

(Fisher, Dwyer & Yocam 1996) Fisher, C., Dwyer, D. C., & Yocam, K. (1996). *Education and technology: Reflections on computing in classrooms*. San Francisco: Jossey-Bass Publishers.

(Kauchak & Eggen 1998) Kauchak, D. P., & Eggen, P. D. (1998). *Learning and teaching: Research-based methods*. Needham Heights, MA: Allyn & Bacon.

(Knapp & Glenn 1996) Knapp, L. R., & Glenn, A. D. (1996). *Restructuring schools with technology*. Needham Heights, MA: Allyn & Bacon.

(McCannon & Crews 2000) McCannon, M. & Crews, T. B. (2000). Assessing the technology training needs of elementary school teachers. *Journal of Technology and Teacher Education, 8* (2), 111-121.

International Society for Technology in Education (1997). *Teacher Foundation Standards for Technology*. [Online] Available: http://www.iste.org/standards/ncate/index.html

(Rogers 2000) Rogers, D. L. (2000). A paradigm shift: Technology integration for higher education in the new millennium. *Educational Technology Review, 13*, 19-27.

The West Chester University *Teaching and Learning with Technology* Program: Aligning Graduate Credit Courses with NETS-T Standards

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Abstract: This paper describes the development of a graduate certificate program for teaching and learning with technology. Program development is a complex process that has numerous accrediting, policy-setting, and political bodies to satisfy requiring the integration of convergent ideologies, all focused on the improvement of teaching and learning. Use of the National Educational Technology Standards for Teachers (NETS-T) enhanced our ability to articulate and expand our vision for technology integration in education. Rather than make this program disparate, the attempt to meet these standards and frameworks resulted in a rich and comprehensive program that will have real value for the teachers and students it serves. This presentation will highlight the development and some of the early results of this program as it is implemented at West Chester University in January 2001.

Background

In 1998 the International Society for Technology in Education (ISTE), in cooperation with the US Department of Education, developed and published National K-12 Educational Technology Standards for students. Subsequently, the standards were connected to curriculum and technology (ISTE, 2000). In April 2000 the National Educational Technology Standards for Teachers (NETS–T) were established through an initiative funded by the US Department of Education's Preparing Tomorrow's Teachers to Use Technology (PT^3) program. These NETS–T standards were approved and adopted by National Council for Accreditation of Teacher Education (NCATE), the accrediting body for West Chester University (WCU). They were the guiding principles as we structured and developed a graduate program at our university, created for educators to learn the dynamic relationship among teaching, learning, and technology integration.

It is important to note that our program encourages teaching with technology rather than teaching about technology and is directly linked to classrooms in K-12 schools. Consistent with a Professional Development School initiative, and/or the teacher-scholar model, our graduate program will be offered through alternative delivery mechanisms such as use of the web, 2-way video and on-site classes in participating school sites.

Process

The development and writing process of this graduate program has been shared so that others can benefit from the lessons we learned. We created three graduate courses for our program: a survey course covering the breadth necessary for understanding educational technology integration; an in-depth curriculum and instruction design, and development course; and an application course called seminar and field study. Through focus groups held in Spring 2000 the development of the graduate program was informed by educators from area K-12 school districts, as well as business and community representatives. This process helped us to focus directly on the needs of our clients and the students they serve.

In addition to meeting academic standards of university curriculum committees, this program also is designed to reflect the conceptual framework that drives our teacher preparation program here at WCU. The components of the WCU Conceptual Framework addressed are: **content knowledge, knowledge of learner, knowledge of self, reflection, and professionalism.**

As we learned and digested the NETS Standards we created a matrix that referenced the 6 standards identified by NETS-T that all classroom teachers should be prepared to meet (see Table 1) and listed the objectives we intended our graduate students to meet under each of the categories. We adopted the 21 indicators of the NETS-T performance profile for practicing teachers (see Table 2).

I. Technology Operations and Concepts
II. Planning and Designing Learning Environments and Experiences
III. Teaching, Learning, and the Curriculum
IV. Assessment and Evaluation
V. Productivity and Professional Practice
VI. Social, Ethical, Legal, and Human Issues

Table 1: Six NETS-T standards for all classroom teachers.

The matrix is comprised of 21 performance indicators identified by NETS-T for practicing teachers. Each indicator is associated with the relevant NET-S standard (see Table 1) by Roman Numerals. The specific courses that focus on the performance indicator are listed. The program has used multiple methods of assessing whether the teachers have demonstrated competence in each of the standards. The type of assessment is indicated in the last column of Table 2.

Performance Profile: Practicing Teachers	Course 500	501	502	Assessment
1. assess the availability of technology resources at the school site, plan activities that integrate available resources, and develop a method for obtaining the additional necessary software and hardware to support the specific learning needs of students in the classroom. (I, II, IV)				a. Integrated curriculum unit
2. make appropriate choices about technology systems, resources, and services that are aligned with district & state standards. (I, II)		X		a. Evaluation of resource & standards handbooks
3. arrange equitable access to appropriate technology resources that enable students to engage successfully in learning activities across subject/content areas and grade levels. (II, III, VI)	X	X		a. Cross-curricular project b. Integrated curriculum
4. engage in ongoing planning of lesson sequences that effectively integrate technology resources and are consistent with current best practices for integrating the learning of subject matter and student technology standards (as defined by ISTE's National Educational Technology Standards for Students). (II, III)	X	X	X	a. Curriculum unit b. Cross-curricular project c. Tech design and implementation
5. plan and implement technology-based learning activities that promote student engagement in analysis, synthesis, interpretation, and creation of original products. (II, III)	X	X	X	a. Cross-curricular project b. Tech design and implementation
6. plan for, implement, and evaluate the management of student use of technology resources as part of classroom operations and in specialized instructional situations. (I, II, III, IV)			X	a. Tech design and implementation
7. implement a variety of instructional technology strategies and grouping strategies (e.g., whole group, collaborative, individualized, and learner-centered) that include appropriate embedded assessment for meeting the diverse needs of learners. (III, IV)	X	X	X	a. Project development & presentation b. Lesson design and implementation c. On-site visits, observations d. On-line peer evaluation
8. facilitate student access to school and community resources that	X			a. Project development

provide technological and discipline-specific expertise. (III)				
9. teach students methods and strategies to assess the validity and reliability of information gathered through technological means. (II, IV)	X	X	X	a. Software & website reviews b. Internet resource project c. Authentic assessment
10. recognize students' talents in the use of technology and provide them with opportunities to share their expertise with their teachers, peers, and others. (II, III, V)	X			a. Journal reviews and discussions b. Project development
11. guide students in applying self- and peer-assessment tools to critique student-created technology products and the process used to create those products. (IV)	X	X		a. Technology plan b. Project presentations c. Electronic portfolios
12.facilitate students' use of technology that addresses their social needs and cultural identity and promotes their interaction with the global community. (III, VI)			X	a. Lesson design and implementation b. Site visit and evaluation
13. use results from assessment measures (e.g., learner profiles, computer-based testing, electronic portfolios) to improve instructional planning, management, and implementation of learning strategies. (II, IV)	X		X	a. Project development & assessment b. Electronic portfolio
14. use technology tools to collect, analyze, interpret, represent, & communicate data (student performance & other information) for the purpose of instructional planning & school improvement. (IV)		X		a. Resource handbook
15. use technology resources to facilitate communications with parents or guardians of students. (V)			X	a. Professional portfolio b. Lesson design and implementation
16. identify capabilities & limitations of current and emerging technology resources & assess the potential of these systems & services to address personal, lifelong learning, & workplace needs. (I, IV, V)	X	X		a. Software and website reviews b. Research journal reviews & discussions
17. participate in technology-based collaboration as part of continual and comprehensive professional growth to stay abreast of new and emerging technology resources that support enhanced learning for PK-12 students. (V)	X	X	X	a. Resource handbook b. Journal reviews and on-line discussions
18. demonstrate and advocate for legal and ethical behaviors among students, colleagues, and community members regarding the use of technology and information. (V, VI)	X			a. Mid-term exam b. Journal reviews and discussions
19. enforce classroom procedures that guide students' safe and healthy use of technology and that comply with legal and professional responsibilities for students needing assistive technologies. (VI)			X	a. Lesson design and implementation b. On-site evaluation
20. advocate for equal access to technology for all students in their schools, communities, and homes. (VI)	X			a. Mid-term exam b. On-line discussion
21. implement procedures consistent with district and school policies that protect the privacy and security of student data and information. (VI)			X	a. Lesson design & implementation b. On-site visits & evaluation

Table 2: Program matrix with NETS-T performance indicators.

Outcomes

Use of the NETS-T standards has given validity and focus to the development of this program. The program shows the impact of this work with a focus that concentrates on technology use for the improvement of teaching and learning in K-12 schools. The presentation of this paper will include the products that were created through the process. These include a Power Point ™ presentation, *Teaching and Learning with Technology* brochures, and data from our evaluation report.

Conclusion

Working on the development of this program through the use of the NETS-T standards enhanced our ability to articulate and expand our vision for technology integration in education. We are confident that the design of the program meets current needs and expectations for teaching and learning with technology.

This program was created through the integration of convergent ideologies, all focused on the improvement of teaching and learning. Rather than make this program disparate, the attempt to meet these standards and frameworks resulted in a rich and comprehensive program that will have real value for the teachers and students it serves.

This paper presentation will highlight the development and some of the early results of this program as it is implemented at WCU in January 2001.

References

International Society for Technology in Education NETS Project (2000). *National educational technology standards for students: Connecting curriculum and technology.* Eugene, OR: Author.

International Society for Technology in Education, NETS Project (2000). *National educational technology standards for teachers.* Eugene, OR: Author.

Subject-Specific Technology Integration Training: Lessons in Planning, Administering, and Follow-Up

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Abstract: Strickland (1999) reported the results of a Teacher Technology Mentor program in southeastern Idaho, which strongly indicated that the school mentors were not transferring their technology knowledge into classroom practice. Strickland recommended that subject-specific technology integration programs be developed to insure better integration of technology in the classroom. Based upon this recommendation, Idaho State University's FOCUS program was developed, targeting three specific areas: fourth grade, secondary language arts, and junior high earth science. This research focuses on the planning, administering and follow-up of one of the junior high earth science program. The goal of this research was to determine if the subject-specific technology integration training of earth science educators makes a difference in teachers' attitude and use of technology in classroom teaching practices. Data from attitude surveys of earth science educators involved in the FOCUS program suggest that teachers' attitude and use of technology in the classroom increase when in-service technology training is subject-specific.

Introduction

The National Governors' Association (Houghton, 1997), the federal government and various state legislatures (Thurlow, 1999) have recommended that teacher training become a part of technology planning, and that approximately 30 percent or more of technology dollars be spent on teacher training. This is in light of the fact that only five percent of the nation's 2.8 million teachers are integrating technology into their regular teaching practices (Parks and Pisapia, 1994). A recent U.S. Department of Education survey (as cited in Thurlow, 1999) indicates that only 20 percent of teachers reported feeling "very well prepared" to integrate technology into classroom instruction. Thurlow suggests that professional development programs be provided for in-service teachers to give them the confidence and skills they need to incorporate technology into their curriculum. Further, Thurlow indicates that many in-service programs focus on providing teachers with basic skills in using hardware and software, but do not provide them with "curriculum-based applications and strategies for integrating them in their instructional activities."

In 1999, Strickland reported the results of a Teacher Technology Mentor program in southeastern Idaho, which strongly indicated that the school mentors were not transferring their technology knowledge into classroom practice. Many of these contemporary teachers, even after being trained how to operate computer systems and tool software (word processors, spreadsheets and databases), were struggling to incorporate this training into their regular teaching practices. Teachers reported that they did not see how the technology could be applied to their subject matter. Strickland recommended that subject-specific technology integration programs be developed to insure better integration of technology in the classroom. Based upon this recommendation, Idaho State University's FOCUS program was developed, targeting three specific areas: fourth grade, secondary language arts, and junior high earth science.

Methodology

This research focuses on the planning, administering and follow-up of one of the eight month long subject specific technology integration programs—the junior high earth science FOCUS program.

In the planning process, it was determined that the junior high earth science program be broken into four subsections: (1) geology, (2) space science, (3) weather science, and (4) oceanography. Teachers would be trained on how to incorporate the Internet, content software, and tool software into each of these subcategories.

To accomplish this task, a notebook and website of materials would be developed with lesson-plan ideas, a list of earth science Internet websites, and a list of recommended software germane to each subsection.

Teacher training consisted of a one-day technology workshop. The one-day workshop supplied teachers with hands-on examples of technology integration in the earth science curriculum; provided educators with a notebook of resources for integrating technology in the earth science curriculum; prepared educators for follow-up classroom visits, WebCT bulletin board postings, technology integration lesson plan writing, and evaluating software and Internet websites.

The FOCUS teacher-training program differs from traditional mentor-type programs described by Thurlow (1999) in that it contains a rigid schedule of teacher follow-up and assessment. Teachers were required to post weekly bulletin board journals on WebCT about how they were incorporating technology into their curriculum; to develop four lesson plan activities that incorporate technology into the curriculum; to evaluate four earth science-related software; to evaluate eight earth science-related Internet websites; and to have classroom visits by a qualified technology instructor.

Findings

Based upon pre- and post-workshop attitude surveys of junior high earth science teachers in southeast Idaho, there was a significant increase in the average attitude scores $t(9)=-2.514$, $p=.033$. Four of the twenty-nine attitude survey questions asked directed question about their use of technology in the classroom. After completing the FOCUS earth science program, the average score of each of these four questions increased. The improvement in Internet resources use was not significant $t(9)=-1.309$, $p=.223$; the improvement of tool software use was not significant $t(9)=-1.152$, $p=.279$; the improvement in commercial software use was not significant $t(9)=-1.714$, $p=.121$. However, the improvement in the use of multimedia presentation software was significant $t(9)=-3.161$, $p=.012$.

Conclusions

When technology integration is subject-specific teachers' attitudes toward technology significantly increases. Teachers are also more likely to incorporate technology into their curriculum, as evidenced by the increase in use of Internet resources, tool software, commercial software and multimedia presentation software. These results seem to confirm Thurlow's (1999) and Strickland's (1999) suggestions that curriculum-based technology training will improve teachers attitudes toward technology integration, and that by improving attitudes toward technology integration teachers will be more likely to use technology in their classroom practices.

References

Houghton, M. (1997). State strategies for incorporating technology into education. National Governors Association, Washington, D.C. 20001-1512. (ERIC Document Reproduction Service No. ED 412 930).

Parks, A., & Pisapia, J. (1994). Developing Exemplary Technology-Using Teachers. (Research Brief #8). Metropolitan Educational Research Consortium, Richmond, VA, 23284-2020.

Strickland, J. (1999). The development and validation of a technology needs assessment (TNA) instrument for Idaho school districts. (Published Doctoral Dissertation). Idaho State University, Pocatello, ID.

Thurlow, J. (1999, May 4). Teachers as technologists: professional development for technology integration. 44th Annual Meeting of the International Reading Association. San Diego, CA. (ERIC Document Reproduction Service No. ED 429 581).

Teachers Discovering and Integrating Technology: An National Online Success Story

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Abstract: The purpose of this study was to determine if teachers could be taught to use and much more importantly integrate technology into their specific classroom curriculum in a national online graduate level educational technology course for K-12 teachers, Teachers Discovering Computers. Both quantitative and qualitative data were collected and analyzed. The pretest and posttest surveys included fourteen, five-point Likert items, and the posttest contained five open-ended questions. Analyst of quantitative data revealed there was a significant difference between the mean scores of the pretest and posttest scores, $p = .000$. Qualitative data revealed that 100% of the student had a positive experience in the class and learned how to use and integrate technology into their specific classroom curriculum. The combination of both the statistical and qualitative analysis lead the researcher to conclude that the impact of the course on the student's perception and integration of technology into the curriculum was dramatic.

Introduction

As communities adjust to the dynamics of the 21st century, the continued prosperity of their citizens will depend upon economic stability and growth. Economic stability and growth will depend upon the ability of a region's K-12 education system to graduate students with the required basic and technical skills needed for employment and life long learning (Draves, 2000).

Without a K-12 educational system producing skilled workers for a region's businesses and industries, continued economic growth becomes stagnated. When schools graduate poor quality students, who lack appropriate skill levels, the entire infrastructure of a region may begin to break down. The most serious problem hindering continued economic development and expansion in many, if not most American communities, is the lack of an educated entry-level worker. As we enter this new century, many American business are experiencing a severe shortage of skilled employees in virtually every area from software engineers, retail and service professionals, to semi-skilled blue collar workers (Perry-Johnson and Millsaps, 1999).

For many reasons, graduating K-12 students has become a very complex social issue. Administrators of K-12 school districts are finding it more and more difficult to: (1) keep students in school and (2) graduate students who possess the required basic skills and technology competency necessary to enter the workforce or to be able to succeed at institutions of higher education. Those students who drop out of school or graduate lacking the proper skills are doomed to join the ever expanding lost generation of American youth. These students simple do not posses the required basic and technology skills necessary to succeed (Trotter, 1999).

Many political leaders are stressing that building a world-class work force must be a national priority for continued economic prosperity in the new global economy. Improving America's capacity to educate and train workers is critical to the future of this county. In the words of former President Bush, "Think about every problem, every challenge we face. The solution to each starts with education." (Blount and Kearn,1991, p. 1). As we have moved into the 21st century, there has been a movement or a paradigm shift to change the way we teach teachers how to both use and integrate technology (Robyler, 2000). Our society has undergone dramatic changes in this century, yet the way our teachers teach and our students learn has not. In fact, we need to redesign our educational systems to be more hands-on and learner centered (Shelly, Cashman, Gunter, and Gunter, 2000).

Teachers in the nation's schools are charged with teaching students who will spend all of their lives in technology driven society. The computer, as a leading technological device, was expected to be a solution in the restructuring of school systems. Yet, many of these teachers report little knowledge of or the ability to use and more importantly to integrate technology into the curriculum. The discrepancy that exists between what teachers know and what students must learn about technology represents a complex issue, even though computers have been available in schools throughout the nation for years (Trotter, 1999). Federal and state funding initiatives have stressed that school districts should purchase technology at an accelerated rate and link those technologies to the Internet. However, the placement of technology in schools, has not been the salvation that many had hoped or even predicted.

The lack of technical expertise shown by the teachers extends from those teachers who have just entered the profession to those already in the field. United States Secretary of Education Richard W. Riley noted in a speech, "Teaching and learning that uses technology effectively can lead to greater academic success and make a real difference in the lives of students. Unfortunately, only 20 percent of today's teachers feel very well prepared to use this technology" (Riley, 2000). Many researchers and educators from federal and state agencies, institutions of higher learning, and K-12 schools have been focusing on why technology has not made a difference in the classroom and repeatedly the same conclusion arises – teacher training. Unfortunately, most training initiatives to date have concentrated on how to use technology and not how to integrate technology.

Research has shown that properly integrated technology by qualified and caring teachers can significantly enhance student learning, increase attendance and graduation rates, improve test scores, and motivate students to want to improve themselves (Schwartz, 1999). Unfortunately, the dramatic increase in purchasing of technology has not improved student achievement at many of our nation's public schools. The primary reason is a lack of teacher training.

Many institutions of higher learning are looking to the improvements in training that industry, business, armed services, and other educators are observing. Educators are hoping to receive guidance in this move to educate students, any path, any time, and any place. In other words, teaching students in a different medium through the use of distance education (Andrews and Marshall, 2000). Our instructional strategies are going to have to change and undergo major transformations.

Due to the increasingly diverse population, education is changing toward a more global, technology-rich environment designed to meet these diverse and changing needs of students. The creation of easy to use graphical browsers has dramatically increased the popularity of the Internet and the World Wide Web (WWW). The Internet has shifted from being a communication mode of text-only to a powerful multimedia communication system with applications that have the potential to revolutionizing teaching and training. This technology phenomenon has directly impacted and is transforming the way we teach and the way students learn (Geibert, B. & Harvey, S.H., 2001). These changes have brought the WWW to the forefront of instructional strategies for all educators. The World Wide Web removes all barriers of time, place, and physical limitations and opens more training opportunities for teachers.

The purpose of this study was to determine if K-12 teachers could be taught to use and much more importantly integrate technology into their specific classroom curriculum in a national online graduate course educational technology course for teachers, Teachers Discovering Computers (TDC).

Methodology

Teachers Discover Computers, an online graduate level educational technology course, was tested in a pilot study at Hungerford High School in Orlando, Florida at the request of senior business leaders in central Florida. The pilot study was conducted between August and November 1999 and all of the teachers at Hungerford High School participated in the TDC online graduate course. Due to the success of the pilot study, Teachers Discovering Computers is being offered nationally as an online graduate level course to K-12 teachers.

The sample utilized for this study consisted of three sections of students who completed the online national graduate course in Spring of 2000. These courses are thirteen-week online graduate-level technology courses that consists of thirteen extensive online curriculum modules, including an end of course curriculum integration project that requires computer, information, and integration literacy. Of the 101 student enrolled in the class, 29 were high school teachers, 26 middle school, 32 elementary, 12 were taking for certification/recertification in other areas, one student was a private music teacher, and one students was a business professional.

The following is a description of the populations of the three classes: The first class began on November 16, 1999 and ended on February 23, 2000. Thirty-nine students began the first national TDC course on November

16, 1999 with 38 students completing the course on February 23, 2000 for a 97% course completion. The 38 students were from six states (Florida - 12, Massachusetts - 3, Michigan - 3, New York - 13, Ohio - 5, and Pennsylvania - 2). Initial survey results revealed that only four students possessed more than basic computer skills (e-mail and word processing) and only two had integrated technology into their classroom curriculum.

The second class started on January 11, 2000 and ended on April 11, 2000. Thirty-five students began the second national TDC course on January 11, 2000 with all 35 students completing the course on April 11, 2000 for a 100% course completion. The 35 students were from seven states (Florida – 14, New York – 6, Massachusetts – 4, Ohio – 3, Pennsylvania – 3, Virginia – 3, Michigan – 2).

The third and last class of this study started on February 1, 2000 and ended May 2, 2000. Thirty-one students started the third national TDC course. Two students transferred to the April course due to injuries sustained in a car accident. One student dropped out of the course. Twenty-eight students completed the course for a 97% completion rate. The 28 students were from seven states (Florida – 12, Pennsylvania – 5, Michigan – 4, Ohio – 3, New York – 2, Massachusetts – 1, and Virginia – 1).

Findings

Both quantitative and qualitative data were collected and analyzed. The pretest and posttest surveys included fourteen, five-point Likert items, and the posttest contained five open-ended questions. The five open-ended posttest questions: (1) Please explain how this course has increased or decreased your support for the use of technology in K-12 education. (2) As a result of your experiences in this class, how has your attitude changed toward integrating technology in your instruction? (3) What words and phrases would you use to describe your experiences in this class? (4) What is the most important thing that you learned in this class? (5) Where do you see yourself one year from now as a result of this class?

Quantitative data analysis revealed there was a significant difference between the mean scores of the pretest and posttest scale scores from the November, January, and February TDC courses. There were 70 students who completed both of the pretest and posttest evaluations and a Pair wise T test was used for the analysis. The pretest mean was 33.29 with a standard deviation of 8.01, while the posttest mean was 22.56 with a standard deviation of 5.63 A summary of the is provided in Table 1.

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	PRESCORE	33.2857	70	8.0129	.9577
	PSTSCORE	22.0857	70	5.6279	.6727

Table1: Paired Samples Statistics

Pair wise T test results revealed a significance level of .000, thereby indicating a strong treatment effect shown in Table 2. This leads the researcher to conclude that the impact of the course on the student's perception and integration of technology into the curriculum is dramatic.

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	PRESCORE-PSTSCORE	11.200	9.2605	1.1068	8.9919	13.4081	10.119	69	.000

Table 2: Paired Samples Test

Qualitative data revealed that 100% of the students had a positive experience in the class and had learned how to use and integrate technology into their specific classroom curriculum. The following are a few examples of the teacher's answers to the open-ended questions: One teacher stated, "Before taking this course I wanted to integrate technology in the classroom but did not know where to start or where to look for help. I was basically frustrated." Another teacher felt, "The exposure I have had through this course has opened my eyes to the many possibilities within my classroom." "The Words that I would use to describe my experiences in this class would be DISCOVERY and LEARNING. Discovering the many ways I could enhance student performance in my classroom by integrating technology effectively. And learning the ways in which to integrate the technologies" was stated by another teacher. This teacher stated, "I have been using computers for sixteen years. I never realized the resources for education available prior to taking this course." "When I began the course I felt very uncomfortable about integrating technology. Having completing the class, I have no doubts that I am up to the tasks." "By far the most important thing I learned in this class is that I now have the ability to successfully integrate technology into my instruction. The confidence I've gained has made me eager to use technology." Please note all qualitative data is available for readers to review at http://www.teachereducation.com/tdcres.html.

Conclusions

Research studies have revealed that students who are in a supportive, less stressful environment, and are actively involved in the instructional process tend to be more academically successful. Through this online graduate course, teachers felt they were learning in a very supportive environment. The combination of both the quantitative and qualitative analysis lead the researcher to conclude that the impact of the course on the student's perception and integration of technology into the curriculum was dramatic. This study revealed that teachers could be taught to use and integrate technology in an online environment. Finally, the quantitative and qualitative research revealed that teachers could be taught to use and much more importantly integrate technology into their specific classroom curriculum in a national online graduate level educational technology course.

References

Andrews, K., & Marshall, K. (2000). Making learning connections through telelearning. *Association for Supervision and Curriculum Development*, 58 (2), 53-56.

Blount, W.F., & Kearn, T.H. (1991). Call for proposals. *New American Schools Development Corporation*. (Unknown).

Draves, W.A. (2000). *Teaching online*. River Fall, Wisconsin: Learning Resources Network.

Geibert, B., & Harvey, S.H. eds. (2001). *Web wise design: lessons from the field*. Englewood Cliffs, NJ: Educational Technology Publications.

Perry-Johnson, A., & Millsaps, J. (1999). *Momentum: moving from a leader in the south to a leader in the nation*. Annual Report of the University System of Georgia, Georgia, US. (ERIC Clearinghouse on Information Resources No. ED430447)

Riley, R.W. (2000, January 20). *Intel® teach to the future brings together microsoft and other industry leaders in half-billion dollar commitment to improve student learning*. Document available online at: http://www.intel.de/pressroom/archive/releases/ed012000.htm

Roblyer, M.C., & Edwards, J. (2000). *Integrating technology into teaching*. Prentice-Hall, Inc., Upper Saddle River, NJ.

Schwartz, J. E., & Beichner, R. J. (1999). *Essential of educational technology*. Boston, MA: Allyn and Bacon.

Shelly, G.B., Cashman, T.J., Gunter, R.E., and Gunter, G.A. (2000). *Teachers Discovering Computers: Integrating Technology in the Classroom.* Cambridge, MA: Course Technology, Inc.

Trotter, A. (1999). Preparing teachers for the digital age. *Education Week*, 19(4), 37-43.

South Central Regional Technology in Education Consortium

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Abstract: The Regional Technology in Education Consortia (R*TEC) program was established by the US Department of Education to help states, local educational agencies, teachers, school library and media personnel, administrators, and other education entities successfully integrate technologies into K-12th grade classrooms, library media centers, and other educational settings, including adult literacy centers. To provide such help, the R*TEC establishes and funds several regional consortia that address professional development, technical assistance, and information resource dissemination. The 2000-2005 South Central Regional Technology in Education Consortium (SouthCentral R*TEC) serving Arkansas, Louisiana, New Mexico, Oklahoma, and Texas is now located at the Southwest Educational Development Laboratory in Austin, Texas. Through a program of focused professional development and information services for teachers and administrators, the South Central R*TEC will enable educational systems in its five state region to use technology to foster student success in achieving state content standards, particularly in schools serving high population of disadvantaged students.

Identifying a Need

The SCRTEC finds that its most critical challenge and its best opportunities for effective action is in helping teachers mesh increased concern for accountability on state content standards with increased interest in the use of technologies for teaching and learning. While national reports indicate that although numbers of computers in schools are increasing and the student/computer ratio is falling, students are not using technology as a tool for learning. According to "Technology Counts" data, only 14% of fourth graders and 13% of eighth graders nationally report using technology daily; moreover, 53% of fourth graders and 39% of eighth graders report "never or hardly ever" using computers.

This gap between the presence of technology and its effective application was foremost on the minds of state and local leaders when the SCRTEC spoke with them about how the SCRTEC could be most helpful. Their unanimous plea was not for basic training in the use of technologies – they already had systems in place for meeting those needs. Their major need was for help in integrating technology into effective teaching and learning.

Given the states' unanimous call for help with integrating technology into classroom instruction and improving students' success in achieving state content standards, SCRTEC planning focused on how those needs could be met through specific objectives and work. SCRTEC identified four distinct groups and their needs: (1) Classroom teachers: What do they need to integrate technology into their classroom practice to address standards? (2) District level educational leaders: What do they need to see to support the integration effort? (3) Service units and higher education: What do they need to provide resources, networks, and support? and (4) State level departments of education: What do they need to prepare and create policy and support to improve systems?

From a working list derived from the needs of all levels, the SCRTEC distilled a set of concentrated, cross-cutting needs to form its current objectives: (1) Build capacity of teachers: the need to enhance teachers' knowledge and skills for integrating technology into learner-centered instruction focused on achievement of content standards. This need addresses both preservice preparation and inservice professional development programs and it presumes an intermediate audience of those who provide preparation and training. (2) Build capacity of leaders at the state, district, and campus levels: the need to enhance the knowledge and skills of education administrators in their effort to support the integration of classroom technology focused on achievement of content standards. This need addresses inservice professional development for campus and district leaders and establishment of professional development communities for state and higher education leaders. (3) Promote use of electronic delivery systems: the need to ensure optimal use of technology-based delivery systems to achieve the widest possible impact from training and resources.

Meeting Needs

SCRTEC will accomplish its objectives through activities conducted in accordance with the program's three prescribed strategies: professional development, technical assistance, and information and resource dissemination. These activities will be carried out collaboratively and with tools available to the SCRTEC from its partners and members. (1) The *Active Learning with Technology* professional development portfolio from the Southwest Educational Development Laboratory, (2) The Aurora Project's (Oklahoma) web-based development and delivery system, (3) The Technology Leadership Institute's higher education network (TCET at the University of North Texas) with its Evaluation Compendium and Technology Leadership Web Library, (4) Student Diagnostic Database Tool from Hart Elementary School (Austin, Texas), (5) The Electronic Emissary Project from the University of Texas (Austin), (6) A network of Access Centers from SEDL's Southwest Center for the Improvement of Mathematics and Science Teaching (SCIMAST) in cooperation with the Eisenhower Clearinghouse.

SCRTEC will also develop and promote a Regional Electronic Clearinghouse that will include easy searching of resources linked to content standards, online evaluation tools, regional professional development registry, educator forums, and telecollaborative projects. Concentration will focus on alternative delivery methods including CD-ROM, web-based modules and courses, and videoconferencing and developing partnerships with state departments of education and other technology and content standard initiatives throughout the region. SCRTEC will develop a Master Teachers Network with 25 teachers from each state, a Professional Development Network, and a Higher Education Network.

Materials and Publications

SCRTEC currently has a variety of materials available that are designed to aid teachers in creating constructivist learning environments supported by technology. This portfolio of materials includes:

Connecting Students, Learning and Technology. This booklet is designed to offer teachers practical information on getting started with technology and student-centered practices. The document is available both in print and online from the web site at: www.sedl.org/pubs/catalog/items/tec26.html

Planning into Practice: Implementing and Integrating Instructional Technology. This book was developed in collaboration with the Southeast and Islands Regional Technology in Education Consortium and assists school planning teams in their efforts to implement technology to improve teaching and learning. It helps teams to move from visioning to goals to action.

Constructing Knowledge with Technology: A Review of the Literature. This paper discusses the tenets of constructivist learning theory in light of its role in education and use with technology. Also available from the web site at: www.sedl.org/pubs/catalog/items/tec27.html

The web site – http://www.sedl/tap/resources.html This is an online database of web resources for teachers and professional development providers. There are multiple subject areas with links to web sites that lend themselves to constructivist approaches and technology.

Active Learning with Technology portfolio. These sixteen professional development modules are available for professional development providers and are based on constructivist learning theory and promote active learning through several classroom management models. They have been field tested with both teachers and professional development providers. Each module contains a step-by-step facilitator guide and is downloadable for free in PDF format from this web site: www.sedl/tap/profdev.html Additional modules will be created and added during the tenure of the SCRTEC.

Tap into Learning newsletter. The newsletter offers useful and highly practical information for K-12 educators wishing to use technology to support more constructivist learning approaches. Each newsletter discusses the classroom implications of a particular student-centered approach and offers classroom examples illustrating such an approach in combination with an appropriate type of software application. The newsletter also provides information on using commonly found educational software. It is available in print and online at: www.sedl.org/tap/newsletters

Video Series. This series of six videos is designed to be used as part of professional experiences for educators. They can be used in a variety of ways and suggestions for using these videos are included in the various facilitator guides in the professional development portfolio. Two videos, *Engaged Discoverers: Kids Constructing Knowledge with Technology* and *Classrooms Under Construction: Integrating Student Centered Learning with Technology* can be used for visioning activities with both school administrators and teachers. Four videos contain specific classroom teaching episodes from 1st grades through 9th grades with classroom teachers carrying out a variety of activities using technology.

Consortium Members and Partners

The newly formed South Central RTEC is comprised of the following consortium members: the Southwest Educational Development Laboratory (SEDL), Texas Center for Educational Technology (TCET) at the University of North Texas, and the Aurora Project (Oklahoma). Consortium partners include the Regional Educational Technology Assistance (RETA) program at New Mexico State University; the Electronic Emissary Project' University of Texas Austin; Southwest Center for the Improvement of Mathematics and Science Teaching (SCIMAST); Hart Elementary School, Austin Independent School District; and the Dana Center for Education, University of Texas, Austin.

Strengths of the SCRTEC include its concentration of effort on students and teachers in schools serving high populations of disadvantaged students in rural or isolated areas and its network of 450 professional development providers across its five-state region. Each of the partners and members will aim at achieving the goal of enabling educators and educational systems to fully employ the benefits of technology to foster student success in achieving state content standards.

LUMA: The Next Step in a Partnership to Enhance Technology Integration

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Abstract: Technology enriched learning environments have a positive effect on the achievement of students. It would seem, therefore, that the environments of in-service educators must also be rich in technology and technology integration. After developing a partnership that focuses specifically on technology integration with pre-service and in-service educators, a second partnership developed to work with specific academic departments at the Upper School level integrating technology within an established curriculum. The goal of this partnership, LUMA (Lehigh University/Moravian Academy), was to give teachers in specific academic areas access to materials, plans, ideas, and support for integrating appropriate technologies into their class activities. From experience, the developers of this partnership know what *doesn't* work—the one-day, one-shot, show-and-tell workshop developed by outside consultants and delivered to teachers. Instead, these workshops were designed to be spread out over an academic semester, involve the teachers in the design and development, and provide support for the teachers between workshops.

Introduction

Technology enriched learning environments have a positive effect on the achievement of students (Schacter, 1999). It would seem, therefore, that the environments of in-service educators must also be rich in technology and technology integration. The CEO Forum in its StaR Report (February 1999) built a strong case for enhancing the education of in-service teachers in technology and curriculum integration. In fact, one of the seven goals of the report deal directly in-service teacher education:

> Goal 2: Current teachers and administrators should be proficient in integrating technology into the curriculum.

Yet, according to the report, only 20 percent of teachers feel well prepared to integrate technology into their classroom instruction. Teachers lacking support and encouragement are more likely to give up using technology if something should go awry (Bronack & Hornung, 2000). A National Survey of Teachers' Use of Digital Content highlighted in Education Week (1999) found that 97% of the teachers surveyed used a computer at home. Of those who use computers for instruction, nearly half of those surveyed claimed that the amount of preparation time necessary for curriculum integration was a large problem. In order for standards to be met and teachers to feel prepared, in-service and pre-service educators must make effective use of technology in learning and show evidence that this learning has taken place (Schacter, 1999). However, teachers must see the relevance of technology integration and what they teach to use technology effectively and show evidence of learning.

A Partnership

Aligning and infusing technology into the curriculum should be a top goal for educators (Fatemi, 1999). In the Fall of 1998 a partnership between Lehigh University and Moravian Academy- a preK-12 independent school, was established to help meet standards and prepare teachers. Throughout these past three years, the partnership has focused on technology integration in school curriculum. The partnership paired a pre-service, Lehigh University, undergraduate with an in-service, Moravian Academy, mentor teacher. Their goal was to work together on technology integration while balancing classroom management, school philosophies and time. The partnership has seen great success and will continue in the Spring of 2000.

The Partnership Continues

Evaluations from the partnership, however, brought to fruition the idea of working with specific academic departments at the Upper School level to integrate technology within the established curriculum. The goal of this partnership, LUMA (Lehigh University/Moravian Academy), is to give teachers in specific academic areas access to materials, plans, ideas, and support for integrating appropriate technologies into their class activities. From experience, the developers of this partnership know what *doesn't* work—the one-day, one-shot, show-and-tell workshop developed by outside consultants and delivered to teachers. Instead, these workshops were designed to be spread out over an academic semester, involve the teachers in the design and development, and provide support for the teachers between workshops.

Designing the Partnership

The academic areas of focus for this semester in the LUMA workshops were math and foreign language. A team of three graduate students, from Lehigh University, served as the designers of the workshop materials. The graduate students worked with a designated faculty team member from Moravian Academy in each academic area to gather resources, design materials, and to prepare for each workshop. The faculty member served two functions --to ensure that what is designed by the graduate student fit the needs of the department, and to increase the likelihood that the other department faculty will join in the workshops.

One partnership goal was to spread out the workshop meeting dates over the course of the semester. Therefore, workshops were delivered in September, October and one in December to interested teachers in that academic area. The materials developed for each content area included: development of a course website, gathering of instructive educational websites for each discipline and the introduction and implementation of Webquest. (Webquest is a teaching tool which integrates technology and curriculum directly.) The course website and Webquest materials included identifying and reviewing other websites and software, example activities, assessments, rubrics, and best practice models. The graduate students designed many of these materials and activities, as well as an "instructors guide" for the workshop that can be used by Moravian faculty for future technology integration workshops.

Communication was a key factor in bringing together the many facets this partnership required. At the onset the participants were enrolled in a webcourse designed specifically for the workshop (http://www.blackboard.com/LUMA-educ). Weekly emails updated the Moravian teachers on hot topics and "Tidbits" of information useful to the discussions and practical applications that had been explored during the workshops. This was also the forum for questions and answers. The graduate students shared responsibility in checking the website, answering email questions and adding useful information weekly.

Evaluating the Partnership

Since the inception of the LUMA partnership, the graduate students have been working to structure and implement the fall workshops. Together the graduate students wrote a power-point presentation to outline the workshops for the Moravian Academy faculty team member. The course website created a space for the information collected and used to be kept in one place for all participants to have access to. This also allowed a place for a "journal" to be kept about the progress of the planning and workshop implementation. At the completion of the second workshop, we asked each teacher to provide an evaluation and description of their needs for future planning. This evaluation directed us in planning our final workshop. Our goal was to divide in specific academic areas and work individually with the faculty participants. Perhaps this will be the impetus needed for several of the teachers to use their course workshop as a teaching tool.

Implementing this New Partnership and the Implementation Dip

As with any new program, the implementation dip was prevalent for our Upper School partnership. Lack of time, experience and even interest were some of the factors that hindered the program. Our goal to spread the instruction over the course of several weeks was designed so that the teachers would have an opportunity to work on their own in developing curriculum appropriate work within a course web-site. We felt that beginning our work in September would allow teachers the time to start their school year with fresh ideas. We encountered the opposite to be true. Most of the teachers were overwhelmed with beginning of the year obligations and spent little to no time working on their course website. In addition, the initial time spent introducing the teachers to the course website and design may have overwhelmed our participants from the beginning. Therefore, they may have been reluctant to take future implementation steps.

Lack of experience also hindered some of the educator's growth. While our attempt to match a graduate student with teachers in specific academic departments appeared ideal, the graduate students were not present to the faculty at Moravian on a regular basis. An on-line presence was established but very few of the teachers took advantage of that assistance. Several of the teachers took advantage of the workshop time to develop together their course websites. This group experience appeared to assist each other and "join" their experiences together. While these educators may not have created their own course website, they did create an academic department website to assist them in their teaching. This experience, therefore, may have brought together a new collaboration that was not present prior to the workshops.

Some of those educators who joined the workshop at its inception were unclear of what tools the workshop would provide them. After seeing the varied uses available in a course website, several of the teachers felt that this technology would not be a key tool in their curriculum. Therefore, they chose to not participate further in the workshops. Other factors such as time and experience may have also influenced the several teachers who did not complete the three workshop cycle.

For those teachers who did complete the three workshop cycle, the implementation dip was prevalent. In fact, as far as the researchers can tell, it may take more than one workshop cycle to support and work through the needs of the various educators within each department.

Some Examples of Teacher Needs

At the completion of the second workshop, those teachers present were encouraged to communicate via email what needs they still would like to be met in the course of these workshops. Here are just a few examples of what they shared with the presenters:

"It was great having the time to sit at the computer and play! I never have the chance to do that during the school day. I think this is why I have not had my students do anything with computers as of now. Next week they will have the opportunity to check out that "day of the dead" web site. I would have liked to create my own web site today. Guess I got side tracked. I'm going to try and do that on my own, and if I run into trouble then I will contact one of you guys." Ali, Upper School Spanish.

"I need lots of time for the simplest concepts to sink in because I rarely see the "big picture" right away. But I am making progress. I went in this morning thinking that a personal web page was a year or 2 down the road, but now I think I may be able to handle this in a few months. However, when simple things like sending Claire an e-mail through the Blackboard site don't work, I get discouraged, put the LUMA stuff away, and don't touch it until the next meeting." Mimi, Middle School Spanish

"Since this was my first LUMA workshop, I was mostly "playing" with the Blackboard.com...I am open to researching the use of websites to allow me to post info about my classes and to research useful things for class. I'm not too comfortable with computers- that's something I'm working on... We will have a new textbook next year, which will include lots of software - so next year may be a perfect time for a graduate student to work with me in the classroom. Meanwhile, I'll keep coming to workshops and try to become more comfortable with MACs (I use my PC at home much more often!) " Bonnie, Middle and Upper School French

As we continue to evaluate this partnership, specific areas of further focus will emerge to help us prepare for our next partnership. Questions and concerns that may arise from our evaluation:

- The issue of time and commitment from those involved may emerge.
- Are there other ways and times to incorporate these learning objectives for the teachers?
- What has the teacher gained from participating in this type of workshop?
- What other pieces of technology or curriculum need to be part of the workshop format?

In addition, the teachers will have an opportunity through this evaluation to review the knowledge they have acquired and the direction they wish to pursue for additional learning. Those planning these workshops will also have the opportunity to evaluate the format and direction that the workshops took.

Future Planning

We hope that the evaluation from all those who participated in the workshop process will give light to their increasing knowledge and understanding of working with technology within their curriculum. One reason our focus has been on the specific subject areas is in hope that those teachers will feel supported by their colleagues who are also taking part in the workshop. Should the partnership continue at this level we will continue to focus on curricular areas and work with the remaining academic departments. In addition, the support given by the Lehigh University graduate students directly to the individual teachers will provide the Moravian Academy teachers with the encouragement needed to use their new found skills to enhance their teaching. Therefore, we can address the questions of how this format was useful and added to their teaching experience. All this knowledge will assist us in our future planning.

References

Bronack, S. & Homung, C. (2000). Preparing technology-based teachers: Professional lessons from a K-12/University collaborative, *TechTrends* 44 (4), 17-20.

Education Week (1999). Technology Counts '99 Survey Highlights. http://www.edweek.org/sreports/tc99/articles/survey.htm

Fatemi, E. (1999). Building the digital curriculum: Summary. http://www.edweek.org/sreports/tc99/articles/summary.htm

Schacter, J. (1999). *The impact of education technology on student achievement: What the most current research has to say.* Santa Monica, CA: Milken Family Foundation.

United States, District of Columbia (1999). School Technology and Readiness Report. Professional Development: A Link to Better Learning. The CEO Forum on Education and Technology, Year Two.

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Ways to Integrate Technology in Your Classroom

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Abstract: This educational web site creates a framework for understanding technology tools and how they can be used for teaching different subjects in the classroom. The site provides links to general education, subject-specific and community sites. Its distinct features are the integrated language arts thematic units developed by teachers in a Connecticut school system to help their students meet the objectives of the Connecticut Achievement Performance Test (10^{th} grade CAPT) and a template to submit your favorite lesson. The web site is organized into four sections: I. Technology Tools II. WWW Educational Resources III. Lessons Database IV. Reading Strategies.

Description

The goal of this educational web site, ***Ways to Integrate Technology in Your Classroom***, is to provide a comprehensive guide to beginning and advanced web users. In addition to providing an overview of technology tools, the site has pages with links to general education and subject-specific sites, sample thematic units for secondary level language arts and a template to submit your favorite lesson plans for publication on the Lessons Plans page.

Technology Tools: *Publishing Tools, Productivity Tools, Internet Tutorial*

Publishing Tools describes ***Powerpoint***, ***Hyperstudio*** and web publishing software. It gives ideas on how teachers and students can use them to present their work and useful addresses for download and usage. For those looking for a server to host their home page and wishing to build a quick home page, there is a download link to ***Tripod.***

Productivity Tools gives suggestions on how to integrate spreadsheets, word-processing and graphics applications in the classroom. It also provides information on software and sites for downloading graphics.

Internet Tutorial consists of three pages: ***Browser Basics***, ***Search the Web***, ***Users Interact.***

Browser Basics tells how to access a web page, view documents, make bookmarks and act on browser errors.

Search the Web gives search tips and links to useful tools that can go a long way towards getting quick and efficient search results. For example, putting a phrase in quotes "" and using the ***Metacrawler*** search engine (www.go2net.com) can drastically reduce the frustration in any search.

Users Interact has links to ***Hot Mail***, the free e-mail service that lets you log on to any computer with an internet connection to check and send your e-mail. It also introduces search tools for usenet groups, to find out what other people have posted on any topic.

WWW Resources

K-12 Web Sites features recommended comprehensive web sites for teachers, Internet Projects conducted by students, K-12 Interactive Web Projects, Internet education, school districts links and professional resources links.

Subjects Links has links to multiple subject areas, shop links as well as homework and multicultural links.

Community Links has links to the Connecticut organizations like the Connecticut State Department of Education, ***ConneCT***-State of Connecticut informational site, and local news and media sites.

Lessons Database: CAPT Thematic Units, Submit a Lesson, Lesson Plans page

CAPT Thematic Units has samples of Integrated Thematic units with lessons developed by teachers in our school system to help our students meet the objectives of 10th grade CAPT (Connecticut Achievement Performance Test). The unit on ***Cloning*** aims at developing skills specific to the interdisciplinary segment of the CAPT Language Arts. The unit on ***Newspapers***, complete with lesson plans and worksheets, teaches students how to be critical newspaper readers.

Submit a Lesson Plan is a template that allows anyone to submit a lesson plan and get it instantly published on the site.

Lesson Plans displays submitted lesson plans. Make sure that you proofread your lesson plan before you submit it.

ICT Training for Teachers: a University response to a National Training Initiative in the United Kingdom

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Abstract This paper seeks to describe a national training scheme currently operating in the United Kingdom, the main aim of which is 'To raise the standard of pupils' achievements by increasing the expertise of serving teachers in the use of ICT in subject teaching, to the level expected of Newly Qualified Teachers who enter the profession, and by improving the competence and confidence of school librarians in their use of ICT'. An analysis of the requirements and learning intentions of the scheme are offered and examples shown of how one training provider has met the challenge using a combination of multimedia CD-ROMs, on-line training modules, in-school support and the development of a virtual learning community.

"The Lottery-funded training.. will focus on helping teachers to use the technology in the classroom to enrich teaching and learning and raise standards - right across the curriculum."
- People's Lottery White Paper, July 1997

The People's Lottery White Paper in July 1997 stated the aim of helping teachers make the most of the new resources being placed in schools. It led to the formation of the New Opportunities Fund (NOF) ICT Training Initiative. The New Opportunities Fund is a National Lottery Distributor created to award grants to health, education and environment projects throughout the UK.

The New Opportunities Fund ICT Training Initiative.

The training started from April 1999, and runs over three years. £230 million has been made available from NOF, to fund the training of serving teachers and school librarians in all maintained schools in the UK, in an initiative for which the expected outcomes are defined by the Teacher Training Agency (TTA).

The main aim of the ICT training initiative is to raise the standard of pupils' achievements by increasing the expertise of serving teachers in the use of ICT in subject teaching, to the level expected of all Newly Qualified Teachers. To ensure that the training focuses directly on helping teachers and school librarians to use ICT appropriately and effectively, Expected Outcomes have been developed by the TTA (http://www.teach-tta.gov.uk/ict/nof). The Expected Outcomes define the knowledge, understanding and skills necessary to make sound decisions about when, when not and how to use ICT in subject teaching. It is intended that training provided under this initiative will integrate training in ICT skills with training in the use of ICT in the classroom.

The University of the West of England Faculty of Education

A number of Training Providers have been approved by NOF, of which the ICT Learning Path from the Education Faculty of the University of the West of England is a National Provider for both Primary and Secondary phases of education. Every state maintained school has been sent a Catalogue of Approved Providers by NOF (available from the NOF web-site www.nof.org.uk), and once the funding for an individual school has been approved through the Local Education Authority, the school chooses of Training Provider.

The Faculty of Education of the University of the West of England has over 1000 students currently training to be teachers and a further 600 students who are qualified professionals following post graduate courses of study in a flexible modular programme of awards. The Faculty of Education provides professional development for teachers in seven LEAs and has partnership arrangements with nearly 400 schools for initial teacher training and in-service work. The Faculty of Education aims to train competent professional educators who have the subject knowledge, the pedagogic skills and the personal capacities necessary to enhance the educational opportunities and educational achievement of all whom they teach.

The Faculty of Education made a first bid for Regional Provider Status in November 1998 and learned that the bid had been successful in February 1999. The original bid was made because the Faculty believed it had an important contribution to make to the development of training in the use of ICT underpinned by the same pedagogical principles adopted for all training at the Faculty. The Faculty has formed the view that its aims are best achieved through courses of training which adhere to, and are informed by, the principles of reflective pedagogy. Put briefly, that teachers should be offered a balance of academic study and practical experience, and critical reflection on both. Critical reflection, it must be emphasised, is not a passive, contemplative activity, but a key element in the evolution of effective professional practice. As training materials were developed it became clear that the training solution could be delivered to any school in England and so the Faculty bid for National Provider status in July 1999 and were awarded national status from November 1999. By February 2000, the training materials were ready and were published as the ICT Learning Path.

The ICT Learning Path

The ICT Learning Path is a training programme combining on-line subject modules, multimedia interactive CD-ROM materials, in-school support and bespoke training, and on-line subject and technology support. The training usually begins with an on-line audit of skills supplementing the TTA Analysis of ICT Training Needs CD-ROM and the National Grid for Learning (NGfL) on-line audit of Using ICT in the Classroom. The trainee then plans their route through the materials using the Statement of Intent completed with the help of their in-school training co-ordinator (a senior member of the school staff) and the school trainer. The school trainer is appointed to the school from a national team of trainers appointed as Visiting Lecturers of the University.

Trainees work through the materials either independently or in collaboration with their Learning Support Assistants, other teachers in the department or Key Stage, or in the case of small Primary schools as a whole staff. They either work through the relevant subject modules and support their training with IT skills and classroom applications from the CD-ROM materials, or begin with some modules from the ICT Learning Path training modules to gather sufficient confidence to move on to the subject modules. Although the NOF funded scheme does not include Learning Support Assistants, the Faculty took the view that we should offer free training to all LSAs, due to our philosophical commitment to work with all professionals who impact upon the educational opportunities for pupils.

During training, teachers and LSAs can contact tutors and their school trainers at the Education Faculty and submit their responses to tasks and exercises for review by a subject tutor. To finish training, teachers and LSAs complete an Exit Audit of using and applying ICT in the classroom. In this audit trainees compare their professional judgement against that of the course team about when ICT should and should not be used in subject teaching. The responses to the exit audit form part of the 'portfolio' created by trainees to share with senior managers within the school, as evidence of successful attainment of the expected outcomes of the training. Completion of training is not an end for teachers and LSAs; rather, it is the end of the beginning. Trainees action plan for the continuation of professional development using materials and additional training available from the University's web site, 'Pathways' (http://pathways.uwe.ac.uk) and from other sources including the National Grid for Learning. (http://www.ngfl.gov.uk/)

Her Majesty's Inspectors of Schools are currently monitoring the impact of current ICT initiatives in schools, including the New Opportunities Fund (NOF) ICT Training Initiative, and will publish a report in Spring 2002. The provision of such large amounts of public money for a school–based training initiative is unprecedented in the history of education in the UK. The Inspectors will, no doubt, be able to tell the teachers and the wider community whether such an investment is 'helping teachers to use the technology in the classroom to enrich teaching and learning and raise standards - right across the curriculum.'

References

New Opportunities Fund (2000) *ICT Training for Teachers and School Librarians. Information for Schools. Updated Version.* NOF ICT 003

HM Government (1997) *People's Lottery White Paper* HMSO, London

Networked Learning: A Project-based Approach in building up the Working Knowledge of Multimedia Teaching Resource Bank

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Abstract This is a working paper describing a proposal for the development of a networked learning program for participants taking "General Studies" as their elective in the part-time Postgraduate Diploma in Education (PGDE) course offered by the Hong Kong Institute of Education. The objective of the networked learning program is to develop a local multimedia teaching resource bank for the subject "General Studies" in the primary curriculum through collaborative learning. The paper describes the rationale and concept of the networked learning program. The mechanism with 4 stages of development is outlined to illustrate how the networked learning program should be designed. The outcomes, and limitations of the use of the networked learning in developing multimedia teaching resource bank are discussed too.

Working knowledge

Stepping into the new century, it is argued that the traditional education system has to be reviewed. Especially in the adult education, traditional University with fix time, space and curriculum cannot satisfy the "Life Long Learning Objective" of the adult learner. In order to satisfy the "Life Long Learning Objective", learning should be taken place independent of time and place, and can be available at all stages of a person's life. (Bates, 1995)

Education has a role to develop the "working knowledge" in their professional aspect. According to the SHARP project conducted by Goodyear (SHARP Guided Tour, 2000), much of what was learned in formal educational systems were proved not to be accessible outside the context in which it was learned. As a result, "working knowledge" has to be developed. In Goodyear's definition, working knowledge is the knowledge that learners have acquired and which they can use in unfamiliar, real world, problem-solving situations. (SHARP Guided Tour, 2000)

In another Project JITOL, Goodyear stated out several assumptions in the collaborative approach for the development of working knowledge. It was assumed that participants were professionals with lots of useful experience and expertise to share. The shared valuable knowledge in the field was bound up in the working practices of the professionals. And the participates would share their knowledge, opinion, descriptions of their working context and working practices, house methodologies etc, if they were given the opportunity and motivation to do so (Goodyear, 1995/6).

Putting Working knowledge in Hong Kong primary school context

It is agreed that learning should be put into context; and teachers should build up their working knowledge, which may not be taught in traditional college. It is a new concept in Hong Kong to develop the working knowledge of Information Technology (IT) among primary school teachers. And it is worth to start with the participants of the part-time Postgraduate Diploma in Education Course (PGDE) in the Hong Kong Institute of Education (HKIEd).

In order to apply IT teaching in primary school, a lot of multimedia teaching materials should be produced. This will definitely increase the workload of the teachers. Though there are plenty of educational CD ROMs in the market, most of them are imported from other countries that do not fit into the local context. Some teachers who have great interest in IT teaching, may have already developed some multimedia teaching aids; but many are still IT illiterate that they even do not know how to log on their personal e-mail account issued by the Education Department of Hong Kong.

In light of this, there is a need to develop a multimedia teaching resources bank shared by primary school teachers with the following objectives:

- To share the working knowledge among primary school teachers in the production of the multimedia teaching aids, which are not taught through formal education,
- To narrow down the IT knowledge gap among teachers; some teachers are IT experts while some other teachers are IT illiterate,
- To bring in the collaborative learning concept to primary school teachers, to help them to work together to face the rapid developed technology in education
- To reduce the workload of primary school teachers in the production of local context multimedia teaching aids

Networked Learning in developing multimedia teaching aids

Networked learning may be cost-effective in distance education based on relatively small-enrolled numbers of students and a frequently updated curriculum. (Goodyear, 1995/6). It is the most economic and efficient way to set up a networked learning course first with participants in the part-time teacher education program to achieve the objective of building up the working knowledge in IT teaching. No additional class, venues, lectures and other hardware are needed to organize on such networked learning activities.

The Directed Collaborative Project Model described by Goodyear was taken in building up the networked learning program. This model was developed from the organization of peer interaction occurred in the context of the part-time MS program. The objective of the program was about the continuing professional development and updating through computing mediated conference where interaction is the essential feature of the conference. (Goodyear, 1995/6) The objective of the interaction is to create an information resource bank, or evolving knowledge base containing structured representations of practitioner knowledge and research-based knowledge. On the other hand, according to the SHARP project, putting multimedia in network includes the putting of video, audio, graphic and text. (SAHRP Guided Tour, 2000) However, to produce a video clip for teaching materials is really a problem for most of the teachers of Hong Kong.

In order to solve the technical problem of video production, a video server is built in the Education Technology Services Unit of the HKIEd. A resources bank containing about a hundred video clips covering the "General Studies" subject in MPEG format are stored in the video server. The content of the video clips is produced according to the General Studies curriculum, and video clips run from 30 second to two minutes. Video clips from the resource bank can be inserted and integrate into the multimedia teaching aids. The PGDE participants could log on the Institute Intranet to download the video clips.

With the support of this video clips resource bank, the condition for developing local context multimedia teaching aids in "General Studies" through networked learning is built up, with the principle to help the participants to create an audio visual representation of key teaching concepts in General Studies. And the representation of these teaching concepts can be edited and shared through network to other participants in order to build up their own practices and professional perspectives. (Goodyear 1995)

The networking learning concept is adopted from the model of Goodyear about collaborative learning: a group of participants collaboratively create a working knowledge through network. The participants are situated at different location and can join in the computer mediated conference either synchrous or ayschnorous. (Goodyear, 1995/6)

As indicated in a number of research and articles, the successful of the networked learning depend on the active participation of members through interaction. It is also suggested by Salmon (1998) with the constructivist approach, that emphasis should be put on creating an atmosphere of openness, helping students to explore ideas and different interpretations, encouraging ownership of the learning and linking to previous learning. The mechanism to maintain the interaction and active participation of the participants is outlined in the following paragraphs:

The mechanism in developing multimedia teaching aids

The mechanism of building the multimedia teaching aids is inspired by two studies. The first one is the SHARP project which is through the Internet to facilitate computer-mediated conference to build up working knowledge with video representation. (Goodyear & Steeples, 1999). The project was about to create video clips for representation of working knowledge and sent into network for collaborative learning. Another study conducted by Hodges and Mott was about using project-based approach to construct web-based hypermedia for instruction via the Internet. The target of the project was for the pre-service and in-service teachers on using HyperStudio software in elementary school classrooms. (Hodges and Mott, 1999)

Based on the two projects, it is found that Internet is a successful medium for the interaction, and the hypermedia software can be shared in the Internet for members. The successful of the network conference is depended on the successful of the interaction. Therefore, the mechanism is mainly through Internet and the Intranet within the Institute, and through the using of Microsoft PowerPoint where the working knowledge in the preparation of multimedia teaching aids can be shared.

The mechanism of the interaction for networked learning is mainly divided into four stages, and facilitated by the tutors. The medium for networked learning is the Institute e-mail system with connection to the video server of the Intranet. The advantage of using the Institute e-mail system is that all the participants have already familiar with the system and no additional orientation course is needed.

Stage I

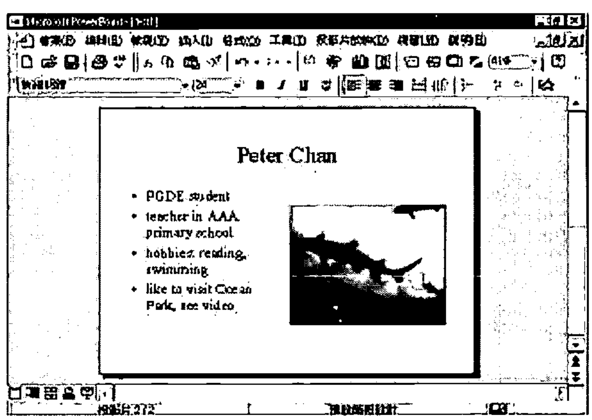
According to Hodges and Mott, it is the stage for the participants to introduce themselves to the rest of the class and at the same time, to master the software such as acquiring image in the Internet (Hodges and Mott, 1999). In order words, participants should get use to the technology in computer-mediated conference, and the most important, to try to post something in the conference and start out the collaborative learning atmosphere.

During this stage, participants are encouraged to produce simple descriptions about themselves with Microsoft PowerPoint; a 30-second video should be inserted in the MS PowerPoint with whatever content they like. The video inserted can be produced by themselves or they can make use the video clips stored in the video server of the Institute. Technical support will be provided to help participants to upload the video clips to the

video servers. Therefore, all participants within the group can view each other MS PowerPoint with video clips. Figure 1 is a sample layout of the PowerPoint. The advantage of using MS PowerPoint with video clips inserted from the video server is that they can attach and share with all users within the Institute Intranet system.

At the same time, the participants are encouraged for joining the computer-mediated conference. The role of the tutor at this stage is to ensure the participants are welcomed and motivated, and can be helped to gain access to the system. (Salmon, 1998)

Fig 1, Sample PowerPoint layout, with video inserted from video server



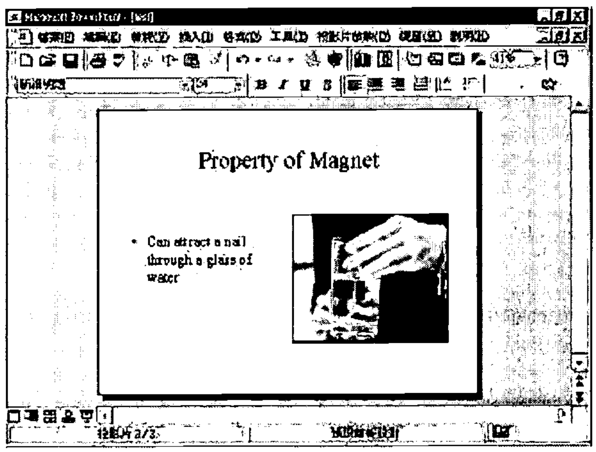
Stage II

According to Hodges and Mott, a project-based approach in online instructional design will provide teachers with a real-world learning environment task, and as a result, will utilize their strengths to construct the technology skills for use in classrooms. (Hodges and Mott, 1999)

In order to create a collaborative learning environment, tutors should set out tasks for the participants to develop the multimedia teaching aids. Participants are free to select any topic. For example, if a participant is a primary school 1 teacher and he/she wants to produce a multimedia teaching aids about the property of Magnet. Then he/she can prepare the MS PowerPoint and insert the video clips about the property of magnet from the video server. Fig two shows the simple layout of prepared PowerPoint.

After that, the participant is encouraged to attach the PowerPoint file in the e-mail and send to other members. Other members are free to discuss, comment or amend the PowerPoint. Participants are also encouraged to ask any questions about the task, such as the technical problem of video inserted, audio inserted, sequence of animated effect in title, text and video etc. The purpose of this stage is to facilitate participants to get use of the e-mail conference and the technique of the production of multimedia teaching aids.

Figure 2: Showing a the layout of PowerPoint prepared by Participant A



The role of the tutor in this stage is to let the participants appreciate the social environment of the conference system and to learn to join in. The response of the e-mail to each other may be largely individual but the tutor should encourage them to make them in public because the students may still need individual emails for support and direction. (Salmon. 1998)

Stage III

At this stage, the participant will use the MS PowerPoint produced in stage II and implement in their real teaching community. It is a real situation to integrate their teaching theory into context of working knowledge about building multimedia teaching aids. To the participants, this is a new experience to them because the application of IT teaching is still uncommon in Hong Kong. This is the stage for the participants to discuss the production and implementation of the IT teaching. The participants are free to discuss the application of learning and teaching theory, the instruction design and the technical problem in IT teaching. At this stage, the role of tutor is gradually fade out and allow participants actively build up their own working knowledge through interaction and collaborative learning. Salmon described this stage as information giving and receiving. The students may appreciate the huge range of information available through the network system, and his/her ability to contribute. (Salmon, 1998)

Stage IV

After thorough discussion through the network, the participants have exchanged their own experience in the application of multimedia teaching aids in the context of primary school teaching. With others' comments, participants will modify their teaching aids, and if possible, implement again in the classroom. At a result, a multimedia teaching resource bank is built among the participants so that they can share with each other and to use in the real situation. Reaching this stage, the participants have gone through the collaborative learning cycle as described by Goodyear. (Goodyear, 1995/6). Salmon described this stage as knowledge construction. It is at this stage that the students work together to generate and make new meanings through their collaboration.

Finally, the evaluation of the effectiveness of networked learning can be done with participants writing a self-evaluation report about what he/she has learnt in the program.

Outcome of the Networked Learning in developing Multimedia teaching aids

A multimedia teaching resource bank in General Studies will be built with the contributions from participants from in-service teachers of Hong Kong. In Hodges and Mott's project, the class of students had developed a true team relationship, and had assisted each other when problems emerged and finally had taken lead roles in facilitating each other through the learning process (Hodges and Mott, 1999). In view of knowledge construction, the students had engaged in discussion and interaction with peers and experts in a process of social negotiation. Knowledge construction did occur among students through discussion about their positions, in an argumentative format, reflection and re-evaluation their positions (Salmon, 1998). It is believed that under the networked Learning program, participants will go through the process of computer-mediated conference and as a result, they will collaboratively construct their working knowledge in developing multimedia teaching aids. They will learn how to organize discussion in network, and understand how to post response, argue and suggest to others during discussion. They will also learn how to produce multimedia teaching aids with the integration of audio, video or text. This is the working knowledge constructed by them and can be applied in their future practice.

Limitation in developing Multimedia Teaching resource bank through network learning

Using E-mail system for computer-mediated conference

According to Goodyear, in the early years of the MSc course of Lancaster University, the main means of communication was e-mail, and which was best suited to one-to-one or one-to-small group communication. However, Goodyear had concluded two main problems for the using e-mail system for computer-mediated conference.

1. Confusion over the addressing of messages
2. Misfiling of message (Goodyear, 1995/6)

The e-mail system is designed basically for an efficient way of information exchange, but not for computer mediated conference. In view of the existing hardware and software of HKIEd, the e-mail system with Internet is the only economic way for the conference. However, there is a lot of limitation as described by Goodyear.

For example, it is proposed to insert video to the MS PowerPoint and attach in the e-mail system. This will cause a lot of burden to the storing capacity of the Institute network. If the file size is too large, it may even break down the system. One way to solve the problem is that the student can create their own homepage and put their MS PowerPoint in the World Wide Web. The students need only to e-mail their homepage address to others members and will not give too many burdens to the Institute network system. However, creating homepage needs a lot of IT knowledge and not all students have adequate knowledge to do so.

The storing capacity of the e-mail system is another limitation. Due to the limited storing capacity assigned to each student, his or her email box will easily be full if for he/she takes active participation in the computer conference. As a result, students have to delete their e-mail messages from time to time. Then the retrieval of past message and the reviewing of the conference will be a problem.

Tutor role in facilitating the active interaction of the participants

The tutor plays an important role in facilitating the interaction of the participants in network learning. If the students do not actively involved in the interaction, the tutor can't do anything. Though the students have shared objective to construct the working knowledge in the context of the primary school, there are some other factors restrict them from actively involved in the interaction. The factors will be

- Heavy workload in the primary school
- PGDE students do not have adequate knowledge in using the technology in conference
- The personality of Chinese are reluctant to confront with others during discussion
- English is the second language of Chinese. To design a networked learning programme in Hong Kong the medium of language for interaction must be considered. Ideally it should be Chinese, but the Chinese input methods are still a barrier to a lot of Hong Kong teachers. Lack of knowledge in Chinese input will restrict students taking active participation in the conference.

Task for Collaborative Learning: Production of Multimedia Teaching Resources Bank

In designing the networked learning, the task of collaborative learning is to produce the multimedia teaching resources bank. This is under the assumption that there is an urgent need for the primary school teacher to implement the IT teaching in school. However, there is a lot of limitation in the primary schools to implement the IT teaching. For example, there is not adequate number of computers in the primary schools. Some of the primary schools are still waiting for the Education Department to allocate budget to install the computer network system in their schools. At the same time, some hardware provision is needed but not so common in the primary school setting. For example, the fixed LCD projector has not been installed in the most of the Hong Kong primary school classrooms. All this hardware provision will restrict the PGDE students to implement the IT teaching. As a result, they cannot take an active role in the networked learning conference about the production of multimedia teaching aids, due the reason that they do not have any experience to share.

Conclusion

The development of networked learning with PDGE participants and the building up of a multimedia teaching resource bank through collaborative learning are based on the fact that there is a shared objective among the participants. The shared objective is to apply IT in teaching strongly encouraged by the Hong Kong Government. Other than the formal training courses, the networked learning may be a good mean to help the participants building up their working knowledge in application of IT teaching in the local context of Hong Kong.

Reference

Bates, A (1995) Technology and the future of education. *Technology, Open Learning and Distance Education* London: Routledge

Goodyear, P & Steeples, C (1999) *Asynchronous multimedia conferencing in continuous professional development: issues in the representation of practice through user-created video clips Distance Education.* 20 (1), 31 - 48

Goodyear, P (1995/6) *Asynchronous peer interaction in distance education: the evolution of goals, practices and technology Training Research Journal.* 1, 71 – 102.

M. Lee Hodges, Michael S. Mott, (1999) *A Project Approach to Distance Education: Teaching Web-based Hypermedia for Instruction via the Internet*, TCC'99 Papers, 1999
http://www.lcahi.kcc.hawaii.edu/org/tcon99/papers/hodges.html

Salmon, G (1998) *Developing learning through effective online moderation. Active Learning* 9, 3 – 8.

SHARP Guided Tour
http://neptune.softlab.ntua.gr/sharpweb/tour/GuidedTour/GuidedTour_files/slide0002.htm
(10 March, 2000)

Wholetheme Learning in the Internet Virtual Community: Some Encouraging Preliminary Results

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Abstract: This study compares data from two different applications of a theoretically grounded wholetheme learning portfolio. The portfolios came from four different sections of the same undergraduate educational psychology course for teacher education students. All students wrote a critical reflection essay on three of their major insights in the course of the semester according to a common schedule and set of guidelines prescribed in their syllabus. Each of the students in two of the sections did and in the other two did not participate in the internet virtual community (IVC) we created. Quantitative results suggest that the IVC participants improved in critical reflection in the course of the semester. Qualitative analysis of the third insight data suggested a trend in favor of an interaction in which better students did better in IVC and poorer students did better in non-IVC conditions.

Introduction

The Wholetheme Learning Portfolio

The results reported here are based on critical reflection on three insights as part of more comprehensive wholetheme learning portfolio (WLP). The WLP is a product of over two decades of research in biofunctional cognition (Iran-Nejad, 1980, 2000) and close to a decade of application in university courses in educational psychology for teachers. One major difference between the WLP and traditional teaching products is the conceptions of learning behind each of the two kinds of artifact (Iran-Nejad & Gregg, in press). These conceptions of learning are presented in Table 1. Whereas the focus on the first two conceptions of learning is on *internalization* of an external disciplinary knowledge base, the third conception views learning as the wholetheme *reorganization* of the learner's own intuitive knowledge base. Critical reflection as reported here was based on this third conception of learning.

Conception of Learning	Metaphor	Shared Characteristics
1. Internalization of External Knowledge by Means of Maintenance Rehearsal	Learner is Like a Clothes Buyer	Acquiring and Storing Ready-made Objects
2. Internalization of External Knowledge by Means of constructive Elaboration	Learner is Like a Dress Maker	Building Objects Using Ready-made Patterns
3. Wholetheme Reorganization of the Learner's Own IKB	Learner is Like a Designer	Inventing New Designs using One's Own IKB

Table 1: Three conceptions of learning based on Iran-Nejad (1990) and their illustration in terms of the metaphor that knowledge is analogous to Clothing.

Specifically, one major implication of the different learning conceptions, as far as the WLP is concerned, is a fundamentally different perspective on critical reflection. The object of critical reflection in the first two conceptions of learning is the declarative or procedural content of a symbolic input stream whose origin is, directly or indirectly, an external disciplinary knowledge base (indirectly, that is, if the message stream comes from a previously internalized representation of that external knowledge base). The kind of critical reflection processes that are assumed to operate on the symbolic and representational message stream are analytic examination of its content, constructive elaboration on it, and/or storage-for-reproduction of it. Critical reflection in the third conception of learning is an entirely different story. It involves turning inward, rather than outward, to one's own non-disciplinary intuitive self-awareness and learning to use it in the art of self-regulating one's own brain-mind cycle of reflection for the purpose of wholetheme reorganization of one's own nonsymbolic and nonrepresentational intuitive knowledge base (Iran-Nejad, 2000). As secondary and indirect objects of critical reflection, external knowledge bases (both disciplinary and non-disciplinary), one's own knowledge of the world, and social nonsocial organizations of learning are all only useful to the extent that they can contribute to the primary goal of self-regulating one's own brain-mind cycle of reflection. The purpose of the WLP is to help students embark on this type of a journey of their lifetime that must also be, in some extraordinarily fundamental sense, a journey of their own choosing.

The Concept of Internet Virtual Community

Because the nervous system and the learning processes of the brain-mind cycle of reflection have evolved in the real world, the internet social and otherwise organizations of learning are likely to facilitate learning to the extent that they can manage to approximate the social and otherwise organizations of the real world. We designed the IVC to "actualize" this other implication of biofunctional cognition. In real world communities, people live in homes which are nothing like the artificial modern classrooms. People prepare their homes maybe first to their own liking, comfort, and entertainment and next to the liking, comfort, and entertainment of their guests. To harness a parallel set of considerations, we made every individual student in the course the proud owner of an IVC home in which to post her or his wholetheme learning portfolio. The homes for the students in each section of the course were also designed into communities of five to seven homes. Within a given community, the owners maintained open house for the duration of the semester for visitation by other members of the community. At the end of every scheduled visit, the guest was to leave a critical reflection and three other brain-min-cycle of reflection ratings of their own experience of the visit.

Methodology

Insight critical reflections (or insights, for short) from 84 portfolios authored by the students in an educational psychology course for undergraduate teacher education candidates were used as the data source. The portfolios came from four different sections of the same course. Most of the participants were white, female, and about twenty years old. There were two different instructors, both advanced educational psychology graduate assistants. One of the two sections of a given instructor participated in the IVC and the other served as the non-IVC equivalent (control).

Each student in an IVC section received sign-on instruction to her or his own individualized "home discussion forum" (HDF) as well as to the HDFs of the other members of the same community. The

HDF enabled its owner to post her or his portfolio entries or view responses posted to each entry by other members of the same community or by the instructor. Each community consisted of five to seven HDFs for all members to visit.

All four sections received the same course syllabus, except that the syllabi for two of the sections contained additional instructions for participating in the IVC. Instead of posting them in an HDF, participants in the non-IVC sections e-mailed their portfolio entries to their respective instructors. All entries were posted or e-mailed according to the same schedule prescribed in the syllabus. Students in all sections were also required to compile all their entries into a custom-designed hard copy of their portfolio and turn it in to their instructor for grading purposes by a deadline toward the end of the semester. Thus, each student was required to submit each entry twice, once by posting or e-mail according to a prescribed schedule and once in hard copy included in compiled portfolio. In this fashion, the IVC and the non-IVC sections were different only in that the IVC sections made their portfolios public within their community. In all other aspects of instruction, including their regular class meetings, all four sections of the course were to be identical.

The wholetheme learning portfolio was described as a QUILT (RR) portfolio, denoting its content types: questions, insights, lessons, and teaching observation essay as well as a (summative) reflection paper and a (summative) reaction to the portfolio. In this study, we only analyzed the insights. Therefore, the other contents of the portfolio will not be discussed here. For each month during the semester, each student was to reflect on her or his major insights for that month, select one of them, and write a critical reflection on it.

Quantitative Results

Each insight was rated by two raters on a critical reflection scale. There were a total of 248 insights to rate. The inter-rater reliability was 0.85. The ratings of each insight given by two raters were averaged. A preliminary analysis showed no main or interaction effects for Instructor. Therefore, a 3 x 2 repeated measure ANOVA was conducted on the ratings with Time (Insight 1, Insight 2, Insight 3) as the repeated measure and Condition (IVC, non-IVC) as a between-subjects factor. A significant interaction was present, $F(2, 156) = 3.195$, $p < .05$). However, none of the main effects were significant. As Figure 1 shows, IVC sections gained in critical reflection from Insight 2 to Insight 3. The critical reflection scores for the non-IVC students went down.

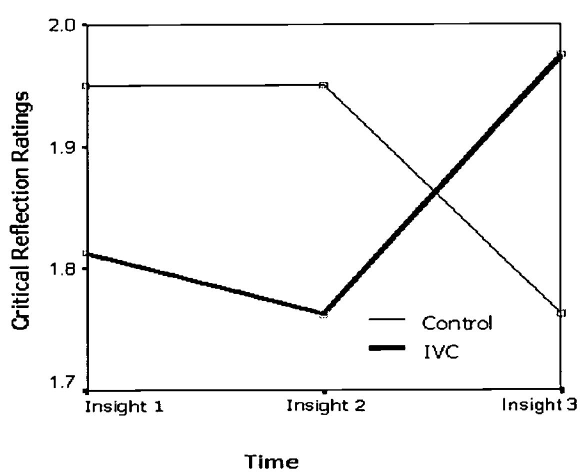

Figure 1: The interaction of time and condition

Qualitative Analysis

We used NUDIST (Q.S.R., Power version, revision 4.0) for a closer look at the data for Insight 3. Upon examining the categories that emerged, we noticed a tendency toward an interaction in which the IVC participants in the top group appeared to be doing better than the control group; but the IVC participants in the bottom group seemed to be doing worse than the bottom control group. Table 2 (See Appendix) shows a sample of the coded sections. To select this sample, we used the criteria of best, common, and worst examples of learning as reorganization. To our estimation, examination of the insight excerpts in the table seems to support the tendency for the interaction we just described.

Discussion and Conclusions

What can we make of this preliminary set of results? According to our quantitative results, participation in the internet virtual community seemed to help between the time that the students wrote their critical reflections on their second and third insights. This was expected. However, during the same period, the opposite effect is apparent for the control students. This was a surprising finding. One tantalizing possibility is that sometime by mid-semester, the IVC participants experienced a crisis in the process of wholetheme reorganization of their own intuitive knowledge base. This crisis then interfered with their critical reflection performance for the second insight. For the non-IVC students, this developmental crisis came a month later affecting their critical reflection performance on their third insight. Whether there is any substance to this highly conjecture remains to be seen.

Our qualitative analysis of the data on the third insight was conducted to see if it could shed any light on the above conjecture. The actual results seem to be cautiously helpful. By the time of the third insight, good non-IVC students seemed to be only slightly behind the good IVC students, indicating that they had already left their wholetheme reorganization crisis behind and were well on their way to recovery from it. Why did, then, the poor IVC students perform worse than the poor non-IVC students. It is possible that the poor IVC students only appear to be doing worse because they are experiencing their wholetheme reorganization crisis at the time of their third insight. The non-IVC students appear to be doing better only because they have not yet reached the wholetheme reorganization phase. The data in Table 2 are consistent with this speculation. It is important to know that this cannot be anywhere near a conclusion. Without further evidence and without any replication data, many similar conjectures can be fabricated for the pattern of results reported here.

Reference

Iran-Nejad, A. (February, 1980). *The schema: A structural or a functional pattern* (Tech. Rep. No. 159). Urbana: University of Illinois, Center for the Study of Reading. (ERIC Document Reproduction Service No. ED 181-449).

Iran-Nejad, A. (1990). Active and dynamic self-regulation of learning processes. *Review of Educational Research, 60*, 573-602.

Iran-Nejad, A. (2000). Knowledge, self-regulation, and the brain-mind cycle of reflection. *The Journal of Mind and Behavior,* 21(1&2), 67-88.

Iran-Nejad, A., & Gregg, M. (in press). The brain-mind cycle of reflection. *Teachers College Record.*

	Top Group		Bottom Group	
	IVC sections	Non-IVC sections	IVC sections	Non-IVC sections
Best Wholetheme reorganiza-tion example	In the above paragraphs, I basically just explain confidence and its importance. However, along with confidence, I think the next best thing to achieve is independence-one's own sense of identity. It took me a while to achieve this one-my parents tried their best to keep me under their wing, but I feel that I have finally broken away. When I speak of independence, I do not just mean being able to support oneself financially. Independence can be used in a variety of different contexts. I bet you are wondering how on earth I would go about teaching independence to a kindergartner. The kind of independence I would show this age group is to rely on their own thoughts and imaginations instead of someone else's thoughts and imaginations. This is the context of independence I would most stress during teaching. This is where confidence ties into independence.	There was now a clearing in my mind; a new path had been opened. This new path indicated a great new set of possibilities for me in my own approach to my studies. The insight helped me to sort out things in my mind very much the same way as one sorts out clothing from a laundry basket or food items placed in appropriate parts of the kitchen. My mind could not go down old paths any longer. I resolved to be in control of my self-regulation in terms of my own motivation in my studies. The challenge had been given and now I had decided to accept the challenge within myself. Only I could make this step. Mental adjustments had to be made. It was not all-smooth sailing in my mind to make the crossover to improve my mental attitude. I will now deal with an experience I had many years ago in relation to this insight.	At the same time, I was listening to one of my gospel CDs. The song that was playing said, "Oh what peace we often forfeit; oh what needless pain we bear, all because we do not carry everything to God in prayer." From that I realized that not only was I forfeiting my peace and happiness, but I was also worrying needlessly. For every time that my mind could not see a way, God made a way. I also realized that all I had to do was pray about my financial situation and any other problems that I may have been having at the time; and leave them there with God, everything would have been taken care of.	While in my placement at Woodland Forrest Elementary I witnessed a lot of different things. One of the most profound however was the effect that motivation has on children even in kindergarten. All children are not driven to achieve but some can be with the help of a little motivation. Ms. Teacher was very good at this. She motivated in so many ways that it was hard not to want to do your work. One of the ways she motivated was the star chart. Good behavior got a star for the day and the children with the most stars at the end of the week go something special. It's almost like the children were feeding off this motivation. However I thought to myself that maybe she was giving too much motivation at times. Then I reconsidered because how can you measure too much motivation. I see that if any class is to succeed, it has to be driven to.
Most common Non-wholetheme non-reorganiza-tion example	After putting thought into my insight, I now have a basis for what type of teacher I want to be. By having this insight, it has given me the ideas and qualities that expert teachers possess in order that one day I may achieve the expert teacher status. My insight has shown me that there is a large difference between an expert and novice teacher. All of my sources of knowledge tell me that I have a long way to go before I fully understand the big picture of an expert teacher. However, by having this insight and all of the information learned from it, I know that the learning process is already in motion.	It is difficult to find sources of motivation for students with disabilities, especially those with limited communication skills. I have discovered that one opportunity for teaching may arise when a student has a desire for an object or task. When working with students in the future I plan to be more observant. I now realize that the students can guide me in the development of individual instructional programs. .	Another question I have is how are the other students handling the fear of going to school. After the shooting was done in Columbine many students for at a weeks time were absent from school, and this only hurts them. How could blame a student who is in fear of their life at school of all places not to come? The answer is you don't. Extra protection is the only solution that the schools can give right now and there doing everything in their power to keep students safe.	This insight transformed me as a person because it made me look at motivation in a totally different way. It made me realize that I can use both external and internal motivation, yet neither one would be used in the bad sense. Now I can make sure that I only try to use external motivation to stimulate internal motivation. (31)
Worst non-wholetheme non-reorganiza-tion example	I think that this insight has transformed me to an extent as a teacher. I cannot expect my students to just want to do well just because they are all driven to do well. I will have to give some incentives for some of them to want to do well. Some may never be motivated towards doing well in school, and I have to make sure that I don't give up on these students at first sight. I will have to look hard to find what does motivate them and tie that into my classroom experience so that they will be motivated to learn. Without this insight, I may have just assumed that these students just didn't have a drive as powerful as mine.	I could have offered the students a reward if they would of eaten a well-balanced meal for a week. I could have also told the students the consequences from not eating from all the 6 basic food groups. This way the students would be able to decide which road they want to choose in healthy eating. In this situation, I could not have used the punishment style of motivation because I could not have taken away something from the students just because they were not eating right. I usually do not eat right myself, much less punish the students for something I do, too. Therefore, I learned there is an appropriate place to use one motivation skill and another place to use the other.	Why did I choose elementary education over obstetrics? I have always wanted to be a teacher, but I also wanted to deliver babies. I really thought, I would be much happier teaching than delivering babies. Then I thought, doctors make about five times as much as teachers make, but what do I really want to do? Doctors are always on call, unlike teachers. Would I enjoy this environment of constant pressure in a hospital or do I want a more relaxed environment in a classroom. … Therefore, I chose teaching.	My name is S and I teach third grade. One of my students went through a traumatizing event not to long ago. He found his mother dead in their house. She had a massive heart attack. Well since this terrible occurrence, he has started to block a lot of things out and to forget things. His father put him through counseling but he seems to be progressing very slowly. He is a very smart boy, always made really good grades. Now he has forgotten things he use to do really well on for example division. So it is obvious that he is forgetting information from his long-term memory.

Table 2: Best common and worst examples of text units from insights by top and bottom groups of students in IVC and non-IVC conditi

Constructing Knowledge Networks in Middle School Science Classrooms

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Abstract: Providing opportunities for K - 12 educators to further their use and understanding of current technologies in the classroom has never been more important than it is at present. This paper will explore ways that university faculty members can provide K - 12 educators with relevant information and hands-on experiences to develop and enhance their use of technology in the science classroom.. An interactive workshop for 15 middle school science teachers provided an opportunity for participating teachers to experience constructivist teaching and learning strategies first-hand. Throughout the workshop, teams of teachers worked to prepare an integrated, technology-based lesson using materials from science, mathematics, as well as the language arts. Highlights of the curriculum developed for the workshop will be presented. Results of a questionnaire given to the teachers will also be shared.

Introduction

Through a Dwight D. Eisenhower Faculty Development Program award, a team of faculty members and graduate students from American University hosted a workshop on the American University campus for a group of 15 middle school teachers from the District of Columbia Public Schools. Teams of three were identified with most teams including a science teacher, a mathematics teacher, and a language arts teacher. Where possible, teams consisted of teachers from the same school. Resources for the workshop can all be found at http://www.american.edu/IRVINE/ike/. The weeklong, interactive workshop provided an opportunity for participating teachers to experience constructivist teaching and learning strategies first-hand. During the week, the teams of teachers worked to prepare an integrated, technology-based lesson using materials from science, mathematics, and the language arts. In the section that follows, highlights of the many workshop activities are outlined. A table summarizing the workshop events is given in the appendix of this report.

Theoretical Framework

The need for the successful implementation of technology into any educational program, especially the innovations within middle school classrooms, must be build upon a genuine educational pedagogy in order for authentic learning to occur (Dede, 1999). The constructivist model has emerged from the works of developmental theorists such as Bruner, Piaget, and Vygotsky. The cognitive constructivist theory adopts the works and conclusions of Bruner and Piaget as the foundations of its principles. Within this theory, students construct their knowledge of the world through assimilation and accommodation. Within the field of educational computing, the best-known cognitive constructivist theoretician is Papert (1993), who characterizes behavioral approaches as "clean" teaching, and constructivist approaches as "dirty" teaching. The contrast emphasizes the difference between perspectives that isolate and break down knowledge to be learned (clean) versus approaches that are holistic and integrative (dirty) (Papert & Turkle, 1993). Intertwined together, at some level both "clean" and "dirty" approaches serve as the authentic foundations of the constructivist theory. By considering these approaches together, we can get a clearer understanding of how Internet technology, when integrated into any classroom, can be used to create successful distance learning in educational and corporate environments.

Another example of constructivism in educational technology is outlined by Dede and Sprague in a 1999 article, "If I teach this way am I doing my job?" which appeared in *Learning and Leading with Technology*. The article is based upon the constructivism theory at work in a traditional classroom. Educational technologists have often stated that an effective way to integrate technology into the teaching and learning processes is to follow a constructivist foundation. In other words, educators may have technical skills, but they may not understand how constructivism translates into effective, "hands on" classroom practice. However, the constructivist theory is in fact one of the best theories to intertwine into the daily classroom lifestyle (Dede & Sprague, 1999).

For an authentic constructivist theory to breed successfully in any classroom, students are expected to be more actively involved than in traditional classrooms. They are required to share ideas, ask questions, discuss concepts, and revise ideas and misconceptions (Dede & Sprague, 1999). In order to successfully ensure that the constructivist theory is in practice while using technology, the educator must in most cases change his or her more traditional beliefs. In the constructivist classroom described by Dede and Sprague there is no evidence of neatly lined desks or a type of "dense" order within the classroom walls. Instead, students work in teams, asking questions and moving about the classroom. In addition, the educator, instead of simply repeating a redundant lecture, is engaging in interactive activities with his or her students. The mission of the constructivist method is centered upon the needs and interests of the student. Any constructivist classroom demonstrates that learning can often times go beyond the content area. The main foundation the constructivist scenario is built upon states that authentic learning must be student-centered and meaningful and must encourage the student to engage in real-world experiences, thus allowing him or her to go further in his or her learning and education (Dede & Sprague, 1999).

There are many examples in which the constructivist theory has successfully been implemented with or around technology. Within the model constructed by Egbert, Thomas, and Fischler (2000), the Tigerlake Public School simulation is assessed through substantial research. The model mimics the following concept: if the constructivist theory is successfully implemented with and around technology, students learn authentically. In this situation, student-educators who are the participants in this simulation learn by doing. This simulation offers a way to integrate field experience and alternative technology-based instruction, which combined can help to improve almost any type of student to achieve high levels of competence in technology. The Tigerlake simulation allows the 29 student-educators to interact in a learning environment where "rich" experiences could be achieved. The richer the experience, the richer and more indelible learning takes place. By presenting related practices in learning environments that are simulated, the participants are provided with a set of "experiences" to compare to the current problem or issue. The participants are able to simplify concepts in order to make them understandable, in order to build upon existing understandings of theory and apply it to practice. Again, even among student-educators, the constructivist theory, intertwined with technology, is successful in allowing the participants to gain a better grasp of applying theory to practice (Egbert, Thomas & Fischer, 2000).

Design

The basic structure of the workshop involved sharing information and materials with the teachers during the morning sessions. This structure builds on known ideas about infusing technology into the instructional techniques of teachers, as many educators are experiencing a transformation in the ideology of "best-practices" as they once knew it (Balestri, Ehrmann, Ferguson, 1992). Although technology has influenced methods and practices in almost all-educational institutions (Balestri, Ehrmann, Ferguson, 1992), traditional pedagogy should still be used as the foundation for all educational practices (Bopry, 1999). The teams of teachers spent each afternoon in a computer lab learning how to use the internet and world wide web to create constructivist-based integrated lessons. Each afternoon, the participants met in the McCabe Center for Computers in Writing, a lab of Windows98 computers with access to the internet and web-design software. Teachers were given intensive hands-on instruction on educational web design, and created materials and resources to use in the process of integrate this instructional medium into their teaching in math, science, and language arts. Thus, the teachers were given a considerable amount of time to work together within their teams to plan and develop their lessons.

Each morning, the workshop began with a group discussion of the previous day's "reflection questions." Each day participants were given several questions to ponder after the conclusion of the day's events and activities. Participants were asked to go home and keep track of their reflections in a journal. The reflection questions were typically associated with information presented during that day's sessions. The intent of the reflection questions was to give teachers time to digest information they had received during the day, and to reflect on how that information might have relevance to them in their daily teaching activities.

Each day, participants engaged in hands-on activities relating constructivist perspectives into instruction in language arts, mathematics, and science. The participating middle school teachers were engaged by activities such as how to use a learning style approach in the classroom, reading the web using a critical literacy perspective, and an interactive, constructivist-based biology laboratory on DNA. Each day following lunch, participants went to a computer lab facility to work on their team projects. The sessions followed a teaching/training methodology for instruction in using the computer applications in the lab. First teachers discussed general principles of educational web design, and then participated in a whole-group training session on how to use the tools. Then teams were given lab-time to work on their projects with one-on-one assistance from the session leaders. Thus, participants had ample opportunity to ask questions and receive personal assistance from the workshop team.

The focus of the projects that the teachers created were around an integrated lesson that allowed the teachers to build on national standards in their own curricular area. The point of this focus was to have the teachers build a series of activities that would not only give their students the opportunity to construct their own knowledge, but also provide a interesting way to meet curricular standards. This allowed teachers to realize that alternative methods of assessment could be used to measure student learning, while still meeting the school district's objectives. Therefore, teachers could still feel they were "doing their jobs" -- in reference to Christopher Dede and Deborah Sprague's Question. For example, in an integrated lesson on the study of petroglyths, students could learn about something of interest, while still achieving learning standards in math, science, and the language arts. This activity allows students to examine this interesting field of study through mathematical activities, scientific methods, and using language and communication skills to show what they learned.

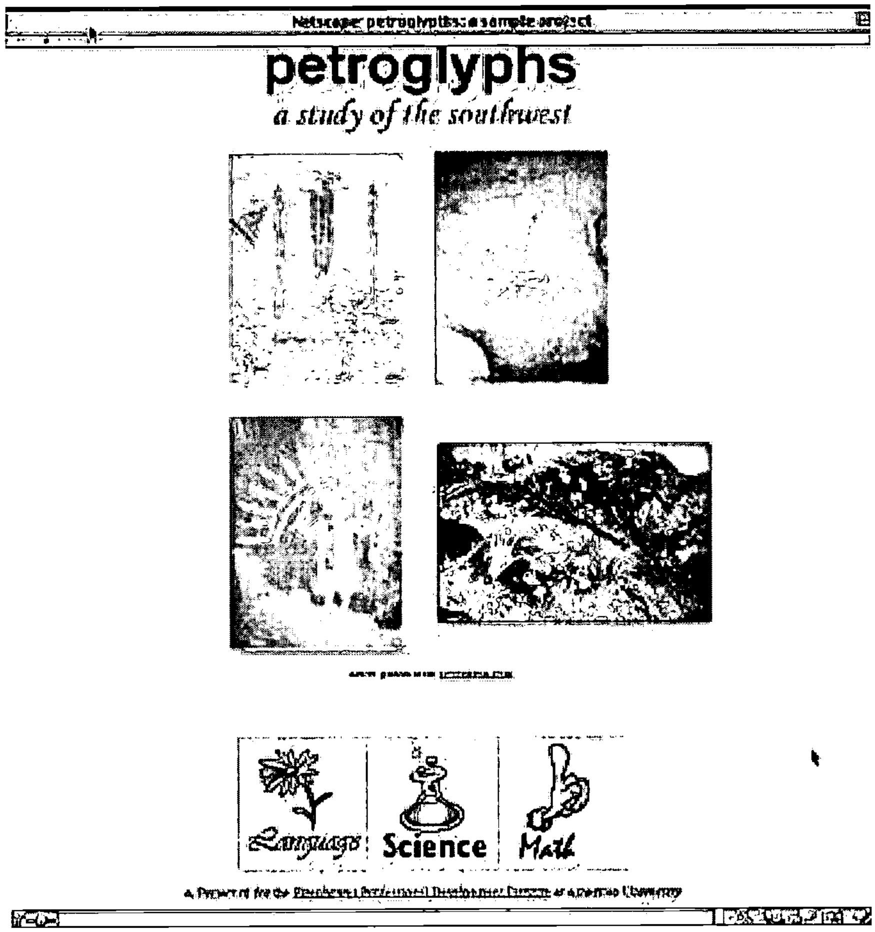

Figure 1: A sample constructivist learning project on the study of petroglyths

Feedback from Participating Teachers

On the final day of the workshop, feedback was elicited from the workshop participants in the form of a written questionnaire. The questionnaire was used as a substantive portion of the summative assessment of the workshop. A copy of the questionnaire is included in the appendix of this report. The questionnaire includes a summary of all comments given by the workshop participants. A brief summary of the feedback received from workshop participants will now be presented.

Numerical ratings given by the participants ranged from 3.86 to 4.93 (with 5.0 being the highest possible rating). The overall average numerical rating was 4.60. From these ratings it might be concluded that overall, the workshop participants were very satisfied with the workshop. Participants were asked whether they felt the goals of the workshop were achieved. Responses to this question clearly show that most participants felt that the goals and objectives were met, and in many cases, exceeded. In regards to the overall structure of the workshop, one participant commented "This was the 'best' professional development experience I have had in several years."

When asked how they intend to integrate what they've learned in the workshop into their own classrooms, participants indicated a definite eagerness to return to school and begin implementation of the new strategies. Several participants suggested that they planned to make better use of the web in their classrooms. In addition, one participant indicated that they would be making use of the constructivist approach as they work with and teach other faculty. Thus, the potential exists for other teachers at the participants' schools to benefit from the material shared in the workshop.

Comments from some participants indicated that they did not necessarily feel there was enough time for interactions to occur, especially between teachers from schools other than their own. The teams were structured such that most teachers worked with other teachers from their own schools. This was done to allow teachers to return to their individual schools and continue working together to further enhance what was learned during the workshop. In addition, these teams were encouraged by the workshop leaders to return to their own schools and share what they learned with other teachers.

Overall participants indicated that they felt the workshop was a valuable experience, worthy of being repeated in future summers. Some participants indicated that if the workshop were to be repeated it could even be extended to two weeks because of the amount of material presented.

Summary

Although many educators think that implementing the most high tech tools is the way to maintain successful educational practices, others bow to traditional theories. What is obvious is that many of the constructivist theories can be successfully implemented when intertwined with current Internet technologies. What seems to be needed currently is an understanding that the constructivist approach to learning can be implemented with the Internet, and if done so properly can be highly successful, taking educators and students where they have not been able to go in the past. For example, when teachers and students are actively engaging in Internet technology and implementing projects in such a domain (by building their own environments), they are simultaneously actively engaging in the learning of knowledge, within that domain. Students building artifacts on the web are creating creditable sharable externalization of their knowledge, which provides both motivation and opportunity to exercise meta-cognitive skills. As a result, students gain the ability to learn simply by applying the constructivist theory to their success factors when using the Internet. A passive view of integrating the Internet into education may only support instructions and techno-centrism (Papert & Turkle, 1993). Educational Internet resources will change this approach by allowing students some degree of autonomy in choosing their path of learning via computers. The Internet alone cannot produce "good" learning, however "good" learning can occur through successful implementation of the Internet (Papert & Turkle, 1993).

The goal of the "Constructing Knowledge Networks: Integrating Science, Math, Language, and Technology in the Middle School Classroom" workshop was to provide teachers with hands-on learning experiences and materials related to developing technology-based learning tools for use in Science, Mathematics, and Language Arts classrooms. Based on feedback from participants, the goals and objectives of the workshop were met and exceeded. In addition, participants encouraged workshop leaders to offer similar workshops in the future, focusing on a project-based approach to professional development.

References

Balestri, P. D, Ehrman, C.S., & Ferguson, L. D. (1992). *Learning to design designing to learn: Using technology to transform the curriculum.* London: Taylor & Francis.

Bopry, J. (1999). The warrant for constructivist practice within educational technology. *Education Training and Development* 47, 5-26.

Bruner, J. (1963). *The process of education.* Cambridge. Harvard University Press.

Dede, C. & Sprauge, D. (1999). Constructivism in the classroom: If I teach this way am I doing my job? *Learning and Leading with Technology.* 27, 6-9.

Dede, C. (1999). The Multiple-Media difference. *Technos.* 8, 16-18.

Egbert J., Thomas M., & Fischler R. (2000). Assessing the tigerlake public schools simulation: Using technology to link teacher education theory and practice. *Journal of Computing in Teacher Education* 54, 23-7.

Papert, S. & Turkle, S. (1993). Styles and voices. *For the Learning of Learning of Mathematics.* 13, 49-52.

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Beyond the workshop: Models of Professional IT Development for Practicing Teachers

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Purpose

This study examines an often over-looked aspect of the implementation of computer technologies in schools, across Canada and elsewhere: we have sought to identify, describe and clarify "successful" models of teacher professional development.

As the number of computers accessible to students and teachers in classrooms and labs has increased, especially in the last ten years, there has been a corresponding emphasis on "integrating technology across the curriculum." Teachers' effective use of computers in their classrooms, however, remains an elusive goal. Researchers have identified numerous barriers to teachers' use of computers in their classes, such as limited equipment, inadequate skills, minimal support, time constraints and the teachers' own lack of interest or knowledge about computers (see, for example, Berg, Genz, Lasley & Raisch, 1998; Ertmer & Addison, Lane, Ross & Woods, 1998; Hadley & Sheingold, 1993).

Rightly or wrongly, teachers have come "under fire" as insufficiently skilled to make use of promising new technologies. Governments, faculties of education, school districts, schools, communities and individuals have begun to focus on helping teachers get access to training and development in required skills. While programs have varied widely, we have chosen to focus on three exemplary models of professional development in Canada: a university-based model, a school-district model, and a school-based model. In each of these examples, we elucidate the methods and practices which support and hinder teachers in their technological professional development, focusing on teachers' own stated preferences for "what works" and "what doesn't work" as they attempt to make more and/or better use of computers in their classes.

Methods

We have employed several methodologies in our work: documentary research, site visits and interviewing. Through observations and semi-structured interviews with teachers, project developers and administrators, and we have identified a common range of issues that have been encountered when providing professional development to teachers.

Models for Professional Development for Practicing Teachers

A university-based model

The Teaching and Learning in an Information Technology Environment (TLITE) is a two-year post-baccalaureate program provided by Open School in collaboration with Simon Fraser University (SFU) in British Columbia. Open School is a division within the Open Learning Agency which provides programs (at a distance or in classrooms) geared toward the K-12 curriculum for students and teachers using print, television and Internet sources.

The TLITE program is designed specifically to aid teachers in using technology effectively in their classrooms; it is self-directed, collaborative and based on the mentor model. Over the two years, teachers meet face-to-face and on-line in their cohort groups (based on geographical area), with their "local" mentors ,as well as university-based mentors (professors in the faculty of education) to design their course of study and interest. In most cases, school districts provide teachers with the incentive of a pay increase for completing the program.

The TLITE model is an excellent example of a self-directed program where teachers explore and learn to use technology in their own time and ways, setting their own goals for use and application of their skills in their classrooms. It further makes use of both face-to-face and on-line instruction and support. TLITE graduates are often found at the centre of innovative technology practice in British Columbia schools.

A school-district model

Integrating Technology in the Curriculum using Inquiry (ITCI) is a workshop-based, school-district model. Teachers and principals from five schools in the Peel District School Board in Ontario were brought together in for a four day summer institute on technology in the classroom. It has been followed throughout the year by workshops, site visits, and on-line mentoring. The program culminates in a final presentation to all teachers of the work they have done with students over the year.

The ITCI model combines workshop and skills oriented professional development with teachers' own subject-related interests for using technology with their students. It provides support for teachers throughout the school year, both on-line and face-to-face.

Even more uniquely, it mentors and supports the school principals involved in the project as they attempt to more fully commit their staff to technology-use.

This district is considered a "leader" in technology integration. Its teachers and principals are committed to helping other teachers and principals integrating technology into learning in their classrooms and schools.

The School-based Model

One individual working within a school, with the support of a principal, can do much to aid his/her colleagues in their use of computers with their students. Jane Clayburn (name has been changed), a teacher at an elementary school in British Columbia has developed a system in her school whereby all teachers have access to professional development and support in their use of computers. She offers, for example, skills-based workshops before and after school and during lunch as teachers request it, and each time the school purchases new hardware or software. She also talks to teachers about how they can use computers for different aspects of the projects they are currently working on. She then helps teachers the first three or four times they use the computers for their projects, working with them side-by-side with their class. She is able to provide what she labels "just-in-time" support for teachers in her school more easily because her principal gives her two hours of "release time" from teaching per day.

This model works best when teachers and principals cooperate to take advantage of the expertise of one or more individuals. While not a "large-scale" model, we found it to be the single most effect model we examined as it provided ongoing support, on-site, and with flexibility. It depends entirely, however, on the good will of the actors, including a supporting principal.

Implications

As many districts and schools have discovered, professional development can be the Achilles heel of technology integration. Each of these models is described and critiqued in the paper in some detail. From the analysis, we have been able to describe key elements which should be considered when designing and implementing professional development programs for teachers. These include:

- The importance of self-motivation – a bottom-up approach to technology integration in the classroom;
- The importance of a facilitating environment – top-down support for innovation
- The importance of play and discovery;
- The importance of incentives, financial and time;
- flexibility which makes allowances for all levels of competency and interest;
- just-in-time support for teachers as they begin to use computers in their classrooms;
- ongoing support, both on-line and in person;
- on-site workshops, where teachers learn on the computers they will be using with their students;

- activity-based emphasis – teachers don't learn "stand alone" skills, but instead use computers in relation to the activities they design and will ask their student to do
- sustainability.

This list is not, of course, exhaustive but it is illustrative of those elements that teachers felt made their professional development experience with computers more successful.

Professional development for teachers cannot be ignored, nor can it be assumed that old models will work with new systems and technologies. In fact, some of the very characteristics of new technologies of computing and communication that make them so effective and challenging to use in the classroom also pose challenges and opportunities for teachers and their professional development. Our study provides some initial indications of best practice in the area, emphasizing the importance of sustainability, and reveals pitfalls to be avoided.

References

Berg, S., Benz, C. R., Lasley II, T., & Raisch, D. (1998). Exemplary Technology Use in Elementary Classrooms. *Journal of Research on Computing in Education, 31, 2,* 111-123.

Ertmer, P. & Addison, P., Lane, M., Ross, E. & Woods, D. (1998). Examining Teachers' Beliefs About the Role of Technology in the Elementary Classroom. *Journal of Research on Computing in Education*, 31, 54-73.

Hadley, M. & Sheingold, K. (1993). Commonalties and distinctive patterns in teachers' integration of computers. *American Journal of Education, 101,* 261-315.

A Framework for Designing Professional Development Courses in Instructional Technology for Teachers

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Abstract: How do faculty in colleges of education gear their instruction in Instructional Technology courses to accommodate the varying levels of knowledge, skills, and abilities of practicing teachers? This presentation provides a framework for designing professional development courses in IT to meet the needs of individual practioners. Key features of the course development model include: assessing the entry level of participants, based on ISTE standards and their levels of proficiency in using technology; determining the availability of technology and support for using technology in participants' schools; and the development of individualized learning plans that are aligned with ISTE standards and based on principles of effective professional development. The intent of the presentation is to stimulate dialogue on designing and delivering effective graduate level coursework in IT to practicing teachers.

Many colleges of education (SCDEs) are currently offering, or are planning to expand their graduate courses for teachers on integrating technology into their teaching. A preliminary examination of Instructional Technology (IT) courses in U. S. colleges of education suggests little agreement on a conceptual framework for designing graduate level coursework for teachers. Perhaps the International Society for Technology in Education Standards for Teachers (ISTE, 2000) will begin to exert more of an impact nationally; but, currently their influence is not yet reflected in coursework to any appreciable extent.

As faculty in SCDEs begin to develop new courses and revise existing ones to align with the ISTE standards, they are confronted with a variety of challenges. Individual teachers differ with respect to their knowledge and skills in using technology. Some teachers are more adept than others, or have had more experience than their colleagues in integrating technology into their classrooms. The settings in which teachers practice differ with respect to the accessibility and availability of technology. Some schools have new computer equipment, whereas others are using outmoded hardware, or have very few computers per classroom. Administrative and technical assistance to facilitate teachers' use of technology also vary among schools, ranging from excellent in some schools to little or no support in other locales (National Center for Education Statistics, 2000) . Course designers must consider these differences among teachers as well as differences related to technological readiness and availability among participants' schools in planning appropriate graduate level coursework for teachers. In addition, given the public's expectations for teachers to become proficient in using technology, emphasis must be placed on designing coursework to assist them in achieving the desired outcomes.

This presentation provides a framework for designing IT courses for practicing teachers. The following key features guide course development. First, data from national studies such as the National Center for Education Statistics (NCES, 2000) are used to describe the varying levels of knowledge and skills teachers possess with respect to technology and differing degrees of availability to technology that characterize our nation's schools. These data illustrate the range of abilities and setting characteristics SCDE faculty must consider in order to meet the needs of individual teachers enrolled in IT professional development courses. Second, the ISTE Standards for Teachers are used as the basis for developing course objectives. Third, course content reflects the literature on stages of proficiency in using technology from novice to expert practioner (Mandinach, 1992; Sandholtz, Ringstaff & Dwyer, 1997). Fourth, differences in availability and support for using technology within participants' schools is used as an impetus for planning ways to overcome barriers to implementing technology. Fifth, the literature on developing rigorous and professionally challenging graduate level coursework for practicing teachers (Little, 1999; WestEd, 2000) that actively engage participants in their own learning is an integral part of the course design. Finally, opportunities for college faculty to conduct research related to incorporating technology into teaching as well as encouraging practioners to become reflective practioners who study their own practice are discussed.

The presentation is best conceived of as a Rubik's cube, a puzzle of sorts, that is multifaceted and seeks to involve participants in examining the factors that are inherent in developing appropriate IT professional development courses for teachers. As faculty in colleges of education, we must be prepared to practice what we preach by modeling the use of technology in our own teaching and individualizing instruction to the maximum possible extent. This presentation seeks to make that point and stimulate discussion on the development and design of graduate level coursework for practicing teachers on instructional technology.

References

International Society for Technology in Education (2000). *National educational standards for teachers*. Eugene, OR: Author.

Little, J. (1999). Organizing schools for teacher learning. In L. Darling-Hammond & G. Sykes (Eds.), *Teaching as the learning profession: Handbook of policy and practice*. San Francisco: Jossey-Bass.

Mandinach, E., & Cline, H. (1992). *The impact of technological curriculum innovation on teaching and learning activities*. Paper presented at AERA.

National Center for Education Statistics (2000). *Teachers tools for the 21st century: A report on teachers' use of technology*. Washington, DC: Author.

Sandholtz, J. H., Ringstaff, C., & Dwyer, D. C. (1997). *Teaching with technology: Creating student-centered classrooms*. New York: Teachers College Press.

WestEd (2000). *Teachers who learn, kids who achieve: A look at schools with model professional development*. San Francisco: Author.

A Professional Development Model for the Use and Integration of Technology

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Abstract: This paper outlines the preliminary results of a study that involved creating a professional development model for the use and integration of technology in an elementary school in Nanaimo, British Columbia, Canada. The 13 teachers and one support staff voluntarily attended professional development workshops on topics chosen based on pre-chosen professional growth outlines and specific action plans. The salient finding were threefold: (1) it is imperative that the participants feel in control of their own development; (2) there are specific motivators and inhibitors for the implementation of the action plan; (3) the respondents need to have a community of learners.

Introduction

Convincing teachers to use technology is not a difficult task; getting teachers to use technology is an extremely difficult task. The preceding statement has become the mantra of the research project outlined in the following pages as the writer found it very easy to discuss the advantages of using technology---specifically computers---in and out of the classroom. In other words, the teachers in this study, by and large did not need convincing to know that they could use Powerpoint presentations as an alternative to oral presentations, that the digital camera could open up possibilities that were endless, that transferring information to the school webpage could send out simple information to a potential audience of millions, as key examples. What they had, and some continue to have, a problem doing was actually getting around to using the technology. This writer believes that we have begun a journey that will allow the teachers to meld these two beliefs; philosophy will become fact.

The Study

In October, 1999, the writer and the grade five teacher at the elementary school, attempted to introduce the staff to a model of technology integration that he and the grade five teacher had designed. The research interest was to investigate the influences of technology on writing achievement. That is, do children write "better" when they are introduced to technological tools such as word processing (e.g., cutting and pasting; graphic importing), digital cameras, Powerpoint, and webquests? The project did not succeed. After a few debriefing sessions with individual staff members, the researcher realized that the project did not succeed primarily because it was moved too fast with a staff that was involved with so many other projects. More importantly, the answer lay in the issue of ownership; the teachers needed to choose what they wanted to learn, how much they wanted to learn, and when they wanted to learn. It is clear that most staffs would also need to have this type of ownership in order to implement technology in the classroom. From these revelations came this project and the Continuum of Technological Literacy (see Fig. 1).

The continuum that was designed for this project was adapted from the literacy (i.e., reading and writing) research from the last 10 to 15 years. Indeed, technological literacy is not any different than reading or writing literacy; however, the writer has not come across any researchers who have designed such a graphic representation. Subsequent to designing the continuum, the researcher has found a similar study (CEO Forum, 1998; 1999; 2000) on a much larger scale. As this study progresses, it may become more appropriate to adopt the CEO Forum (1998; 1999; 2000) descriptors: entry, adoption, adaptation, appropriation, and invention; however, the strength of this continuum and the descriptors laid in the key questions that teachers ask themselves as they progress along the continuum.

According to the Continuum of Technological Literacy, the participant might ask one of five questions depending where he or she begins. The first question, at the beginning of the continuum or the **pre-literate** stage, asked whether or not technology could help the person. In answering this question, the respondent is forming a habit of mind that assists him or her to move along the continuum. The second question asked what the effective tools would be for particular tasks or goals. The person would be at the **emerging** stage at this point. The third question queried, at the **developing** stage, when the participant could optimize learning so that he or she examines the conditions in the classroom, the attitude of the students, and the aforementioned tools. The fourth question, when the person is at the **competent**, stage, asked how to use strategies effectively. The last, at the end of the continuum and the **literate** stage, questioned why the person is using technology strategies, in general and, in particular.

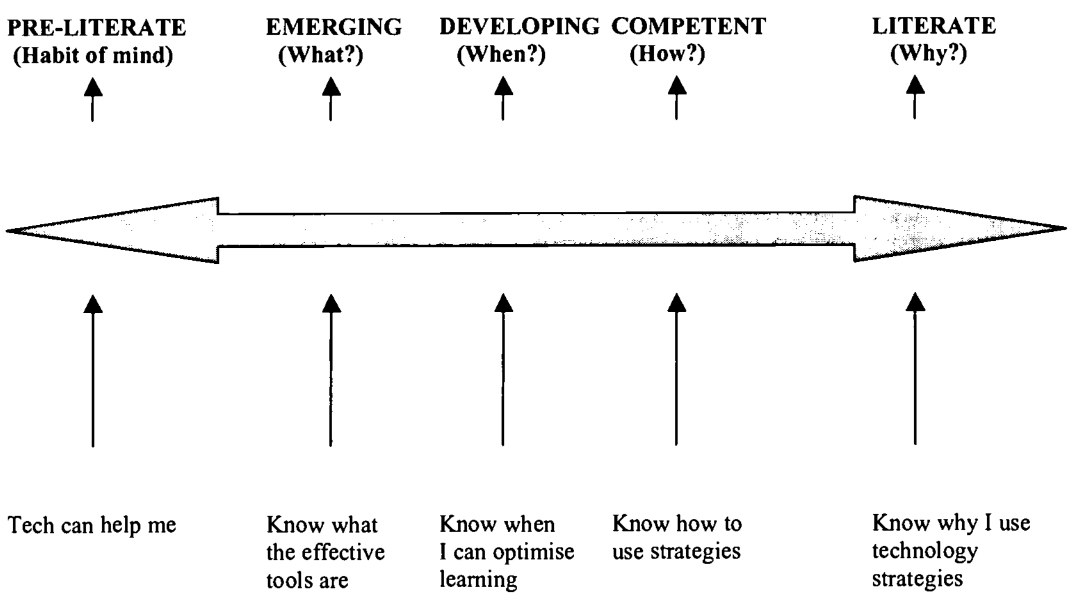

Figure 1: The Continuum of Technological Literacy that all participants will use to map their journey.

Critical to this study is the fact that the site school is a recipient of a Network of Innovative Schools (NIS) grant and was the first elementary school in the province of British Columbia to receive the prestigious recognition from the Canadian government. As the school was so open to technological innovation, in June of this year, the researcher circulated a personal growth plan questionnaire that had been created in consultation with the principal and two staff members. All teaching staff, including three new teachers, and one support staff member completed the questionnaire. The results of the Likert-scale questionnaire were collated and a meeting with the principal was set up to discuss these results before presenting it to the staff. When the overall results were presented to the staff, each of the fifteen participants completed an action plan that outlined on what he or she would like to receive professional development, who would be involved in the delivery of the Professional Development, when it would start and end, and how would "success" be measured. Respecting the fact that many of the teachers in this school have been recognized, at various levels and by various organizations, for their outstanding contributions to the education of students, the researcher asked them to outline what they felt would be roadblocks and easy access, to use a highway metaphor, for the success of their action plans.

In conjunction with these action plans, the Continuum of Technological Literacy was presented to the staff as an artifact on which they could measure their personal growth. That is, much like when students learn to read and write, teachers started at a particular point of this continuum and as they reached each "stage" on the continuum, they asked themselves questions about what was happening at that point in their movement along the continuum. In short, a teacher might have moved from being "pre-literate" (Can technology really help me?) to the end of the continuum and be "literate" (Why do I use the technology that I am using?). It should be noted that the continuum is recursive in that teachers may need to move back to a previous stage or stages in order to understand a particular concept or technological tool and that some teachers may have to begin at the first stage for some concepts or tools but may begin at the last stage for other concepts and tools. It also acknowledged that some teachers may choose to master only one computer software or hardware concept or tool in the course of one year; however, by encouraging teachers to "take it slowly" and by providing support when needed, the personal growth (action) plans will be sure to be completed.

Approximately half of the participants (n = 8) attended the initial Professional Development workshop on how to use a digital camera and how to import those files into word processing (e.g., Word) and multimedia presentation (e.g., Powerpoint) programs. After this workshop, each of the participants were given a questionnaire that pinpointed the pros and contras of that particular workshop as well as general information that would assist in further workshops. The key questions asked on the questionnaire revolved around three areas: (1) the utility of the workshop (i.e., on a scale of 1 to 5, what the usefulness, for the success of the individual personal action plan was); (2) the next layer for the scaffolding (i.e., what is needed now that the participant has this new knowledge); (3) the sense of community (i.e., has there been an opportunity to discuss the information with a colleague or to implement in the classroom).

At the time of writing, three to five more workshops will be conducted. Questionnaires will be conducted at the conclusion of each workshop. In addition, a short interview will be conducted with randomly selected participants in January and March of 2001.

The Findings

The findings to date are minimal in data but plentiful in trends and patterns to come. Even at this early stage of data analysis, it is apparent that three salient findings are evident. Firstly, it is critical that the teachers and support staff have a sense of autonomy. Secondly, there exist a number of characteristics that promote or motivate success as well as characteristics that inhibit or prohibit success. Lastly, the participants need to belong to a community of learners.

The researcher has noted that the participants in this study need to know that they, themselves, are in control of, and responsible for, their learning and movement along the Continuum of Technology Literacy. These particular teachers and the support staff member are exceptional in many fields within and without the school community and it would be insulting and detrimental to the success of their development and of the research study to treat them otherwise. They know what are their timelines for completion, they know what they want to know, and they know what they want to use in the classroom. As common sensical as the preliminary finding is, it appears to be critical that each teacher knows that he or she has direct "ownership" of his or her learning and professional development.

In the informal discussions with teachers before and during the study and gleaned from the literature (see CEO Forum, 1999 "Principles for successful technology professional development," pp. 17-21 and U.S. Department of Education: NCES, 2000, pp. 89-100), the researcher generated a list of "motivators" and "inhibitors" for the successful completion of individual professional development action plans (see Tab. 1). In other words, if a school district, particular school, or individual teacher wanted to know what conditions needed to be present for successful professional development, this inexhaustive list would be a place to begin. This paper is too brief to expand on each list item but two motivators will be discussed in the next paragraph; two inhibitors are worth mentioning at this point in the paper: "cliques of learners" and "locomotive staff member." The former inhibitor is an integral component for the success or failure of professional development in technological literacy. If a group of learners get together with each other in the school and share their knowledge, there is direct benefit for the school (as will be discussed in the following paragraph); however, if that group only seeks to keep its learning and knowledge within the group, those learners become a clique and, by definition, a clique, rather than a community, of learners. The latter inhibitors, "locomotive staff member," refers to the person in the school who does know a great deal about technology and believes that everyone in the school should also be at this philosophical and/or technical level of expertise. This person shows others how to use technology by doing rather than by teaching; he or she might demonstrate the construction of a webpage by creating the page in front of his or her colleague without allowing that learner to attempt the task from a participant rather than observer point of view. It should be noted, on the other hand, that this person is rarely acting in the capacity of "computer coordinator" who would be beneficial to a staff (Becker, 1998). At his or her worst, the "locomotive" also sees him- or herself as superior to those who cannot or choose not to be at his or her level.

The last preliminary finding, and a corollary to the preceding trend, is the notion that the professional development participants must belong to a community of learners. A community of learners is a group of like-minded individuals who believe that their learning goes beyond the group and should be shared by others outside of the group. It is also dynamic so that, unlike the "clique of learners," the composition of the learners changes from topic to topic. The researcher has witnessed several instances of this community of learners at work. Particular teachers have spent time attending a workshop, practicing the newly-acquired skills independently or with others and then teaching those teachers who did not or could not attend a specific workshop. At the core of the community of learners is the idea that these participants are teachers and the concept allows them to do what they are best at: teaching. The idea of community of learners will be an interesting one when the data---especially the interview data---begin to come in later in the study.

Motivators	Inhibitors
• Direct administrative support	• Little or no administrative support
• Indirect administrative support	• Little valuing from district
• Support network within school	• Token assistance from federation or ministry
• Support network outside school	• Cliques of learners
• District support	• One or two key players
• Federation support	• Close proximity of experts
• Ministry support	• Sporadic funding
• Key pods of learners	• Disorganized spending
• In- and out-house facilitator	• Bandwagon/Missionary zeal
• "Peer tutoring"	• Locomotive staff member
• Collaboration	• Excluding support staff
• Distancing of experts	• Blind faith
• Including support staff	• Moveable anchor
• Specific Professional Development	• No limits to your own time and effort
• Earmarked funding	• Misallocation of time
• Targetted spending	• Working alone
• Experimentation	

Table 1: Motivators and Inhibitors for the Success of Personal Growth Plans

Conclusions

This paper has outlined a small-scale study of 13 teachers and one staff member who volunteered to participate so that they could learn more about the use and integration of technology. The school is innovative in its use of technology but the number of teachers who use technology in the class is low. In fact, the principal of the school completed the STaR and the school was "mid tech" in hardware, connectivity, and content; however, in professional development and integration and use, it was "low tech." In other words, there are few hardware barriers in the school but the level of expertise and confidence is low. This study has helped the participants to understand that the opportunity for the use and integration of technology is present but they, themselves, need to take the next step to achieve success.

The three preliminary trends of the need for autonomy, the identification of motivators and inhibitors, and the notion of a community of learners will be interesting and informative to follow as the study progresses over the next stage. This researcher hypothesizes that the participants will move along the Continuum of Technological Literacy and will feel empowered to continue that journey until each teacher has reached his or her comfort zone for that set period of time. It is also apparent that the teachers will need more than one year to unanimously agree that they are a "high tech" school. Time will tell.

References

Becker, H. J. (1998). Running to catch a moving train: Schools and information technologies. *Theory into practice, 37*(1), 20-30.

CEO Forum on Education and Technology. (1998). *School Technology and Readiness (STaR) Year 1 Report – From pillars to progress.* Washington, DC: CEO Forum.

CEO Forum on Education and Technology. (1999). *School Technology and Readiness (STaR) Year 2 Report – Professional Development: A link to better learning.* Washington, DC: CEO Forum.

CEO Forum on Education and Technology. (2000). *School Technology and Readiness (STaR) Year 3 Report – The power of digital learning: Integrating digital content.* Washington, DC: CEO Forum.

U.S. Department of Education. National Center for Education Statistics. (2000). *Teachers' tools for the 21st Century: A report on teachers' use of technology.* Washington, DC: U.S. Department of Education.

An In-Service Methodology Course via the Internet: A Designer's Perspective on the Learning Potential of the Delivery System

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Abstract: This presentation describes a model of an in-service Methodology course for teachers through the Internet which not only aims at teaching a content area but also represents a model of instruction. While focusing on the content of the course, the participants are exposed to a delivery system which includes features they can easily adapt to their own teaching environment; while expanding their personal horizons regarding the use and potential of the technology. Knowing how to transfer pedagogical skills and strategies from one context to another is essential to help teachers solve problems and reach students more effectively. We intend our training programme to serve as a model of teaching which the participants may transfer to their own teaching contexts. The design of the course is based on a Presentation, Practice and Production (PPP) model.

We are in a period when strong efforts are being made to develop a new kind of professional community in education - one whose ethos is built around the continuous study and improvement of teaching and learning, and the direct application of knowledge to real life situations. Educators are attempting to design environments conducive to the construction of knowledge which have relevance to learners' authentic needs.

In such a constructivist view of education, we aim at developing a learning environment which facilitates the enquiry of learners but also emphasizes the practical implications for production, both in the immediate setting and in the long term. Within the general framework of constuctivism, knowledge is emerging rather than static, learning means seeking meaning within one's expanding frame of reference, building knowledge and checking it against the concepts of others, and connecting what is being learned in the instructional setting with real life demands (Richardson, 1997).

The theoretical underpinnings for such a view are that new concepts can change ways of organizing knowledge, provide new material for associations and problem-solving (Ellis, 1993), and that meaningful learning is likely to go beyond the classroom and provide skills and strategies that will impact future actions. A further underlying assumption is that the design of a useful instructional model must incorporate a computer environment of some kind, since we strongly believe in the increasing importance of computer literacy for functioning in the real world. Indeed, one of the ways of bridging the gap between the instructional environment and life outside the classroom is learning and knowing how to function with the technology.

Rationale: The rationale behind the design of this Open University in-service methodology course for teachers of English as a foreign language is based on the construction of teachers' knowledge, an awareness of the importance of a teaching paradigm that models teaching and learning, and the development of the capacity to face the real world both within and outside of the instructional setting. We have created a course based on a task-based syllabus (Long & Crookes, 1992). which is teacher-directed in its conception but highly learned-centered in its actualization (White & Weight, 2000).

A salient feature of teaching is that it requires continuous adaptation and demands new learning in order to solve the problems of each moment and situation. Therefore the process of knowing how to transfer pedagogical skills and strategies from one context to another is essential to help teachers solve problems and reach their students more effectively. Horizontal transfer refers to the conditions in which a skill can be shifted directly from the training situation. When the work and training settings are very similar, a skill can usually be transferred "as is" with little additional alteration and learning. On the other hand, if the two contexts are very different, vertical transfer is needed. Vertical transfer refers to conditions in which the new skill cannot be used unless it is adapted to fit the new conditions wherein an extension of learning is required before the skill can be applied. Such transfer is more likely when there is a greater gap between the context of training and the conditions of the new situation: the newly learned skill being different and thus not easily fitting into the new situation. The distinction between horizontal and vertical transfer refers to the amount of adaptation and reinterpretation that is necessary if the skill is to be effective in the new situation. Familiarity is the key. The greater the degree to which a new skill fits into already familiar patterns, the less adjustment will be needed.

Because English is the subject that our experienced teacher trainees teach, we have been able to take advantage of the globalization of English and the fact that it has become the main medium for international communication and technology. English provides us with a window to the real world as well as with additional opportunities for accessing information. As a result, we have created a framework which links pedagogical perspectives on teaching and learning to elements of Internet input in order to achieve our particular desired educational outcomes.

Design of the Course: The 15-week course is transmitted via the Internet. It consists of weekly readings from selected professional journals provided to the teachers in a printed anthology, and of questions related to these readings delivered through the Internet. Some of the questions focus on the theoretical principles discussed in the articles while others are application tasks which the trainees are required to think about, plan and implement in their own teaching context. The trainees' reflections and reports about the practical tasks, the presentation of individual and of collaborative projects among participants, the discussions, as well as all other interactions are asynchronous and occur on-line. Depending on the nature and the purpose of the communications, some involve the trainees only while others include the trainees and the instructor.

The participants are responsible for finding and sharing Internet sites and articles which are topically related to the subject matter at hand and which they feel will enhance their knowledge and increase their teaching repertoire. In addition, three areas which may be problematic for teachers are selected on the basis of negotiation with the trainees. Each chosen area serves as a topic for on-line discussions for a period of four weeks, with the specific aim of finding appropriate solutions that will emerge from sharing ideas and drawing applicable conclusions. At the end of the course, trainees submit an individual portfolio which includes some of the above and a journal in which they are asked to reflect on their experience of the course and its practical relevance to their teaching context.

The design of the course is based on a Presentation, Practice and Production (PPP) model (Willis, 1996). Planning the presentation of the content, getting the participants to practice and execute the required tasks, and eventually take what has been learned beyond the framework of the immediate environment into a wider world seems to reflect a sensible definition of an educational mission. In other words, we take the view that one of the secrets of successful learning lies in the process of transfer – the effect of learning one topic or skill on another situation.

In this context, the teacher trainer presents the course content, encourages the teacher trainees to practice what is being learned within the framework of the course, and hopes that eventually some of the elements of the course, including the strategies and skills presented, will be utilized (in horizontal transfer) adapted and perhaps even reproduced (in vertical transfer) by the trainee in his/her professional world (as a teacher) and personal world (as an Internet user).

Similarly, the teacher prepares and presents materials in class, encourages the pupils to practice what is being learned in the school, and hopes that in the future some features of what has been taught and learned will be useful in the pupils' lives outside the classroom. The presentation and practice stages feature mostly in the school setting while the production stage is expected to first occur in the instructional environment, and eventually filter through beyond that environment into the pupil's big wide-world. In other words, pupils will operate first on the basis of horizontal transfer and then proceed to a vertical transfer of the skills and knowledge they have acquired.

How is this model of teacher training for a Methodology course for teachers different from others? The method of delivery via Internet not only teaches a content area – Methodology for teaching English as a foreign language – but it also represents a model of instruction for their own use in their classrooms. While focusing on the content of the course, the participants are exposed to a delivery system which consists of features they can easily adapt to their own teaching environment; at the same time they are expanding their personal horizons regarding the use and potential of the technology.

References

Ellis, R. (1993). Second language acquisition research and teacher development: The case of teachers' questions. Paper given at the Second Language International Conference on Teacher Education in Second language Teaching, City Polytechnic of Hong Kong.

Long, M. and Crookes, G. (1992). Three approaches to task-based syllabus design. *TESOL Quarterly*, 26, 27-56.

Richardson, V. (1997). Constructivist teaching and teacher education: Theory and practice. In V. Richardson (Ed.), *Constructivist teacher education* (pp. 3-14). London: Falmer Press.

White, K.W. and Weight, B.H. (Eds.) (2000). *The online teaching guide: A handbook of attitudes*. Needham Height, MA: Allyn and Bacon.

Willis, J. (1996). *A framework for task-based learning*. Harlow: Longman.

Teacher Reflections on Learning New Technologies

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Abstract

An experimental course offered at The George Washington University (GWU) is specifically designed to assist teachers in meeting the technology standards and performance indicators developed by the International Society for Technology in Education (ISTE, 2000). Eleven teachers representing three school systems participated in the first offering of the course in Fall 2000. Teacher reflection through journal writing focused on how teachers perceived themselves as learners of technology and the ways they were able to transfer those perceptions and new understandings to their instruction of secondary students. Several common themes emerged relative to learning and using technology to enhance student learning.

Introduction

The formulation of National Education Technology Standards for Teachers or NETS (ISTE, 2000) reflects what many participating national education affiliated associations (i.e. National Education Association, American Federation of Teachers, National Association of Secondary School Principals, Council of Chief State School Officers) as well as corporate (Apple, Milken Exchange on Education Technology, Microsoft Corporation) and government (U.S. Department of Education, National Aeronautics and Space Administration) organizations believe is an urgent need to elevate the technology proficiency of PK-12 teachers. Added to the list of other national, state, and local standards created for students and teachers in all curriculum areas across all grade levels the standards movement is propagating at a dizzying rate. At the center of it all is the classroom teacher who must assume considerable responsibility for implementing standards to improve students' learning.

How do teachers meet the multiple demands of standards? In the case of technology, the options for learning can be limited when schools are underserved or when the folks with the "know how", the technology specialists, are forced to spend their time connecting wires and trouble-shooting. At GWU, we offered an experimental course to assist area teachers in learning about and learning to use new technologies for instructional purposes. The course was tailored to assist teachers in meeting the performance indicators outlined in NETS. Six standards encompass what teachers should know about and be able to do relative to technology. In brief, they are: understanding technology operations and concepts; using technology to design effective learning environments; applying technology to maximize student learning; effectively using technology to facilitate assessment and evaluation strategies; enhancing productivity and professional practice with technology; and, understanding social, ethical, legal, and human issues surrounding technology (ISTE, 2000).

In the course, computer technology was the primary medium. Learning experiences ranged from simple to complex. Teachers learned to create newsletters, develop presentations using MS PowerPoint, evaluate and use various software, explore and evaluate Internet resources, critique listservs, complete a scavenger hunt to in order to uncover the technology resources available to them in their schools and school systems, design webquests, and develop a website to showcase their technology portfolios. As teachers encountered new content, they were encouraged to consider how they learned, what strategies were most useful for them, and what, if anything, made learning technology unique. Reflections were captured through journal writing.

Promoting Reflection Through Journal Writing

John Dewey (1933) believed that there are three primary sources for student knowledge: beliefs based on emotions, beliefs based on authority, and reflective thinking. He believed that reflective thinking involves active, persistent, and careful consideration of any belief or practice in light of its supporting evidence and its eventual consequences. Dewey implied that both content and process are components in reflective thinking. Han (1995) distinguishes between the two: "While the process element of reflection emphasizes how teachers make decisions, content stresses the substance that drives the thinking" (p 228).

Reflective teachers think about their behaviors and experiences in the context of the educational environments in which they work. They then make work related decisions that are more informed. While reflection is a source of personal and professional development essential to effective teaching, it's often a difficult process for teachers. Two reasons for this difficulty are: 1) lack of time and structured opportunities for reflection and, 2) teachers' inability to view their school based experiences objectively and thereby benefit from them (Black, Sileo &Prater, 2000).

One method for promoting reflective thinking is journal writing since it engages the writer "... in making beliefs and knowledge explicit and provides an internal dialogue between feelings and thoughts" (Han, 1995, p 229). Simply requiring that they respond in writing to experiences in the course and their classrooms, does not guarantee that teachers' professional development will be enhanced, or that changes in professional practice will occur. My experience has taught me that reflective writing is most useful for the writer and for me as instructor when it has an organizing structure. This structure can take the form of specific questions that the writer responds to, a descriptive or expository writing that the writer critiques, or a step-by-step process in which the writer describes an event, then reacts and analyzes the event in order to determine a course of action.

In the GWU course, three central questions prompted teachers to reflect on both content and process. The table below describes the structure of their journal writing.

React	*What thoughts, responses, perceptions, and/or attitudes were generated as you learned and used technology presented in the previous class?*
Extend	*In what ways can you use this technology to promote students' learning and/or enhance your instruction?*
Transfer	*Given your experiences as a learner in the previous class, what have you learned about teaching technology to your students?*

Table 1: Organizing Structure for Journal Writing

Eleven teachers submitted thirteen journal entries representing continuous reflections on their experiences during class and between classes. Between classes experiences were those that teachers had while practicing and applying what they'd learned in class. These included developing new lessons or revising existing lessons to include a technology component, creating a technology-based assessment or using technology to manage teacher work. Continuous reflection refers to the expectation that teachers would cycle through previous entries before writing so that they could reinterpret and articulate their understandings and beliefs in light of new experiences and knowledge. A description of the course design provides a context for understanding the text of the journal entries.

Course Design

Class sessions were generally divided into three main segments. The initial time was spent reviewing what was learned in the previous class then introducing new or less familiar material, equipment, and skills. This was followed by guided practice and finally lab time to begin applying new learning in an activity linked to a course assignment. Assignments in the course were designed for use in teachers' classrooms and allowed for individualization based on interests and needs. Skills and knowledge required to successfully complete the initial assignments were folded into successive assignments.

Research Questions

The purpose of this study was to describe professional growth evidenced in the journal writing of eleven teachers participating in a course on technology applications in educational settings. I was particularly interested in identifying common themes that emerged from the entries. Three questions guided this investigation: Do reflective journals demonstrate heightened awareness of technology standards and applications? Do reflective journals validate that course assignments linked to classroom practice actually lead to transfer of new knowledge and skills to secondary students? Do reflective journals aid teachers in identifying the conditions necessary for effective classroom implementation based on their own experiences as learners?

Data Analysis

A total of 143 journal entries were analyzed in a multi-step approach described by Huberman and Miles (1994). Using the organizing structure for the journals as a framework for initial analysis, the entries were sorted into three categories: react, extend, and transfer. A second step in the analysis involved selecting entries from each category that demonstrated reflective thinking in three cluster areas: awareness, transfer, and teaching. The data set was reduced to 104, and analyzed to determine themes common in each of the cluster areas. Excerpts from the journals represent a partial sample of quotes.

Findings

Heightened Awareness

Of the eleven teachers participating in the course all had experience with word processing and communicating using e-mail. None of the students had used a word processing program to create a newsletter, 3 had some experience with presentation software, all had attempted Internet searches at some level, none had any prior knowledge of webquests and none had ever developed an electronic portfolio or published a website. The range in technology related knowledge, skills, and experiences among the group was extensive. One teacher had used a computer for the first time only six months before the course began, others varied in their abilities based on the technology and only one teacher had advanced skills in communication and productivity applications. Evidence of heightened awareness was found in at least three journal entries for all teachers. Themes that emerged are awareness expressed as excitement, as anxiety, as recognition, and as realization.

Excitement

Most of the narratives expressing excitement refer to responses to technology tools or applications introduced in class, to instructional uses for familiar technologies, or to students' responses when the teacher implemented technology use in his/her middle or high school classroom.

> I feel like a student again. I find myself discussing what I have learned in this class with my students. I ask how many would be interested in learning how to do some of the things we do. Even the young man who yearns to be out of my class wants to be a part of a computerized classroom.

> A webquest works by taking a group of learners on an inquiry-based exploration of real-world facts and ideas that result in a collaboratively-mediated authentic learning experience. Eureka! Who could ask for anything more?

Anxiety

Increased awareness doesn't always produce pleasant thoughts and feelings. Sometimes, tension results when one initially become aware of something that has direct implications for her or him. This was the case for many of the teachers in this course as they learned about new technology standards for teachers and as they were introduced to some of the course material and expectations. As teachers added to their knowledge and skills feelings of anxiety were reduced or eliminated.

> My head is starting to reel from the wide array of technologies that can be used by teachers. All of these tools and resources are to be used in a way that complies with technology standards, which are tossed on the pile to complement the content and pedagogy standards that are also to be complied with. I wonder when I will find time to actually teach!

> In the last session we were introduced to creating a web page. The guest speaker...was very knowledgeable. She did a remarkable job on her own web site. I felt somewhat overwhelmed as I listened to her presentation. [The speaker's] website seemed to be so much more than what I felt I could accomplish.

> I feel very much like my students must – overwhelmed and anxious. Sometimes I count the sessions until the end of the course. Other times I cannot wait to get to class.

Recognition

Several of the teachers expressed heightened awareness as recognition of their abilities and predispositions as learners.

> To confess, I was a victim of my own creative process. I like to re-do things, exploring the alternatives, trying to take it a notch higher. I took this one a notch too far, though, and ran out of stick! The first effort was simple but it had a nice effect to it. As the days and nights passed, I reworked the newsletter so much that on the way to creating The Best Thing I Could Do, I nearly snuffed out all the original spark.

> My week was spent thinking about my electronic portfolio. I feel like I have so much to do that I don't want to start anywhere. I can tend to be a perfectionist and that is why it takes me so long to get started.

> As for technology, I think that my use of technology fits with my personality type as well. A person can communicate, create and organize on the computer with out ever directly talking with another soul.

Realization

As teachers' awareness of technology applications in classrooms expanded, they all wrote about experiences or thoughts that I characterize as being "Ah-hahs". By that, I mean they came to realizations about broader issues related to technology than they had written about previously.

> We must be selective in our use of technology tools in our classrooms. As educators, we must always have the primary goal of effective learning and cannot become so impressed with what technology can produce. We must always consider different strategies and be sure to use the best one to do our primary job, which is teaching.

> I just wonder how much input the students have in the planning, process[ing], and implementation of technology. It bothers me that we seem to be "doing technology" to the students. Most of the decision-making power resides at the top of the pyramid...and the students are down there at the base.

Transfer

An important indicator of professional growth is the transfer of knowledge and skills gained in the course to other experiences or environments. In this case, my concern was whether the reflective journals validated that course assignments linked to classroom practice actually lead to transfer of new knowledge and skills to secondary students. Three themes surfaced in the analysis as critical influences in transferring knowledge and skills: overcoming barriers, managing time and gaining confidence.

Overcoming Barriers

As teachers explored the opportunities to introduce the computer-based skills they'd acquired to their students many frequently encountered barriers to technology use in their school sites. Their reflective writing describes their frustration, but also highlights their creativity, persistence, and success.

> When I think about my school and my class, I'm not very excited about integrating technology. I feel like there is so little access to computers for our students. Because of this course, I've spoken with our principal and will be getting a computer in my classroom soon which will allow me to implement some of the projects I've mentioned in my journals.

> Our technology coordinator told me that I would not be getting a new computer. I was livid ...but, sometimes bad news makes you work a little harder. Since our discussion, I have secured two more computers with Internet capabilities. This brings me to a grand total of six. I am currently designing in-class fieldtrips using computer technology. My students are responsible for producing a newsletter and will help maintain a course-related website. This course has turned a flame to my classroom operation.

Managing Time

One of the issues that teachers raised regarding technology use was time. If using technology saved them time, they were wholeheartedly in favor of it. If it required more time than some other approach, they were less inclined to use technology.

> Creating newsletters to communicate with students and/or parents is a perfect example of how classroom practices can be improved by a very simple application of technology. A common complaint of teachers as well as other professionals is that new technology consumes rather than saves time. This is an example of the opposite being true.

> [The presentation on searching the Internet] made me realize I was not using the information I learned about searching the web and how much time I could save by simply implementing some of the research tools I had previously learned. I want my students to be equipped with the necessary knowledge that will make searching the web a good experience rather than a burden.

Gaining Confidence

In order to transfer skills and knowledge to their students, teachers needed to feel confident in their ability to both use and teach a particular technology.

> It is not enough to have teachers "technology certified" on paper. Teachers need to be given the confidence in order to get them to want to implement the technology in their classrooms. I had never truly used PowerPoint as it's designed to be used before last week. As it is, I used it effectively twice in one week.

> This weekend I have been going back and forth between hating this course (it entails so much work!) and loving it (I have learned how to use more technology in this course than I have in the last ten years!). Despite my frustration, I am confident the webquest I developed is one my students can really use and learn from.

Teaching Technology

Reflective writing encouraged teachers to identify the conditions necessary for effective classroom implementation based on their own experiences as learners. Empathy and effective teaching are two themes that captured what teachers had learned.

Empathy

As teachers encountered challenges in learning to use technology some made references to having a new appreciation for how their students must feel in similar situations.

> I feel like I'm all alone! I am sympathizing with my students BIG TIME. While I am usually not afraid to ask if I have a question, many students are; they may frequently feel as I do: LOST.

> As I reflect on my feelings toward creating my website, I can relate to some of the grumbling my students do when asked to do certain projects. I need to help them get started and express their thinking. I need to be there to help them move forward rather than see their reservations as a refusal to participate.

> My experiences have also informed me in terms of using and teaching technology with my students. Just like I did, students need the proper equipment, time to investigate the web, and time to struggle with the software.

Effective Teaching

Teachers identified clear instructions, planning, organization, sufficient time, pacing, instructor patience and support, and differentiated instruction as key elements of what they'd learned about teaching technology while sitting in the "student seat".

> Technology based instruction needs to be carefully planned out in advance. This is no different than instruction that does not utilize technology. As teachers, we must always carefully map out activities, noting potential pitfalls and be prepared for potential detours.

> A good practice for my classes is to have them do a brainstorming activity before getting started on their projects. The brainstorming will give the students time to think through and work cooperatively to come up with ideas. I do a lot of brainstorming but I'm not good about writing them down.

Discussion

Reflection was an essential aspect of teachers' professional growth. This study found that reflective journals allowed teachers the opportunity to (a) become more aware of what and how they were learning and make connections to broader educational issues, (b) transfer what they had learned to secondary classrooms, and (c) examine how their experiences as learners revealed conditions necessary for effective technology implementation. The organizing structure of the journals helped to focus writers' thinking. Revisiting earlier entries as the first step in writing each new entry pushed teachers to reconsider their feelings and thoughts in the context of newly acquired skills and knowledge. Reflection assisted teachers in making informed decisions about their classroom practices.

It was not surprising to find that teachers often cycled between feelings of excitement, frustration, acceptance, and satisfaction as they encountered new technologies since much of what must be learned required "doing". The movement from seeing the possibilities to creating a usable product fit within Einstein's description of genius as one that primarily requires perspiration and a modicum of inspiration. Learning technology requires practice, practice, and more practice. Many of the problems teachers encountered (a sudden error message, or a frozen screen) aren't solved by referring to written text and don't usually lend themselves to easy solutions. A heightened sensitivity to their students' feelings resulted from teachers' encounters with challenging situations.

Further study on effective strategies for teacher infusion of technology in schools with highly defined content standards is needed. Since, for all teachers in this study, transferring skills and knowledge to their students required they spend class time teaching technology rather than math or English content, teachers were selective about when and how much technology they integrated in their classes

Literature References

Black, R., Sileo, T., & Prater, M. (Winter 2000). Learning journals, self-reflection, and university students' changing perceptions. *Action in Teacher Education*, 21 (4), 71-89.

Dewey, J., (1933). *How we think: A statement of the relation of reflective thinking to the educative process*. Boston, MA: D. C. Heath & Co.

Han, E. (Summer, 1995). Reflection is essential in teacher education. *Childhood Education*, 71, 228-30.

Huberman, M. & Miles, M. (1994). *Handbook of Qualitative Research.* Thousand Oaks, CA: Sage Publications.

International Society for Technology In Education, (2000). National Educational Technology Standards for Teachers.

Puzzling Over the Missing Pieces: The Real Practice of Technology Integration

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Abstract: This paper is a report on the findings of a pilot study conducted on novice technology-using teachers. Although emerging technologies have significantly impacted much of society, they have not yet and to any large degree, transformed the practice of many educators in the classroom. Findings indicate that several strategies may assist these teachers in learning to use technology. Provide them with a logically sequenced curriculum guide that identifies specific computer objectives and methods of including these in content areas. Encourage administrators to establish concrete guidelines to promote teachers' regular planning and practice of technology integration.

Introduction

Recently emerging technologies are presenting dynamic instructional opportunities for educators such as they have never before experienced. Through the use of these technologies, some teachers are providing students with powerful classroom experiences that will significantly enhance learning. These teachers, who are still few in number, have eagerly welcomed the opportunities technology offers and are moving forward in acceptance of these new learning resources. On the other hand, a large number of computers still sit in the back of classrooms collecting dust or on a teacher's desk being used only for classroom bookkeeping. Teachers in these classrooms have experienced enormous uncertainty and anxiety at the restructuring they foresee as a result of technological reform. Use of technology has yet to make a significant impact on the way they teach or in the way their students learn (Parr, 1999). Roblyer (2000) reminds us that the mere presence of technology will not guarantee its use (p. 29). In either case, teachers are keenly aware of an inescapable fact–technology has made its impact on society and if they are to effectively prepare students for tomorrow's world, they will have to adjust their thinking and their methods of teaching to incorporate its use.

Society has been experiencing this technological transformation for some years now but only, due in part to increased funding and connectivity, has the field of education begun its transformation at the same rapid pace. Trying to find ways to prepare our educational institutions and personnel to make the needed changes can be likened to putting together the pieces of a puzzle. When putting together a puzzle, the framework is usually connected first, consequently making it easier to assemble the inside of the puzzle. The rest of the puzzle is arranged until the last piece completes the picture. Throughout the process the box cover provides the picture, or illustration of the final goal. Herein lies part of the problem with technology integration–no one knows what the final picture of this reform will include. It is easy to fit the outer edges together because each of these pieces can be identified by at least one straight side. The framework for integration has been identified and many of these outer pieces have provided a preliminary framework.

An enormous infrastructure has provided many of our nation's schools with the equipment and connectivity needed to ensure computer integration in the classroom. Integration models have described successful characteristics needed for the overall planning and implementation of technology use as well as for teacher training (Grant, 2000). Professional organizations, government agencies, and private sponsors have expressed a general consensus that one of the most important steps in effectively incorporating technology into education is preparing teachers. They have provided the funding and mandated that a percentage of their allocations go toward teacher training. Universities have implemented programs to equip preservice teachers with the skills and knowledge to use technology in their classrooms. State, district, and local levels of education have increased technology spending and revised their technology plans to implement a variety of educator training programs such as in-service day workshops, after-school workshops, conferences, seminars, and "train the trainer" models to accommodate the requirement to train inservice teachers. Yet despite the general framework provided thus far, to a large degree teachers have not shown any sudden shift in wanting to integrate technology. If technology is to reform education the way it has the rest of the world and teachers are to become motivated and energized with new ideas, then their voice needs to have an impact in the shaping of the reform where it ultimately counts–in the classroom.

In an attempt to learn what teachers had to say, a pilot study was begun by a beginning doctoral student. This study was conducted at a middle school situated in a rural, low socioeconomic county of North Carolina. Some very simple, yet important pieces emerged in how to assist teachers in learning to use technology and in providing a school with concrete steps to encourage this technology integration. This school was chosen for the study because of a prior ongoing relationship the doctoral student (trainer) had with the school in technology training. In June of 2000, the teachers of the participating school were trained in many aspects of computer skills and technology integration during a two-day workshop. Another invitation was received for teacher training and in August 2000 teachers reviewed what had been learned in the previous workshop. In addition to a review, teachers were introduced to a web site designed by the trainer to test an online method of technological support that would provide ongoing communication and resources. A half-day workshop was offered without cost as reciprocity for the school's willingness to participate in the research. This workshop was given to twelve of the teachers in late August.

A major concern throughout the study was how to maintain objectivity since the trainer designed many of the materials being used. Some of these materials and ideas were found to be ineffective while others worked extremely well. The ultimate goal of the study was to find some practical strategies or "pieces," that would provide teachers with effective tools to begin arranging their picture of technology integration. Would an online support system offer help in this process? And if what teachers still need are the basic technology skills, how can they be presented so that teachers will begin to use them in the classroom? Throughout the study great effort was made to listen to what teachers had to say in their attempts to use these resources.

The Research Study

In June 2000, teachers were trained in various aspects of technology integration. The goals of the workshop were to:

- Familiarize teachers with each of the major competencies and objectives of the state technology requirements for teachers and students, and provide background knowledge of how each of the objectives is built upon skills learned as early as kindergarten.
  Example: 6th grade Objective 2.2: Create/modify a database relevant to classroom assignments. (North Carolina, 1998).
- Break the objectives into individual and manageable skills or chunks that could be practically integrated into classroom instruction.
- Practice brainstorming lesson ideas and spend time creating lesson plans that integrate content areas with the individual computer skills.
- Provide further understanding of technology integration by modeling effective lessons.
- Schedule time to practice, implement, and record personal development in technology integration in a portfolio.

Before the workshop in June 2000, teachers completed a survey that identified the types of technology used, how often it had been used with students, and their beliefs about technology integration. Teachers were asked, "Do you think that you should be using technology in the classroom more?" and "If you were told that your use of technology in the classroom should become part of your yearly evaluation as a teacher would you be positively motivated to learn it?" On a scale of 1-4, with 4 being "yes, to a large degree," most teachers answered 3 or 4 on both questions.

Prior to beginning the workshop in August, the survey results were shared with the new principal. During this workshop, teachers reviewed what they had learned in June, reviewed the integration materials, and planned their technology goals for the school year. Teams of teachers were partnered and together they planned a schedule in which they would write a technology lesson and practice it together. During the following month, they would teach the lesson. At the workshop teachers were also introduced to a commercial web site at Blackboard.com (http://www.blackboard.com) that was set up by the trainer to test the idea as an online form of ongoing support and access to technology resources. They expressed much enthusiasm about using the site and because of their enthusiasm it was thought that this could be a vital method for providing the much-needed support usually lacking in technology training (Schlager & Schank, 1997). Leaving teachers with concrete plans and enthusiasm about using the web site were thought to be significant steps in getting the teachers to begin their efforts in using technology. After this workshop, a letter was sent to the principal explaining what was seen as the current state of technology in the school and to encourage further development in this area.

In a half-day workshop in late August, teachers were to be introduced to the many features of the Blackboard web site that could be helpful in encouraging their technology growth. Having only used locally installed software on the school's computers in previous workshops it was not anticipated how incapable the outdated equipment would be for this workshop in which the Internet was needed. Trying to explore the web site on these computers was futile. However, it proved to be a great opportunity to model for novice users how to handle the frustrations that so often accompany the use of technology. Because of the mounting frustration and lack of time, the focus of the workshop (and consequently the research inquiry) was changed from testing an online support system to technology team planning. Teachers chose partners and spent the next hour in technology planning. Before the teachers moved to separate rooms they were provided with an agenda of what they should accomplish during this planning time and reminded to take the materials they had previously received in workshops.

The agenda included five steps: plan your lesson, practice the lesson with the group, schedule a date to teach the lesson, schedule the next planning meeting, and record personal technology growth in portfolios. Teachers had received a template, "Technology Mini Lesson Plan" during their previous training. This template was created as a simple guide to assist teachers in the thinking process of including a manageable chunk of technology while planning a classroom lesson in their own content areas. Teachers had received step-by-step instructions for completing the lesson plan and during the June two-day workshop each teacher wrote five lesson plans using the template. Before using the plan on this particular day, the lesson template was amended and further explanations added as a guide for filling in each section. This same template was also used successfully during a graduate class in technology integration with inservice teachers. With this prior success and the previous training the teachers had received on the use of the template, it was assumed that the same success would be observed. From recording this planning session, several emerging pieces became very clear. Teachers did not clearly understand the various technology applications and their uses. Because of this they were unable to choose a specific skill or objective within an application to make the technology component of the lesson manageable. Although, in several workshops the teachers had been introduced to computer applications and breaking computer skills into chunks, they had not remembered this and did not refer to the notebook materials that may have provided direction. They also skipped around while filling out the form when logically one section should progress to the next. This only seemed to add confusion to the process and prevented the teachers from getting the lesson completed.

On an optimistic note, teachers were focusing on their content area and even trying to expand the lesson in a variety of ways. Their desire and suggested ideas for enhancement of the lesson would have added variety in both content and technology. The vocational teacher monitored the practice sessions and this proved to be a great benefit to the teachers in understanding specific problems. By monitoring the team planning sessions, she identified a fundamental obstacle with most teachers–they did not know how to choose small chunks (or objectives) from the computer applications to include in their lessons. Teachers completed surveys after the workshop that added some optimism for the outcome of the team planning sessions. Survey results were corroborated on questionnaires and through formal interviews: Question: How did you feel about working in teams to learn how to integrate technology? Answers:

- "Great! Two heads are better than one and working together may allow me to get different ideas,"
- "It helped me out just by watching someone else go through the motions and explain every step."
- "Teams are always helpful; sharing different teaching strategies you're more incline to use them."

Question: How do you feel the meeting itself will influence your learning to use technology in your classroom instruction? Answers:

- "I will be more apt to try it since I know I can run down the hall for help!"
- "It will help with thinking of strategies when planning. "
- "You're more inclined to teach the skill as a team project rather than individually."

"The technology team gave me the boost of confidence and assurance that I could have successful as well as meaningful lessons using technology."

"It was fun, their input...you know if you have three people looking at a problem you might get three different solutions or three new ideas, three different ways of doing it and to me that's important that maybe there are some other ways, and somebody might benefit from it."

After the workshop an impromptu meeting took place with the principal and the vocational teacher. The principal shared, "I want you to know that your letters keep me focused, and that's what I need in technology. It's an area that's easy to overlook. I agree with you that the teachers will not grow if this is all that they get. They need something that will make them continue to use it." She then asked for feedback on some ideas she was considering for her staff: (1) Teams were to make technology planning a part of their regular weekly team-planning times, (2) they were to write one technology lesson and schedule a date to teach the lesson and provide this information to the office, (3) and they were to be evaluated monthly during the teaching of a technology lesson.

Brainstorming began and through further discussion other ideas were developed to encourage the use of technology within the school. After the workshop a letter was sent to the principal to outline the ideas discussed, share the workshop survey results, and to offer support for her efforts:

"These answers lend more credibility to the ideas you shared after the workshop about requiring teachers to include technology as part of their planning. I believe if you will implement the ideas you mentioned you will see more conscious effort among your teachers to include technology."

Part of the team-planning meeting was to practice the lesson but the teachers did not have time for this. A return trip was scheduled a few weeks later to observe the teachers during their practice. In the meantime, the teachers had revised their lesson plan with the help of the vocational teacher and had already practiced the lesson on several occasions. They were eager to share their results and proud of what they had accomplished. One of the teachers commented on a questionnaire completed after teaching the lesson, "I feel very confident and proud I used technology with my lesson content...I now feel even more comfortable using technology in my class lessons." Upon examination of the revised lesson plan, it was evident that they now had a much better understanding of the technology application and how to choose a specific skill to teach. However, during the practice session another important piece of the puzzle emerged.

The teachers had chosen a clear objective, "Students will enter information about mythical gods and goddesses into a database." After a short review of mythology, the teacher went to the computer to demonstrate what students would do on the database. The trainer, acting as a student raised her hand and asked, "Teacher, what is a database?" At this point the teachers found that they still did not have enough background knowledge to support the use of this application with students. A mini-lesson in database was provided and teachers expressed how much more confident they felt having this knowledge. Encouragement and praise was offered for their efforts and a date scheduled for observing the lesson. A formal interview with the vocational teacher later that afternoon confirmed what had been observed during the practice session, "Yes, at the planning sessions teachers chose whatever computer skill they wanted to use in a lesson and they didn't choose what should have been taught first, 'an introduction to database.' Teachers needed a sequence of skills to follow. Then they would've had this background knowledge." This piece, which should have been reinforced, was another false assumption that the process of learning to sequence in one curriculum would transfer to another. This did not appear to be the case when learning to teach lessons that include computer skills.

The following week each of the teachers taught their lessons and was again observed. Documents used during the lessons were collected and examined. The trainer, in order to measure the components of an effective technology lesson, created a formative evaluation instrument. This instrument was a combination of measures borrowed from other evaluation measures and the personal knowledge and experience of the trainer. Therefore, the instrument could only be considered an informal means of gauging the use of certain technology components.

One class had 9 students in 6^{th} grade. This teacher was in her 9^{th} year of teaching and this was not her first lesson using the integration of technology. The other class had 7 students in 8^{th} grade. This teacher, while not a certified teacher, was a full-time tutor at the school. She was in her first year of teaching. These two teachers taught their lesson in the same room that housed only one computer and one printer. Students in both these classes were performing at grade level. The third teacher, in her 3^{rd} year of teaching, taught her lesson in a room with 8 computers. In this class, there were 11 special education students who were performing at a 3^{rd} grade level. During each of the lessons the teachers used the same strategy of pairing two students at the computer while other students worked on seatwork in the content area. Following is a brief summary of the observations recorded during the lessons:

Strengths:

- 2 of the 3 teachers provided adequate background information for database; 1 provided exemplary knowledge of the subject; 2 of the 3 provided a review in the content area.
- 2 of the 3 had the objectives clearly written on the board for both content and computer areas.
- All teachers had materials ready and they effectively managed the instructional time with both the students at the computer and those at their seats.
- All teachers were exemplary in explaining to students the process they were to follow: what they were to do at the computer, at their seats while waiting their turn, and how they would take their turns at the computer.
- Effective strategies were used to account for the available equipment and needs of the students.
- All teachers maintained a focus on the content area rather than on the technology.
- Technological problems occurred with 2 of the 3 teachers and it was adequately handled and the lesson was continued.
- All students in 2 of the 3 classes were able to participate at the computer during the lesson. Only in the special education class were all students not able to take their turn. In this case, it would be more realistic and effective to continue the lesson for several days.
- Collaboration among students working at the computer was encouraged in 2 of the 3 classes. In the special education class one student was to mentor the next student in what they were to do.

Areas for Improvement:

- 2 of the 3 teachers did not provide for students a real connection from the content area to the use of the database. This may have been due to their lack of knowledge, adequate practice, or simply being new to using technology.
- Only one teacher completed the lesson with enough time for closure and assessment of learning.
- Seatwork was adequately used as a strategy in a one-computer classroom for a beginning technology lesson. However, in time and with more practice it would be anticipated that a diversity of strategies would be used to actively involve more of the students in the lesson by using a computer presentation device which the school has available.

After the process of planning, practicing, and teaching the technology lessons these teachers answered a questionnaire about their experience. The following is a summary of some of their answers:

- Training or staff development and practicing helped them the most to prepare and perfect the lesson.
- The lesson plan template was helpful as a guide and to provide step-by-step instructions.
- The team planning session boosted confidence and helped in knowing what to expect.
- The in-house technology expert was a valuable resource in planning. "She gave technology hints and advice; showed them what was wrong and how to correct it; and helped them narrow the lesson."

Surveys taken by twelve teachers appear to confirm some of these findings. When asked, "What do you think teachers mainly need in a personal way to be able to integrate technology?" Ten out of twelve had common responses, "more training, more time to plan for it, and more knowledge of computer skills."

Before the study was officially completed a formal interview was conducted with the principal. She shared that her team leaders had been informed that technology planning was to be a part of their weekly team meetings and that they would be evaluated once a month during one of these lessons. She described how her function as an administrator was to communicate with her teachers that technology was to be one of their major goals. Again she insisted, "You keep me focused; I need you to keep communicating and sharing with me about technology, to keep us on track."

Conclusions

Some of these simple technology "puzzle pieces" have already been identified through other studies and this paper tends to confirm what has been already found. Because of the rapidly changing nature of technology, much of the literature seems so quickly outdated or has been extended beyond the initial stages of technology integration and does not address the needs of beginning technology users. Many educators have not even yet begun to include technology in their instruction so this study could be most useful in reminding administrators, technology specialists, and trainers that there are still teachers who need the basic skills before they will be eager and able to use technology in the classroom. Training and materials for inservice teachers should combine technology instruction for personal use and strategies for using the technology as an instructional resource. Although many states provide a computer skills curriculum for the vocational teacher or computer lab instructor, this comprehensive curriculum may offer much more than any classroom teacher could begin to process when combined with their other responsibilities. Even so, classroom teachers need some type of guidelines if they are expected to integrate one curriculum with another. This curriculum, as in the case of any good curriculum, should be a logically sequenced method of including computer objectives in the content area curricula but possibly in a condensed or simplified form that could be easily referenced by the classroom teacher. Regularly scheduled planning and practice sessions may increase in-house technology support, peer collaboration, and comfort level of teachers. As much of the literature before has indicated, most teachers will probably only grow in their desire and ability to integrate technology in their classroom instruction if it is strongly supported and encouraged by an administrator. More administrators may be receptive and enthusiastic about providing this support and encouragement if they were kept "focused," or given ideas by technology resource personnel. Further study would be useful in identifying an effective, but simplified version of a computer curriculum for classroom teachers. In addition, as more educators learn to integrate technology, administrators will need more appropriate and valid instruments to evaluate instruction of integrated lessons. In order to be qualified as evaluators of technology instruction, administrators will also need further training in the use of technology, methods and strategies that prove most effective, and characteristic differences in learning environments when technology is used as a resource. Finally, even though an online technology support system was not fully developed in this study due to inadequate equipment and time constraints, its potential should be further examined.

References

Grant, Cathy Miles (2000). Professional development in a technological age: New definitions, old challenges, new resources. *TERC.* Retrieved September 15, 2000 on the World Wide Web: http://ra.terc.edu/alliance/TEMPLATE/alliance_resources/reform/tech-infusion/prof_dev/prof_dev_frame.html

North Carolina Department of Public Instruction. (1998). *North Carolina Standard Course of Study-Computer/Technology Skills*. Raleigh, NC: NCDPI

Parr, Judy M. (1999). Extending educational computing: A case of extensive teacher development and support. *Journal of Research on Computing in Education, 31* (3), pp. 280-292. Retrieved September 15, 2000 from North Carolina State University Databases (MasterFILE Premier Fulltext Database, Item 2780731) on the World Wide Web: http://www.lib.ncsu.edu/eresources/databases.html

Roblyer, M.D. & Jack Edwards. (2000). *Integrating Educational Technology into Teaching* (2nd ed.). Upper Saddle River: NJ: Prentice Hall, Inc.

Schlager, Mark S. & Patricia K. Schank (1997). TAPPED IN: A new on-line teacher community concept for the next generation of internet technology. *The Second International Conference on Computer Support for Collaborative Learning.* 13+ Retrieved September 15, 2000 on the World Wide Web: http://ww.tappedin.sri.com/info/cscl97.html

The Unique Impact of Internet Instruction on Future Teachers: A Qualitative Study of Delivery Systems and Their Impact

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Abstract: Recent teacher shortages and the growing popularity of teaching as a viable career change has led to a blossoming of many graduate teacher education programs. Distance education is especially attractive to these students since many have families and must maintain jobs. However, many teacher educators are still suspicious. This paper summarizes a qualitative study, which looked at two required courses in the graduate teacher certification program at a teacher training university. Two groups of students participated in these courses in the traditional manner of traveling to the university and attending classes. Two other groups of students took the identical courses over the internet. The same two instructors instructed all four courses. This study followed these students not only while they took the courses, but also as they continued their studies and in some cases, when they started teaching in their own classrooms. The results suggest that while the instructional delivery models may have impact on course objectives, the greater impact may be upon a future teacher's attitude toward the effective use of technology in the classroom.

Introduction

Recent teacher shortages and the growing popularity of teaching as a viable career change have led to a blossoming of many graduate teacher education programs. Distance education is especially attractive to these students since many have families and must maintain jobs. In fact, as distance education becomes routine at even the most established universities, future teachers are able to take a significant number of courses through distance education.

At this time, there appears to be at least two models of distance education that are becoming popular. There is the classroom distance education model, and an emerging model of instruction being presented over the internet. In the classroom model, students sit in a specially designed room and view a projected television image while their image is beamed back to the instructor via television cameras. These facilities are usually fairly high in cost to establish and operate and requires students to travel to a specially equipped facility, not much different than current educational practices of having students attend classes at the university.

The internet model can be broken down into two variations- asynchronous and synchronous instruction. Asynchronous instruction, meaning students view materials posted by the instructor or by other students at any convenient time, is readily supported by most institutions by making available various pieces of template software that allow a faculty member to create course materials fairly easily. This type of course support is necessary for any internet instruction, but lacks the interaction of a live class. Many students report feelings of isolation and find it difficult to remain motivated using this type of instruction.

The synchronous internet model, gaining popularity with business and industry for training, allows the instructor to be in one location and students in different locations, their schools, homes, offices, or a computer laboratory, for example. The instructor is similarly in another location. Instruction takes place using streaming video, audio, white boards, and similar technologies. Students and the instructor can see and participate with one another, much like in a regular classroom. Students no longer need to travel to a central location for a class, and there is live communication and interaction taking place. This type of instruction is less expensive in terms of facilities, but does require expenditures for special software and some hardware on the part of the student.

The advantages of either type of delivery system have been celebrated on numerous occasions.

Disregarding the financial issues, the positive potential for instruction cannot be denied in certain circumstances (Teh, 1999). Berger (1999) has justifiably pointed out the potential for global learning over the internet.

However, many teacher educators are still suspicious that web based instruction, while adequate in some situations, still falls short when teaching future teachers the skills necessary to function in current classrooms. Many anecdotal studies have taken this more cautious approach to web based delivery systems. (see Dewald, 1999; Waters, 1999; Sullivan, 1998). While there may be advantages in terms of convenience, the pedagogical advantages might be limited and need to be explored in more detail.

This paper summarizes a qualitative study which looked at two required courses in the graduate teacher certification program at a teacher training university. Two groups of students participated in these courses in the traditional manner of traveling to the university and attending classes. Two other groups of students took the identical courses over the internet, one using the synchronous model and one class utilizing asynchronous web based instruction. All four courses were instructed by the same two instructors. This study followed these students not only while they took the courses, but also as they continued their studies and in some cases, when they started teaching in their own classrooms.

The Study

Since the university has a carefully monitored curriculum process, both courses had to offer similar content. One class was an introduction to the internet for teachers. This course had traditionally been offered in a lab classroom at the university and relied heavily on project based instruction. The other course was an overview of schools and their place in the community. This course had included internet components in the past, but had not required extensive use of web based resources.

Students were interviewed in focus groups prior to taking the course and upon completion of the course. In addition, follow up interviews were conducted based on a willingness to participate. Surveys were also administered at the end of the course which focused on instructional issues. The instructors then interviewed each other focusing on the common experience of offering courses at the university and over the internet. Taken all together, this interview and survey data from instructors and students gave a good picture of the issues involved in this type of teacher education.

Findings

As might be expected, the variety of responses suggest that the learning style of the students is a consideration, but not to the degree as might be expected. There was no general pattern which emerged which suggested that those students with a certain learning style were more suited to internet or classroom instruction. This might suggest that a wide range of students may find internet instruction, in certain situations, a viable option. Students in the "Internet for Educators" course clearly gained additional benefits by having the class conducted over the internet. They felt they were more self-reliant, better able to solve technological problems, and had a better understanding of the capabilities of internet instruction for their own classrooms. Students who took this course at the university felt the course was valuable, but did not report these positive trends in their own learning to the degree reported in the internet only course. The fact that this course was offered in the synchronous mode turned out to be of limited importance. The course evolved to the point that the project based approach really did not require the entire class to be on line at the same time.

The instructor for this course had taught internet based courses in the past and was technologically skilled enough to answer all technical questions. Also, having taught internet based courses in the past, he was concerned that the amount of instructor time would be far greater when so many individuals demanded increased attention. His experience has suggested that internet based courses were far more work than regular, classroom based instruction. However, since this was a project based course relying on internet resources, he documented that this course did not take any additional time than the lab based course.

In short, the data suggests that as long as the course is project based, internet based instruction in this particular course, "Internet for the Teacher", is superior to lab based instruction on site. The course did not require additional instructor time, and the students reported that they became more skilled in their use of internet resources than those in the lab classroom. The key, however, seems to be that the instruction was project based. Whether the course was offered in synchronous or asynchronous mode did not seem to be an issue with this particular course.

Students in the "Teacher and the School Community" had a very different reaction. Those taking the class at the university felt that they had been exposed to new issues, had interacted with their colleagues in new and meaningful ways, and had a better understanding of where they might fit into a community once they became teachers. The course content allowed frequent field trips and the opportunity to question guest speakers in person. Students who took the course on site repeatedly commented that these opportunities were the best learning experiences the course had to offer.

Students who took a portion of this course over the internet felt they had gained valuable technical experience, but did not feel that they had significantly grown in these same areas. They felt that the spontaneous interaction was lacking, since this course was offered in the asynchronous mode. Chat room discussions or conferencing on particular topics was useful, but "slowed down" the process by which students might clarify and synthesize ideas. Many commented on the fact that they felt disconnected from the instructor. Several mentioned that they did not exactly understand the role of the instructor in that he only seemed to "worry about setting up activities on the web." The web based assignments were group projects, which seemed to have potential with this type of delivery system. Unfortunately, many commented on the difficulties of interacting with each other which led to frequent frustration and an exclusive focus on technology issues.

Conclusions

Follow up interviews indicate that those students taking these courses over the web gained useful technological skills which they have been able to apply both in other courses and in the teaching field. In retrospect, those who took the "Teacher and School Community" course over the web do not feel they have "missed a significant opportunity." Many commented on the fact that the limitations of web based instruction has proved to be a useful lesson in that they can critically analyze the benefits and pitfalls of internet based instruction.

One of the most useful products of this study was the dialogue established by the two instructors. The "Internet for Teachers" course had a distinct advantage in requiring individualized work and instruction. The "Teacher and School Community" course, relying on web discussions in chat rooms and group projects, suffered. The instructors learned from each other in that future courses will make appropriate modifications to explore more effective ways to promote instructional strategies other than project based learning. The issues involved in web based delivery seem to cross disciplines and what may work with one content area may cause problems in another. Helmi, Haynes and Maun (2000) noticed that the experiences and potential solutions to this type of instruction may in fact create useful bridges between disciplines which may lead to interdisciplinary instruction. This is exactly what happened in this particular case.

References

Berger, N. (1999). Pioneering experiences in distance learning: Lessons learned. Journal of Management Education, 23 (6), 684-691.

Dewald, N. (1999). Web-based library instruction: What is good pedagogy? Information, Technolgy & Libraries, 18 (1), 26-32.

Helmi, D., Haynes, G. & Maun, C. (2000). Internet teaching methods across the disciplines. Journal of Applied Business Research, 16 (4), 1-13.

Sullivan, E. (1998). The web isn't always the best teacher. PC Week, 15 (6), 36-37.

Teh, G. (1999). Assesing student perceptions of internet-based online learning environments. International Journal of Instructional Media, 26, (4), 397-403.

Waters, B. (1999). Ideas for effective web-based instruction. Music Educators Journal, 85, (4),13-19.

On Integrating IT into Teaching of English in Taiwan Junior High School

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Abstract: The goal of this study is to investigate the support and training needed in integrating information technology (IT) with teaching of English as a foreign language. Two junior high school English language teachers were given 20 hours of basic computer software training along with 15 group discussions on how to integrate IT into classrooms. Teaching experiments were then conducted in 8 class periods. The major findings of the study are: (1) training of computer skills needs to focus more on the short-cuts of operating a software; (2) CAI titles that facilitate IT induced instruction is yet to be improved; and (3) full support from the school, both administrative and technical personnel are necessary for the long term implementation of IT integration into classrooms.

Introduction

K-9 curriculum in Taiwan has undergone major changes in the last few years. With the advance of information technology (IT), not only are information technology courses being taught in the K-9 schools, the new K-9 curriculum calls for full integration of information technology into teaching of all subject areas. Thus, not only will the students be IT informed; teachers also need to be IT trained to be qualified educators of tomorrow.

Although the newly graduated teachers are most likely IT trained, most of the teaching force are educated from yesteryears; thus lacking suitable IT training, making integration of information technology into teaching a difficult task. The Taiwan Ministry of Education sponsors many on-the-job IT training courses to teachers through colleges and universities in Taiwan. These courses range from introductory hands-on courses to theoretical advanced network management course. Furthermore, special funding was appropriated to all K-9 schools to training teachers of their respective schools. Thus, it is safe to say that most teachers are at least aware of the inevitable changes brought on by the advancement of information technology.

Taiwan's new K-12 curriculum guideline has now mandated that foreign language courses be offered to all students beginning at the 5th grade. With the government's will to push ahead the use of IT in the educational sector (Lee & Wu, 2000) and the requirement for studying foreign languages by all students, the need for effective teaching of foreign language is more pressing now then ever before. In this study, we invite junior high school English teachers to join us on learning to integrate IT tour. By experimenting with using IT in their classrooms, it is hoped that the experience learned can be shared among all teachers in Taiwan.

Related Research

In this day of information age, teachers are increasingly under pressure to use technology as a learning tool and to integrate technology into classroom instruction (Scheffler & Logan, 1999). In many ways, integration strategy is often guided by different factors including equipment accessibility, educational objectives, students' needs and the teachers' technical know-how (Halpin, 1998). In a report by OTA (1995), a number of common barriers exist among the teachers in using technology in classroom instructions. For one, many teachers lack a clear understanding about what resources technology can offer them as they try to meet their instructional goals. Yet another is that teachers need extra time to experiment with new technology and plan lessons using new methods that incorporate technologies. In terms of integration IT into teaching and learning, Roblyer (1997) classified the efforts into 6 categories. On a more abstract level, we can also categorize the experiments in the literatures into 2 categories based on who is required to operate the IT equipments in the learning process.

Student-centered IT induced activities: Many of the experiments reported in the literatures involve the students using the IT equipments in fulfilling the assignment given by the teachers. For example, in "Project with Teeth" exercise by Roblyer (2000), teachers use e-mail to connect K-3 students with "Keypals" around the world. The students interchange how many teeth the children lose during the year. Thus the students must practice their writing via email message to their keypals. Another example also by Roblyer is to let students use word-processing tools or crossword puzzles generators to develop several test items over the learning contest. It was argued that this hands-on approach helps students retain more because they themselves generate the questions. In both cases, the teaching or learning is student-centered. Furthermore, students must have adequate access to computing equipments. Thus activities such as those are only possible in a learning environment where students and teachers alike have ample computer access opportunities.

Teacher-centered IT induced activities: In contrast to student-centered IT activities, a teacher-centered IT activity is one in which the teacher is in charge of operation of the IT equipments. Here IT equipments are used merely as a teaching aid as oppose to self-learning facilitator. For example, a teacher may use PowerPoint as a delivery-metaphor technology. In Saye (1998) group of 10 teachers experienced with transforming teaching material into digital forms. So instead of chalk and board, teachers used computers and LCD monitors/projectors in class. However, if not carefully planned, teacher-centered IT induced lesson can cause many classroom management problems (Mason & Hlynka, 1998). A different use of IT is exemplified by the "Project Essay Grade" (Jones, 1999), in which English teachers use computer and essay analyzer to help grading students' writing. The analyzer can look at five specific traits, namely content, organization style, mechanics and creativity and provide feedback to the teachers. Thus saving teachers' time in grading essays.

Experiment Setup

This study was carried out at a municipal junior high school where the principle has agreed to allow schoolteachers to try out new teaching methods as would be required by this study. The procedure of the study is as follow. First, participating English teachers were gathered through a general call for participation. No pressures from the school principal were exerted on any of the teachers, so all joined were on voluntary basis. Bi-weekly meetings with participating teachers were then held to give the teachers a sense of the current state of IT and of how teachers in other parts of the world are using IT in their instructional activities. More importantly, the meetings allowed the teachers to express their opinions on how IT can be integrated into their classrooms and allowed us to formulate the necessary training courses for those teachers. After the training, the teachers began to practice integrating IT into their teaching. Students were asked to fill out questionnaires, with both Liker-scaled questions and open-ended questions, at the end of the teaching experiment, which the teachers have post-experiment interviews. In addition, teachers were asked to keep a teaching journal detailing their thoughts on the experiment. After analyzing all the data gathered during this study, one last meeting was conducted with the teachers to resolve any unanswered question at the data analysis phase. Timetable of this study is outlined in Table 1, and a brief account of each stage of the study is given below.

1. **General preparation:** Ten teachers volunteered for this study at the outset. However, only 2 made it through the teaching experiment. The other 8 dropped out of the study when it comes time to design their own IT integrated teaching plans. The most often cited reason for dropping out was heavy teaching duties and not having enough time to do the extra work. The two remaining teachers all have 3 plus years of teaching experience and are casual users of computer even before this study. Three discussion sessions were held to let the participating teachers be acquainted with the research team and to gather information about the school. Thus, topics of discussion range from school's computing environment to how the teaching of English language is being conducted.

2. **Learning about IT integrated teaching:** Four discussion sessions were held with participating teachers to discuss possibilities of integrating IT into teaching and into classroom activities. During these four meetings the research team show the teachers the teaching resources that are available on the Internet and

Stage	Session No.	No. of Participants	Activities
General preparation	1 2 3	10 6 7	1. Go over the nature of this study. 2. Get an understanding of participating teachers' IT skills. 3. Get an overview of schools' IT facilities. 4. Get some understanding of the teaching methods and classroom activities for teaching English as a second language.
Learning about IT integrated teaching	4 5 6 7	8 8 10 8	1. Demonstrate the teaching resources that are available on the Internet. 2. Show examples from the literatures and the Internet on various IT usages in teaching of English.
Preparing for IT integrated teaching	8 9 10 11	10 3 3 2	1. IT proficiency training (20 hours). 2. Design of teaching methods and classroom activities.
Experiment	12 13 14 15	2 2 2 2	1. Experiment with IT assisted instruction in 2 classes for a period of 4 weeks (2 in the regular semester, 2 in the summer sessions). 2. Getting feedbacks from students. 3. Discussions with the teachers on the pros and cons of preparing and using IT in the classrooms.

Table 1: Time line of the experimental study.

discussed about other IT integrated teaching projects reported in the literature. During these discussion sessions, it was determined the type of IT trainings those participating teachers needed the most.

3. **Preparing for IT integrated teaching:** There are two objectives during this stage: participating teachers' IT training and design of teaching plans for use in the experimentation stage. Twenty hours of computer usage training were provided to the participating teachers to ensure they have enough IT background to conduct IT integrated teaching activities. The topics of the training were results of the previous discussion sessions and the trainings were all conducted at the school's new multimedia computer PC lab. The training covered the topics of Windows 98 (2 hours), Word (8 hours), Power Point (4 hours) and Internet basics (6 hours). Class notes and exercises were all specially prepared to ensure quick learning results. Upon completion of the computer usage training, teachers were asked to design teaching plans to include classroom activities that involve usage of IT equipments. Although only two participating teachers remain at this point, both were very enthusiastic about the opportunity to experiment with new teaching methods. Over a period of 4 weeks, those two teachers refined their teaching plans and prepared the necessary teaching aids (e.g. Power Point slides, scanning of pictures) all by themselves.

4. **Experiment:** Eight hours of teaching experiments were carried out in two different classes toward the end of the semester (actually 2 weeks at the end of the semester, 2 in the summer). All the experiments were done in a classroom equipped with LCD projector. The teachers had to bring in their own notebook computer and setup it up on their own. Each lecture was tape-recorded for future analysis. The two classes were chosen for the simple reason that their schedule matches with that of the research team. As it turned out, the first class (Class A) is a model class in which all the teachers praise about the good study habits of the students in the class. On the other hand, the second class (Class B) is a complete opposite of the first class in which the motivation to learn is non-existence among the students in the class. At the conclusion of the experiment, students in both classes were asked to fill out a survey to give their thoughts on the new teaching method. The questionnaire focused on whether IT integrated teaching will better attract and retains attention and on its effect on learning. The questionnaire and the results are given in Table 2. The teachers were also interviewed after the experiment with questions relating to teaching preparations and classroom management.

Experience Learned and Discussions

Thoughts from the Students on IT-Integration

The students' questionnaire and summary of their responses are given in Table 2. From the table, several observations can be made. In general, Class A (the model class) gave more favorable response than Class B in all questions by a large margin. Furthermore, majority of the Class B responses fall into the indifference category, meaning that the students do not care much about the new teaching/learning method. This can be attributed to the fact that students in Class B are less motivated to learn. Anything the teachers try is probably fruitless. Looking at Questions 7 and 8, although only 30% of students in Class B liked the IT induced classroom activities, 42% favored the use of CAI software to ease the pressure of learning (English). This observation raised an issue for future study. That is what type of classroom IT activities can help bring about students' desire to learn foreign language, or any school subject for that matter.

As for Class A, it is interesting to know that although only between 41% and 60% (questions 4 to 6) of students think that IT aided teaching method facilitated their learning, 71% liked the new teaching method over the traditional mean (question 8) and that only 6% of the students dislike the IT induced classroom activities (question 3). Again, a future in depth study of the correlation between IT induced classroom activities and students' learning progress is warranted.

Questions	Class A (35 students)			Class B (33 students)		
	agree	indifference	disagree	agree	indifference	disagree
1. Use of CAI in the classroom can raise my interest in learning English.	25 (71%)	8 (23%)	2 (6%)	11 (33%)	11 (33%)	11 (33%)
2. I can better focus my attention in class when IT is used during the class.	23 (66%)	10 (29%)	2 (6%)	8 (24%)	17 (52%)	8 (24%)
3. I am more inclined to join in on the classroom activity when the activity involves usage of IT equipments.	25 (71%)	8 (23%)	2 (6%)	8 (24%)	16 (48%)	9 (27%)
4. The computer animation of CAI software used in class can facilitate my learning of new words and phrases.	21 (60%)	10 (29%)	4 (11%)	10 (30%)	14 (42%)	9 (27%)
5. The computer animation of CAI software used in class can facilitate my learning of new sentence structures.	18 (51%)	11 (31%)	6 (17%)	8 (24%)	15 (45%)	10 (30%)
6. I am more inclined to practice English conversation in class with a CAI software.	15 (43%)	18 (51%)	2 (6%)	6 (18%)	19 (58%)	8 (24%)
7. Use of CAI software in the classroom eases my pressure of learning English.	23 (66%)	11 (31%)	1 (3%)	14 (42%)	12 (36%)	7 (21%)
8. In general, I like the new IT facilitated way of learning English.	25 (71%)	8 (23%)	2 (6%)	10 (30%)	16 (48%)	7 (21%)

Table 2: Students' questionnaire and summary of their responses.

Thoughts from the Teachers

At the outset of this study, both teachers were having doubts about the feasibility of integrating IT into classroom instruction, let alone that the ever presence of the National High School Entrance exam makes any deviations from routine teaching/learning method susceptible to challenges from parents. However, after one semester of experimentation, both teachers have outgrown their initial skepticism and now embrace the idea of integrating IT into their teaching. From this study, we are also able to conclude that teachers are like students in terms of installing new teaching method. At first, they need to be guided. With a few IT integrated teaching sessions under their belt, they will be more enthusiastic and be able to design and implement IT integrated lesson plans on their own. The following is a brief summary of the experience that the two teachers have shared with us.

Teaching preparation

As can be expected, preparation of IT integrated classroom activities takes more time than the non-IT activities. However, besides shortage of ideas for IT-integrated activities, unfamiliarity with the operations of IT equipments is also a major factor. For example, one of the teachers encountered scanner problem. After running around for help for a couple of hours, the problem was finally resolved, thanks to the school technician. However, an impatient teacher would likely have given up on it if the equipment fails to work properly. Thus it is important to have the teachers properly trained to not only use computer software, but also routine operations of the commonly used IT equipments.

Classroom management

Although neither teacher experienced additional classroom management problems other than those common faced, they did brought to our attention that it is better to prepare additional contingency activities for use during unexpected equipment failure. One of the teachers ran into an unexpected problem during one of her classes. The LCD projector apparently got too warm and it triggered the automatic shut-off and cool down function. For about 10 minutes, the teacher had to do without the projector. Once the "power" was restored, it went off again after only a short while. Students often can get too hyper when unexpected event occurred. Fortunately, the teacher had a contingency plan and the class went on smoothly.

Administrative support

During the course of the experiment, the school administrative support was critical. Since IT integrated teaching is still in the experimental stage in Taiwan, the classrooms were not equipped with the necessary IT equipments. Our teaching experiment was carried out at a make-up IT classroom, equipped with the necessary IT equipments. However, the first few teaching sessions went on with routine calls to the schools maintenance staff to make better the teaching environment. For instance, window blinds or curtains of the class need to be added because the LCD projector was not bright enough. However, the curtain problem was never resolved in a satisfactory way. If it weren't for the teachers' persistence, setbacks like these could discourage teachers from using IT in their instructions.

General comments with regard to IT integrated instruction

Though there were some setbacks at the beginning of the teaching experiment, both teachers were quick to point out the advantages of using IT in the classroom. Though it takes more time and effort to design IT induced teaching plan and that some class time may be lost due to equipment failure, both teachers agreed that the IT integrated activities are more compact than the non-IT activities. As a result, students seemed to concentrate better through out the whole activity. The teachers also pointed out that many of the CAI titles are not suitable as a teaching aid in the traditional classroom setting. The current titles are suitable only for individual viewing only. When it is projected onto the white screen for the whole class, the characters on screen are generally too small to be visible for students sitting in the back of the classroom. The teachers also noted that during our training sessions, we have taught them many ways of accomplishing a task (e.g. copy and paste operations) for reason of completeness. However, they found that during teaching, they often use only one of the many ways, the fastest way! It was recommended that future training courses should include a "short-cut" sessions in which the teachers learn the fastest way of operating around a piece of software.

Concluding Remarks

Teaching of English as a foreign language is very suitable for IT integration because repeated practices on the same content is the major teaching method. With multimedia computer being capable of replacing many of the equipment currently in use in teaching foreign languages, including word cards, audio tapes, situation diagrams, a trivial form of IT integration would be to transform all the material currently in use into digital form so that students can have access to the same material for practicing at home. With the suggestions of the experienced English teachers, we are currently working on a word card system for which the teachers can easily create electronic word cards for use in IT equipped classrooms.

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References

Halpin, R. (1998). Computer literacy through exploration and discovery: Integrating technology into the classroom. *Technology and Teacher Education Annual 1998 CD-ROM*, 741-744

Jones, B. D. (1999). Computer-rated essays in the English composition classroom. *Journal of Educational Computing Research,* 20 (2), 169-187.

Lee, G. C. & Wu, C.-C. (2001). An overview of information technology on K-12 education in Taiwan. *12th International Conference of Society for Information Technology & Teacher Education (SITE2001).* Association for the Advancement of Computing in Education, Orlando, Fl.

Mason, R. & Hlynka, D. (1998). 'PowerPoint' in the classroom: where is the power? *Educational Technology,* 38 (5), 42-45.

Roblyer, M. D., Edwards, J. & Havriluk, M. A. (1997). *Integrating Educational Technology into Teaching,* Columbus, Ohio: Prentice Hall Inc.

Roblyer, M. D. (2000). The National Educational Technology Standards (NETS): A Review of Definitions, Implications, and Strategies for Integrating NETS into K-12 Curriculum. *International Journal of Instructional Media,* 27 (2), 133-146.

Saye, J. W. (1998). Technology in the classroom: The role of dispositions in teacher gatekeeping. *Journal of Curriculum and Supervision,* 13 (3), 210-234.

Scheffler, F. L. & Logan J. P. (1999). Computer technology in schools: What teachers should know and be able to do. *Journal of Research on Computing in Education*, 31, 305-326.

U.S. Congress, Office of Technology Assessment (1995). *Teacher and technology: Making the connection.* (OTA-HER-616). Washington D.C.: U.S. Government Printing Office.

In-Service Teacher Development for Fostering Problem-Based Integration of Technology

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Abstract: This paper reports on professional development approach, used in an Indiana-based Technology Innovation Challenge Grant, for middle and high school teachers designed to promote problem-centered uses of technology. As an initial activity, in-service teachers, pre-service teachers, and grade 6-12 students took part in a two-day modeling activity using technology to investigate and report on a local community problem. This allowed teachers to experience problem-based learning and understand the elements of the process. Evaluation of the modeling activity showed positive reactions from both teachers and students. Subsequently, teachers took part in a semester-long, school-based course involving a number of problem-centered activities. Teachers developed their own problem-centered projects that contained appropriate elements of problem-based learning. These findings suggest that the professional development approach used in this project was effective.

Introduction

Fast-paced life in the 21st century will demand adaptability, problem-solving, and continual learning. A recent Presidential panel report (Panel on Educational Technology, 1997) stated that 21st century workers must possess "the capacity to readily acquire new knowledge, to solve new problems, and to employ creativity and critical thinking in the design of new approaches to existing problems" (p 6). Because of these demands, there is growing emphasis in educational reform efforts on learning models based on students' active construction of knowledge and skills. Learners must learn how to learn if they are to be successful in a rapidly changing world.

Two similar learning models, problem-based learning (Torp & Sage, 1998) and project-based learning (Krajcik, Czerniak, & Berger, 1999), embrace this perspective on students' construction of understanding and show great promise for helping learners acquire knowledge and skills while using technology as an authentic tool . Although the specifics of problem- and project-based learning vary somewhat, they share an emphasis on situated learning (Brown, Collins, & Duguid, 1991) in authentic contexts (Stepien & Gallagher, 1993). Authentic problems anchor the curriculum and provide a vehicle for both problem-solving and content learning. In general, this approach is characterized by: (1) use of an ill-structured problem or driving question that provides opportunities for student investigations and problem-solving; (2) student analysis of the overarching problem or question to identify a specific problem for investigation (e.g., identifying what is known and unknown); (3) student-conducted investigations or actions that typically result in the development of artifacts or products; (4) collaboration among students, teacher, and community; and (5) student presentation of a final report or solution that summarizes the process and findings. Technology can play an integral role throughout this process as a tool for acquiring relevant information, gathering and manipulating data, and producing and presenting the culminating presentation in multimedia format.

For teacher educators, a key issue is how to best help in-service and pre-service teachers learn to apply problem-based methods that effectively integrate technology. Little (1993) argued that traditional models of professional development are not adequate to the task of preparing teachers for the challenges of teaching in the climate of reform. Because of the complexities of pedagogies demanded by learner-centered approaches, deeper and more meaningful professional development experiences are needed. One-shot technology workshops will not work today (if indeed they ever did). The Indiana Education Policy Center (1996) suggested that, to provide for continuous growth, effective professional development must: be school-based, use coaching and follow-up techniques, be collaborative, focus on student learning and be evaluated at least in part on that basis, and be embedded in the daily lives of teachers. Hill (1999) suggested that teacher technology development can rely on the same problem-centered and activity-based methods that are suggested for students in problem- or project-based learning.

This paper reports on the initial professional development activities of an Indiana-based Technology Innovation Challenge Grant project. These professional development activities, launched in the fall of 2000, were conducted by university faculty working in collaboration with teachers from the lead school district. Activities relied on problem-centered approaches to introduce problem-based learning with technology. The goals of the in-service professional development were to: (1) promote teachers' understanding of problem-based learning, (2) facilitate teacher's development of technology integration skills and knowledge, and (3) facilitate teachers' development and implementation of their own problem-based learning activities incorporating technology. The process consisted of an initial problem-based learning modeling activity, designed to show teachers the problem-based method in action, followed by a semester-long, on-site course focused on technology integration and problem-based learning approaches. The process and preliminary outcomes are described here.

Project Background and In-Service Professional Development

Tech-Know-Build: Indiana Students Building Knowledge with Technology is a Technology Innovation Challenge Grant project, funded by the U.S. Department of Education, which deals with problem-based learning approaches integrating the use of technology. Initiated in August of 2000, this five-year project focuses on the development and implementation of a learner-centered and problem-based curriculum, beginning in the sixth grade, involving collaborative construction of knowledge in authentic contexts using technology. Naturally, professional development is an important element of this process. Additional elements of the project include the use of portable technologies, electronic mentoring of K-12 students by university pre-service teachers, and electronic links among project partners and with the larger community. Project partners include the Crawfordsville (Indiana) Community Schools, Indianapolis Public Schools, Purdue University, and Indiana University Purdue University at Indianapolis (IUPUI).

The university partners, working closely with school personnel, direct the teacher professional development component of the project. Purdue University (main campus) has a long history of cooperation with the Crawfordsville Community Schools, the lead school organization. In addition, the Purdue campus is located relatively near (about 30 miles) to Crawfordsville, a small rural community in central Indiana. IUPUI has a similar long-term relationship with, and proximity to, the Indianapolis Public Schools. Hence, Purdue University works primarily with the Crawfordsville Community Schools, and IUPUI works primarily with the

Indianapolis Public Schools on the professional development aspects of this project. Because of funding patterns, grant activities involving Indianapolis teachers will not formally begin until summer of 2001, but activities involving the Crawfordsville teachers began during the fall of 2000.

The professional development activities involving Purdue faculty and teachers in Crawfordsville actually pre-date the grant by several years. In 1997, the Crawfordsville Community Schools launched a project to provide all district teachers with laptop computers. To receive a laptop, teachers had to acquire computer competencies through one of several available means. One of these was completing an on-site introductory educational technology course offered through Purdue University. Since this collaboration began, over 150 teachers have elected to take an introductory and/or advanced educational technology course through Purdue to satisfy the requirement to obtain a laptop computer.

During the fall of 2000, twenty-four Crawfordsville middle and high school teachers enrolled in the advanced educational technology course (EDCI 564, Integration and Management of Computers in Education) as the first group of grant participants. These teachers had already completed the introductory level course, which concentrated primarily on basic computer applications for teacher productivity (e.g., Word, Excel, Powerpoint), or an equivalent alternative. While the first course dealt with learning fundamental computer applications, EDCI 564 focused on integrating educational technologies in the classroom.

As a kick-off activity, we wanted the teachers to see and experience first-hand a problem-based activity involving the use of technology. So, we designed a modeling activity – a short-term problem-based learning activity. Early in the semester, participating teachers along with eighteen students from grades 6-12 and six pre-service teachers from Purdue took part in a two-day problem-based learning activity involving a significant environmental problem (water quality) in the local community. The purpose of the activity was to help the teachers understand the problem-based learning process, the roles of teachers and students, and the use of technology as a supporting tool. We involved pre-service teachers because 1) they brought a high level of technology competence, 2) they could benefit from the experience themselves, and 3) this provided a vehicle for initiating collaboration between the university students and the K-12 teachers and students. We involved K-12 students because a growing body of literature suggests changes in teacher-student relationships can accompany technology integration (e.g., Ertmer & Hruskocy, 1999; Ringstaff & Yocam, 1994). We wanted teachers to work with students as co-learners in this process.

During the two-day activity, mixed teams of participants first were presented with the driving question on water quality, "What's in our water, why is it there, and what does it mean to us?" Teams designed their own investigations within the framework provided by the overarching driving question and conducted their investigations. In most cases teams traveled to field sites to collect water samples and used available water test kits to assess what was in their samples. Finally, each team produced a multimedia report of their investigation and findings, which was then shared with the other teams on the second day. Rather than teaching about technology, the emphasis in this approach was on using technology as an authentic tool to gather background information (e.g., Internet searching), collect data and artifacts (e.g., digital camera photos of field sites, Excel graphs of data), and assemble and present multimedia reports of the investigations (e.g., Powerpoint presentations). Results of an evaluation of this activity are presented below.

Following the modeling activity, the teachers participated in a semester-long in-service development program that consisted of a specially tailored version of the EDCI 564 Purdue course. The professional development course focused on development of participants' knowledge and skills to integrate technology within a problem-based context. Several activities involving the use of technology in a problem-solving context were employed during the course. For example, early in the course, participants engaged in a spreadsheet activity involving prediction of the medal times/distances for track events in the 2000 Summer Olympics in Sydney, which took place during the course. A Webquest activity was used to introduce concepts related to evaluation of websites. A web-based discussion board was utilized to give participants the opportunity to reflect on class topics and interact with peers. A history-based activity required teams of participants to research and develop multimedia presentations to convince their peers of the historical significance of one decade of the 20th century. These activities were designed to demonstrate additional ways that technology could be integrated into the classroom in a problem-centered context. As a culminating course activity, participating teachers developed their own problem-based learning activities, incorporating technology, to be implemented in their own classrooms during the spring of 2001. As a means of sharing their project plans, teachers also produced websites describing their projects.

Outcomes

The two-day modeling activity was viewed as a key element of the professional development approach, because in a relatively short time it allowed teachers to experience the process, understand the roles of teachers and learners in the process, and see effective ways to utilize technology. At the end of the activity, a short evaluation form was administered to all participants. This evaluation form consisted of eight Likert-type items, five semantic differential items, and five open-ended items. Table 1 presents the mean ratings by participant group for the Likert-type and semantic differential items.

Evaluation Item	Mean Rating Grade 6-12 Students (n=14)	 Pre-Service Teachers (n=6)	 In-Service Teachers (n=23)
Likert-type Items			
1. In this activity, I feel like I learned a lot of science.	4.36	3.67	3.74
2. In this activity, I feel like I learned new things about using technology.	4.29	3.83	3.91
3. I would rather work by myself than work in groups.	2.14	1.50	2.00
4. I did <u>not</u> like the hands-on activities.	1.36	2.00	1.48
5. Compared to what we usually do in school, I liked this activity better.	4.71	4.17	3.91
6. I do <u>not</u> really like school.	2.29	1.83	1.52
7. This project is okay, but it does <u>not</u> really relate to me and my life.	2.07	2.00	2.00
8. Because of this project, I am more confident in my ability to do investigations.	3.93	3.83	3.74
Semantic Differential Items			
1. Boring … Exciting	1.79	2.00	1.83
2. Challenging … Too Easy	3.43	4.00	4.13
3. No Fun … Fun.	1.57	2.00	1.61
4. Worthwhile … Waste	4.43	3.50	4.30
5. Best … Worst	4.29	4.00	4.09

Table 1. Mean Ratings of Evaluation Items from the Two-Day Problem-Based Modeling Activity

The Likert-type items were rated by participants strongly agree (5 pts), agree (4 pts), undecided (3 ps), disagree (2 pts), or strongly disagree (1 pt). Therefore, a mean of 3 indicates undecided, while means greater than 3 indicate agreement and means less than 3 indicate disagreement. Semantic differential items were rated by participants closest to the word on the left (5 pts), closer to the word on the left (4 pts), undecided (3 pts), closer to the word on the right (2 pts), or closest to the word on the right (1 pt). Therefore, a mean of 3 indicates undecided, while means greater than 3 indicate preference for the word on the left and means less than 3 indicate preference for the word on the right.

The data for the Likert-type items in Table 1 indicate agreement with positively worded items and disagreement with negatively worded items. The strongest reactions were disagreement with item #4 and agreement with item #5. This indicates that participants *did* like the hands-on activities, and they liked the problem-based activity compared to what they usually do in school. Reactions to the semantic differential items indicate that participants thought the activity was exciting, challenging, fun, worthwhile, and the best.

In response to the open-ended question, "What did you like most about the activity?" participants' most common responses were working with others and learning about technology. In response to the open-ended question, "What did you like least about the activity?" responses were scattered but lack of prior knowledge and the short time frame were the most commonly mentioned. In response to the open-ended question, "What was your favorite part of the activity?" participants cited working with others, going outside, and learning about technology. In response to the open-ended question, "List something you learned in the activity," participants mentioned science content, information about the community, and technology. Finally, in response to the open-ended question, "List some words that describe how you feel about the activity?" the most commonly cited words in order of frequency were: fun, interesting, exciting, and worthwhile. The results suggest that participants had positive reactions toward the problem-based modeling activity while learning about science and technology.

The in-service professional development course that followed the initial modeling activity was designed to adhere to principles of good professional development practice. It was school-based; classes took place each Tuesday after school, a time that was generally convenient for participating teachers, in a computer laboratory/classroom in Crawfordsville High School. It took place over an extended period of time, a whole semester. This gave participating teachers the opportunity to practice what they learned and hence grow under the coaching and guidance from the university faculty and project staff. The emphasis in the course was on integrating technology for student learning, not on learning about technology devoid of context. The course was highly collaborative; most of the problem-centered activities throughout the semester involved teams of teachers working with one another. We hoped that this course collaboration would carry over into collaboration in the classroom when teachers implemented their own problem-based learning activities.

As a culminating activity in the course, teams of participating teachers developed their own problem-based learning units for implementation in the classroom during the spring of 2001. The components of these projects included: a driving question, curriculum objectives and links to curricular standards, possible student investigations and other activities, materials and resources, and assessment. The driving questions that were developed by the teachers to guide their projects were:

- Why should we care about deforestation of the rain forest? (interdisciplinary middle school unit)
- What makes the good life? (high school English, social studies, and elementary special education)
- What is conformity and how does conforming / not conforming affect our society? (high school English and music)
- What good is math and science? (high school mathematics and science)
- What makes something strong? (middle school technology and physical education)
- What would it take to live off planet Earth? (middle school interdisciplinary unit)

Websites describing the teachers' projects are available online at: http://research.soe.purdue.edu/challenge.

Conclusions

Problem- or project-based learning is a promising approach that involves students investigating complex problems in authentic contexts. Technology can play an important role in this process as a tool for gathering information, analyzing and representing data, and communicating results. How can teacher educators best prepare teachers to utilize this methodology in the classroom? This project utilized an approach that involved modeling problem-based learning via a realistic activity involving in-service teachers, pre-service teachers, and students. Evaluation data showed that teachers and students alike viewed this modeling activity positively. In a short period of time, this activity was able to convey the nature and components of problem-based learning to the participating teachers. Following this activity, a semester-long in-service course that was collaborative, school-based, and focused on integration introduced additional examples of problem-based learning and allowed participating teachers to build the conceptual and skills framework necessary to construct their own problem-based curricular units. This appears to be a promising approach for helping teachers to integrate problem-centered applications of technology in their own classrooms.

References

Brown, J. S., Collins, A., & Duguid, P. (1991). Situated cognition and the culture of learning. In M. Yazdani & R. Lawler (Eds.), *Artificial intelligence and education, volume 2* (pp. 245-289). Norwood, NJ: Ablex Publishing.

Ertmer, P. A., & Hruskocy, C. (1999). Impacts of university/elementary school partnership designed to support technology integration. *Educational Technology Research and Development*, *47*(1), 81-96.

Hill, J. R. (1999). Teaching technology: Implementing a problem-centered, activity-based approach. *Journal of Research on Computing in Education*, *31*(3), 261-279.

Indiana Education Policy Center. (1996). *Learning together: Professional development for better schools.* Indianapolis, IN: Indiana Department of Education.

Krajcik, J. S., Czerniak, C. M., & Berger, C. (1999). *Teaching children science: A project-based approach.* Burr Ridge, IL: McGraw-Hill.

Little, J. W. (1993). Teachers' professional development in a climate of educational reform. *Educational Evaluation and Policy Analysis*, *15*(2), 129-151.

Panel on Educational Technology. (1997). *Report to the President on the use of technology to strengthen K-12 education in the United States.* President's Committee of Advisors on Science and Technology. Washington, D.C.

Ringstaff, C, & Yocam, K. (1994, April). Integrating technology into classroom instruction: Creating an alternative context for teacher learning. Paper presented at the annual meeting of the American Educational Research Association, Chicago, IL.

Stepien, W., & Gallagher, S. (1993, April). Problem-based learning: As authentic as it gets. *Educational Leadership*, 25-28.

Torp, L., & Sage, S. (1998). *Problems as possibilities: Problem-based learning in K-12 education.* Alexandria, VA: Association for Supervision and Curriculum Development.

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Multimedia in the Classroom With PowerPoint and VBA

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Abstract: This paper describes the results of a pilot project to use PowerPoint and Visual Basic for Applications with a class of teachers taking Multimedia Design in the Classroom. Most participants in the class were enrolled in a masters program in Educational Technology and had completed Introduction to Educational Technology in which they learned basic multimedia functions of PowerPoint and HyperStudio. Few participants had more than beginner-level computer programming background but all were able to use and modify a limited number of Visual Basic for Applications tricks to create fully interactive multimedia projects.

Introduction

Interactive multimedia needs a mechanism to facilitate interactivity. Most basic tools, even modern word processors and spreadsheets, support the incorporation of a wide range of media, such as graphics, sound, and video. But few tools support interactivity, and of those, even fewer are within the reach of classroom teachers. Professional tools are cost-prohibitive, and many tools require technical skills that are beyond the level of even technology-savvy teachers. A graduate-level class in multimedia design that is geared to classroom teachers must strike a balance between sophisticated technology and accessibility; i.e., we want to stretch the teachers but not to the point that they cannot use in their own classrooms what they have learned.

PowerPoint is a tool that is widely available in schools because it is part of the Microsoft Office suite of tools. The basics of PowerPoint are very easy to use, and many teachers are already using PowerPoint in their classrooms. With the advent of PowerPoint 97/98 (and with little change in PowerPoint 2000), PowerPoint supports the basic tools of interactivity. PowerPoint slide shows no longer are limited to linear presentations. With buttons and hyperlinks, they can be full hypertext documents that provide links to multiple paths (Cavanaugh & Cavanaugh, 2000). This is a start, but it is not enough.

The true power of interactivity comes with scripting. Fortunately, PowerPoint comes with a sophisticated scripting language: Visual Basic for Applications (VBA). With VBA, the possibilities are endless. VBA is a complete object-oriented programming environment. VBA can provide interactivity with buttons, textual input, variable feedback, and much more.

"Wait!" I hear you cry. VBA is a sophisticated programming language. Can teachers become programmers? Certainly, many teachers can become programmers—and Galloway (1999) even argues that all teachers should have a foundation in programming—but the goal is not to create *programmers* but to create *scripters*. A programmer learns all the subtleties of a computer language in minute detail. A scripter might learn some of the details of the language but, more importantly, learns a few easily-modifiable scripts that can perform important tasks.

Scripting might not be a useful technique when used with a stand-alone programming language, but VBA can be built around PowerPoint. Content, media, and some basic interaction are already built into PowerPoint. Knowing a few simple VBA tricks, teachers can add more interactivity. By building the project around PowerPoint, teachers can use as much or as little VBA as their knowledge permits. Every VBA script is built on a framework of PowerPoint, so the basic structure of the project can be built with tools that all teachers can master easily.

This paper describes a pilot project to use VBA to enhance teacher-created PowerPoint projects in the context of a multimedia design class. The class consisted of teachers of various backgrounds, including: computer teachers, general elementary teachers, a middle school science teacher, a high school math teacher, a special education teacher, and a media specialist. Ten of thirteen of the teachers were enrolled in the class as part of a masters program in educational technology. The teachers were asked to report on their experience with computer programming when entering the class. On a scale of zero to five (with zero indicating no experience), none of the teachers reported above a three, and almost all teachers reported a zero or one.

The pilot project was set up to study the feasibility of this approach to a multimedia design class. The basic question was whether or not teachers could successfully learn enough VBA to add a significant level of interactivity to PowerPoint projects. The paper describes why the answer was "yes" in this case, and it describes the methods the class used to make this a successful experience for the teachers.

Multimedia Design in the Educational Technology Program

Multimedia Design in the Classroom is a required class for the Loyola College in Maryland masters program in Educational Technology (see http://www.loyola.edu/education/EdTech/). Additionally, it is used as an elective by other programs in the Education Department. The Educational Technology masters program is geared toward classroom teachers in the K-12 environment who are interested in expanding their use of information and communication technology within their own classrooms or becoming technology specialists on the school or district level.

Loyola College is currently undergoing review by the National Council for Accreditation of Teacher Education (NCATE). To this end, the masters program is aligned with International Society for Technology in Education (ISTE) Standards for Advanced Programs in Educational Computing and Technology Leadership. These ISTE standards are used by NCATE to judge advanced programs (any program beyond initial certification) in Educational Technology. Multimedia Design in the Classroom is largely responsible for addressing standard 4.2 (International Society for Technology in Education, 1996):

> 4.2 Instructional Design and Product Development.
>
> Candidates will evaluate authoring and programming environments for use in the classroom. They will apply instructional design principles to develop, implement, and test interactive multimedia instructional products using authoring environments.
>
> 4.2.1 use and apply more than one computer authoring and/or programming environment.
> 4.2.2 describe the characteristics and uses of current authoring environments and evaluate their appropriateness for classroom applications.
> 4.2.3 describe the characteristics and uses of current programming and scripting environments and evaluate their appropriateness for classroom use.
> 4.2.4 apply instructional design principles to the design of screens, text, graphics, audio, and video in instructional products under development.
> 4.2.5 describe and practice strategies for testing and evaluating instructional products designed.
> 4.2.6 apply instructional design principles to develop substantive interactive multimedia computer-based instructional products.

The goal of the class is to provide K-12 teachers with a firm grounding in multimedia development to create their own multimedia projects for use in their classrooms and to help their students create multimedia projects. Additionally, as per the ISTE guidelines, this class gives a basic introduction to instructional design principles. Since the goal of the masters program is not to create professional instructional designers or professional multimedia designers, the above ISTE guidelines can be met within the context of a one-semester class. However, the class covers a wide range of topics, so the appropriate selection of a textbook and supplementary materials is crucial.

Textbooks

Several textbooks provide a good foundation in Multimedia Design, including Ivers & Barron (1998) and Agnew, Kellerman, & Meyer (1996), which both concentrate on multimedia uses in the classroom. Ivers and Barron (1998) was chosen because of its strong emphasis on an instructional design model that easily can be applied to the classroom. While the text mentions specific technologies, including software and hardware tools, its strength is its emphasis on general principles of instructional design and multimedia design, and how these principles can be applied to the K-12 classroom. The next challenge was to supplement this text with material that can help the teachers use specific technology (in this case VBA) to create working projects.

This is a hands-on technology class in which teachers are not only required to understand general principles but also apply those principles to the design and development of a significant multimedia project. This left the dilemma of technical reference material for the programming/scripting/authoring environments used. As per ISTE standard 4.2.1 (see above), the class was required to "use and apply more than one computer authoring and/or programming environment" (International Society for Technology in Education, 1996). Previous versions of this class had used HyperStudio as the authoring environment with HyperLogo as the scripting language within HyperStudio. For this class, PowerPoint was added as an additional authoring environment with VBA used as the scripting language.

Reference books, at the level of the beginning programmer or scripter, are available for HyperLogo (see for example, Smith & Yoder, 1998; Lynn, 1995). However, no comparable books were available for VBA. VBA is a very sophisticated programming language, and reference books treat it as such (see for example, McFedries, 1999). HyperLogo is also a sophisticated programming language (which is based on the Lisp programming language used for artificial intelligence), but HyperStudio and HyperLogo were designed for schools and reference material has been developed that addresses the needs of teachers and students. Due to this gap in material for VBA, the author chose to develop his own supplementary material that brings the sophisticated power of VBA to a level that a classroom teacher can grasp without a background in computer programming.

This supplementary material, entitled *An Introductory and Oversimplified Guide to Using Visual Basic for Applications for Scripting PowerPoint Slideshows*, gave some background information but concentrated on specific practical applications of VBA for adding interactivity to PowerPoint. The next challenge was to create an environment in which teachers with differing technical backgrounds could learn from each other and learn to use a difficult technology (VBA) that was different from anything that most of them had ever used.

Partners and Templates

One premise of the class was that teachers would work together, if not throughout the entire class, at least when working on a significant final project. To this end, the first project (completed in class on the first day) was titled the *Pick-A-Partner PowerPoint Project*. This project served several purposes:

(1) It introduced some of the potential of PowerPoint as an interactive tool.
(2) It served as an icebreaker by allowing the teachers to meet each other using the technology.
(3) It introduced the concept of templates, an important concept in a multimedia design class.

All teachers in the class had some familiarity with PowerPoint. On the first day, the basics of PowerPoint were reviewed with careful attention being paid to incorporating media, buttons, and hyperlinks (to other places within a PowerPoint slide show and resources outside a PowerPoint slide show). These skills were then used to fill in the media and links in a PowerPoint template. The template included places for personal information, technical skills, and final project ideas. Although this was done at the very beginning of the semester, teachers were immediately encouraged to think about topics for final projects.

To start the second day of class, each teacher went through all the other projects. As they went through a project, they were asked for certain information, including their names, whether or not they were interested in working with the project's creator, and any project ideas they had. This information was added to the slide show in such a way that only the show's creator could access it. When everyone had gone through everyone else's slide show, each teacher returned to their own show to peruse the comments made by potential partners. This acted as an icebreaker and as a mechanism for choosing groups for final projects.

The power of this template project was not merely that the teachers only had to concentrate on the media and content. This, in itself, was a powerful introduction to the template concept. But even more powerful were features that were built into the template that the teachers could not, at that point, do themselves. All interactive features were added with VBA, providing a powerful example of the use of VBA in PowerPoint. The VBA code was made available to teachers and studied as part of the class.

Programming Concepts

VBA is a programming language. To fully understand it and take full advantage of it, one must understand basic programming concepts. While the goal of the class was not for teachers to fully understand VBA or take full advantage of it, introducing certain programming concepts was beneficial. This was always done in the context of performing a specific task. With the emphasis on scripting, the theme was *script first; ask questions later*. That is not to say that questions were not welcomed at any time, but that each VBA script that was introduced was introduced to either be useful in and of itself or with only minor modifications. Without understanding the programming concepts, teachers could use the script unchanged. Significant programming concepts, such as variables, loops, and if-then statements were then introduced as part of the working scripts. As teachers gained more knowledge about these concepts, they could modify the scripts to tailor them for their own purposes.

Some teachers left the class with only a vague understanding of key programming concepts. These teachers were only able to make minor modifications to scripts that were given to them. Others were able to grasp many programming concepts and were able to make significant modifications to scripts to do new and interesting things with VBA.

Simple Script Examples

The scripts that were introduced to the class started out simply. To start with, teachers put simple message boxes on the screen:

```
Sub SayHello()
   msgBox("Hello")
End Sub
```

This quickly advanced to scripts that could ask for user input:

```
Sub YourName()
   userName = InputBox(prompt:="Type your name", _
      Title:="Input Name")
End Sub
```

The input was then used in a message box:

```
Dim userName As String

Sub YourName()
   userName = InputBox(prompt:="Type your name", _
      Title:="Input Name")
End Sub

Sub DoingGreat()
   MsgBox("You are doing great, " & userName)
End Sub
```

Along the way, the concept of variables was discussed.

By tying YourName to a button on the first slide (possibly adding to that a simple script to advance to the next slide), the DoingGreat feedback could be placed anywhere in the slide show. This feedback would include the user's name.

With simple scripts, like the ones above, and more complex scripts that were introduced throughout the semester, teachers learned how to add objects (such as drawn shapes and text boxes) directly to PowerPoint slides, how to add slides, how to modify the text on a slide, how to keep track of right and wrong answers in a quiz, and how to provide feedback on a menu slide to indicate which topics had been visited by the user. All the while, issues of instructional design, graphical design, interface design, student-created multimedia projects, assessment, and much more were discussed.

Projects

Teachers demonstrated their skill with two VBA projects. The first project required the teachers to use a few of the VBA tricks they had learned. This was a technical project, where they were to show that they had mastered a few tricks. They had to include at least four tricks from this list:

- Student inputs a name which is used in feedback.
- Student answers some questions and is given feedback as to the number of correct answers.
- Objects are added to slides.
- Text is added to or modified on slides.
- Text color, font, size, or style is modified.
- A menu gives feedback as to what topics have been visited.
- Timed functions are used (with VBA, not standard PowerPoint timing).

For the most part, the VBA code for these tricks could be taken directly from class handouts. If this were a computer programming class, simply taking code from a handout would be discouraged. However, with the emphasis on scripting, mastering four or more of these tricks leaves a teacher with a limited but powerful set of tools to add interactivity to PowerPoint slide shows.

The final project was the most significant accomplishment for the class. Teachers worked alone or in groups of two, three, or four. In the final projects, teachers applied what they had learned about interactive multimedia and VBA to a significant educational project. Some groups chose to create templates for their students; other groups chose to create interactive projects that were complete, and others chose to do both. Teachers had a choice of using HyperStudio with HyperLogo or PowerPoint with VBA for their final projects. All groups chose PowerPoint because it was more accessible to them at home and in their schools and because the older version of HyperStudio we had available in class was not as stable as PowerPoint on the Windows platform.

Work on the final projects included discussions of how to create and assess a group project, instructional design, and storyboarding (a storyboard was required in advance for each final project). The class emphasized learning while doing and tying important concepts like these from the textbook to real projects.

In terms of VBA, the amount and complexity of VBA used varied from group to group. The goal was to have everyone comfortable with a few basic tricks. This was clearly demonstrated in the final projects as each group used at least a few basic tricks. More advanced teachers took VBA to the next level and were able to modify scripts used in class and write a few original scripts to create powerful interactive effects. The most common uses of VBA were for users to add their own feedback to a presentation and for quizzes.

For example, the *Canada* group created a template for their students about the provinces of Canada. They modeled their use of VBA after the Pick-A-Partner project. Each group of their elementary students would fill in the information about their chosen province into the teacher-created template. Other students would then have the opportunity to go through their slide show and give feedback about the information they learned about that province.

The *Economics* group created a project with several parts, including a tutorial and quiz for elementary students. The tutorial used VBA to keep track of menu selections, insuring that the students had visited all sections of the tutorial before proceeding to the quiz. The quiz used VBA to keep track of individual scores and provide feedback about numbers of right and wrong answers.

While these projects based their VBA on the tricks presented in class, the teachers expanded these tricks and demonstrated an ability to do a limited amount of original programming.

Conclusions

For the professional multimedia designer, PowerPoint is probably not the right choice. However expensive and complicated tools are not common in schools. Using PowerPoint as a framework, teachers are able to add as much or as little interactivity as their skills allow and their needs require. Thus, PowerPoint is an appropriate multimedia tool for teachers.

The goals of the Multimedia Design in the Classroom class included providing skills that teachers could use to create their own multimedia projects and provide skills to allow them to have their own students create multimedia projects. The first goal clearly was met. All teachers in the class were able to master a few basic VBA tricks that they could use to add true interactivity to their PowerPoint slide shows.

The second goal was partially met. The teachers learned to create multimedia projects that students could use. They also learned to create multimedia assignments in which their students could create multimedia projects. However, none were confident enough to try to get their students to script with VBA. The largest extent to which VBA would be used by these teachers' students was to fill in templates with VBA already scripted by the teacher. Perhaps as the teachers use VBA more on their own, they will gain the confidence to allow their students to create their own interactivity with VBA.

Overall, the class was a success. The emphasis on interactivity allowed teachers to think beyond media to make projects that engaged students and were more than page-turners with pictures.

References

Agnew, P.W., Kellerman, A.S., & Meyer, J. (1996). *Multimedia in the classroom.* Boston: Allyn and Bacon.

Cavanaugh, T., & Cavanaugh, C. (2000). Interactive PowerPoint for teachers and students. In D.A. Willis, J.D. Price, & J. Willis (Eds.), *Technology and Teacher Education Annual*, (pp. 496-499) Charlottesville, VA: Association for the Advancement of Computing in Education.

Galloway, J.P.. (1999). The value of programming in beginning educational computing. In J.D. Price, et. al. (Eds.), *Technology and Teacher Education Annual*, (pp. 376-381) Charlottesville, VA: Association for the Advancement of Computing in Education.

International Society for Technology in Education (1996). Standards for advanced programs in educational computing and technology leadership. *Curriculum Guidelines for Accreditation of Educational Computing and Technology Programs.* [Online] Available: http://www.iste.org/standards/ncate/advanced.html

Ivers, K.S., & Baron, A.E. (1998). *Multidmedia projects in education: Designing, producing, and assessing.* Englewood, CO: Libraries Unlimited, Inc.

Lynn, B. (1995). *Exploring HyperLogo: A scripting language for HyperStudio.* El Cajon, CA: Roger Wagner Publishing, Inc.

McFedries, P. (1999). VBA for Microsoft Office 2000 unleashed. Indianapolis: Sams Publishing.

Smith, I., & Yoder, S. (1998). *Inside HyperStudio: Scripting with HyperLogo.* Eugene, OR: International Society for Technology in Education.

Reflections on the Impact of ICT on Teacher Education

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Abstract

"New ideas of any worth to be effective require a in-dept understanding and the development of skill and commitment to make them work" (Fullan, 1993)

The attitude of the teacher has been identified as a crucial factor in the successful integration of ICT in education as has the role of teacher education. This paper reflects on the learning experiences of a group of teachers – two in particular - during the first year of a Masters programme in the area of ICT in education. Supported by data gathered from the class mailing list, video taped reflection, face-to-face interviews and informal discussion this paper focuses on how student-teacher attitudes to the role of technology, and perspectives on their own learning, changed over the course of the first year.

Background

The course in question is a masters degree in the area of IT in Education run jointly by the Departments of Computer Science and Education in Trinity College Dublin. The first two authors are students on the course the second two instructors. The stated aim of the course is to enable graduates "to play a leadership role in the area of IT in education". The degree is offered on a part-time basis over two years and is structured as a taught component followed by a substantive research dissertation leading to the degree of Master in Science.

The first cohort of twenty-eight students started in October 1999. Students were selected on the basis of academic qualifications, teaching experience and some by interview. They were characterised by a mixed ability skill set in terms of technical proficiency. Most of the students on the course were returning to formal education after many years. Assessment of student learning during the first year was via nine assignments, some done in groups, some done independently. Four assignments were given at the end of term one, four at the end of term two and one at the end of term three. The final assignment consisted of a capstone, or meta-assignment, and required a ten thousand-word dissertation and an IT artifact which was either a piece of educational multimedia or a website to present the findings of the *meta* research. A strong sense of community is one of the hallmarks of the class and students in the class refer to themselves as *mite99* after the name of the class mailing list mite-99 (Masters in IT in Education class intake 1999). The second intake are referred to as *mite00*.

The research reported here focuses particularly on three snapshots of the class taken in October 1999, June 2000 and October 2000. (It is from these sources that most of the student, and staff quotations, used in the rest of this paper are taken.) We attempt to identify positive and negative learning outcomes and how learning changed over time. The course aimed to provide an environment where students learned with and about technology and we explore how this changed not only the learning outcomes but also more fundamentally the learning process itself.

Summary of Findings

It was found that there was a marked contrast between the students' learning and the attitude to learning at undergraduate level and that on the Masters course. Overall the learning experience on the Masters was a more positive one than that at undergraduate level. The reasons for this are explored fully in the body of the paper but a contributing factor was certainly the smaller class size which allowed the development of interpersonal relationships among the entire class not possible at undergraduate level, where up to five hundred students took some courses.

As elaborated upon below the use of ICT had a significant effect. In particular the use of a simple asynchronous communication medium, i.e. a class e-mail list, contributed significantly to the development of a learning community as it allowed students to engage in anytime, anywhere communication with their peers and thus helped learning to take place in a scaffolded environment of peer support and support from lecturers.

Teaching strategies were significantly different from those at undergraduate level, where the didactic model was the norm. On the course the "lecturer as learner and learner as lecturer" model was the norm. This was evidenced through the use of video for lecturer self-analysis and reflection in an effort to learn more about teaching through and with ICT. Course lecturers acted as learners by auditing courses given by other lecturers. This allowed lecturers to experience the course as a learner and is typified by a remark made by one of the course lecturers on being interviewed as part of the reflection process at the end of the first year - *"I think I've learned more as a learner than a teacher".* Students often acted in the role of lecturer themselves by giving classes to their peers and to the lecturers. The group dynamics and the fact that a thriving learning community existed allowed students the confidence to do this. This confidence further allowed students on the course to make even greater strides in the fields of education and business. One student on the course is now currently lecturing on this year's first year intake, while two other students have left teaching and taken up jobs in ICT/Education companies. Still others have taken career breaks and become involved as researchers in the University's Center for Information Technology in Education (CRITE).

The body of this paper argues that different learning and teaching strategies facilitated by the use of Information and Communication Technology characterised this positive learning experience.

October 1999 Snapshot

At the outset the class were highly committed with one student commuting from a distance of over 200 km away twice, and sometimes three times, a week to attend lectures. There was a mixed ability skill-set among students in relation to technical proficiency. This proved daunting and some students felt intimidated by the high level of experience and skills of their peers. There were students who were familiar with Java programming or had completed degrees in computer science while others were just mastering Microsoft Word! Many students were returning to learning after a long period of time and were motivated to learn because of the commitment they had made in terms of time and money. There was a willingness to use new learning tools in the quest for IT knowledge. The high attendance at lab sessions was an indicator of this willingness. Students on the course, as educationalists and parents, wanted to equate their IT skills with those of their counterparts in the business world and with those of their own students and children. Both of these aspects emerged clearly when students introduced themselves to the class at the first lecture.

At this early stage one of the main problems experienced by students was the originality of the type of learning process. Students were faced with the prospect of engaging with new technology, not just the internet but MOOs (Multi User Object Oriented), MUDs (Multi User Domains), SMART boards, digital video etc. More fundamentally students were faced with new types of learning involving collaboration, communication, presentation, publication, sharing and above all reflection on their own work and learning process. For most it was a new way of learning which was initially frightening, and off-putting, and there was some reluctance on the part of students to engage with this new methodology.

> *"We were exposed to completely different ways (of learning)."*
>
> *"We were coming from this drastically different learning environment to this new learning environment which was totally alien. I was frustrated by it."*

This reluctance was exemplified at the beginning of the year when it was noted that there was very little engagement in the *mite99* e-mail list. In October 1999 there were approximately eleven e-mails sent and these came mainly from the lecturers. This stood in marked contrast to October 2000 when forty nine e-mails were posted. This was also shown in students' lack of enthusiasm with regard to the use of digital video in first term assignments.

This reluctance to engage with this new type of learning was further exemplified by the lack of participation in the an online debate which the class was invited to participate in. Students were required to obtain a login name and password by filling in an online form and submitting it to the debate organisers. It was a course requirement that students participate, however only 15% of the class did so. When the class was queried as to why they thought the participation rate was so low some responded that the debate took place on a Saturday and they wisely (in their opinion) chose to remain in bed! More seriously it was remarked that this type of activity was too daunting and ambitious for those who had little or no experience of using the Internet, in particular engaging in online debate with people who had done so before.

One particular lecture in October 1999, introduced the concept of MOOs. Students had no prior knowledge of using MOOs for learning and it was introduced without much scaffolding. Instead the focus was on discovery learning which as not well received at this point in the year. It was later discovered that the reason for this was because students did not fully understand the meaning of the task or the concept of MOOs. Students became increasingly confused and their desired learning outcomes were not achieved. Reference to a log of this particular MOO session is testament to this. There were lots of jokes and chit chat unrelated to the lesson objectives with the reflective comments being of the form *"These (MOOs) are dumb".*

June Snapshot

At this stage of the year students had completed the taught component and were completing their end of year capstone, or *meta*, project. As was to be expected the quality of the contents, and production, of assignments was of course higher than that found during the year[1]. By now students were using more sophisticated tools and experimenting with programming. Netscape Composer, so highly prized in the first term, was left for dust with students using tools such as Dreamweaver or Flash to produce their artifacts which ranged from presentation of research assignments in the form of websites to the development of educational software.

June also witnessed the development of higher expectations and motivation to continue experiencing success on the part of students. This was borne out by a readiness to become involved in ICT related projects outside the realm of the course. In particular some students became involved in research projects being carried out by CRITE which led to one student from the course sharing a stage at a confernce in Dublin with Nicholas Negroponte, the Director of MIT's Media Lab. Motivation and commitment was also borne out by students initiative to learn the Dreamweaver package even though it was not taught on the course. This was done through peer tutorage and independent learning. By August the motivation had still not waned and many students embarked on commercial courses to further develop their web authoring skills.

There was far greater participation in online discussions at this stage with over 90% being active participants . Many of the emails at this point expressed support and sympathy because of the stress and strain being experienced by students in relation to the *meta* assignment. (*"Don't mention the meta"* was a common response to queries about work in progress.) The email list offered an important support structure to students, particularly at this stressful time. *"Keep up the good work"* and *"Nearly there"* were common messages to the list. *"Where's the barbecue happening"* was the question on everyone's lips after the *"meta madness"* had ended!

There was a willingness to share resources both in class and online particularly because the *meta* assignment was proving so time consuming and stressful. People used the class mail list to share resources, found online, with fellow students. As soon as someone learned a new skill it was passed on to the class, the mastery of digital video editing being a case in point. Books, journals and feedback on individual assignments were offered. Most students felt more confident and had better self esteem. This resulted in even more access to assignments and work in progress as people wanted to share and reflect and had the confidence to do so in a safe learning environment.

[1] So high in fact was the standard that the external remarked that many of the Meta assignments were the equivalent of Masters dissertations, such was the amount of work that had gone into them.

October 2000 Snapshot

At the start of the second year of the program a number of career changes took place among the original cohort. The first two authors had left formal teaching and embarked on new career paths. Others had extended career breaks to focus on research, while others are considering the possibility of pursuing PhD degrees. Most interestingly, a number of the original cohort are now engaged in lecturing course modules to the first year students.

Enthusiasm has not waned, evidenced by the fact that more than half of the *mite99* class turned up on the first night of lectures for *mite00*, to welcome the new class and share their experiences of learning over the past year. It was remarked by *mite00* students and one of the lecturers that the enthusiasm and motivation of *mite99* was an inspiration to *mite00*. Immediately a system of mentoring was fostered between the *mite99* class and the new incoming class. ICT facilitates this process as the main communication method is via email. A sharing of resources and assignments has also begun to emerge. Data from the *mite00* web discussion reveals that the new intake are experiencing the same fears and anxieties as their predecessors.

> *"I feel overwhelmed with unfinished tasks & wonder when I will post the uncompleted strands - which are now on Floppy disc. While many of my peers appear to achieve this, my difficulty is not getting set tasks completed on the given night".*
>
> *"I feel that I am lacking in technical ability compared to some people on the course".*

It is our intention to map the impact ICT has on the learning of this group and to compare it with the ongoing reflections of the *mite99* group. We hope to monitor the interaction between the two groups with particular emphasis on the use of email list facilitates and a virtual learning environment.

A New Type of Learning & The Role of ICT

As argued in (Margaret Riel and Kathleen Fulton, 1998) computer technology can be viewed as an effective vehicle *"to transform classroom learning into learning communities with students, teachers and community members all playing a vital role in directing the course of education."* The experiences described here exemplify this type of learning model with its emphasis on collaborative group based learning, lecturer as learner and learner as teacher, as alluded to earlier. Electronic communication, peer tutoring etc. have contributed to the development of a community of learners in which learning flourishs in a non- threatening, supportive environment. Learning at undergraduate level was the antithesis of this experience. It stressed isolated, competitive endeavor in an environment where failure was not a valued learning experience.

The students' own perceptions on how ICT has impacted on their learning experiences are informative. Initially many students began the course with the perception of ICT as a 'scary' subject, e.g. *" I was afraid to be left alone in a room with the computer for fear it might blow up". "I don't know the first thing about technology. I am hearing words like operating system, ftp, ASDL, broadband and I haven't a clue what they mean!"* while some were even unconvinced as to the value of ICTs in education. *"I don't see what a computer can do that a blackboard and chalk can't, and with far less hassle."* In addition, many students had little experience of integrating ICT into the curriculum. *"I have never used a computer with my students before. Number one, I have never had the opportunity and number two I would not know how to".*

Students found however that their perceptions changed when they experienced success in learning and grew more confident in using ICT as a learning tool themselves. *"We can see how children can benefit from our experience and that's been very motivating".* Student fear of ICT and group work was overcome by experiencing early success in learning through and about ICTs. *" I remember when fellow students arrived at my house to do the first assignment. I was terrified. I had never worked in a group before where I shared my work with others and displayed it for them to comment on!" "Having received a good grade and enjoyed the experience of working collaboratively I was ready to do so again but this time without the anxiety"* (A positive view towards ICT is not universally shared. *"I felt there was no reward because by* *the time I had finished coming to terms with the technology I was so exhausted that I couldn't enjoy the success".)*

Early success was crucial to the development of a positive attitude to ICTs and being motivated to continue learning. The course created a range of learning opportunities and environments, which addressed the needs of multiple intelligences and provided a framework for successful learning outcomes. Riel & Fulton (1998) argue that people of multiple intelligences working collaboratively makes a learning community interdependent i.e develops peoples strengths and competencies which leads to empowerment. " *I really felt that we brought out the best in each other*" one student said about collaborative learning.

A particularly interesting observation on the course to date is that students with a moderately successful experience of learning at undergraduate level are achieving higher results than many of their peers who excelled in the traditional undergraduate and even postgraduate system. Many factors may be contributing to this but one possibility is that those who are most dissatisfied with the traditional learning paradigm may feel more motivated to fully embrace a new learning environment characterized by self-direction, collaborative learning, peer tutoring and experimentation with new technology.

Motivation, combined with competence and confidence in learning with and about ICT led to increasingly successful learning outcomes as the course progressed. This development of competency in ICT was invaluable in motivating students to become involved in the transfer of learning to the global community. This was evident when an interest emerged among *mite99* students in participating in conferences and projects outside the realm of the course. Fullan (1998) views this "connection with the wider environment as being critical'' to successful learning.

A steep learning curve was recorded during the course. Students' learning began with Netscape Composer and PowerPoint progressing to Macromedia Flash, Dreamweaver and Java Script. Research, presentation (both orally and written), communication and collaboration skills were enhanced. Keeping pace with regular changes in technology necessitates lifelong learning. A specific example of this related to the constant revisions of software and applications used on the course. In particular web-authoring tools changed at a rapid pace.

Finally and perhaps most importantly the students stressed the importance of reflection in the learning process and how ICT facilitates this. Students revisited assignments and used their reflections as a catalyst to construct new learning situations. ICT enabled this process by facilitating rapid revision and review of learning. For example the use of video allowed immediate review of reflections on learning and thus the reflection became an integral part of the learning process itself.

Summary

This paper has briefly explored some of the reflections of students on the affect that ICT and broadly collaborative, or social constructivist, approaches to learning have had upon their own their own learning. The reflections are for the most part very positive. It is still however early days and we aim to continue to monitor and reflect upon the learning experience as we endeavor to construct knowledge on how to learn with ICTs.

References

- Vygotsky, L.S "Mind in Society, the Development of Higher Psychological Processes" Cambridge, MA; Harvard, Union Press, 1978
- Riel, M & Fulton, K "Technology in the Classroom, Tools for Doing Things Differently or Doing Different Things", America Educational Research Association, San Diego. 1998
- Pea, R. D & Gomez, LM "Distributed Multimedia Learning Environment, Why and How, Interactive Environment". 1992
- Merrill,M.D "Constructivism and the Instructional Design" Educational Technology 31,no.5(1991):45-53
- Pachler, N. "Theories of Learning and ICT" ed. Marlyn Leask and Norbert Pachler. London: Routledge, 1999
- Scalglion, R "Analysing the Results" In Doing your Own Research: ed Eileen Kane, London and New York, Marion Boyars,1993
- US Department of Education. "An Educators's Guide to Evaluating the Use of Technology in Schools and Classrooms". December 1998
- Holmes, Bryn. "IT Supported Research Methods", December 1999. http://www..cs.tcd.ie/courses/105/Introduction.html
- Holmes, Bryn." Computer Based Resources for Research", January 2000 http://www.cs.tcd.ie/courses/mscitedu/101/research

Instructional Staff Development Project: A Pre-Post-Post Follow-up Evaluation

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Abstract: The second year of the professional development project was designed to facilitate the integration of instructional technology in the classroom. Twenty-five teachers in grades 3-5, from 9 different schools, participated. The project consisted of four workshop modules on technological training and five modules on development of interdisciplinary thematic units for integrating materials to achieve the Mathematics, Science and Technology, and English Language Arts New York State Learning Standards. Effectiveness of the project was determined by giving all participants a General Pre-test to determine baseline measures for each of the aspects of the Project and a General Post-test. In addition, participants in the original project were contacted one year later and were given a General Post Follow-up measure. Results indicated that the both years of the project was highly successful. The Post Follow-up showed that the positive changes achieved during the first year, endured one year later.

Introduction

The original Targeted Instructional Staff Development Project took place during the spring semester of 1999. Its major purpose was to facilitate integration of technology in the classroom. The ultimate goals were: to empower students to use technology in all phases of their education, to facilitate teachers as learners, and to achieve the New York State Learning Standards in Mathematics, Science and Technology, and English Language Arts, and to facilitate integration technology into the curriculum. The one-semester project consisted of nine separate workshop modules.

The Targeted Staff Development Project was renewed for the 1999-2000 academic year. In the second phase of the project, seventeen teachers from six different school districts participated in seven workshop modules. Four of the modules were specifically designed to facilitate integration of technology into the classroom.

The purpose of this paper is to describe the evaluation procedures used to determine the effectiveness of both phases of the project. A review of the literature suggests that the major limitation of evaluation research is the research design employed. In 1997, Bauder, Carr, Mullick & Sarner reviewed research techniques employed in evaluating effectiveness of programs and found that few employed sound research designs. As a result, the authors developed a set of guidelines for researchers that were adopted for the current study.

A pre-post test design was employed. This design is particularly appropriate for assessing both formative and summative information. Because each subject acts as his/her own control it minimizes any random influences of extraneous factors and determines the effects of the project on changes between pre and post-measures.

Previous research by Ely (1990) and Bauder (1993) has shown that there are a number of conditions that facilitate or impede implementation of educational technology. Questions were included in the questionnaires to determine if changes of perceived barriers to integration of educational technology into the curriculum occurred as a result of participating in the project.

The Evaluation of the Project

The participants in both phases of the project were given a general pre-test to determine baseline measures for each of the aspects of the project. Upon completion of the workshop modules, a general post-test, consisting of many of the same items, was administered for both phases of the project. These questionnaires provided summative information regarding the overall impact of the various modules on teachers' responses. Pre-test and post-test questionnaires were also administered for each of the individual modules. These results were used for formative information to refine or modify the procedures and information being presented in each of the modules, if required. A post-follow-up questionnaire was also administered to the participants of the first phase of the project. Only the results of the general pre and post-tests and the post-follow-up test are considered in this paper.

The Questionnaires

The pre and post questionnaires had four common parts. Part I examined frequency of use of hardware and software, perceived importance of these technological aspects in achieving the New York State Learning Standards, and the teachers' degree of comfort in using each of the items. Part II examined teachers' experience with technology including the use of technology in the classroom and the specific activities for which students used technology. Part III examined the extent to which teachers integrated technology into the classroom and Part IV tapped teachers' perceptions of barriers that impeded integration of technology into their classroom instruction. The post-test included a final section that asked teachers to rate each of the modules on three dimensions. These responses provided an overall summary of the teachers' experiences throughout the project.

Results

Pre-Post Changes to Determine the Effectiveness of the Development Modules
Part I : Frequency of Use and Degree of Comfort Working with Hardware and Software

For summary purposes, total indexes were developed for both phases of the project and for the post-follow-up by summing the ratings for the subsets of items related to frequency of use of hardware, frequency of use of software, comfort in using hardware and comfort in using software. The average scores for each Total Index is displayed in Table 1. In both instances, teachers rated the items higher on the post-test than on the pre-test. The only exception was average comfort in using the hardware items in Phase I. The average on the pre-test (52.00) was higher than on the post-test (49.96).

		Mean Pre-test Phase I	**Mean Post-test Phase I**	**Mean Post Follow-up Phase I**	**Mean Pre-test Phase II**	**Mean Post-test Phase II**
Frequency of use of	Hardware	32.09	47.87	32.50	33.73	41.60
	Software	47.22	69.87	62.47	49.40	76.93
Comfort in using	Hardware	59.48	49.96	51.13	60.40	76.93
	Software	52.00	84.30	79.47	56.27	91.93

Table 1: Mean scores for the indexes for total frequency of use and total comfort for hardware and software items in both phases of the project.

An analysis of variance for repeated measures using overall indexes from the pre-test, post-test and post-follow-up as the within-subjects variables for Phase I was conducted. The results of the analysis for Total Index of frequency of use of hardware and Total Index of comfort with hardware yielded one non-significant results (see rows 1 and 3 columns 3 through5). This finding is not surprising in light of the fact that teachers continue to use the hardware they used previously. However, significant F values were found for Total Index of frequency of use of software ($F = 6.72$, $df = 2,28$) and Total Index of comfort in using software ($F = 16.51$, $df = 2,28$). Post-hoc comparisons indicate that the pre-test scores are significantly less positive than both the post-test and the post follow-up while the post-test and post follow-up scores did not differ significantly. Taken together, these results suggest that positive changes occurred as a result of participating in Phase I of the project, and remained positive even after a year had elapsed.

To examine the data for Phase II more fully, t-tests for dependent (paired) samples were performed to compare changes in the Total Indexes to determine whether or not significant changes in teachers' responses occurred as a result of their participation in Phase II of the project. The findings from the analyses of the t-tests for the Total Index for frequency and Total Index for comfort of use of hardware and software are displayed in Table 2.

Post test – Pre test for Phase II	Mean differences	t	df	Sig. (2-tailed)
Total frequency of use of hardware	7.87	2.07	14	.057
Total frequency of use of software	27.53	3.52	14	.003**
Total comfort of using hardware	5.07	.52	14	.613
Total comfort of using software	35.67	4.15	14	.001**

** $p < .01$

Table 2: Summary of the t-tests for dependent samples on changes in total index for frequency of use and total index for comfort in using hardware and software for Phase II.

An examination of column 5 in Table2 shows that two of the analyses yielded significant changes from pre to post testing. Rows 2 and 4 show that frequency and comfort ratings for using software were significantly higher at the completion of the project than at its onset. However, two of the t-test failed to achieve significance. No significant changes occurred in the teachers' overall ratings of frequency of use of hardware or level of comfort in using the hardware at the end of Phase II of the project. This finding is not surprising in light of the fact that the types of hardware used tended to be the same types that teachers reported having experience with prior to the project. It appears as though the frequency and comfort levels in reference to hardware were not impacted by participating in Phase II of the project.

Part II: Changes in Experience with Integrating Computing into the Classroom

Teachers were asked to rate their experiences in dealing with technology in the classroom. For Phase I of the project, teachers responses yielded a pre-test mean total index of 42.40, a post-test mean total index of 59.47 and a post-follow-up mean total index of 61.73. A repeated measures analysis of variance on the total index for use in the classroom achieved significance. The post-hoc test indicated that the significant difference was caused by the lower scores on the pre-test while no significant differences occurred between the post and the post-follow up evaluation. These results show that teachers tended to integrate computing into the classroom significantly more after participating in Phase I of the project. In addition, these significant changes endured one year later.

Changes in responses to items dealing with experiences involving technology in the classroom for participants of Phase II of the project yielded similar pattern of results. The results of the series of t-tests

Post test – Pre test for Phase II	Mean Differences	t	df	Sig. (2-tailed)
Fully Integrate technology into instruction	2.67	4.34	14	.001**
Integrate technology into specific units	2.27	4.21	14	.001**
Guide students in use of technology	1.93	2.64	14	.020**
Accommodate different levels of expertise	1.47	1.79	14	.096
Relate Technology to curriculum objectives	2.67	4.51	14	.000**
Relate Technology to student achievement	2.80	4.98	14	.000**
Prepare materials for student management	2.87	43.62	14	.003**
Prepare classroom materials for students	3.07	4.51	14	.000**

$^{**}p < .01$

Table 3: T-tests for dependent groups on items related to experience with technology for Phase II.

for dependent samples examining these changes are displayed in Table 3. An examination of the last column of Table 3 shows that all but one of the t-test achieved significance. These results indicate that teachers believed they were better able to implement technology into their curriculum at the completion of project. The responses on the post-test of Phase II were significantly more positive than on the pre-test. Taken together, these findings show that participating in Phase II of the project did have a positive impact. Upon completion of the project, teachers believed that they were better able to integrate technology into their curriculum and into specific units, and to guide students in the use of technology. In addition, teachers were better able to relate technology to curriculum objectives and to student achievement. Finally, the teachers indicated that upon completion of the project, they felt more confident in developing materials for student management using instructional technology and in preparing materials to be used by students in the classroom. However, Table 3 also shows that teachers did not feel that they were better able to accommodate to different levels of student expertise, even after participating in the project. It may be that more practice and time to integrate learning into the teacher's own experience is required before they feel that they are able to use the knowledge in a flexible manner.

Part III: A Comparison of Perceptions of Teachers use of Computers in the Classroom Compared to Students.

Part III of the pre and post-tests obtained during Phase II of the project compared teachers' perceptions of frequency of various activities involving the use of technology in the classroom by the teachers themselves and by their students. Teachers believed they used computers more frequently compared to their students for organizing and storing information, for e-mail and for retrieving information from the Web. However, no significant differences were perceived between teacher and student use on text editing, creating non-visual graphics, performing calculations, and performing any of the Web related activities. In examining the ratings on each of these individual items it becomes clear that no differences occurred for one of two reasons. Teachers tended to see their level of use of computers for text editing, to support individualized learning and for remediation as similarly high. Mean ratings for these items ranged from 7.7 to 6.5 on a nine-point scale. However, teachers perceived activities associated with the development of Web pages and performing calculations as equally low for both themselves and their students.

Part IV: Changes in Perceptions of Barriers to Integrating Technology into the Curriculum.

Part IV of the post-tests was designed to re-examine the teacher's perceptions of some of Ely's (1990) and Bauder's (1993) factors that impede their ability to integrate technology into the classroom. Results from Phase I of the project indicated that teacher's perceptions of degree of impediment of integration of technology into the classroom significantly decreased for all but one perceived barrier. A Total Index of Perceived Barriers was also developed and was used as the dependent measure for a repeated measures analysis of variance for the three time periods of Phase I. The mean Total Index for Perceived Barriers was 71.13 for the Phase I Pre-test, 63.07 for the Phase I Post-test and 39.47 for the

Phase I Post-Follow up. The significant F value of 7.74, df = 2,28, $p = .002$, shows that the ratings changed over the time periods. The post-hoc test indicated that teachers perceived the factors as significant impediments to integrating technology into the curriculum prior to participating in the project. In addition, the perceptions of degree of impediment on the post-test were significantly higher than on the post-follow-up. One explanation for this continued reduction in perceived impediments over the three time periods is that as teachers continue to work with the hardware and software and gain additional confidence, external factors are perceived as less of an impediment to integrating technology into the curriculum.

T-tests for dependent samples were performed to examine whether or not changes in perceptions occurred during Phase II of the project. The results of these analyses displayed in Table 4 show the same pattern of results as was found during Phase I. Teacher's perceptions of the extent to which the factors act as impediments to integrating technology into the curriculum significantly decreased after participating in Phase II of the Targeted Staff Development Project.

Perceived barrier Post – Pre test for Phase II	**Mean Difference**	**t**	**df**	**Sig.(2-tailed)**
Not enough or limited access to computer hardware	5.40	7.84	14	.000**
Not enough computer software	4.80	7.48	14	.000**
Lack of time in school schedule for projects involving technology	4.13	4.74	14	.000**
Use of technology not integrated into curriculum documents	3.53	5.66	14	.000**
Not enough teacher training opportunities for technology projects	4.27	6.04	14	.000**
Technology integration is not a school priority	.67	.856	14	.406
Difficulty in finding substitutes in order for teachers to attend training	4.07	7.68	14	.000**
Lack of technical support	3.67	5.08	14.	.000**
Lack of instructional support	2.27	2.98	14	.010**
Lack of other supporting materials	3.60	5.78	14	.000**
Total Index for Perceived barriers	38.87	9.22	14	.000**

*****p <.01, *p <.05***

Table 4: Changes in perceived barriers after completion of Phase II of the project.

Part V: Overall Evaluation of Each of the Modules of the Project:

In order to obtain summative information for the impact of each of these individual modules, rather than reporting the analyses of each individual module, the last part of the Post-test asked teachers to evaluate each of the models by: giving an overall favorability rating to each, indicating the extent to which they believe that each Module would be beneficial in achieving the NY State Learning Standards and indicating the extent to which they expected to apply information from each of the modules in their future classes. These responses provide an overall summary of the teachers' experiences throughout the project.

The results of the analyses show that teachers had a favorable impression for each of the modules for both Phase I and Phase II of the project. On a nine-point scale where a rating of 9 indicates high favorability, the average rating ranged from 6.48 to 7.88 on modules in Phase I and from 6.00 to 8.00 on modules in Phase II. The average ratings of the extent to which teachers' believed each of the modules would help to achieve the NY State Learning Standards were also highly favorable with mean ratings ranging from 5.84 to 7.6 on Phase I and 6.00 and 7.87 on Phase II. Ratings of the extent to which the teachers expected to apply information from each module in their future classes showed a similar pattern of results. The mean rating for each module ranged from 6.4 to 8.0 on Phase I and from 6.0 to 7.93 on Phase II.

An analysis of variance for repeated measures using teachers' overall ratings for the eight modules as the within-subjects variable, failed to achieve significance on all three of the sets of ratings. These findings indicate that teachers' overall ratings of the modules were not significantly different from one another and tended to be consistently high.

Conclusions:

The results clearly indicate that both phases of the Targeted Instructional Staff Development Project were highly successful. There were three major sets of findings. First, the teachers' responses for both phases indicate that as a result of participating in the project they were using software more frequently in their classrooms than they had prior to the project. It is interesting to note, however, that there were no changes in frequency or comfort of using hardware. It appears as though the project required teachers to use only the types of hardware with which they already had experience and felt relatively comfortable in using. Second, teachers believe that these activities helped them to learn new ways to integrate technology in the classroom and they felt more confident in using technology themselves and in guiding their students in the use of technology at the completion of the project. The third major set of findings showed significant change in perceived barriers to the integration of technology in the classroom. Factors that had been perceived as barriers prior to participating were seen as significantly less of an impediment as teachers gained new experience and knowledge about technology and learned new strategies for integrating technology into their curricula. This finding is particularly interesting since few of the activities within the project addressed the perceived barriers directly. The one year post-follow-up of teachers who had participated in Phase I of the project indicated that the significant changes that resulted from participating in the project maintained one year later.

Participants did identify several limitations of the project in their post-test comments. Specifically teachers felt that the activities were too concentrated and there was too little time to deal with the material adequately. They also indicated that a severe limitation to integrating technology in the classroom is the lack of technical support when they returned to their schools. Future projects should therefore attempt to address these difficulties.

References

Bauder, D.Y. (1993). *Computer Integration in K-12 Schools*, Unpublished Doctoral Dissertation, Syracuse University, Syracuse, N.Y.

Bauder, D.Y., Carr, D.L., Mullick, R.J. & Sarner, R.(1997). Making research count: Some guidelines for researchers in Willis, J., Price, J., McNeil, S. Robin, B., & Willis, D. (eds) *Technology and Teacher Education Annual*, 1997. Charlottesville, VA: Association for the Advancement of Computing Education.

Bauder, D.Y., Rossi, E., & Mullick, R.J. (2000). Merits of mentoring and modeling in internet technology integration: Overcoming operational obstacles in Willis, D., Price, J., & Willis, J. (eds) Information *Technology and Teacher Education Annual,* 2000. Charlottesville, VA: Association for the Advancement of Computing Education.

Ely, D.P. (1990). Conditions that Facilitate the Implementation of Educational Technology Innovations. *Journal of Research on Computing in Education*, 23, (2), 298-303.

Mullick, R.J., Bauder, D.Y., Sarner, R. and Carr, D.L. (2000). Targeted instructional staff development project: An evaluation in Willis, D., Price, J., & Willis, J. (eds) Information *Technology and Teacher Education Annual,* 2000. Charlottesville, VA: Association for the Advancement of Computing Education.

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When Attitudes Change, Do Changes in Practice Follow?

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Abstract: In order to meet the challenge of teacher education responsive to the integration of the newer electronic technologies, the Integrating Technology in Schools (ITS) Program leading to a Masters of Education in Curriculum and Instruction was developed. The ITS Program is structured around a cohort process that supports students finding common ground around a shared set of experiences, knowledge, readings, activities, and support systems. This paper presents a summary of data obtained during the 1999-2000 ITS Program and examines 1.) changes in participants' stages of concern, 2.) changes in participants' self-reported frequency of technology use, 3.) changes in participants' self-report concerning collegial interactions, 4.) changes in participants' summary of assigned technology use in their classrooms, and 5.) conversations with participants. Examining these changes enabled the authors to discuss the relationship between changes in attitude and classroom practice.

Failure to incorporate technology into the schools is frequently placed on the classroom teacher. Yet, this failure does not belong with the classroom teacher alone or even with the technology itself. Teachers' use of technology often forces it into traditional teaching paradigms that have existed for decades. Teachers and educational reformers rarely recognize that innovative uses of technology require a revision of educational practice if technology is to impact the American education system. Schubert (1986, p. 371), for instance, asserts that the professional educator is "the most salient force in the curriculum improvement process" and that the most important aspect of curriculum development is professional development. He states that for inservice teachers, graduate programs need to focus on the needs of teachers as well as be cohesive and integrated. Such programs should be oriented toward the utilization of research and practical knowledge and take into account the experiences of teachers. Graduate level teachers must be supported in learning that a "teacher is a leader from within, not a dictator (no matter how benevolent) from without" (Doll, 1993, p. 168).

Meeting the Challenge: The ITS Program

In order to meet the challenge of teacher education responsive to the integration of the newer electronic technologies, the Integrating Technology in Schools (ITS) Program leading to a Masters of Education in Curriculum and Instruction was developed. The ITS Program is structured around a cohort process that supports students finding common ground around a shared set of experiences, knowledge, readings, activities, and support systems. Each group shares a common area of inquiry – one that centers on models, methods, and processes that support the incorporation of technology into educational practice. As teachers enter the Program, their most pressing goals center on learning to use the newer electronic technologies. Participation in the ITS Program, however, leads not only to technological expertise but to a consideration of the social, cultural, political, and epistemological impacts of these technologies. Participants are encouraged to wrestle not only with how to use these technologies but also with their meaning for the practice of education (Norton, 1994).

Since its inception, the impact of the ITS Program on the attitudes of participants has been repeatedly studied. Sprague (1995), for instance, used an ex post facto survey/interview design to investigate the effects of the ITS Program on participants' self-reported use of a variety of instructional strategies as well as their stages of concern related to the integration of technology as a change or innovation. She reported a significantly higher self-reported use of technology in their classroom for ITS participants over a control group. Additionally, those who had completed the ITS Program expressed concerns related to understanding the consequences of technology and collaborating with peers related to the integration of technology as opposed to higher concerns among the control group about basic awareness and information. Norton & Sprague (1996) reported similar changes. Using a pre/post design, they reported that ITS participants significantly changed their perceptions of the role of technology to support teaching and learning as well as shifting from awareness and information concerns to concerns related to consequences and collaboration. In addition, open-ended questions revealed a self-reported increase in leadership activities related to technology integration.

Examining the Relationship between Attitudes and Practice

Research suggests that the ITS Program plays a significant role in attitude. Yet, no data exists to examine the impact of the Program on actual classroom practices of participants beyond those self-reported on surveys. In the past, collecting such data was difficult because of the unpredictable nature of access to technology. In the early years of the ITS Program, many participants had no access to technology. In later years, many teachers were limited to computer labs in their schools with difficulties in regular or sustained access to these resources. Because of these irregular and unpredictable access problems, it was difficult to assess the relationship between attitude changes reported on surveys and actual classroom practice. In August, 1999, a group of 24 teachers began their participation in the ITS Program. Unlike any previous group, this group of teachers was teaching in a school district that had implemented a major technology initiative. ITS participants were teaching in schools where all classrooms had four, Internet connected computers. *The time had come to ask the question: when attitudes change, do changes in practice follow?*

Of the 24 original participants, all remained in the program. At the beginning of the program, four of the participants were assigned to schools as Technology Resource Teachers (TRTs). A fifth participant assumed this role during the course of the program. In addition, two participants were specialty area teachers – one in art education and one in music education. These seven teachers were eliminated from the research pool because they did not have regular, sustained classroom responsibilities. Thus, the final subjects for this study were 17 classroom teachers. Seven participants were elementary classroom teachers; four were middle school classroom teachers; and six were high school teachers. The subjects' averaged 12.3 years teaching experience, ranging from 1 to 28 years.

In order to answer the question – when attitudes change, do changes in practice follow, a pre/post survey was administered to the 1999-2000 participants. The pre survey was administered at the group's first meeting in August, 1999. The post survey was administered 10 weeks before completion of the Program in October, 2000. The survey was divided into two parts. The first part asked about frequency of technology use and the frequency of collegial interactions related to technology planning. The second part of the survey asked participants to complete the Stages of Concern Questionnaire (Hall, George, and Rutherford, 1998). A third section was added to the post survey asking two open-ended questions: what are obstacles you experience in using computers to support teaching and learning and what are some of the enabling things that support you in using computers to support teaching and learning. Finally, participants were asked to summarize assigned classroom use of computers each Friday for two four-week periods. These teacher summaries were collected during a four-week period in October, 1999 and again in October, 2000.

Changes in Attitude: The Stages of Concern Questionnaire

Participants' responses to the thirty-five items on the pre and post Stages of Concern Questionnaire (SoCQ) were grouped by relevant stage, totaled and converted to percentile scores using guidelines in the SoCQ manual. The stage reflecting the highest percentile score for each participant was identified. The stages of highest concern are presented in Table 1, and averaged percentile scores for the group are presented in Figure 1. Upon beginning the ITS Program, the largest number of participants expressed personal concerns followed by those participants who expressed information needs. In addition, expressed concerns about consequences for students, collaboration with peers, and refocusing were lower. This profile illustrates normal, interested nonusers who are somewhat aware of and concerned about the role of classroom computers integrated with teaching and learning. This would be an expected profile for those entering the ITS Program. Post survey scores indicate unchanged awareness, information, and personal concerns as well as demonstrating increased concerns relevant to consequences for students, collaboration with others and refocusing, that is, concerns that reflect ideas about seeing their ideas put into practice, tried out, or ideas to improve the use of classroom computers to support teaching and learning. As demonstrated in the figure reflecting group percentile score averages, this pattern holds true for the group as well as for individuals.

	Stage 0 Awareness	Stage 1 Information	Stage 2 Personal	Stage 3 Management	Stage 4 Consequences	Stage 5 Collaboration	Stage 6 Refocusing
Pre Survey	1	3	7	2	1	2	1
Post Survey	0	0	2	1	0	10	4

Table 1. Highest Stage of Concern by Number of

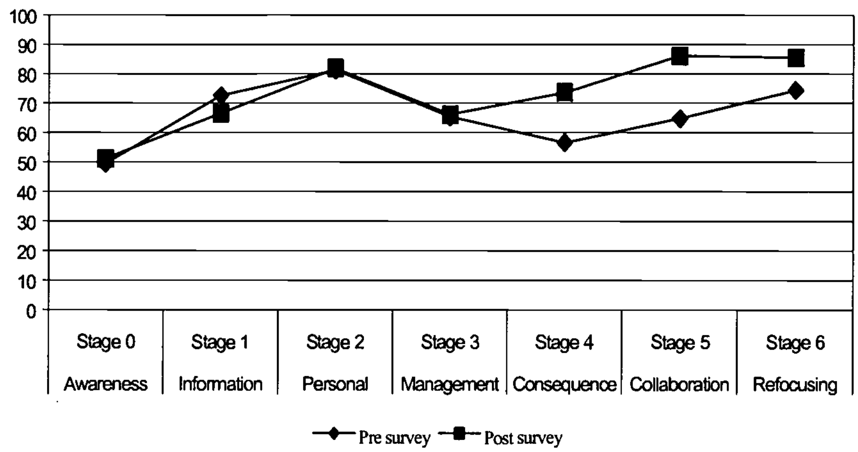

Figure 1. Average Group Percentile Scores by Stage of Concern

It is clear that the concerns of participants changed over the course of the ITS Program. Intuitively, one would expect awareness, information, and personal concerns to lower as participants shift from a nonuser to a user profile. However, it is not uncommon for the Stage 0 concerns of established users to rise. Experienced users tend be more concerned about other things in their lives. Examining the individual Stage 0 items may identify one reason for this. Item 21, for example, which was rate as "somewhat true of me" by all participants, states "I am completely occupied with other things." Individuals who are more experienced, comfortable, and confident users tend to shift their concerns to other aspects. They therefore report very directly that things other than integrating technology with teaching and learning are of concern to them. After looking at self-reported use of technology, participants' logs of assigned computer activities, and conversations with participants, we will return to discuss what might have replaced integrating technology in schools as a concern.

Changes in Practice

Participants' Self-Reported Use of Computers

To determine if participants' changes in concerns were reflected in their use of classroom computers, the first part of the survey asked participants to respond to four questions: 1.) student use of a variety of computer applications, 2.) frequency of discussion with other teachers, 3.) student use of computers, and 4.) primary goal for classroom computer use. Results from the questionnaire are reported in Table 2. As reported in the table, self-reported use of a variety of applications shows a consistent shift toward more frequent use. There are, however, several notable exceptions. At the beginning of their program, 70 per cent of the participants reported frequent use of word processing. On the post survey, this declined to 39 percent with a rise to 46 per cent from 12 per cent in the occasional category. Similar shifts can be noted for use of the Internet and for the Other category. While not inherent in the raw data, it is likely that two factors influenced this shift. One, participants became more aware of and able to use a larger variety of applications and, thus, were not dependent on one or two applications. Second, participants became more realistic about the benefits and limitations of particular applications and their role in supporting teaching and learning.

Participants' self-reported student use of computers also shows an important shift. On the pre survey, 35 per cent of the participants reported their students' daily use of computers while only 27 per cent of participants reported daily use of computers by their students, suggesting no change. However, in the 2 to 4 times a week category, participants' students' use of computers shifted from 18 per cent on the pre survey to 60 per cent on the post survey. It is possible to interpret this as an important shift toward both more frequent use of computers and more realistic and planned use of computers rather than use of computers just to be using them. Participants also reported increases in conversations about hardware, software, curriculum, and issues. Eighty per cent of the participants reported frequent or occasional conversations with colleagues.

	Pre Survey			Post Survey		
	Frequently	Occasionally	Never	Frequently	Occasionally	Never
Use of a Variety of Applications						
Word Processing	70	12	18	39	46	15
Spreadsheets	12	47	41		39	61
Databases		30	70		54	46
Email		35	65	23	38.5	38.5
Internet	18	59	23	46	39	15
Desktop Publishing	35	30	59	31	38	31
Hypermedia	12	30	59		38	62
Other	47	30	23	23	62	15
Conversations with Others						
About Hardware	12	35	53	53	40	7
About Software	17.5	17.5	65	47	20	33
About Curriculum	12	53	35	40	33	27
About Computer Issues	35	24	41	40	40	20

	Daily	2 to 4 times week	Once a week	Once a month	Never
Student Use of Classroom Computers					
Pre Survey	35	18	23	12	12
Post Survey	27	60	13	0	0

	Pre Survey	Post Survey
Primary Goal for Computer Use		
Teach about Computers	5	0
Teach Computer Applications	11	12.5
Support learning a skill	5	12.5
Integrated with Curriculum	68	75
Never Use	11	0

Table 2. Self-Reported Use of Classroom Computers

Participants' Logs of Assigned Computer Activities

In October of 1999 at the beginning of the ITS Program and again in October of 2000 nearing the end of the ITS Program, participants were asked to submit a log of computer activities assigned to students. Upon examination of the data, it became clear that all participants had not submitted complete sets of weekly assignments. However, thirteen complete sets were available. The most remarkable aspect of these reports was that six of the thirteen participants reported no computer use during the four-week period in October of 1999.

Thus, nearly half of the participants were *not* using the four computers placed in their classroom at all. Of the remaining seven, one participant reported only teacher/administrative use of the classroom computers. Of the six who reported student use of computers during the four week period in October of 1999, three reported that their students had used the Integrated Learning (skill building) System mandated by the school district, three reported Internet use, one reported using *PowerPoint*, and two reported using word processing or desktop publishing programs. Things were very different during the final four-week period in October of 2000. All thirteen participants reported weekly computer use. Use during this period included one participant who used a computer simulation, one who used Logo programming, one who used HyperStudio, one who used a web-based editor, one who reported using a graphics program, one who used digital cameras and scanners, six who reported using *PowerPoint*, and all thirteen reported using word processing programs and the Internet. Clearly, patterns of use had changed.

Responses to Open-Ended Questions: Obstacles and Enablers

On the post survey, participants were asked to respond to two open-ended questions. Their responses to these questions are reported in Table 3. When asked what obstacles they experienced in using computers to support teaching and learning, 47 per cent of the participants mentioned challenges associated with the management of classroom computers and 41 per cent mentioned challenges associated with software including inadequate software availability and disagreements with software decisions made at the school district level. When asked about things that enabled their use of computers to support teaching and learning, 88 per cent of the participants mentioned peer support including building TRTs and fellow ITS participants and 41 per cent mentioned educational opportunities including staff development and the ITS Program. Although only mentioned by 18 and 12 per cent respectively, participants also mentioned their own personal confidence, success, and desire as well as recognition of student successes and enthusiasm for computer supported learning.

Obstacles		Enablers	
Management of classroom computers	47%	Peer support	88%
Problems associated with software	41%	Educational Opportunities	41%
Problems with hardware	41%	Access to hardware and software	23%
Not enough time	35%	Personal confidence, success, desire	18%
Access problems	29%	Administrative support	18%
Lack of support personnel	18%	Student success and enthusiasm	12%

Table 3. Reported Obstacles and Enablers in the Use of Computers to Support Teaching and Learning

Conversations with Participants

In their final semester, the group focused on issues related to leadership and change. Participants studied and discussed strategies for creating change, for promoting learning communities within their school and school division, for coping with criticisms related to computer use, and for advocating changes consistent with their emerging vision of teaching and learning. During the course of these discussions, a number of concerns arose. Participants expressed concerns about the decision-making process within their school division, particularly as related to who made decisions about software purchases and policies, why the use of Integrated Learning Systems was mandated without teacher input, how Internet access was managed, and how hardware was configured in classrooms. The general feeling among participants was that much decision-making was done at the district level with little attention given in that process to teachers' needs and visions or even to students' learning needs. A second area of considerable concern among participants was the difficulties associated with implementing teaching and learning that capitalized on the power and possibilities of technology within a district and state culture that mandates Standards of Learning and high-stakes, multiple choice testing. Finally, while participants recognized the need for planning and collaborating time in order to implement needed curricular and instructional change, they believed that the reality of institutional and systemic structures made such time minimal or nonexistent. Participants felt that their ability to implement innovative practices would not drastically improve until provisions were made for collaborative planning activities. Concerns such as these may well account for the continued high scores on the SoCQ in Stage 0 – Awareness and Stage 2 – Personal. While nonusers have concerns about the integration of computers with teaching and learning and "self" concerns related to impacts on their own practice, the high awareness and "self" concerns have, for these participants, become different in nature. Participants have shifted concern to the impact of issues like district decision-making, standards, and time (continued high Stage 0 - Awareness concerns). Additionally, these systemic concerns are reflected in continued high "self" concerns, increases in concerns for consequences for student learning, and identification of hardware, software and time obstacles. Thus, continued high personal concerns have shifted from personal practice to issues related to systemic concerns and their role in promoting needed system-wide changes and the impact of their efforts on student learning outcomes.

Conclusion

We asked the question: when attitudes change, do changes in practice follow? As reflected in the pre-post SoCQ comparison, participants' attitudes did change. The group profile shifted for one of typical nonusers to one more consistent with users. This newer user profile suggests a shift to concerns related to the impact of computers on student learning, collaboration with others to promote change, and clear ideas they are interested in trying and promoting. Continued high scores on Stage 0 – Awareness and Stage 2 – Personal coupled with concerns expressed in the *Conversations with Participants* section can also be interpreted as demonstrating shifts from basic awareness concerns and the impact on participants' classroom practice concerns about other issues and with concerns about their personal role in promoting change related to systemic as opposed to classroom issues. In addition, changes in attitudes are reflected in changes in practices, such as, more frequent and realistic use, primary use as an integrated part of teaching and learning, and increases in discussions with colleagues as well as increases in both the number of assignments and the variety of applications used. Clearly, there is a positive connection between changes in attitudes and changes in practice. As attitudes become more positive, there are positive changes in practice.

This positive relationship between changes in attitudes and changes in practice is not, however, as dramatic as one might hope. Although results of this research show positive *shifts* in actual classroom and professional practices related to the increased integration of computers to support teaching and learning, the results do not indicate a *transformation* in practice. Based on results of this study, it seems evident that no matter the extent of attitudinal change, there are system-wide obstacles that create a climate that is less than conducive to change. Thus, no matter how much participants profit from their educational experiences, there remain systemic issues that impede their progress toward substantial transformations in educational practice. It may well be that questions related to the effectiveness of teacher education to impact the use of computers to support teaching and learning can only be answered in the broader context of public policy. If we, as teacher educators, hope for a transformation in teaching and learning, we must become active advocates in the public arena as well as skilled teacher educators.

References

Doll, W. E., Jr. (1993). *A post-modern perspective on curriculum*. New York: Teacher's College Press.

Hall, G. E., George, A. A., & Rutherford, W. L. (1998). *Measuring stages of concern about the innovation: A manual for the use of the SoC Questionnaire*. Austin, TX: Southwest Educational Development Laboratory.

Norton, P. (1994). Integrating technology in schools: a cohort process for graduate level inquiry. *Journal of Information Technology for Teacher Education*, *3*(2), 163-174.

Norton, P., & Sprague, D. (1996). Changing teachers - Teachers changing schools: Assessing a graduate program in technology. *Journal of Information Technology and Teacher Education,* 5(1/2), 93-105.

Schubert, W. A. (1986). *Curriculum: Perspectives, paradigm, and possibiliity*. New York: Macmillan Publishing Company.

Sprague, D. (1995). *Integrating technology in the schools: An ex post facto study of a College of Education graduate program*. Unpublished dissertation. Albuquerque, NM: The University of New Mexico.

How Much Is Enough?: Comparing Certificate and Degree Teacher Education Options

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Abstract: Few would argue that teacher education is a central factor in realizing the potential of educational technology to influence teaching and learning. Understanding the impacts of a variety of teacher education options on teachers' concerns, self-reported uses, and self-reported collegial activities related to technology can play an important role in deciding what opportunities are most appropriate. This paper examines two graduate level options: a 12 graduate credit hour certificate program and a 36 graduate hour Master's of Education degree program. Using a two-part questionnaire, 44 teachers from the Master's of Education degree program and 247 teachers from the Certificate Program were surveyed. Responding teachers in the Master's group were matched with a responding teachers in the Certificate group using grade level/subject taught and years of experience. The resulting matched groups are compared and discussed in this paper.

Lack of teacher training is one of the greatest roadblocks to integrating technology with curriculum. Yet, most school districts spend less than 15 percent of their technology budgets on teacher training and development (Office of Technology Assessment, 1995). Yet, teachers must have substantial time if they are to acquire and, in turn, transfer the knowledge and skills necessary to effectively and completely infuse technology with the curriculum and into classroom practice (Hawkins & MacMillan, 1993; Kinnaman, 1990). However, Harvey and Purnell (1995) suggest that there is an overwhelming sentiment that schools have yet to create the kind of training and practice time teachers need in order to learn to effectively integrate technology with the curriculum. Opportunities for teachers to learn about the role of technology to support teaching and learning must do more than simply help them embrace technology; it must also anticipate classroom changes that must accompany technology's widespread use (Guhlin, 1996; Stager, 1995). If teachers are going to be convinced to change their practice and integrate technology into their teaching, they must come to understand the relevance of technology to what they do in the classroom (Shelton & Jones, 1996).

The need to provide meaningful contexts for effective teacher learning is clearly evident. When there is substantial effort and interest in learning to use technology as an integrate part of teaching and learning, teachers are supported to grow and change. As teacher educators, school systems, and universities wrestle with appropriate strategies, incentives, and content for effective teacher education, they must also confront the question - *how much is enough?*

Two Educational Options

In the Winter Semester, 1998, faculty in the Graduate School of Education implemented two new programs. The first was a 12 graduate credit hour ITS Certificate Program – 180 contact hours or the equivalent of 30 inservice days. Although offered as an on campus option, the ITS Certificate Program was primarily offered in collaboration with school divisions throughout Northern Virginia who were seeking to provide educational opportunities for teachers as part of a state-wide initiative for teacher technology competency.

Faculty worked with leaders in these school divisions to organize and deliver the Certificate Program to groups of 24 teachers, kindergarten through twelfth grade including specialty areas. Generally completed in about 18 months, those who chose to complete the Certificate Program with sponsorship from their school division completed five one-credit hour courses focusing on teaching and learning with telecommunications, databases, computer graphics, TV/video, and educational software. They then completed two two-credit hour courses focusing on teaching and learning with desktop publishing and hypermedia. As a capstone class, students completed a 3 credit hour capstone course, Principles of Integration. This course built on knowledge about the individual applications from previous coursework and focused on methods and models of curriculum and instruction that incorporate a range of technology tools. Some school divisions paid all tuition costs while others shared costs with those seeking to complete requirements for the Certificate. Teachers were required to apply to and meet entrance requirements established by the Graduate School of Education and were awarded a Certificate at the completion of the program.

The second program implemented in the Winter Semester, 1998 was a comprehensive, 36 credit hour Master's Degree Program emphasizing Integrating Technology in Schools (ITS) – the equivalent of 440 contact hours with no inservice equivalent. This intensive cohort program consists of four consecutive semesters of study. Cohorts are comprised of 24 practicing teachers. The curriculum for the Master's Degree includes four, three credit hour courses that focus on teaching and learning with a range of technology tools. In addition, teacher-students take two courses that focus on social issues related to technology and education and learning and teaching. They enroll in a Web-Based Learning course, and, like those in the Certificate Program, complete Principles of Integration. Finally, teacher-students complete a course focusing on leadership and technology, a course focusing on action research, and a 6 credit hour Practicum. The practicum culminates in the presentation of an action research project to Graduate School of Education faculty. Table 1 summarizes the curriculum for each Program.

12-hour Certificate Program	36-hour Master's Degree Program
Teaching with Telecommunications (1 hr)	Tools 1: Telecommunications and Databases (3 hrs)
Teaching with Databases (1 hr)	Tools 2: Graphics, Simulations, and TV/Video (3 hrs)
Teaching with Computer Graphics (1 hr)	Tools 3: Desktop Publishing and Computational Tools (3 hrs)
Teaching with TV/Video (1 hr)	Tools 4: Multimedia/Hypermedia and Emerging Technologies (3 hrs)
Teaching with Educational Software (1 hr)	Technology, Society, and Education (3 hrs)
Teaching with Desktop Publishing (2 hrs)	Technology and Learning (3 hrs)
Teaching with Hypermedia (2 hrs)	Principles of Technology Integration
Principles of Technology Integration (3 hrs)	Technology Leadership in Schools (3 hrs)
	Educational Research (3 hrs)
	Web-Based Learning (3 hrs)
	Practicum in Instructional Technology (3 hrs)

Table 1. Comparison of Courses for Certificate and Master's Degree Program

To compare the impacts of the two programs on teacher attitudes and self-reported practices, questionnaires were sent to 247 teachers enrolled in the Certificate Program. These teachers had either just completed the Certificate Program or were nearly finished with the capstone course. Of those sent a questionnaire, 153 returned a completed questionnaire (62%). Questionnaires were also sent to 20 teachers who had completed the Master's Degree Program three months previous to receiving the questionnaire and to 24 teachers who were in the final semester of the four-semester Master's Degree Program. Of the 44 teachers who received the questionnaire, 32 were returned (73%).

The questionnaire was divided into two parts. The first part asked about frequency of technology use and the frequency of collegial interactions related to technology planning. The second part of the questionnaire asked participants to complete the Stages of Concern Questionnaire (SoCQ) (Hall, George & Rutherford, 1998). On the SoCQ, respondents are asked to respond to 35 items on a scale of "not true of me at all" to "very true of me." The items are grouped into seven stages (Awareness, Information, Personal, Management, Consequences, Collaboration, and Refocusing) of concern related to an innovation. In this case, the innovation was defined as the integration of technology with the curriculum to support teaching and learning.

It was determined that the most appropriate way to insure that the two groups were comparable, Certificate respondents were matched with a Master's Degree respondent using grade level and subject taught as well as years of teaching experience. Since the number of questionnaires obtained from the Certificate respondents was so large, it was possible to match respondents fairly closely. Demographics for the two groups are, therefore, similar. 46.9 percent of the Master's group and 43.8 percent of the Certificate group were elementary teachers. 18.8 percent of the Master's and the Certificate Group were Middle School teachers. 21.9 percent of both groups were high school teachers. 12.5 percent of the Certificate group and 15.6 percent of the Master's group were technology resource teachers. Average years of teaching for the Certificate group and the Master's group was 12.25 years and 11.97 years respectively.

Summary and Discussion of Questionnaire Results

Participants' responses to the thirty-five items on the pre and post Stages of Concern Questionnaire (SoCQ) were grouped by relevant stage, totaled and converted to percentile scores using guidelines in the SoCQ manual. The stage reflecting the highest percentile score for each participant was identified. When an individual had percentile scores on two stages that were equal, both stages of concern were counted. The stages of highest concern are presented in Table 2. This table reflects a marked difference between stages of concern ranked highest by individuals in the group. The largest number of individuals (10) in the Certificate Program ranked information concerns – general awareness and interest in learning more detail – as their highest concern while 16 in the Master's Degree Program ranked collaboration – a focus on coordination and cooperation with others – as their highest concern. Clearly, respondents in the Certificate Program still felt they needed to learn more while respondents in the Master's Program felt knowledgeable and confident integrating technology to support teaching and learning and had shifted their attention and concerns to collaborative efforts to expand and implement the innovation in broader contexts.

	Stage 0 Awareness	Stage 1 Informational	Stage 2 Personal	Stage 3 Management	Stage 4 Consequences	Stage 5 Collaboration	Stage 6 Refocusing
Certificate	5	10	3	4	0	5	6
Master's	2	1	3	4	2	16	8

Table 2. Highest Stage of Concern by Number of Participants

Percentile scores for each stage were averaged for each group and graphed. This strategy diminishes the diagnostic and prescriptive potentials inherent in individual profiles but provides the ability to better compare the two groups. Results are presented in Figure 1. Information concerns are highest for the Certificate group while awareness – little concern or involvement - and consequences – a focus on the impact of the innovation on students in the respondents' immediate sphere of influence – are lowest. For the Master's Degree Program respondents, the highest group concerns were collaboration with others and personal – uncertainty about the demands of the innovation and inadequacy to meet those demands. The Certificate and Master's Degree groups were most different in the Stages 4, 5, and 6 categories. The high scores in these stages for the Master's Degree group are typical of more experienced users, confident in their knowledge and ability to cope with the innovation.

Two aspects of this figure are particularly interesting. The first is the group score for the Master's Degree group on Stage 0 – Awareness. Intuitively, one would expect awareness – little concern about or involvement with the innovation - to be lower for experienced users. However, individuals who are more experienced, comfortable, and confident users tend to shift their concerns to other aspects. They therefore report very directly that things other than integrating technology with teaching and learning are of concern to them. The second is the high group concern score on Stage 2 – Personal for the Master's Degree respondents. Given the higher concerns in Stages 4, 5, and 6, the high Stage 2 – Personal concerns, like the continued Stage 0 – Awareness concerns, would not be expected.

Since half of the respondents in the Master's Degree group were still actively involved in their final semester, we took the opportunity to ask them to tell us more about their "other" and personal concerns. Participants expressed concerns about their school division's decision-making process, particularly as related to who made decisions about software purchases and policies, why the use of Integrated Learning Systems was mandated without teacher input, how Internet access was managed/blocked, and how hardware was configured in classrooms. The general feeling among participants was that much decision-making was done at the district level with little attention given in that process to teachers' needs and visions or even to students' learning needs.

A second area of considerable concern among participants was the difficulties associated with implementing teaching and learning that capitalized on the power and possibilities of technology within a district and state culture that mandates Standards of Learning and high-stakes, multiple choice testing. Finally, while participants recognized the need for planning and collaborating time in order to implement needed curricular and instructional change, they believed that the reality of institutional and systemic structures makes such time minimal or nonexistent. Thus, high personal concerns of those in the Master's Degree Program are actually reflective of challenges in designing appropriate responses to their concerns about consequences for student learning, collaboration with others, and refocusing – the need to explore more universal benefits including the possibility for major changes – not about their roles or ability to integrate technology with in their own practice.

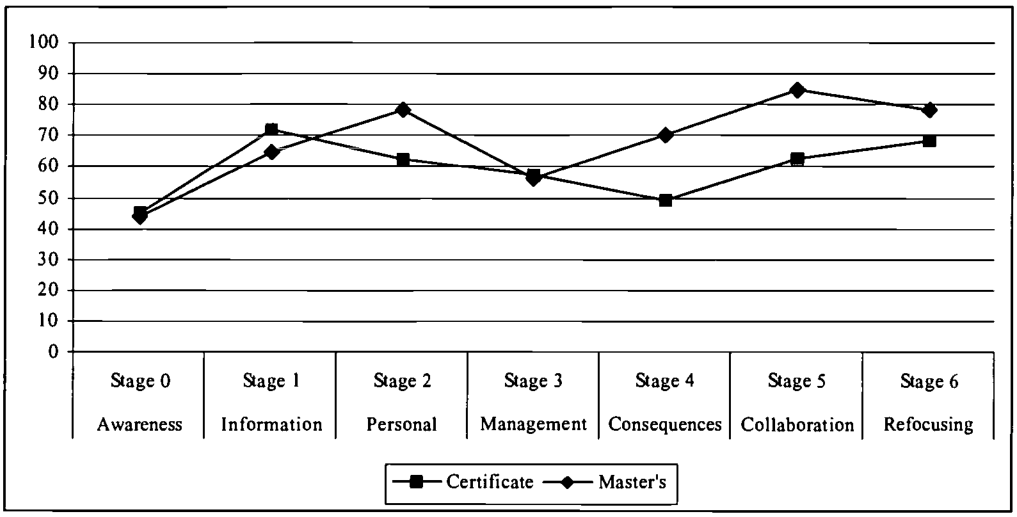

Figure 1. Average Group Percentile Scores by Stage of Concern

To determine if differences in concerns were accompanied by differences in practice, Table 3 presents responses of the two groups to three questions: 1.) use of a variety of computer applications, 2.) frequency of discussions with colleagues, and 3.) primary goal for classroom computer use. The data reflects no substantial difference between the two groups in the frequency of use of a variety of different applications. There is a slight tendency for those in the Master's Degree group to use a wider range of applications. There is, however, a marked difference in the respondents' self-reported frequency of conversations with colleagues about hardware, software, curriculum, and computer issues. Frequent discussions were reported almost twice as often for respondents in the Master's Degree Program as for those in the Certificate Program. This is consistent with the groups' reported collaboration and refocusing concerns and suggests that those in the Master's Degree group are acting on their concerns. A difference in the percent of respondents reporting integration as the primary goal of their use of computers for instruction is also evident in the data. Fifty-three percent of the Certificate group reported integration as their primary goal while 75 percent of the Master's Degree group reported integration as their primary goal. Only 6.3 percent of the Master's group reported learning a skill as a primary goal while 31 percent of the Certificate group stated learning a skill as their primary goal. Fewer of the respondents in the Certificate group appear to have become integrators of technology.

How Much is Enough?

In the opening section, we asked the question: *how much is enough?* Given the data for the Certificate group, it is possible to conclude that their participation in the Certificate Program has supported them in their efforts to use a variety of computer applications as part of their practice. It has encouraged most of them to have at least occasional conversations with colleagues about hardware, software, curriculum, and computer issues. Fifty-three percent of them report integration as their primary goal for classroom computer use. Participants in the Certificate Program have made important strides. One might consider this "enough." Yet, despite these positive advances, one third of them still report only occasional use of all varieties of applications, and forty-seven percent of them still have teaching about computers and teaching skills as their primary goal. In addition, the highest concern for the group is Information – an interest in learning more. They do not seem to be satisfied with their level of knowledge and skills related to integrating technology. If the goal of professional development is for teachers to learn about the role of technology to support teaching and learning and to help teachers anticipate necessary classroom changes (Guhlin, 1996; Stager, 1995) as well as to convince teachers about the relevance of technology to what they do in the classroom (Shelton & Jones, 1996), the Certificate Program was not "enough."

	Certificate Program			Master's Degree Program		
	Frequently	Occasionally	Never	Frequently	Occasionally	Never
Use of a Variety of Applications						
Word Processing	56.3	34.4	9.4	53.1	25	21.9
Spreadsheets	9.4	21.9	68.8	15.6	25	59.4
Databases	3.1	37.5	59.4	12.5	25	62.5
Email	15.6	31.3	53.1	28.1	25	46.9
Internet	50	31.3	18.8	53.1	34.4	12.5
Desktop Publishing	28.1	37.5	34.4	28.1	25	43.8
Hypermedia	9.4	34.4	56.3	12.5	25	62.5
Other	50	31.3	18.8	43.8	40.6	15.6
Conversations with Others						
About Hardware	40.6	25	34.4	62.5	28.1	9.4
About Software	25	28.1	46.9	46.9	31.3	21.9
About Curriculum	21.9	56.3	21.9	56.3	34.4	9.4
About Computer Issues	25	43.8	31.3	56.3	28.1	15.6

	Certificate	Master's Degree
Primary Goal for Computer Use		
Teach about Computers	0	6.3
Teach Computer Applications	15.6	12.5
Support learning a skill	31.3	6.3
Integrated with Curriculum	53.1	75
Never Use	0	0

Table 3. Self-Reported Use of Classroom Computers

Those participating in the Certificate Program were more invested in learning to integrate technology to support teaching and learning than most. Although the school divisions of those in the Certificate Program provided partial or full financial support for their participation in the Program as well as providing the benefit of 12 credit hours of graduate credit, this was not mandatory professional development. Participants volunteered to participate in the Certificate Program and gave up precious after school time to attend class as well as the time it took to complete reading and written assignments. Despite their commitment, the data does not reflect that all their learning needs were met nor have they finished the process of transforming their practice to integrate technology with teaching and learning even after 180 contact hours or the equivalent of 30 inservice days.

This is particularly disturbing when compared with common professional development practices. Trotter (1999) reports that when

> Asked how many hours of basic technology skills training they had received within the past 12 months, the largest group of respondents—31 percent--said one to five hours. Next came the 27 percent of teachers with no training. The figures are worse regarding training on integrating technology into the curriculum: 36 percent of teachers received one to five hours, and another 36 percent received none.

So, is the more robust Master's Degree option "enough." Certainly, data obtained from participants in the Master's Degree Program suggests that they have become established users who have matured to concerns about implementing and revising practices based on their consequences for student learning as well as collaborating with others to further the goal of integrating technology to support teaching and learning. Their reported actions further support the notion that these respondents are not only thinking about these concerns but acting accordingly. They report higher incidences of conversations with colleagues than the Certificate participants. More of them report integration as their primary goal for student computer use. Their higher group score for Stage 6 – Refocusing suggests that they are interested in exploring more universal benefits, the possibility of major changes, and that they have definite ideas about alternatives. They are concerned about seeing their ideas put into practice or at least tried out. These respondents are well on their way not only to being established integrators of technology but also to leadership roles. They appear confident in their ability to implement the innovation but remain concerned and feel unprepared to cope with external pressures that impede their progress. Participants in the Master's Degree group still have high personal concerns about their ability to implement their vision within the context of system-wide structures.

Certainly, more appears to be better, but is it "enough?" Probably not. Although results for the Master's Degree group show positive *shifts* in actual classroom practice and in professional activities related to the increased integration of technology to support teaching and learning, the results do not suggest that these respondents recognize that a *transformation* in teaching and learning is still a vision on the horizon. And they remain concerned that they may not be able to achieve that vision within the confines of existing systemic structures.

Conclusion

For us, there are two lessons to be taken from this research. One, professional development activities designed to promote changes that fully integrate technology to support teaching and learning must be extensive, consistent, and long term. Short term or one shot professional development activities do little to advance the power of inherent in the newer technologies to change teaching and learning. Those who are in teacher education must understand that they are in it for the long haul. Second, teacher educators must listen carefully and take to heart the message sent by the Master's Degree group. That is, their ability to translate their learning into system-wide practices depend not only on what they learn or what they are able to implement in their practice but on the ways in which their learning and practice interact with broader, systemic issues. No matter how much participants profit from their educational experiences, there remain systemic issues that impede their progress toward substantial transformations in educational practice. It may well be that the answer to the question, *how much is enough*, can only be answered in the broader context of public policy. Teacher education may never be "enough." "Enough" may well depend on teacher educators' ability to merge teacher education and advocacy in the public arena.

References

Guhlin, M. (1996). Stage a well designed Saturday session and they will come! *Technology Connection*. 3(3), 13-14.

Hall, G. E., George, A. A., & Rutherford, W. L. (1998). *Measuring stages of concern about the innovation: A manual for the use of the SoC Questionnaire*. Austin, TX: Southwest Educational Development Laboratory.

Harvey, J., & Purnell, S. (1995, March). *Technology and teacher professional development*. Report prepared for the Office of Educational Technology, U.S. Department of Education, Santa Monica: Rand Corporation.

Hawkins, J., & MacMillan, K. (1993). So what are teachers doing with this stuff? *Electronic Learning*, 13(2), 26.

Kinnaman, D.E., (1990). Staff development: How to build your winning team. *Technology and Learning*. 11(2).

Shelton, M., & Jones, M. (1996). Staff development that works! A tale of four T's. *NASSP Bulletin*, 80(582), 99-105.

Stager, G.S. (1995). Laptop schools lead the way in professional development. *Educational Leadership*, 53(2), 78-81.

Trotter, A. (1999). Technology Counts "99: Preparing teachers for the digital age.. *Education Week* (September 23, 1999). http://www.edweek.org/sreports/tc99/articles/teach.htm. September 23, 1999

Engaging Learners with Technology: An Innovative Professional Development Model

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Abstract: This paper will describe an innovative professional development initiative where teachers, administrators and curriculum development specialists assume the role of students as they explore how the **engaged learning** environment can be supported by technologies in meaningful and authentic ways. The purpose of this paper is to share a replicable, instructional, technology-integration model designed to help educators (pre-service and in-service) develop and implement learning experiences that invite and engage students to construct knowledge and to make meaning of their world. Additionally, details and particulars of the supporting professional development program will be outlined and discussed.

Learning comes naturally. It's what humans do intuitively. The need to understand, to bring order and create patterns to new ideas and concepts, to share this new learning, and to feel empowered to act using this new understanding speaks to the very foundations of learning in today's classroom. Within a classroom, there are observable and measurable indicators which signal that learning is taking place. What does that look like? What are students doing? How are they accomplishing the tasks? How and when does technology support the learning process? How do you know the learning "stuck? Did this process happen accidentally or was there a deliberate plan and scheme to develop such a context for learning. These questions are at the foundation of "engaged learning".

The following treatise will:

- Define *engaged learning*
- Explore how the *engaged learning* environment can be supported by technologies in meaningful and authentic ways
- Describe the steps of the Van Andel Educational Technology School (VAETS) project-based instructional model including the infused strands of problem-solving, collaboration, and technology
- Describe the technologies and curricular materials selected in this project
- Explain how technology can become *transparent* in this engaged learning environment
- Highlight the particulars of the one-week Van Andel Education Institute (VAEI) Teacher Academy

What is Engaged Learning?

Exemplary teachers have always known that their *students* are at the center of the learning in the classroom. Learner-centered awareness can be observed in classrooms where students are encouraged to build upon their experiences and strengths, are provided with realistic options and choices about their learning, are given opportunities to share with fellow learners, are provided with opportunities to assess their progress, are engaged in internal and external reflective dialog to monitor self-learning, and are given appropriate access and use of the necessary tools to support the learning process.

Because learning is a process, not a product, research and its authors such as of Dewey, Vygotsky, Feuerstein, Diamond, Caine, Bransford and others, suggest to us that what students do, what teachers do, what learning tasks students perform, and the type of assessments associated with those tasks are essential factors in achieving engaged learning. Identifying these variables as dimensions of learning helps us, as educators, to document that engaged learning is indeed occurring. These dimensions, as listed and described below, form a clearer picture of an engaged learning culture.

- *Passion for learning*: In a classroom where engaged learning is honored, the learner is involved in the learning process from the beginning. Developing this *passion for learning* comes from being responsible for setting goals, choosing tasks to accomplish those goals, and developing assessments to monitors one's progress in achieving success. In short, the learner must understand the "big picture" and enlist a cadre of thinking and learning strategies to accomplish the tasks.
- *Challenging, authentic tasks*: Challenging learning tasks need to address issues in the real world by integrating a variety of disciplines to solve problems. A blending of content in a multidisciplinary context provides opportunities for sustained, *authentic* learning. When deliberate and thoughtful choices are made about the use of specific technologies, strategies and resources to support their learning, the engaged learner becomes resource savvy.
- *Performance-based assessment*: As an essential part of the instructional process to improve learning, assessment is ongoing, equitable, and purposeful. In an engaged learning context supported with technologies, assessment comes in the form of *performances*, demonstrations, and products that have meaning and purpose for the learner. These examples of evidence should match the goals of the curriculum, represent knowledge and essential skills, and provide authentic contexts for assessment. Tools of assessment such as self, peer, and teacher assessments should evaluate both individual and group efforts.
- *Generative, multi-contextual environments*: The classroom culture must be engaging and responsive to learner needs by providing *multiple contexts* for learning. In order to assist the learner in constructing meaning and understanding, this enriched classroom environment will support strategies whereby the learner can actively solve problems, conduct meaningful inquiry and discovery, and function effectively in a variety of diverse contextual settings.
- *Collaborative, flexible grouping*: Classrooms that encourage and support engaged learning allow students to learn collaboratively. *Flexible* learning communities build upon the diversity of their members and create a more empathetic environment which encourages the pooling of knowledge and experiences of the group. Engaged learning environments challenge the learner to ask complex questions, define the problems, and seek out information and knowledge from professionals. Diverse grouping strategies will provide opportunities to differentiate goals for all students.
- *Reflective, metacognitive dialogue*: Within the culture of an engaged classroon, metacognitive reflection is ongoing. As an essential component of the learning process, learners are consistently engaged in activities that encourage and rely upon *reflective* dialog with peers in order to bring clarity and focus to their thinking and learning. *Metacognitive* opportunities provide each learner with a context for reflection and articulation about his/her individual learning strategies, successes, and growth potential.

These dimensions of learning are at the very foundation of a constructivist instructional model that is currently being implemented with the goal of identifying the most effective ways to integrate current instructional technologies into existing curricular frameworks.

VAETS Engaged Learning Model: Project-based Learning

In an attempt to provide an instructional schemata whereby technology becomes an intuitive part of the learning landscape, this model combines a 5-step process with three interwoven strands of problem-solving, collaboration and technology. Using the collective wisdom of cognitive science, as well as the emerging field of brain-research, this 5-step model helps to create a framework where learning occurs naturally and with purpose:

1. Curriculum Planning – This model speaks to the needs of accountability and assessment with the beginning step of curriculum planning. Great care and detail is given at this first step as the teacher provides the curricular framework using existing standards and benchmarks. The teacher clusters standards or objectives, defines project content, identifies general and specific goals and objectives of

content, instructional technology, and collaborative learning skills, identifies prerequisite skills, plans a strategy for creating teams, sets general project timelines and identifies resources and materials.
*Three strand examples: Teacher planning always involves problem solving and teachers are encouraged to collaborate with colleagues. The Internet, spreadsheets, Inspiration® and other organizers are a natural part of planning.

2. Project Focus – The teacher outlines and presents the general project topic to the students, sets timelines, milestones and assessment options for students, lists resources available, identifies prerequisite skills and competencies, and forms teams.
*Three strand examples: Teachers must cultivate a project-based culture by modeling and demonstrating problem-solving and collaborative techniques and sampling the technology resources available to students. Teachers should use organizers and a variety of technologies in modeling for students.

3. Project Planning – Students begin preliminary planning, pool their knowledge of the topic, narrow their focus and identify their specific team projects, complete a project planning chart which might include assigning individual roles and responsibilities, confer with the teacher, receive feedback and revise their plans.
*Three strand examples: Students, of course, will be working collaboratively and should be using some type of graphic organizers such as Inspiration® and they must be required to problem-solve and make decisions about their particular approaches to the project.

4. Project Implementation – Students use a three-story intellect model which involves gathering activities, processing activities and applying activities. (Fogarty, 1995) They create a timeline with one milestone for each task involved, refine their project definition and procedures, decide on the product to be produced, continue to collaborate and cooperatively problem-solve, seek and receive feedback and move toward completion.
*Three strand examples: Working collaboratively, the students should employ a division of labor. The gathering process should involve the use of electronic encyclopedias, web searching, interviews, textbooks, etc. and some method of electronic recording using word processing, database, spreadsheet, filming,etc. Processing should involve imagination, problem-solving, and manipulation of data to bring clarity and focus to the project. Applying involves the creation of a final product in the form of desktop publishing, an electronic presentation, movie, etc. Students typically use: Inspiration (organizing), Appleworks® (word processing, spreadsheets and slideshows), Hyperstudio® (interactive presentations), Presswriter® (desktop publishing) or iMovie® (movies).

5. Completion – Students do their final revising, polishing and presenting. The teacher and students assess, celebrate, and bring closure to this project by reflecting and discussing where it fits in the big picture and how it leads to further investigations.
*Three strand examples: Assessing and celebrating may be combined with students collaboratively making their presentations, presenting their documents, playing their videos, etc., explaining their methods and receiving feedback.

This model serves as scaffolding for an engaged learning culture by providing a student-centered vision for learning. This engaged, collaborative learning environment stimulates a passion for learning with authentic, challenging tasks, meaningful opportunities for reflection, and assessments that reflect purposeful learning. As confidence and proficiency increase over time, this scaffolding becomes transparent and the use of technology becomes natural and intuitive.

Van Andel Education Institute: Teacher Academy

The focus of the academy is to explore current cognitive research as it relates to the development of the VAETS Project-based Model. Using the tools of technologies, the participants identify the instructional standards and plan, develop, implement, assess, and evaluate a project using productivity, research, and multimedia resources.

Specific topics such as process writing, research strategies, cognitive mapping and multimedia development are used as focus areas to connect the learning in a project format. Methods used in the academy include direct instruction using short lecture segments, demonstration and hands-on practice of selected technologies. These methods are complemented with modeling of collaborative group activities, independent writing, reflective dialoging, assessment, and evaluation.

The VAEI Teacher Academy is a 1 week, 30 hour immersion into the VAETS Project-based Model. Designed for pre-service and in-service educators in grades K-12. This workshop environment provides the participants with:

- An overview of the latest cognitive and brain-based research as it relates to the educational setting
- The project-based learning model, its components, and its foundations in constructivist theory
- A state-of-the-art technology-rich environment designed to engage learners by focusing attention appropriately in multiple contexts
- Just-in-time training on appropriate educational software and hardware
- A curricular framework document for planning and implementation including curriculum and project planner resources and multimedia design considerations
- Modeling procedures of engaged learning strategies such as cognitive mapping, process writing, collaborative problem-solving strategies, etc.
- Assessment rubrics and guidelines for developing rubrics for student projects
- Sample vignettes using the project-based model and supporting technologies
- Hands-on opportunities to experience the process and resources of project-based learning (Each participant is a member of a team which experiences a complete project from planning to completion.)
- Sampling and discussion of pertinent professional articles and publications supporting engaged learning
- Replication scenarios in diverse educational settings

After a successful trial program for 25 participants in the summer of 1999, the VAEI program was expanded in the summer of 2000 to three Teacher Academy sessions. Information about the Teacher Academy offerings was disseminated to area schools and area college and university departments of education. Announcements were placed in a statewide technology newsletter, and invitations were distributed at professional education conferences. With a participation limit of 25, the three sessions were filled in advance and a waiting list was begun. The teachers were drawn from school districts across the midwest and Canada, representing public, private, and charter schools. Some districts sent teams of teachers to create self-supporting networks while others sent individuals. Participants were charged a nominal $50 registration fee. Because the Teacher Academy was funded as an outreach activity of the Van Andel Education Institute, it was possible to return that value to them in the form of curricular materials, workshop notebooks, and support resources. Graduate credit from two local universities and professional development credits from some local school districts were available. The three members of the VAETS staff served as the facilitators for the Teacher Academy.

Conclusion

When learner-centered education is at the heart of today's classroom, we honor the naturalness and intuitiveness of the learner. In his/her quest to bring order and understanding to the world, the learner becomes responsible for the learning process and claims ownership of the process. This ownership of the learning process empowers the learner to gain confidence in his/her ability to think creatively, solve challenging problems and make sense of powerful ideas. Ultimately, this is the purpose and goal of education.

References

Anderson-Inman, Lynne & Leslie Ditson (1999). Computer-Based Concept Mapping. *Learning and Leading with Technology*, 26 (8), 6-13.

Bransford, J. D., A. L. Brown, & R. R. Cocking, Eds. (1999). *How People Learn: Brain, Mind, Experience, and School.* Washington, DC: National Academy Press.

Caine, Renate Nummela and Geoffrey Caine (1997). *Education on the Edge of Possibility*, Alexandria, VA: Association for Supervision and Curriculum Development.

Costa, Arthur and Bena Kallick (1999). *Discovering and Exploring Habits of the Mind*, Alexandria, VA: Association for Supervision and Curriculum Development,.

Costa, Arthur and Bena Kallick (2000). Getting into the habit of reflection. *Educational Leadership*, 57 (7), 60-62.

Fogarty, Robin (1994). *Teach for Metacognitive Reflection*. Arlington Heights, IL: Skylight Publishing.

Fogarty, Robin (1995). *Best Practices for a Learner-Centered Classroom*. Arlington Heights, IL: Skylight Publishing.

Fogarty, Robin (1999). Architects of the Intellect. *Educational Leadership*, 57 (3), 76-79.

Goleman, Daniel (1995). *Emotional Intelligence: Why It Can Matter More Than IQ,*. New York, NY: Bantam Publishing.

Jensen, Eric (1998). *Teaching with the Brain in Mind.* Alexandria, VA: Association for Supervision and Curriculum Development.

Sylwester, Robert (2000). *A Biological Brain in a Cultural Classroom.* Thousand Oaks, CA: Corwin Press, Inc.

Sylwester, Robert (1998). *A Celebration of Neurons: An Educator's Guide to the Human Brain.*, Alexandria, VA: Association for Supervision and Curriculum Development,..

Preparing Teachers for the School of the Information Society in Greece

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Abstract: Hellenic Pedagogical Institute is implementing a large-scale national teacher-training project. The project aims to expand teachers' understanding in Information and Communication Technologies (ICT) and to equip them with the necessary knowledge and skills in order to support their efforts in utilising ICT effectively to teach particular subjects. Central issue of the design of the project is its flexibility to accommodate the various professional needs, background knowledge and skills, learning styles and inclinations of the teachers. The training process is totally decentralised, transferring to the schools the responsibility for the selection of the training model and the training providers. Final target of the project is the establishment of a life-long training mechanism based on the operation of sustained learning communities around the country. In this paper the design principles as well as the implementation process of the project are presented.

Introduction

As our society changes from an industrial one to an information society, dealing with information is becoming a key element for people. Educational systems of the third millennium face the challenge to reconsider their educational beliefs and teaching routines, in order to be able to effectively prepare the future citizens of the information society.

A central issue of the changes occurring in today's educational systems is the integration of Information and Communication Technologies (ICT) into subject teaching. The educational community has recognised the value of ICT as a teaching tool since the early 80's. However, in a world crossed by the information super-highways, ICT plays a more significant role than just that of another teaching tool. ICT can perform as the vehicle for the reform of the educational strategies towards a student-oriented learning model, transferring part of the responsibility of the learning process to the students, implying at the same time new roles for the teachers and changes in their classroom performance.

The effective integration of ICT in teaching and learning is directly dependent on teachers' knowledge, skills and abilities to make decisions about when, when not and how to use ICT in teaching particular subjects. Therefore, supporting teachers in this direction is one of the most critical factors for the successful integration of these technologies in daily school practice. Helping teachers in integrating ICT into their teaching process has little to do with helping people operating machines. It has to do mainly with supplying teachers with a powerful educational toolkit, which can enhance their own expertise and professional practice, redefining at the same time their profession's core practices and requirements.

Since learning takes place in a social context, teachers' communication and collaboration with each other as well as with experts, is of major importance in extending their knowledge base and skills. In this perspective, ICT can perform both as the motivation and the platform for the creation of the required communication and collaboration channels for the establishment and operation of learning communities.

In the last four years the Greek Ministry of Education has been working through various actions and projects to introduce ICT technology into the Greek primary and secondary schools. Towards meeting this target, new and flexible curricula have been developed capable of accommodating ICT based activities and new educational material that has been produced (books, CD-ROMs, Web-based material). All schools will have an Internet connection by 2001 providing all teachers and students with e-mail addresses. Additionally, the schools' network is being established offering access to educational content and services over the Web.

However, the key figures for the introduction of any innovation introduced in schools are always the teachers. In this context, many pilot teacher-training programmes have been taking place around the country, making use of various teaching and delivery methods.

Project Design

Recently the Ministry of Education announced a project to train 75,000 primary and secondary teachers (80 percent of all the schoolteachers in Greece) in ICT as an educational and professional tool. The project -managed by the Hellenic Pedagogical Institute (HPI) (http://www.pi-schools.gr)- is the largest and most comprehensive national investment programme ever to be implemented as far as education is concerned. The scope of the project -entitled "Preparing teachers of the Information Society"- is to integrate ICT technologies into daily school practice, in an attempt to provide students with the knowledge and skills required by the Information Society. Within this framework, the project aims to expand teachers' understanding in ICT and to equip them with the necessary knowledge and skills in order to support their efforts in utilising ICT effectively to teach particular subjects.

Central issue of the design of the project is its flexibility to accommodate the various professional needs, background knowledge and possible difficulties of the teachers around the country. Thus, training process makes use of various models as far as the delivery methods and training activities are concerned. In this context, the schools are designated as decision-making units as far as the training model and the training providers are concerned.

One of the main principles of the project is the presumption that teachers themselves will take personal responsibility and create opportunities for their professional development in a self-learning approach. In a continuously changing world, learning should be a life-long process, taking place in all the situations, in which people live and work. From this point of view, the project focuses on providing the teachers' community with the appropriate environment in order to be able to make out their own learning and professional development paths (Rogers, 1977)

The final target of the project is to develop a non-intensive and life-long training mechanism through the establishment of learning and communities around the country capable to support a peer-to-peer training model (Wilson & Ryder, 1998).

Training Programmes

Within the framework of the project various training programmes are organised across the country involving all the Greek primary and secondary teachers as well as local administrative heads and school masters.

The programmes targeted at the teaching staff, are structured under three main axes:

- Axis-1: basic skills in the use of ICT:

These particular training programmes aim at improving self-confidence, knowledge and skills of the teachers as far as the use of new technologies is concerned. The curriculum of the programmes is tailored to the particular needs of the Greek teachers determined through the various pilot projects that have been implemented during the last four years. The main principle under which the programmes are structured is the belief that helping teachers in using ICT is more than training people in operating machines (Wild, 1996). Thus the training material and the activities designed for the programmes derive from the schools' daily programme and the particular needs of various teaching subjects.

- Axis-2: use of ICT in subject teaching:

In the context of these training programmes teachers are expected to participate in activities relating to the use of ICT as a teaching tool. The curriculum of the programmes is structured over various special activities. The activities include the development of lesson plans as well as the teaching process using educational software titles as well as common applications (browser, e-mail, word processor etc.) used in subject teaching. The effective use of ICT in the classroom implies new roles for the teachers, who are expected to act as facilitators of their students' approach to learning (Bickmore-Brand, 1996). In an attempt to promote and articulate new roles in teaching and learning process, during the implementation of the activities, teachers play the role of the student, having an expert as an instructor.

- Axis-3: design and production of educational activities, lesson-plans and scenarios concerning ICT exploitation in classroom.

The programmes of this axis concern teachers who feel confident in using ICT. The programmes will be implemented within the school or on a co-operative basis among a number of schools. Within the context of the programme, work groups are established with the active participation of both teachers and pupils.

The important issues in these programmes are peer-to-peer interaction among teachers as well as the active participation of the members of the group. Each work-group will implement an interdisciplinary project with the participation of the students. The programme encourages project themes, which are of interest to the local societies of the schools, in an attempt to bring schools in touch with the real world. Additionally, schools from remote locations collaborate-using the facilities of GroupWare tools - in developing projects of common interest. In that way, the programmes are expected to perform as the kick off activity for the establishment and operation of the learning communities.

There is no defined curriculum for these particular programmes, as work-groups make use of the educational material provided by the Greek Web for Schools (GWfS). In this context, participants are neither expected to have the same starting points nor to achieve similar outcomes. The target here is to provide teachers the opportunity to improve their understanding and to extend their knowledge base about the effective use of ICT as a learning tool (Underwood & Cavedish, 1996).

The general target of the three above programmes is to provide the teachers the skills and abilities needed to evaluate ICT applications and resources, to be able to chose the appropriate for teaching, assessment, school management as well as self-learning and professional evolution. Additionally, teachers are expected to be able to determine the abilities required from their students in order to construct their knowledge model through the use of new technologies (Davis, 1998).

Additionally, the following training programmes are organised:

- Head-teacher and administrative staff training, so that those involved will then serve as mentors and facilitators for their colleagues. The role of head-teachers is rather critical in the integration of education innovations into the school environment as they are in daily contact with the teaching staff, managing and encouraging their efforts (Lawson & Comber, 1999).
- The trainers who are going to facilitate group-work at schools will participate in special seminars organised by the HPI. The scope of these seminars is to equip the trainers with the expertise gained by Institutions in Greece and abroad from various projects. Additionally, the seminars will inform trainers about the alternative resources, which will be used during the training process.

Due to landscape peculiarities, too many isolated small schools -basically primary schools- exist in Greece, which are served by only one or two teachers. Especially for this kind of schools, a pilot training programme is going to operate, in the project's framework. Specifically, these schools are supplied with special equipment and fast Internet connection, in order to be able to participate in on-line training programmes, using synchronous multimedia communication. The additional outcome expected from this pilot programme, is to bring the students and the local communities of these areas in touch with human and digital resources from around the country, removing in that way their isolation.

Support Activities

The training process will be facilitated and supported by a number of actions and activities aimed at firstly making the life of the participants easier and secondly helping them articulate the knowledge offered to them. Additionally, the support activities aim to enrich the existing infrastructure in the domain of teacher training.

The teachers participating to the training programmes are supplied with a multimedia PC and Internet connection for home use. In that way teachers will have the opportunity to practice as well as to prepare their lesson plans and material.

Local training support centres are established across the country. The role of these centres is to function as a reference place for trainers and trainees. The centres are staffed with expert scientists and are equipped with state-of-the-art laboratories and updated libraries.

A 24/7 help desk centre operates in the HPI in an attempt to solve the various problems that occur during the training process.

The educational environment implemented within the context of the project "Added Value Services to the GWfS" will perform as the virtual reference and meeting place for the participants of the training process. (Papadopoulos et al, 2000)

Evaluation-Quality Assurance

The quality of the training process is firstly going to be ensured by the quality of the educational material. The HPI has developed a specification framework as far as the educational material is concerned. Additionally, the HPI has developed curricula for all the training programmes describing the targets of the training process and outlines the skills and abilities expected to be acquired (Fleischman & Williams, 1996).

Universities and Institutions from all over the country participate in the process of developing material The training material consists of activity-based lesson plans for subject teaching using ICT, trainers' guidelines, educational software titles as well as web-based material.

As a second level of quality assurance, the abilities and the skills developed by the teachers are going to be evaluated through an assessment mechanism compatible with the European Union Initiatives. Finally, external evaluators will evaluate the whole project as far as the effectiveness of: the training mechanism, the training centres and the training material.

Implementation

The HPI has developed the curricula for all the programmes included in the project. Additionally, the HPI has produced a specification framework as far as the training material is concerned. Both the curricula and the specifications' framework have been published in the GWfS and have also been distributed to all the schools around the country.

The training material varies depending on the training programme as well as the training model and includes lecture notes, multimedia titles, web-based material, interactive tutorials etc. The HPI has produced sample-training material while, already existing material is being evaluated. Additionally, Universities, Teacher Unions and other Institutions around the country produce material.

The training programmes concerning the axes 1 and 2 are offered through three alternative models. The models differ mainly on the delivery method adapted:

- In-school training, which includes face to face training seminars. The trainers can be either members of the school's teaching staff (e.g. the IT teacher) or external trainers. Wherever possible, the training process takes place with the participation of students.
- Seminars organised by training providers. Teachers sit in seminars organised at the premises of the training providers. The later have to ensure that the computer lab will be available for practice purposes, for at least six months after the end of the seminars.
- Distance training, provided both by the training providers and the HPI. The training process will make use of both web-based and conventional distance training methods.

A call was made addressed to all the organisations, institutions etc. intending to participate in the training process as training providers. The training providers have to meet a number of prerequisites concerning the equipment and the services they can provide. Only approved training providers are allowed to deliver training. These providers had to demonstrate a track record of expertise and experience in providing successful training, advice and materials. Additionally, the call was addressed to individuals who have expertise in ICT use as a teaching and learning tool. The individuals who meet the prerequisites are going to be used as training staff by the training providers or to perform as independent trainers in in-school training programmes.

The approved training providers and individual trainers are included in a list published by HPI. The training providers and the trainers can cover all the axes of the training programme or just one of them.

The training process will be facilitated and co-ordinated by the local support training centres, which are founded in all the regions of the country. The training support centres are managed by training committees (consisting of administrative staff, facilitators, scientists/experienced teachers), which are responsible for the implementation of the project at the local level and the communication process with the schools of the region as well as with the HPI.

Seminars, concerning the scopes and the design principles of the project, are organised for school head-teachers and the local administrative staff. Additionally, special trainer's training is organised around the country. The participants in these seminars are going to perform as facilitators of the group work in schools (axis 3). The training content focuses on the trainers' role as tutors to colleagues and aims to support them in successfully co-ordinating the teamwork as well as to stimulate the participating teachers. The seminars are held by the HPI in all the capital cities of the regions of the country with the contribution of the local Universities and municipalities.

The teaching staff of the schools decides how they will be trained. Schools are asked to fill in and submit to the local training committee an application form describing the training models and the resources required for the training. It is possible for a school to choose more than one training model according to the particular needs of its staff. It is also possible for a teacher to choose different training models for the various programmes in which he/she participates. Depending on the members of the staff seeking training and the chosen training model the schools receive a fund to cover the training expenses.

The following training programmes are being implemented:

The training programmes under axis 1 concern teachers with minimal or no previous experience in the use of ICT. They include seminars focusing on the achievement of basic ICT skills. The teachers work in computer labs (one person per computer) in groups of 10-15 people with the presence of one or two trainers. At the end of the seminars the teachers are asked to sit an on-line exam in order to receive accreditation for their training.

The training programmes under axis 2 concern teachers who have attended axis-1 programmes or already have the basic knowledge and skills in the use of ICT. The teachers are expected to work in groups (three persons per computer) in the computer lab. At the end of the training programmes the teachers have to carry out assignments concerning the production of teaching scenarios and lesson plans, exploiting ICT use in subject teaching.

The training programmes under axis 3 concern teachers who have either successfully completed axis 2 or have already adequate previous experience in using ICT.

The teachers participate in work groups consisted of the members of teaching staff of the same or different schools. The work groups carry out projects with the participation of their students and under the co-ordination of facilitators. The content of the projects implemented by the work-groups is a synthesis of individual interests and inclinations pointed out by the participating teachers.

Each facilitator may be involved in up to five work groups. The facilitators' contribution to the work group concerns among others:

- the determination of the subject and the methodology of the group work
- the planning and the documentation of the methodology followed to implement the project
- the definition of the learning targets
- the encouragement of the work group
- the facilitation of communication and collaboration among different work groups.
- the technical support of the work groups
- the synthesis, the presentation and the publishing of the results of the group's work.

The facilitators also organise seminars/meetings, for the members of work groups they facilitate. During these meetings, the groups will present the interim results of their work and receive feedback by their colleagues.

The results of the work of the groups are published in the GWfS and are expected to perform as reference material for other groups.

Conclusions-Further Work

First of all, the project aims in supporting teachers to overcome their feeling of insecurity in dealing with new technologies. Moreover, a serious attempt was made in order to bring teachers in touch with the potential and features of the use of ICT in teaching and learning. Teachers' perceptions about innovations in teaching and learning are continuously revised according to the feedback they receive from their students as well as by the changes in society and the evolutions in technology. Under this prism, the project aims in establishing a training environment capable to accommodate different perceptions derived from different skills and inclinations.

The project spends a lot of efforts in transferring the responsibility for the selection of the training model, the training providers and the training rate to the teachers. Furthermore -through the teamwork organised in schools- the project makes an attempt to involve schools in research activities concerning the cross curriculum utilisation of ICT. In that way, schools are expected to develop the abilities to investigate, evaluate and finally integrate into the classroom the innovations in technology and society.

One of the main issues of the project is the establishment of a human network of experts around the country. The human network is going to use the infrastructure of the GWfS in order to create the required communication and collaboration channels. Additionally, the members of the network are expected to facilitate the enrichment and management of the educational content available over the GWfS. The human network will be facilitated by the existence of the local training centres, which are expected to perform as local training institutions, covering not only the needs of the project, but also acting as a permanent support mechanism for the professional development of the Greek teachers.

At the beginning of the project HPI was concentrated in the development of the training curricula as well as in the training material specifications. The training curricula describe the targets of the training process and outlines the skills and abilities expected. It is for the training providers to decide the teaching methods and strategies in order to achieve the described targets. Furthermore, the whole national curriculum is being reconsidered in order to be able to accommodate ICT based activities.

Final target of the project is the establishment and operation of sustained learning communities, which can not only perform as a peer-to-peer interaction environment for the Greek teachers but also to bring in touch all the members of the educational community towards a life-long training approach.

References

Bickmore-Brand, J. (1996). Bickmore-Brand's literacy and learning principles. *In stepping Out: Literacy and Learning Strategies, EDWA.*

Davis .(1998). Information Technology for Teacher Education and Professional Development: responding to demand. *Journal of Information Technology for Teacher Education,* 7(2), 155-161

Fleischman, H. L. & Williams, L. (1996). *An Introduction to Program Evaluation for Classroom Teachers.* Development Associates, Inc., Arlington, VA. http://teacherpathfinder.org/School/Assess/assess.html

Lawson, T & Comber, C (1999). Superhighway technology: personnel factors leading to successful integration of information and communication technology in schools and colleges. *Journal of Information Technology for Teacher Education,* 8(1), 41-53

Papadopoulos G., Karamanis M, Roussos P. (2000) "Added value services on the Greek Web for schools". *ED-MEDIA, 2000.* AACE, Charlottesville, VA. 1440-1441

Rogers, J. (1977). *Adults Training (Third Edition).* Milton Keynes: Open University Press

Underwood, J. & Cavedish, S. (1996). Are Intergated Learnimg Systems Good for Teachers too? *Journal of Information Technology for Teacher Education,* 5(3), 207-218

Wild, M. (1996). Technology refusal: ratioanalising the failure of student and beggining teachers to use computers. *British Journal of Educational Technology,* 27, 134-143

Wilson, B. & Ryder, M. (1998). Dynamic Learning Communities: An Alternative to Designed Instructional Systems. *University of Colorando at Denver.* http://carbon.cudenver/~mryder/dlc.html

TEACHERS' PERCEPTIONS of TECHNOLOGY IN-SERVICE: A CASE STUDY

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Abstract: A series of case study-type interviews were conducted with selected K-12 teachers on their perceptions of technology integration in-service activities in which they had participated. Teachers were selected to represent rural and urban, small to large schools, and a variety of disciplines. The primary goals were to determine the depth and breadth of in-service activities teachers experienced such as variety of computer applications, utility applications versus instructional applications, Internet usage, degree of expertise, and degree of successful implementation developed from the experiences. Teachers reported positive results of in-service in terms of awareness of the technologies available. Often, recent in-service activities were focused on administrative/utility functions rather than instructional applications. One major concern mentioned was that during the in-service activities, teaching strategies and 'hands-on' time were seldom included. Many teachers expressed frustration with the limited time allocated to the topics/skills being taught in the in-service activities.

Background and Rationale

In the recent past, the Wyoming State Department of Education has mandated the integration of technology in the classroom. There have been a number of initiatives by the State Department of Education to encourage technology use. Along with the Wyoming School University Partnership's Staff Development Academy (a consortium of school districts, community colleges and the University of Wyoming), school districts have been required to develop and initiate Technology Plans. The State of Wyoming and QWest have provided Internet access to all its schools. With the introduction of the WHEN (Wyoming High School Equality Network), compressed video has been brought into all the high schools in the state, community colleges and the College of Education. Regional technology training centers have been put into place in order to contend with the vast distances that separate the state populations to provide local staff development centers. And, within the University, the College of Education has had a strong mandate to raise the level of technology use in the pre-service program for both student and faculty. Obviously with an influx of this much technology into a state, there is a need to know how well our teachers are coping. Are they using these technologies? Do they have access? Are they being trained effectively to use these technologies? Are they receiving support?

This situation is not unique to Wyoming. Nationally, Internet use has been on the rise in all public schools growing from 35 percent in 1994 to 78 percent in 1997(Bare & Meek 1998). We are now rapidly approaching a level of 95 percent use of Internet use in Wyoming schools in the year 2000. Another major trend is in the arena of standards based assessment for both in-service and pre-service teachers. Both are now required to begin to meet technology standards on a national level. ISTE's (International Society for Technology in Education) National Educational Technology Standards for Teachers quite clearly states," All candidates seeking certification or endorsement in teacher preparation should meet educational technology standards" (ISTE, 2000). NCATE (National Council on the Accreditation of Teacher Education) has responded with a similar standards requirement (NCATE, 2000). Several states have responded with commitments to implement these standards. For example, Utah has fulfilled its commitment to public schools to provide access to educational technologies that promises to enhance teaching and learning (Tyner. 1998). Missouri has begun investigations to determine the status of technology integration in schools as well as provide laptop computers to all College of Education majors (University of Missouri, 1998).

In spite of all of the efforts to improve the quality of education and integrate new technologies, it has been suggested that most teachers continue to teach the way they have in the past (Sparks & Hirsh, 2000). The argument has been well documented that purchasing new technology equipment and software alone does little to cause effective change in the classroom (Hite, 2000). Recent investigations, indicated that this influx of technologies into the educational system has caused many teachers express high degrees of frustration and bewilderment as how to integrate these technologies into their classroom instructions. At the same time, the school districts have established technology integration and staff development as primary goals (Reynolds, 1999). Given that school districts have established technology integration and staff development as primary goals, and recognizing that teacher participation in both these areas is increasing, the question that we must ask is, "What are the teacher's perceptions as to the effectiveness of these efforts?"

Objectives of the Study

The intent of the study was to determine the answers to the following statements, which also served as the interview questions for the study:

1. What technology do you currently use in your classroom? How often?
2. To how much technology do you have access?
3. How does the technology that you access suit your needs?
4. What recent in-service activities has the district provided to you?
5. What have you implemented as a result of these in-service activities?
6. What barriers exist that prevent you from integrating technology?
7. How would you integrate more technology if it were available?
8. What should the district do to enable you to integrate more technology?

Procedure

A naturalistic inquiry approach was used to conduct this study. This approach was selected in order to facilitate on-site observations while schools were in session and to enable unsolicited answers to be followed by additional inquiry during the interview (Lincoln & Guba, 1895, Reynolds, 1999). Selected high schools were contacted throughout Wyoming in the fall of 2000 and the researchers obtained permission to interview various teachers within the school districts. Teachers were sought out that were users of technology in the classroom rather than the technology professionals enlisted by the school districts to improve technology use. However, it should be noted that on at least two occasions, the latter individuals did find their way into the interview process. The questionnaire was designed to elicit responses in an informal setting. Each interviewee was given a questionnaire and free flowing discussion took place, using the lead questions as a guide. The data developed in these discussions was extracted from the taped conversations and the extensive field notes taken by the researchers during the interviews.

Results

The intent of the interview questions was to obtain teachers' perceptions as to the availability of technology, and to what extent and how often they use technology in their classrooms. Moreover, the primary focus was to determine recent in-service activities, their effectiveness, and how well the in-service prepared them to integrate technology into their instruction. We were also interested in determining how much support they receive as follow-up to the in-service activity. And, we were also curious as to the identification of barriers that prevented them from using technologies, whether they would integrate more technologies if they were made available, and in what way their respective school districts could assist in the process of more integration of technology.

In response to the first question, "What technology do you currently use in your classroom? How often?" the majority of teachers used computers with the basic Microsoft Office package for word processing and presentations, email, and the Internet and WWW. A limited number of teachers indicated they used spreadsheets with their students to teach problem solving. On two occasions, with foreign language and the Schools to Careers program, we saw teaching computer centers with a wider focus on various software packages that supplemented the subject matter. Very few teachers indicated they used peripheral technologies such as; presentation equipment, computers, digital still and video cameras, video editing, scanners, and CD writers.

Responses to the second question, "To how much technology do you have access?" included a wider range of technology was in fact available for use: presentation equipment, computers, Internet, digital still and video cameras, video editing capabilities, scanners, CD writers and a fairly wide array of software. In almost every case, teachers reported that the district provided a wide array of the latest technologies but because of location, complications with scheduling, or lack of expertise, they often perceived it as having limited availability. One teacher stated that there were CD-ROM writers however they were on a teacher's desk as part of their personal computer and it was uncomfortable to ask to use the equipment. Another teacher reported that they had presentation equipment on carts but one had to move up and down stairs or across to another building in order to use it.

In response to question three, "How does the technology that you access suit your needs?' the overall responses were that there was not enough equipment in the necessary places. Most computers were located in the labs and not always accessible because of scheduling conflicts. Several teachers expressed that there was not enough money in the district to purchase the needed items. Limited access to existing computers seemed to be a problem in that certain computers were often dedicated to special groups because of grant purchases. There was a need for more varied and interactive software and a need for presentation hardware in the classroom. One teacher noted that their particular Superintendent liked to see technology and supported the purchases of such things but getting training to support that technology integration was next to impossible.

In response to question four, " What recent in-service activities has the district provided to you?" in-services were related to the needs of the district and not the individual curriculum needs of the teachers. Recent in-services had provided information on how to us the new grading systems in order to meet the needs of the new standards based requirements. One high school however was out of the norm in that they had organized more effectively and had begun a' mentor to mentoree' program with Apple Computer and their in-service was growing in a different direction. A third predominate idea that surfaced was that several districts relied on in-service needs being fulfilled by sending certain teachers to conferences. Basically, the notion that going to a conference some how provided the necessary in-service training for a teacher was the model. The individual rather than the group was the focus and teachers felt like this was granted to the "privileged few."

In response to question five, ""'What have you implemented as a result of these in-service activities?" most successful implementation was directly related to the needs of the district. "We were taught how to use the grade book on the computer (in some cases the paper grade book was actually taken away) and now we use the grade book on the computer. " Another example was the implementation of attendance software. One exception, in the case with of the school district using the mentor program, teachers were the most satisfied with this implementation strategy. One teacher would learn a topic and mentor it to a variety of other teachers, including teaching strategies as well as develop expertise in using the technology. The practice of sending selected teachers to a conference was not perceived as being a very effective model unless the 'mentor-mentoree' approach was implemented as a follow-up.

In response to question six, "What barriers exist that prevent you from integrating technology?" the responses were overwhelmingly lack of money, lack of knowledge, resources in the labs, software and equipment, and greater need for time to learn to use and implement technologies into the curriculum. Also, access to technical support and follow-up were often mentioned as major barriers.

In response to question seven, "How would you integrate more technology if it were available?" the answers were more curriculum specific. For example, math teachers wanted graphic calculators and programs such as Geometry Sketch pad. Most teachers expressed the need to make the technologies more mobile or having more of them concentrated in the classroom. Rather than having computer labs which are often generic in nature and are often overbooked, teachers prefer that those technologies were available in the classroom. This change would create the feeling of ownership and the opportunity to realistically make the technology part of the everyday curriculum.

The responses to question eight "What should the district do to enable you to integrate more technology?" were oriented toward a variety of concerns. Having greater access to technologies and providing more time and money for training and integration were prevalent. The teachers voiced the position that the development of a more responsive management team was necessary. Overall, a technology team, which included a technology director, repair crew, integration specialist and data specialist complimented by a strong technology plan, was suggested. Also, the technology plan should reflect the need for planning of obsolesce and rotation of equipment. Better staff development, with more hands on in-service experiences, more follow-up, and creating a cadres of student assistants, were also expressed as primary needs.

Implications

It was enlightening to hear most teachers express that they would like to integrate more technology in their classrooms. But, most of the barriers they expressed pointed toward insufficient or inadequate in-service. Also, it was frequently expressed that the approach by districts to select the 'chosen few' to attend regional and national conferences had limited in-service value. It seemed to be a common theme that in-service to integrate administrative functions i.e. electronic grading and attendance software, was usually quite adequate and had continued technical support. The most commonly expressed frustrations were with instructional software applications where the in-service activities did not include enough 'hands on' time and follow up support. Strategies for ways to integrate instructional software in teaching were frequently mentioned as lacking as well. One positive finding, the process of establishing expertise among a few teachers, who in turn taught their peers, was seen as being one of the more effective types of in-service to aid in the integration of technology.

To effectively integrate technology in classroom instruction, school districts must involve teachers more in the in-service planning and delivery process. Second, school leadership needs to be aware of more "user friendly" ways to make the existing technology accessible. Another strategy is that a continued support system needs to be put in place to aid teachers, for example, when technical assistance is needed, it needs to be easily accessible. The message came through very clear that without the technical support; it was unlikely that much integration would occur.

It was also made clear that too many in-service activities were planned for the large groups where 'hands-on' activities where limited. This approach worked well to develop awareness of technology, but it wasn't very effective for integrating the technology. Smaller group activities in which teachers have the opportunity to practice using the software must become the norm as opposed to the traditional "show and tell' presentation approach. Finally, teachers prefer the in-service activities to be taught by those who can relate to the classroom climate. Teaching strategies, and subject matter related examples must be a part of the technology in-service process. Follow-up support as well must contain a teacher-oriented component.

References

Bare, J & Meek A. (1998). Internet in public schools (NCES 98- 031) U.S. Department of Education, National Center for Educational Statistics, Available at http://www.NCES.ed.gov

Hite, S. (2000). Professional development for educational technology, Available at; http://home.earthlink.net/~stefhite/545/545B.html

ISTE (International Society for Technology in Education), Available at http://www.iste.org/standards/index.html

NCATE, National Council on the Accreditation of Teacher Education
Available at http://www.ncate.org/standard/m_stds.htm

Reynolds, C. (1999). An investigation of the influence of computer technologies on teaching and learning by students and school personnel in selected public secondary schools in wyoming, Society for Information Technology& Teacher Education, SITE 1999

Sparks, D. & Hirsh, S (2000). A national plan for improving professional development, National Staff Development Council, Available at
http://www.nsdc.org/Library/NSDCPlan.html

Tyner, K (1998). Bridging technology access and integration: new visions for professional development. Available at; http://www.surweb.org/enc/background.htm

University of Missouri (1998) 1998 Missouri school district census of technology, Office of Social and Economic Data Analysis, Available at http://www.Oseda.missouri.edu/index.html

Multimodal distance learning: A personal cooperative video on-line asynchronous experience.

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Introduction:

Idaho State University's College of Education serves an area of nearly 40,000 square miles. Three major cities are the loci of economics and higher education in this region. Pocatello, where ISU is based, lies approximately 50 miles west of Idaho Falls and 110 miles east of Twin Falls. Idaho Falls is home to a large federal research facility, as well as to a higher education satellite center and a nearby private college. Twin Falls, whose main source of income is agriculture, also has a well-known state junior college. A few small towns dot the desert landscape between these larger communities. Though rural and sparsely populated, southern Idaho does have a strong emphasis on education, as witnessed by the junior colleges, college centers, and university. Many of the inservice teachers of the 55 school districts within southeastern Idaho participate in graduate degree programs through ISU's College of Education. These graduate programs have, in the past, been supported by faculty who commute from Pocatello to teach night or weekend classes in Idaho Falls or Twin Falls. However, in order to coordinate graduate cohorts in the three cities, to save faculty from the inconvenience (sometimes danger!) of commuting long distances late at night or in extreme weather, and to follow through on its commitment of making graduate courses available to all students in its service area, the College of Education seeks innovative means of delivering graduate courses, including compressed video and web-supported classes.

This paper describes one distance learning class that utilized compressed video and supplemental web-based material to reach students at six different cities and towns. This class was a master's level class on learning theories, with a combined enrollment of 73 students. Besides the larger groups of students located in Pocatello, Idaho Falls, and Twin Falls, smaller groups of students also attended the class from Blackfoot (20 miles east of Pocatello), Malad (60 miles south), and Soda Springs (50 miles southeast). The primary means of delivery was a weekly 3-hour broadcast from Pocatello to the other six sites. During the weekly broadcast, the instructors and students delivered presentations which incorporated compressed video feed, computer, videotape, and Elmo technologies. The broadcast sites in Twin Falls and Idaho Falls also had Elmo, videotape, and computer facilities for transmission. The smaller sites could receive and send audio and compressed video signals, but were unable to send computer-based applications, videotape, or Elmo images.

The class met one night each week over a sixteen week semester. A different learning theory was presented each week by the instructor, during the first half of the class. The following week, that same learning theory would be presented in greater detail by a group of six to eight students, during the second half of the class meeting. Groups were assigned during the first week of the semester and did not begin their reports until the third week of the semester. Each presentation was required to include an overview of the learning theory, discussion of a research article, and a class activity which demonstrated the principles of the particular learning theory. Group members came from all the class sites and so, in order to cooperatively develop the different components of their presentation, the group members had to communicate over long distances. Brief "meetings" during the evening breaks, asynchronous messages on the WebCT bulletin board, personal email communication, and long distance phone calls were the primary means of communication.

Outside of class, students utilized on-line components of WebCT to access additional information, quizzes, and examinations. The WebCT sections of the course included course contents, quizzes, and communication. The syllabus and calendar, as well as chapter reviews, were posted under course contents. The course contents section also contained the instructor's and students' electronic presentations, converted to .pdf files and posted for downloading. This was an economical way to distribute hand-outs and class notes to all the students without photocopying and sending them to the sites. Also within the course content section were chapter quizzes linked to the chapter reviews. Chapter quizzes and two examinations were created and posted, using WebCT's capabilities to create objective and short-answer assessments. Ten quizzes assessed students' comprehension of the text through 15 multiple choice questions. At the mid-term and at the end of the course, multiple-choice examinations (50 items) were posted which tested the students on content knowledge of both text and lectures.

On-line communication included a bulletin board which supported asynchronous conversations. The bulletin board was organized into a main forum to which all students had access, and eleven subject-specific forums. Weekly study questions were posted to the main forum by the instructor; all students were expected to discuss the question via the bulletin board. The eleven forums were reserved for discussions between members of a presentation group. These discussion groups were limited in their membership; only those students who were part of that presentation group could see the messages posted to that forum. The bulletin board group fora were central to the cooperative groups' communication and planning of their presentation. The students' cooperative groups posted on the bulletin board: messages to each other, drafts of electronic presentations and hand-outs, and research articles to be read. The student groups also used the chatrooms in WebCT for synchronous planning sessions as they coordinated their group's presentation on a specific learning theory

Method:

A survey of the students was undertaken to determine which of the various distance learning technologies was used most frequently by the students in the preparation and delivery of their group presentations, and whether particular technological components facilitated or hindered their learning experience. The survey consisted of four parts, only three of which are touched upon here (demographics, student assessment of technological components, number of distance learning/WebCT classes). The first part collected demographic information about the students, including the site from which they took the class, their age, their gender, and which their area of concentration within the Master's of Education program. Of the 73 students enrolled in the class, 67 attended the night the survey was delivered. Table 1 summarizes the class demographics of these 67 students.

Gender	Age	Class Location	Master's Degree Program
F = 39 M = 28	<30 = 14 30-40 = 20 <40 = 29 not reporting = 4	Pocatello = 18 Twin Falls = 23 Idaho Falls = 16 Others = 9	Ed Technology = 34 Ed Administration = 14 Human Resources Training = 8 Curriculum = 3 Others = 8

Table 1. Demographics (number of students in each category)

This paper reports the students' responses to the second part of the survey, which examined three major constructs. The students were asked to rate specific technological elements of the class relative to (1) how well the technology supported the class objectives; (2) how well the technology supported the group presentations and (3) how well the technology facilitated their learning as individuals. As can be seen in Table 2, the questions dealt with technological components of the compressed video broadcast, as well as elements of the WebCT supplement.

Components 1-4 are those which were used during the compressed video broadcast during class. The instructor and the presenting groups used these components to varying extents. Students at the remote sites did not have all these technologies at their sites, but they interacted with them to the extent that the instructor or other students used them. Components 5-7 refer to elements of the course content available at WebCT site, including chapter summaries and overviews authored by the instructor, articles and hand-outs which were available in PDF format on the web site; and quizzes and exams. Components 8-11 deal with electronic communications through WebCT, especially the bulletin board and chatrooms. Each component was rated on a Likert scale of 1 to 4, from Strongly Disagree to Strongly Agree.

Construct	Technological Component
I. This component supported the class goals: II. This component facilitiated our group presentations: III. This component facilitiated my learning:	A: Compressed Video Components • Live video feed of instructor and presenters • Electronic presentations (PowerPoint) • Computer applications in class (Internet, etc) • Other media sources (Elmo, videotape) B: WebCT Components: • Chapter summaries and reviews on WebCT • Quizzes and exams on WebCT • PDF documents to download from WebCT • Bulletin Board Communication (study questions) • Bulletin Board Communication (group forums) • Chatroom communication • Email with instructor

Table 2. The constructs and components rated by the student survey

Table 3 indicates the average rating and standard deviation for each construct.

Construct	Component	Mean	Std. Dev.	Mode
I. Class Goals	A, Compressed Video (#1-4)	3.01	.59	3
I. Class Goals	B. WebCT (#5-11)	2.86	.59	3
II. Group Presentations	A. Compressed Video (#1-4)	3.02	.55	3
II. Group Presentations	B. WebCT (#5-11)	2.90	1.02	3
III. Individual Learning	A. Compressed Video (#1-4)	2.92	.58	3
III. Individual Learning	B. WebCT (#5-11)	2.77	.64	3

Table 3. Mean, Standard Deviation, and Modal Scores for Constructs Measured by Student Survey

Results:

As indicated in Table 3, most of the response to the various technological components of the course was positive. Students found that the compressed video format was the most used and most useful in supporting the class objectives and their group presentations; they also indicated that the compressed video format supported their individual learning more successfully than did the WebCT components. The table further suggests that there is a greater variation in some scores than in others. For example, while the standard deviation is similar for four out of the six constructs, the use of WebCT components to support the group presentations was rated from strongly negative (1) to strongly positive (4). This is due in large part to the students' use and perception of the two functions of WebCT – presenting content and communication. Those portions of WebCT which conveyed content (overviews, articles, hand-outs, quizzes; components #5-7) were rated mostly negatively by the students (average score of 2.5). Those elements of WebCT which dealt with communication, however, were rated highly by the students, especially for planning and presenting their collaborative group projects. The use of the bulletin board (components #8-9) for group presentations (construct II) had an average score of 2.9 (SD = 0.9; mode = 3); the use of chatrooms had an average score of 2.83 (SD = 1.06); and the use of email had an average score of 3.3 (SD = 0.9).

Student valuation of either the compressed video broadcast or the WebCT supplements to the course does not appear to be related to their experience with these formats. As Tables 4 and 5 indicates, there is no clear increase or decrease in students' assessment of the technological components relative to the constructs over time. Students for whom this was their second distance learning course tended to rate the constructs at a slightly lower level than their counterparts with either more or less experience with distance learning (Table 4). Students for whom this was the third (or more) class supplemented by WebCT which they have taken, tended to rate the WebCT components slightly more negatively than their counterparts who had had only one or two previous web-supplemented classes (Table 5); however, there is no real trend in the students' assessment of either the compressed video or the WebCT components related to their experience with these formats.

Conclusion:

Students' high rating of the video compressed broadcast and the incorporation of videotape, electronic presentations, and other technologies in the weekly broadcast is not surprising. These elements were incorporated into most of the lectures and group presentations, so all students interacted with these technologies on a regular basis. However, the use of the WebCT supplements to the class was determined by the individual students. Class participation, including participation in the WebCT site, was incorporated into each student's grade, but it contributed only a small fraction to the student's overall score. Therefore, students had only weak external motivation for using the WebCT site. Intrinsic factors would be the primary motivators for the students' use of the WebCT resources, bulletin boards, and chatrooms. It appears from the survey results that students tended to use the WebCT site primarily for communication rather than for additional content. Further study is required to determine what factors may have limited or enhanced students' use and value of the chapter summaries, topical overviews, and articles which were available as part of the course content.

Construct	# of distance learning classes	Positive (2.6 – 4.0)	Negative (1.0 – 2.5)	Construct	# of distance learning classes	Positive (2.6 – 4.0)	Negative (1.0 – 2.5)
I.A.	1	22 (71%)	9 (29%)	I.B	1	26 (77%)	5 (23%)
	2	10 (63%)	6 (37%)		2	12 (75%)	4 (25%)
	3	15 (83%	3 (17%)		3	13 (79%)	5 (21%)
II.A.	1	24 (77%)	7 (23%)	II.B.	1	25 (81%)	6 (19%)
	2	10 (63%)	6 (37%)		2	12 (75%)	4 (25%)
	3	12 (67%)	6 (33%)		3	10 (56%)	8
III.A.	1	23 (74%)	8 (26%)	III.B	1	23 (74%)	8 (26%)
	2	9 (56%)	7 (43%)		2	10 (63%)	6 (37%)
	3	13 (72%)	5 (28%)		3	9 (45%)	11 (55%)

Table 4. Students' rating of constructs and components based on number of compressed video distance learning classes they have had.

Construct	# of WebCT classes	Positive (2.6 – 4.0)	Negative (1.0 – 2.5)	Construct	# of WebCT classes	Positive (2.6 – 4.0)	Negative (1.0 – 2.5)
I.A.	1	20 (71%)	8 (29%)	I.B.	1	22 (79%)	6 (21%)
	2	16 (80%)	4 (20%)		2	16 (80%)	4 (20%)
	3	10 (63%)	6 (37%)		3	12 (75%)	4 (25%)

II.A.	1	22 (79%)	6 (21%)	II.B.	1	21 (75%)	7 (25%)
	2	11 (55%)	9 (45%)		2	14 (70%)	6 (30%)
	3	13 (81%)	3 (19%)		3	10 (63%)	6 (37%)
III.A.	1	21 (75%)	7 (25%)	III.B.	1	17 (61%)	11 (39%)
	2	13 (65%)	7 (35%)		2	15 (75%)	5 (25%)
	3	10 (63%)	6(37%)		3	9 (56%)	7 (44%)

Table 5. Students' rating of constructs and components based on number of courses they have taken supplemented by WebCT.

The most highly rated components of the WebCT resources were those dealing with communications. Most students strongly agreed that the bulletin board and email contact with instructors and fellow students were very important to supporting the class objectives, planning and preparing group presentations, and facilitating individual learning. In some ways, the bulletin boards, chatrooms and email communication created a new community consisting of students and instructors. This electronic community gaves names and personalities to the otherwise anonymous faces that we saw each week over the compressed video. The combination of on-line communication and weekly visual contact was a unique element in the distance learning experience.

Course Design Overview of a Web-Based M.S. Program

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Abstract

This poster presentation will provide an overview of the course design of the Master of Science in Agronomy Distance Education Program at Iowa State University. The presentation will share experiences of the course design and formative evaluations of the courses provided by the program. In the fall of 1998, the Masters of Science in Agronomy Distance Education Program at Iowa State University (ISU) started providing interactive multimedia courses in which most course materials and resources were accessed and delivered through the WWW and CD-ROM. Most of the students enrolled in this program were professionals working in industry and government. Several interactive multimedia activities were developed in the courses. Those activities included *Study Questions*, *In Detail*, *Try This*, *Check This Out*, and *FYI.* Various formative evaluation activities related to the course design have been conducted and actions have been taken to improve the courses and program. Lesson maps, glossaries, and calculation examples have been added to the courses. Additional multimedia presentations have been developed. Links to previous and subsequent lessons have aided with navigation. A search function for topics and words within each course has also been tested.

Overview of the Program

Distance education has a long history of applying technologies in delivering instruction to those who are not able to participate in a campus-based curriculum. Many people involved in distance education are professional individuals who are seeking to pursue advanced degrees and empower themselves with knowledge that is relevant to their career field.

A Masters of Science in Agronomy Distance Education program began in the fall of 1998 at Iowa State University (ISU). The program introduced interactive multimedia courses whereby students could access most course materials and resources through the WWW and CD-ROMs. A major goal of this program was to provide an alternative educational program for professionals working in industry and government to gain an advanced degree in Agronomy without having to attend the campus in person.

The curriculum consists of 12 courses, a one-credit workshop, and a three-credit creative component, totaling 30 semester credits (Iowa State University, 2000). The courseware integrates content material on WWW/CD-ROM with the interactive tools of WebCT (WebCT, 2000) located on an ISU server. The WebCT tool allows students to electronically interact with their instructors and classmates by utilizing a course calendar, discussion board, chat room, student homepage, assignments, emails, and student records. The program began with an enrollment of fifteen students in a fall, 1998 pilot program. In the fall of 2000, 51 students are enrolled in the program. The program has admitted 81 students.

Several interactive multimedia activities were developed in the lessons. Those activities included a) *Study Questions*, b) *In Detail*, c) *Try This*, d) *Check This Out*, and e) *FYI*.

a) *Study Questions* generally provide immediate feedback to the students concerning how well they are grasping the concepts of a particular lesson. They may be simple questions about concepts, or may ask the student to think beyond a particular concept. These questions are not assessed for a grade.
b) An *In Detail* activity probes a concept further without interrupting the flow of a lesson. After the *In Detail* window has been closed, the student returns to the lesson at the same place they left off. This is required information for the lesson and could involve activities like assignments, *Study Questions*, or *Check This Out*.
c) *Try This* activities allow students to try out or practice tasks, further clarifying concepts to the students. These are usually followed by *Study Questions*.
d) *Check This Out* links are connected to external WWW websites aiming to provide additional information to the students on particular subjects. It is a great opportunity to put other well-developed sites to work for our program, especially extension sites from Iowa and other states.
e) *FYI* activities further explain topics and impart tidbits of interesting information. The information is interesting but is intended to be remedial.

Various formative evaluation activities related to the course design have been conducted. Faculty members and students were the primary target groups of the evaluations. Results of these evaluations indicate: a) students believed they were learning as much in the distance environment as they would on campus and b) they liked the interactive multimedia presentations and asked for clear navigation structure. Based on the evaluation results, improvements have been made to the courses and program. For example, lesson maps, glossaries, and calculation examples have been added to the courses. Additional multimedia presentations have been developed. Links to previous and subsequent lessons have aided with navigation. A search function for topics and words within each course has also been tested.

This poster presentation will provide an overview of the course design of the Master of Science in Agronomy Distance Education Program at Iowa State University, and share experiences of the course development and formative evaluation results of the courses. Brochures with detailed information regarding this M.S. in Agronomy Distance Education Program will be available during the poster presentation. The multimedia interactive lessons will also be demonstrated.

References

Iowa State University, "Master of Science in Agronomy Distance Education Program," http://masters.agron.iastate.edu, (accessed October, 2000).

WebCT, http://webct.cc.iastate.edu:8900/ (accessed October, 2000).

Revolution of the Pedagogical Use of ICT by Influencing the Whole School Community

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Abstract: The only way to make changes in the pedagogical practices of teacher's work is to influence the whole school community in collaborative way. Also the background organizations like the whole commune should actively give the frame of reference and financial resources to make it possible to all students to participate in the information society. Based on these findings ICT Learning Centre of Helsinki University has been developing the practices for in-service training that includes methods like collaborative learning, research based learning, computer assisted team work and distance learning on the net. It is easier to make a change in a school community when there is a team of teachers to adapt new pedagogical skills to use. In this article we present the authentic case: Information Strategy for the Educational Use – Done by Collaborative Work.

Background

In the middle of the first period of the Finnish national information strategy, Committee of the Future (established by the Finnish Parliament) started an extensive evaluation project the goal of which was to devise an up-to-date and well-grounded evaluation of the impact of ICT (Information and Communication Technology) on instruction and learning. The Finnish National Fund for Research and Development (Sitra) carried out the evaluation project which was divided into five sub-projects. One of these sub-reports was an evaluation of institutions of general and vocational education and kindergartens. According to the evaluation, only one fifth of the educational staff extensively applies new technology to support teaching. The new Information Strategy for Education and Research for period 2000–2004 devised by the Finnish Ministry of Education is based largely on the results of this evaluation project and the recommendations made in it. At the same time the city of Helsinki started to equip comprehensive schools and high schools with computers and networks (LAN) and the training ICT for teachers. ICT Learning Centre grounded a research group to study and evaluate the comprehension and ICT skills of teachers, students and parents. One major part of that research was to study teachers' technical skills and pedagogical thinking and relationships between them. In the research it was proved that those teachers who use ICT actively showed to have a more mature insight of the use of ICT in education and generally more sophisticated pedagogical thinking. They also valued ICT more than the others as a tool for collaborative learning and emphasized the active role of the learner in information constructing process. These teachers also believed that it is possible to develop human intelligence. (Hakkarainen 1998b).

The only way to make changes in the pedagogical practices of teacher's work is to influence the whole school community in collaborative way. Also the background organizations like the whole commune should actively give the frame of reference and financial resources to make it possible to all students to participate in the information society.

The Modern Model of Teachers In-service Training

Based on these findings ICT Learning Centre has been developing the practices for in-service training that includes methods like collaborative learning, research based learning, computer assisted team work and distance learning on the net. In all our courses we use multiform teaching containing face-to-face lessons, learning tasks and collaborative team work as project work. We use open learning environments so that all teams can access and make comments to others workspaces. In all of our courses we presume that there will be a group of at least two teachers from a single school and they will work together during the course. It is easier to make a change in a school community when there is a team of teachers to adapt new pedagogical skills to use. Learning tasks are done within the whole school community. In this way we try to guarantee that almost the whole school community will be involved in or at least will be conscious of the learning process.

The basis of all our in-service training is that all the methods and models used are transferable to the student level. When teachers learn to use these methods as a student they have a better ability and willingness to implement the methods into practice with their students. Dissemination of these pedagogical practices facilitate to form modern learning culture.

Open Learning Environments Support the Modern Model of In-Service Training

The use of Open Learning Environments (OLE) supports in an excellent way the modern model we are using in teachers' in-service training. As a matter of fact, several applications of learning could not be realized or they would be very difficult to carry out without ICT or open learning environments. The fact is that the demands of teacher's work and the pressing nature of it may often limit the possibilities to attend face-to-face training. OLEs make it possible to study and work with projects without the limitations of the time or the place. The training that is not limited to time nor place is however not the main reason to the use of OLEs. The most important reason is the method of learning, examples being collaborative learning and research based learning which can very easily be implemented with OLEs.

The traditional working model of the school has not supported the demands of the Information Society. It is necessary to move on from the traditional working model towards the culture represented by real world (living life). The construction of new information, the evaluation of information and sources and the use of information as a tool will be the most essential part of education. In several professions the modern expertise and know-how presuppose an ability to use ICT and ability to construct new information and to use information. Open learning environments and proper use of them offer schools very good possibilities to develop the education all-inclusively.

Most of the OLEs have a property to make thinking and the problem solving process visible. Thinking can be made visible by writing texts, drawing schemes or charts. It is possible to present ones ideas and hypothesis and other users can comment on them and ask questions. After that the second version of the text can be written based on the comments, and be published on the OLEs and the writer can have even more comments. The whole developing or problem solving process will become visible and also other users can learn by observing it. Interaction with colleagues, instructors, experts and the whole community of the school plays a significant role in development of education.

The open learning environments and their pedagogically meaningful use are the key factors to the challenges and demands of Information Society and open classroom. The use of OLEs facilitates the transformation of learning (and thinking) into a profound process and to a collaborative activity. The direction is from traditional working models towards research based learning and the real development of dynamical expertise. OLE is not restricted only in the classroom or the school, it openly extends to various fields of science and to the whole society and the world.

Case: Information Strategy for the Educational Use – Done by Collaborative Work

The Finnish Ministry of Education presumes that every Finnish school creates its own strategy for the educational use of ICT. The National Board of Education is funding training programs to guide this work. In the ICT Learning Centre we have planned a training program in which a group of teachers from a school creates the strategy collaboratively with other teachers of their own school and other groups of teachers in the same training program. It is expected that the head master, IT-teacher and one to three other teachers participate from a single school. The team will work together on face-to-face lessons and during a distance period they are responsible for taking their own school community to work with them by informing and dividing tasks and duties. At the same time there are eight to ten other teams from other schools working on the same subject. There is an open learning environment to use for all those teams. In the open learning environment all the material the instructor has done is available (for example tools for the development process), as well as plans, ideas, learning tasks and etc. from each team. Every participant is able to access all workspaces and comment on the work of other teams. It means that every team can use and improve the ideas of the others and so the teams don't have to invent things that another team has already developed.

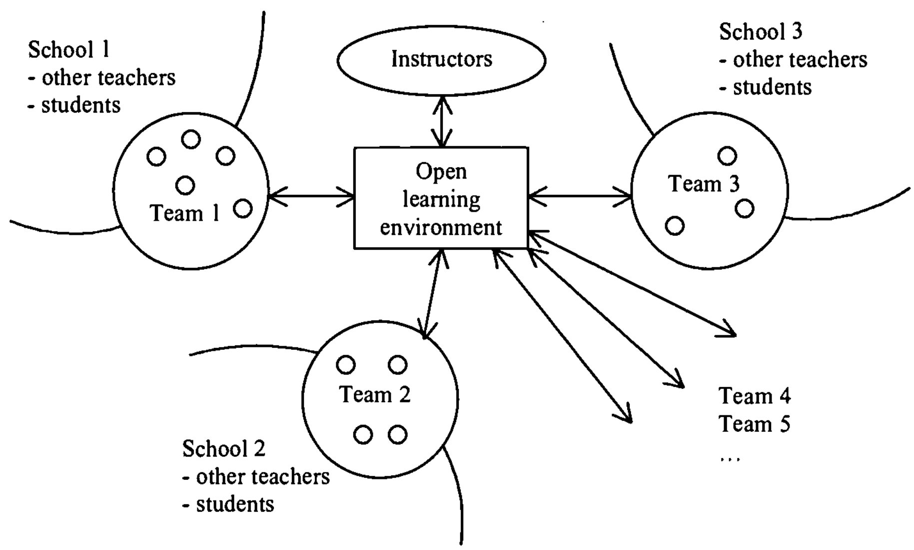

Figure 1: Collaborative model of constructing Pedagogical Information Strategy for the Educational Use

The course of three credit weeks consists of three parts: four day face-to face lessons, learning tasks done in advance and during the course and the project work: planning of the strategy and its execution plan. All the work is done on the open learning environment by the team. There are no individual tasks; work is done collaboratively and the whole team is responsible for the results. The first task is to map the situation of the school at this particular time. It means that the team or its authorized group at school have to collect the facts about the ICT equipment and personnel's knowledge about software and its use in teaching. Because there are some teachers who wouldn't like to use computer in their teaching, it is important to discuss also about the attitudes, fears and threats and to give everyone a possibility to be heard. That way it is easier to make a big change in working community.

First there must be a discussion of values; what is the information and the skills of ICT the students need in their future. It is also important to discuss and agree on the concepts like ICT, the pedagogical use of ICT, open learning environment etc. that are needed to create the ICT strategy. After the discussion the school community needs to decide what are the visions and the goals of using ICT in education. All this can be done in an open learning environment or as an open discussion. The most important part of this work is to write down all decisions and inform everyone.

To get new ideas of using ICT in education during the course every team plans an ICT project to implement with students, carries out the plan and describes the experiences on the open learning environment. Many of the teams have planned a project where students study some new entity using learning environment. This way teachers also get an idea of how to guide and tutor on an open learning environment when they themselves are students in the course using an open learning environment.

The most essential matter in this kind of training is the collaborative process. When every member of the school community has a possibility to take part in creating the strategy and all work is done together, everyone is motivated to carry out the strategy in their own teaching. In the strategy there must be plans on how to train ICT and its pedagogical use to teachers, how to organize the technical and pedagogical support in a school and how to apply an open learning environment to teaching and learning. It is not so important to emphasize an individual teacher and his knowledge but the knowledge of the whole school community. The point is to facilitate all students to get the ICT skills needed in the future and the possibilities they have in improving their learning.

References:

Finnish Ministry of Education (1999). *Education, Training and Research in the Information Society A National Strategy for 2000–2004 [http://www.minedu.fi/minedu/publications/online.html].*

Finnish Ministry of Education (2000). *Information Strategy for Education and Research 2000–2004 Implementation plan.*

Hakkarainen, K. (1998a). Cognitive Value of Peer Interaction in Computer Supported Collaborative Learning *American Educational Research Association Annual Meeting.*

Hakkarainen, K., Ilomäki, L., Lipponen, L., & Lehtinen, E. (1998b). *Pedagoginen ajattelu ja tietotekninen osaaminen (Pedagogical Thinking and ICT Skills)* Helsingin kaupungin opetusviraston julkaisusarja A7:1998.

Huovinen, L. (edited) (1998). *Peruskoulujen, lukioiden, ammatillisten oppilaitosten ja varhaiskasvatuksen nykytilanne ja tulevaisuudennäkymät (Evaluation and future of institutions of general and vocational education and kindergartens)* Sitra 191.

Kylämä, M., & Koli, H. (2000). *Tieto- ja viestintätekniikan opetuskäytön strategia – välineitä kehittämistyöhön (Pedagogical Information Strategy for Schools – Tools for the Development Work).* The Finnish National Board of Education, Helsinki.

Sinko, M.,& Lehtinen, E. (1999). *The Challenges of ICT in Finnish Education.* Edita, Helsinki.

EdTech Online (ETOL): A Master's Degree Program in Educational Technology

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Abstract: This paper describes an educational technology online Master's degree program at Florida Gulf Coast University. The Curriculum & Instructions M.Ed. graduate program provides both educational and technology experiences for educators who are interested in using technology to support the learning process. A rationale is provided for distance learning. The target audience is defined. A rationale for the selection of courses is provided, faculty support, selection of student, and features of the program. Student and program evaluation techniques are discussed.

Introduction

Florida Gulf Coast University, founded in 1991, is the tenth institution in the Florida State University System. The approximate enrollment is 2,700 with a faculty and staff of 500. The campus is located in Southwest Florida on 760 acres of land. The mission statement of the University encourages the use of distance learning, and the Strategic Plan of the University states that FGCU will develop 25% of its enrollment using distance learning.

The M.Ed. in Curriculum and Instruction with a specialization in Educational Technology program (EdTech) began in 1997 when the University opened. The EdTEch program offered 50% online courses and 50% face-to-face courses. The two three-week summer Tech-Ins offered 18 hours of course credit. Students completed the program as a cohort in 13 months.

Evaluation of the existing program demonstrated that students are successful with the online courses. Faculty in the college have experienced success with online learning, and the university supports training and support for online delivery of instruction. In order to support the Strategic Plan of the University and to provide more students with increased opportunities and flexibility, the current program will be offered as a 100% online program.

Online Distance Learning

Online distance learning courses have become an important facet of curriculum at many universities (Robertson & Stanforth, 1999). Schools are increasing their distance learning opportunities through the use of web-based technologies (Moran & Myringer, 1999). Colleges and universities are embracing online distance learning as a means to increase accessibility to many of their courses and programs (Phillips & Peters, 1999, Blumenstyk & McCollum, 1999). The increase in home computers and access to the Internet has expanded the potential student population (Dunn, 2000). If increased accessibility is the goal of colleges and universities, it is important to ensure that they are meeting the needs of all learners through online distance learning, and not excluding large portions of their potential population.

Some of the reasons to support the ETOL program at FGCU included:

- Online/distance leaning is one of the major missions of Florida Gulf Coast University.
- One of the goals of the EdTech program is to learn about distance learning.
- EdTech students have the necessary skills and computer power to successfully learn online.
- The hardware and software technology for distance learning is improving and becoming more affordable.
- Software packages such as WebCT support higher quality distance learning activities.
- FGCU's support system for distance learning is in place and is improving.
- COE has faculty who are knowledgeable and supportive of online learning.
- Online programs have the potential to earn significant FTE.
- Research exists to support quality learning online.
- Thousands of courses exist using WebCT. Some courses are at the pre-college level.
-

Some of the issues facing the College as an online program is developed include:

- Online courses require careful planning for a quality experience.
- The content of technology courses changes often and requires frequent updating.
- Some students require face-to-face learning and live social interaction.
- Live classes may be more fun for both instructor and student.
- Some courses are more appropriate for distance learning than others.
- Intellectual property rights and faculty load issues need to be addressed.
- Faculty need to be trained to provide quality online experiences.

Target Audience

Students enrolled in this program fall into four broad categories:

- Classroom teachers who want a Master's degree that emphasizes technology.
- Classroom teachers who want to become Ed Tech Specialists at school or county level.
- Computer trainers who want to increase computer and pedagogical skill.
- Those with undergraduate degrees who want to learn about technology in education

Sub categories include:

- Level - kindergarten through college.
- Subject area - mathematics, art, elementary education, business
- Physical location – Anywhere in the world.
- Computer background – Minimum computer skills to computer science degree
- Intensity - part time to three courses per semester.

Student Learning Styles

Researchers in the field of distance education examined effectiveness, student motivation, student attributes and traits, student perceptions and attitudes, and interaction. Most of the research did not examine online distance learning, but focused on other forms of distance education (Russell, 1999). Clow (1999) and Sonner (1999) discovered that courses delivered by distance yielded greater effectiveness than traditional courses. Russell (1999) found no significant differences in the effectiveness of distance education compared to traditional education.

Locus of control refers to a student's perception about who is responsible for, or has control over, the events in his or her life (Baynton, 1992; Jonassen & Grabowski, 1993). Tests measuring locus of control provide students with a type of either internal or external locus of control (Dille & Mezack, 1991; Jonassen & Grabowski, 1993). Students with internal locus of control tend to believe that academic success is due to their own abilities; responsibility for learning has been internalized (Dille & Mezack, 1991). Individuals with an external locus of control attribute their academic success to external factors or luck (Dille & Mezack, 1991). Dille and Mezack (1991) found that students defined as having an internal locus of control completed more in telecourses and performed better than students with an external locus of control. The implications for instruction include providing activities that "capitalize on the external student and challenge the internal student" (Jonassen & Grabowski, 1993, p. 360). These activities include teacher-controlled highly structured instruction, highly cued information gathering, and deductive activities all supported by praise and positive feedback from the instructor (Jonassen & Grabowski, 1993).

Kolb's Learning Styles Inventory (LSI) ranks students on four modes of learning, concrete experiential, reflective observer, abstract conceptualizers, and active experimenters (Dille & Mezack, 1991; Jonassen & Grabowski, 1993; Kolb, 1984). The modes of learning yield four learning styles, converger, diverger, assimilator, and accommodator (Dille & Mezack, 1991; Kolb, 1984). Implications for instruction include providing learning opportunities for all four types. Convergers prefer technical tasks to interpersonal issues, whereas divergers prefer activities of information gathering and imagination (Dille & Mezack, 1991; Kolb, 1984). Kolb (1984) stated that assimilators learn best when directed by theory, and accommodators work best while carrying out plans and being involved in challenging experiences (Dille & Mezack, 1991; Jonassen & Grabowski, 1993; Kolb, 1984).

The Student Learning Styles Scale (SLSS) was developed and refined by Grasha and Riechmann (Grasha, 1996; Jonassen & Grabowski, 1993). The SLSS classifies students in six categories, competitive, collaborative, avoidant, participant, dependent, and independent (Grasha, 1996; Jonassen & Grabowski, 1993). Grasha (1996) suggested that the six categories represent three dichotomous relationships, competitive-collaborative; avoidant-participant; dependent-independent. Grasha's research (1996) discovered that learning styles may be dependent on or influenced by course structure. Implications for instruction include providing a variety of learning opportunities to meet the learning styles of all learners (Grasha, 1996; Jonassen & Grabowski, 1993). Extensive research on learning styles shows some correlation between particular styles and success in different classrooms, with different instructors, and in different majors (Dille & Mezack, 1991; Grasha, 1996; Jonassen & Grabowski, 1993). Much of this research has been conducted on distance learning involving telecourses (Dille & Mezack, 1991; Institute for Higher Education, 1999; Russell, 1999). Online distance learning research is limited in scope and depth (Institute for Higher Education, 1999; Russell, 1999), due to the limited history of online technologies.

Student motivation has been studied on two levels, motivation to enroll in the class and motivation to complete the course. Motivation to enroll in distance learning courses included all-hours accessibility to learning, choice and variety of classes, and flexibility of location (Rodrigues, 1999; Rowntree, 1992; Saba & Shearer, 1994). Internal motivation for course completion was a key factor in successful completion of many distance courses (Ehrman, 1990; Kinzie, 1990; Schrum, 1998).

Verudin and Clark (1991) examined several traits and attributes that affect student performance in distance learning courses. These attributes include values, attitudes, and self-concept of the learner. Dille and Mezack (1991) evaluated additional factors that impacted student performance in telecourses. They discovered a positive correlation between grade point average and earned credit hours and final course grade. Dille and Mezack (1991) also discovered that older students received better final grades than younger students received, and married students fared better than divorced students did. Several researchers examined student perceptions and attitudes. Most research found that students completing the distance learning courses were satisfied with their learning experience (Inman & Kerwin, 1999; Phillips & Peters, 1999: Teh, 1999). Inman and Kerwin (1999) found that lack of direct interaction with the instructor did not negatively impact student perceptions or attitudes regarding course effectiveness and delivery. Dillon, Gunawardena, and Parker (1992) concluded that distance education students were positive about their interaction with the instructor and other students. Researchers reported that students preferred greater control and responsibility of their learning (Schrum, 1998).

Electronic Portfolios

The portfolios are developed and maintained in an online format, making them available to professors, students, and employers for the duration of the program. Portfolios are employed as a capstone project, an alternative to comprehensive examinations. The portfolios are developed throughout the program, and the final product is used to evaluate student knowledge gained in the coursework. The students have FTP access to their portfolios throughout the program. They can update the portfolios anytime, and faculty can examine the contents and page design and layout. The students can use the online portfolio as a professional resume. The university can use the portfolios for marketing the ETOL program.

Program

The EdTech program is designed to provide students with a theoretical foundation and the practical skills required for developing curriculum and instructional materials, in a specific area of concentration and for a variety of settings, from pre-school through adult education. The EdTech program concentration is designed to enable students to (a) provide leadership in applying information technology to a variety of educational systems; (b) provide in-service education and basic technical support to teachers and instructors who wish to use technology in curriculum and instruction; (c) assist in curriculum development that integrates technology as a tool for learning; and (d) design and implement courses in computer applications, literacy, and programming.

Degree Options

The M.Ed program is specifically designed for those who already possess Florida teacher certification, while the M.A. program is designed for those who are neither currently seeking nor intending to seek Florida certification.

Entrance Requirements

Students entering the program are required to have a Bachelor's degree from a regionally accredited university.
GPA and GRE or MAT are considered for admission. Letters of recommendation, an e-mail interview, and a self-assessment will determine student qualifications for DL.

Required Courses

Required courses in the degree program core (17 hours):

EDF 6215	Learning Principles Applied to Instruction	4
EDF 6432	Foundations of Measurement	3
EDF 6481	Foundations of Educational Research	3
EDF 6606	Socio-Economic Foundations of American Education	3

Required courses in the concentration (21 hours):

CGS 6210	Microcomputer Hardware Systems for Education	3
EDF 6284	Problems in Instructional Design for Microcomputers	3
EME 6930	Programming Languages for Education	
(This three-credit-hour course is repeated two times: VB and ASP)		6
EME 6936	Application of Computers as Educational Tools	

(This three-credit-hour course is repeated three times:
Web Design, Integrating, Special Projects) 9

Special Features

Develop Student Care Package: (Sell through Bookstore.)
- Guidelines for online learning
- Books to read
- Organizations
- Web Sites
- CD ROM

Electronic Portfolio
WebCT consistency of courses
Quality Faculty
ASP Interactive support
Encourage Learning Teams
Integration of Courses
Technology Emphasis in all courses
Any order
Flexible
Distance Learning Self-Readiness Assessment
Technology Skills Self-Assessment Survey
Online tracking
In order to compete with other online programs, we will have to build QUALITY.
We need to shift from "experience-based" learning to "performance-based" learning.
Online focus group for feedback

Schedule

Nine courses are offered only once a year, but three courses are offered each semester. The Social Foundations/Research/Special Projects block would be taken during the student's last semester. This Foundations/Research/Projects block of 9 hours could be an integrated online synthesis with a team of faculty working with the students. Online teaming with WebCT is a natural. Multiple instructors could interact with students. Online faculty teaming would be a unique feature of the program.

Fall:	**Spring:**	**Summer:**
Instructional Design	Simulations with VB	Hardware/Networking
Integrating Computers	Curriculum & Instruction	Multimedia on the Web
Web Programming	Learning Principles	Measurement
Social Foundations	Social Foundations	Social Foundations
Research	Research	Research
Special Projects	Special Projects	Special Projects

References

Baynton, M. (1992). Dimensions of "control" in distance education: a factor analysis. *The American Journal of Distance Education*, 6(2), 17-31.

*Blumenstyk, G. & McCollum, K. (1999, April 16). 2 reports question utility and accessibility in distance education. *The*

Chronicle of Higher Education, p. A31.

Clow, K. (1999). Interactive distance learning: impact on student course evaluations. *Journal of Marketing Education*, 21(2), 97-106.

Dille, B. & Mezack, M. (1991). Identifying predictors of high risk among community college telecourse students. *The American Journal of Distance Education*, 5(1), 24-35.

Dillon, C., Gunawardena, C. & Parker, C. (1992). Learner support: the critical factor. *Distance Education*, 13(1), 29-45.

Dunn, S. (2000). The virtualizing of education. *The Futurist*, 34, 34-38.

Ehrman, M. (1990). Psychological factors and distance education. *American Journal of Distance Education*, 4(1), 10-24.

Grasha, A. (1996). *Teaching with style: a practical guide to enhancing learning by understanding teaching and learning style*. Pittsburgh: Alliance Publishers.

Inman, E. & Kerwin, M. (1999). Instructor and student attitudes toward distance learning. *Community College Journal of Research and Practice*, 23, 581-598.

Institute of Higher Education Policy (April 1999). *What's the difference: a review of contemporary research on the effectiveness of distance learning in higher education*. Washington, DC: The Institute for Higher Education Policy.

Jonassen, D., & Grabowski, B. (1993). *Handbook of individual differences, learning, and instruction*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Kinzie, M. (1990). Requirements and benefits of effective interactive instruction: learner control, self-regulation and continuing motivation. *Educational Technology, Research, and Development*, 38(1), 1-21.

Kolb, D. (Ed.). (1984). *Experiential learning: experience as the source of learning*. Englewood Cliffs, NJ: Prentice Hall.

Moran, L. & Myringer, B. (1999). Flexible learning and university change. In Harry, Keith (Ed.), *Higher education through open and distance learning* (pp. 57-71). New York: Routledge.

Phillips, A., & Peters, M. (1999). Targeting rural students with distance learning courses: A comparative study of determinant factors and satisfaction levels. *Journal of Education for Business*, 74(6), 351-356.

Robertson, L., & Stanforth, N. (1999). College students' computer attitudes and interest in web based distance education. *Journal of Family and Consumer Sciences*, 91(3), 60-64.

Rodrigues, S. (1999). Evaluation of an online Masters course in science teacher education. *Journal of Education for Teaching*, 25, 236-270.

Rowntree, D. (1992). *Exploring open and distance learning*. London: Kogen Page.

Russell, T. (Ed.). (1999). *The no significant difference phenomenon*. North Carolina State University: Office of Instructional Telecommunications.

Saba, F. & Shearer, R. (1994). Verifying key theoretical concepts in a dynamic model of distance education. The American *Journal of Distance Education*, 8(1), 36-59.

Schrum, L. (1998). On-line education: a study of emerging pedagogy. In Cahoon, B. (Ed.), *New directions for adult and continuing education: adult learning and the Internet* (pp. 53-61). San Francisco: Jossey-Bass.

Sonner, B. (1999). Success in Capstone business course--assessing the effectiveness of distance learning. *Journal of Education for Business*, 74, 243-247.

Teh, G. (1999). Assessing student perceptions of Internet-based online learning environments. *International Journal of Instructional Media*, 26, 397-402.

Verduin, J. & Clark, T. (1991). *Distance education: the foundations of effective practice.* San Francisco: Jossey-Bass.

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Innovative Program Design & Instructional Methods for Online Teacher Education

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Abstract: Can faculty views about internet-based online courses and degree programs change from skepticism to acceptance, and from opposition to cooperation in less than two years? This paper reviews the development and institutionalization of two 100% online teacher education degree programs at Webster University (St. Louis, MO, USA). The number of course offerings grew from one pilot online course in Spring 1999 to 14 in Spring 2001. This success is attributed to program developers' efforts to understand the institutional climate, select suitable program directions, and design online instructional methods congruent with those program priorities. The applicability of Webster University's solutions to online program development efforts at other colleges and universities are discussed.

Introduction

Two years ago, 100% online (Internet-based) courses were non-existent in the School of Education at Webster University (St. Louis, MO). Faculty were skeptical about offering online courses or degrees. The University's administration was also unwilling to commit new funding or resources to the online initiative. Today, the School of Education boasts two successful online Master of Arts in Teaching degree programs. Increased faculty interest in teaching online and high expectations about these courses have supplanted the skepticism. With the online programs now integrated into the University's operational infrastructure, administrative support for online programs is now a given. This paper traces the development and institutionalization of the School of Education's online programs. The successful institutional integration of Webster's online programs may be attributed to the program developers' attention to three dimensions: (a) the organizational climate, (b) curricular and program directions and (c) instructional methodologies. The innovative strategies for each dimension are discussed. With many other institutions starting online programs, Webster's case narrative here may be instructive in their efforts to chart a meaningful program development direction there.

Webster University / School of Education overview

Webster University is an independent, comprehensive, multi-campus University with an enrollment of 17,000 students worldwide and a home campus in St. Louis, Missouri. Its extended campus network consists of 80 locations in the U.S., Europe, and Asia. The School of Education is one of five academic units within the University, with an enrollment of 1,100 in St. Louis, River Heritage & Kansas City, Missouri. Eighty percent of enrollment is in the graduate programs, including the Master of Arts in Teaching and the Education Specialist degree programs. The School also offers the Bachelor of Arts degree. In addition to the degree programs, it offers programs that lead to Missouri Teacher Certification and Missouri Administrator Certificates.

Progress of online School of Education Programs

The School of Education began offering 100% Internet-based graduate courses in the Spring 1999 semester. New online courses were added each semester. The coursework for two Master of Arts in Teaching degree programs, ("Educational Technology" and "Multidisciplinary Studies") may now be completed entirely online.

The School of Education was a pioneer for Webster University in offering among the first 100% online courses and was the first to receive approval for entire degree programs to be offered online. The instructor and student experiences in a pilot course in Spring 1999 were used to assess whether to proceed in further online program development. The pilot course was a success for the instructor and the 15 students alike. Student evaluations of the course was superlative, and the instructor assessed that course objectives were fully achieved in the online format.

	Courses	Sections	Newly Developed	New Online Instructors
Spring 1999	1	1	1	1
Summer 1999	2	3	1	2
Fall 1999	3	3	2	1
Spring 2000	6	6	4	5
Summer 2000	5	5	5	2
Fall 2000	7	10	4	3
Spring 2001	15	15	9	7
Totals:	39	43	26	21

Table 1: Number of online courses, sections & instructors (SP 99 – SP 01)

Subsequently, the online offerings have increased (See Table 1.). New courses have been added every semester since the pilot. Some courses had multiple sections. As new instructors are added each semester, there are now 21 different instructors teaching 39 different courses online. The enrollment total has exceeded 600 students.

Faculty Concerns

There were several reasons for the prevalent campus-wide faculty skepticism and opposition: (1) Many believed online courses were impersonal simply because the familiar face-to-face interactions were not present. Online courses were hence viewed to be in conflict with Webster University's mission statement that emphasized "student-centered" approaches and "personalized learning." (2) Faculty did not know how effective online courses were: Would students learn as much in online courses as they do campus courses? (3) Faculty were concerned that teaching online would be too taxing on individual instructors and on other campus programs or projects. They believed the time required to learn how to teach using this medium and extra time needed to teach the courses were unreasonable. They were concerned that online effort would take greater importance than existing programs, and therefore compete for money, time and other resources. Some faculty feared that online teaching would become a new criterion for evaluation. Some opposed it because they themselves were not interested in teaching online.

It was important to recognize the intensity of the faculty opposition to the online initiatives. The motivations and reasons for the opposition were both philosophical and emotional. Advocates and developers of the online courses were outnumbered. This meant that a cautious approach was necessary. In this climate, the potential for a devastating backlash was ever present.

Priorities in Program Development and Instructional Methods Development

The intense faculty skepticism necessitated planning and development strategies that did not compete with existing programs and University resources, and did not threaten faculty interests. It would be ideal if both the program development process and the results and products were beneficial to all involved, especially faculty and students. The program developers even hoped that the experimentation and development process itself would eliminate the threats, uncertainties, and problem issues. If the experimentation and development proved successful, additional faculty support was still required for faculty curriculum committees to approve the online courses and programs for the curriculum. The faculty concerns played a significant role in shaping the online program development priorities. These priorities in turn supported the development of the new online instructional methods. (See Table 2.)

Faculty Concerns	Program Development Priorities	Instructional Methods
1. Too impersonal for Webster's mission?	• Increase time / place flexibility • Reject tutorial, self-paced approaches • Stress high instructor involvement	• Threaded discussions • Peer critique • Self-reflection
2. Are online courses effective?	• Select instructors, courses and methods wisely • Document, assess and report results of online experiences	• Instructors' motivation to create effective designs • Improved writing observed • Student work comparable to work in campus courses • Strong norms for quality
3. Too taxing to faculty and other programs?	• Voluntary faculty involvement • Faculty stipends, training & support • New student audiences • Faculty development	• Multipurpose funding • Instructor templates and tools

Table 2: Relationship between faculty concerns, program development priorities, and instructional methods

A. Too Impersonal for Webster's mission?

Like the faculty skeptics, the online course developers were committed to advancing the university's mission to provide "student centered" approaches and "personalized learning:" The online initiative should cease if the format or instruction in these courses did not lead to *more* personalization. Program development efforts were therefore shaped by this guideline. Resulting curricular and program directions included:

- 100% Online Courses: Courses taught entirely online, and without any required on-campus classes increased flexibility for students in both time and geography. Students could participate in the course within wider time frames from home, school, office, or from a hotel room if they are traveling.
- Asynchronous: Removing any specific meeting time for classes also increased time flexibility for students.
- Rejection of self-paced tutorial format: It was important to keep the instructor involved and "visible" throughout the online course experience as a means of increasing the sense of personal contact.

Instructional methods that resulted from the attention to personalization include the following:

- Threaded discussions: Students value the interaction in campus-based class discussions. This is mirrored in online courses through threaded discussions, and occasional "chat" sessions.
- Peer critique: Students appreciated the peer critiques online because the record of the written feedback allowed for later review and reflection.
- Self-reflection: The written format of online course enabled students to review the material and reflect on the value of the process as well.

Online courses may be viewed as more personalized when it increases convenience for the students and affords them more flexibility in time and place. Some students find the online experience itself highly personalized because there may be greater opportunity to share one's experiences, read about others' and be heard in the threaded discussions. Others may not value this in the same way because they do not experience the written communication as personal enough.

B. Are Online Courses "Effective?"

How much learning occurs in online courses compared to campus-based courses? Are online courses merely "watered-down" seconds? Aren't students too passive in online courses to learn much at all? These questions reveal the importance of (a) choosing instructors, courses and instructional methods that have the greatest potential for success and teaching-learning effectiveness; (b) documenting how students experience online courses that our faculty teach; (c) assessing learning in both campus and online course; and (d) communicating the results of these assessments to faculty. Regularly updating the faculty is also beneficial in raising awareness about what are online courses and in correcting misconceptions or faulty assumptions about them.

These program development guidelines had the following effects on instructional methods:

- Instructors known for their effective or excellent campus teaching are among the best candidates for online teaching. "Excellent" instructors are likely work conscientiously to shape their teaching methods to also be effective online.
- Instructors seemed more motivated to develop new teaching methods when they or their courses were selected for online delivery because of the potentiality for teaching-learning effectiveness.
- Instructors have observed improved writing among students within the semester in online courses.
- Instructors report the quality of student assignments to be comparable to that in campus courses.
- There may be a stronger norm in online courses to produce quality work when the instructor requires some assignments to be shared among class members.

How much learning happens in an online or campus course is contingent on many factors including the instructors and their aims, priorities, skill and experience, as well as the course topics selected and the teaching methods employed. It appears unlikely that the online medium per se is the most significant factor in learning effectiveness. Finally, it may be just as important to communicate this conclusion to faculty in the department and across campus.

C. Too Taxing to Faculty and Other Programs?

Opposition to the online initiative may have been strongest when it was viewed as competing for priority, personnel, time, and resources. The absence of extra or special funding for the online initiative may have helped reduce the perception of inequitable distribution of resources. For the online initiative, it did mean experimentation costs could not exceed existing operating budgets. Given strong faculty sentiments, it was not possible to redirect funds already committed to departments and programs. There was some flexibility in some small grant (soft money) projects to multi-purpose some of the project objectives. For example, in a funded project to develop professional teacher networking across several school districts, the electronic communication tools designed for use in the teacher collaboration could also be used for collaboration and teaming activities in the online courses. Many of the experimental instructional designs for online courses could be supported in this manner.

It was important to reassure faculty that online teaching was voluntary. No new expectation or requirement for faculty to teach online was being advanced. Evaluation of those who teach online involved the same criteria as those who teach campus courses. The impact of a voluntary online faculty, meant involvement of highly motivated instructors, which contributed to the strength of the courses. Also, with reluctance among full-time faculty to teach online, a strong pool of adjunct faculty teaching for online courses emerged.

Faculty concerns about significant learning time and preparation time for online courses were addressed by: seeking new instructor stipends for online teaching and providing specialized training and instructional design support for instructors. Instructors participate in a short-term training sequence to introduce them to the online tools and to course design issues. The tools and templates are especially helpful in shortening the time instructor might spend preparing the course, organizing activities, and grading assignments. Technical support is available to instructors throughout their course development period and through the duration of their course delivery. The strength of the support is its quick turnaround and response to problem solving provided by two staff members assigned to the online programs.

The threat that the online courses would "steal" students from existing programs was not realized. There was an immediate increase in new student enrollment when the online courses were launched. Also, it was possible for students in current campus programs to enroll in an additional online course, because of the time flexibility, whereas they would not have been able to schedule another campus course. This pattern also validates the program developers' decision to increase time and place flexibility.

As more instructors volunteered to teach online, and benefited from the support, the time-saving tools and templates, and new stipends, many realized the personal value of the experience. Teaching online, for most first time instructors, was an opportunity to learn about the technology, about teaching, and about their own teaching skills. Instructors have expressed the value of discovering new ways to organize a course, and how valuable this is in teaching both campus and online courses. Many faculty now view teaching online as an arena for their own learning and professional development. For them, these results are well worth the extra hours spent developing their skills.

Discussion

Two kinds of generalizations may be made from the School of Education's successful launching of its online programs: (a) Other institutions starting online courses may benefit from Webster University's case; (b) Some elements of the process may be instructive for other program innovations at Webster University or other institutions.

Like the Webster faculty, other university and department faculty are likely to be divided in their views about establishing online courses and program. Strategies used at Webster that not only reduced opposition, but also won the cooperation of faculty colleagues are probably applicable to many situations. Expanding the employment of qualified adjunct faculty when full-time faculty opt not to teach online (or whatever is the program innovation) is effective in building the programs and minimizing unwanted pressure on full-time faculty to participate.

While few universities share the multi-campus presence and organizational infrastructure, many departments, colleges or universities face similar budget and human resource limitations that the School of Education faced. It may be helpful for advocates of any innovation to view some lack of funding as an asset in reducing the resentment, sense of inequity or even hostility toward the innovators. "Multi-purposing" special projects appears to be an effective strategy when used for other program development goals in the context of frozen or restricted budgets.

When faculty have misconceptions or strong negative bias about other innovations, concepts or change being advanced, it makes good sense to document and collect assessment data, which can then be distributed to begin clarifying incorrect assumptions and biases.

Conclusion

It is likely that exploring any innovative curriculum such as this online initiative inevitably begins in a context of skepticism and opposition, as it did at Webster University's School of Education. Some of the strategies in program development and instructional methods employed in this case seemed unexpected or counterintuitive when taken out of context. In retrospect however, the choices made and the process followed were sensible and meaningful. We do not know if the association between these decisions and the success of the online programs or the change in the faculty climate was coincidental or germane. It is also speculative whether applying these factors to other situations would lead to similar success. Perhaps the more important lesson lies behind the individual factors discussed above. The underlying *process* may be more essential. This process was: to listen carefully to the voices of opposition; to understand and acknowledge them; and to provide creative but genuine and meaningful institutional responses to them. The resulting program directions and instructional methods will differ in every case where this process is used, but they are likely to be the most appropriate and, let's hope, successful direction for that innovations.

A Graduate Track in Learning Technologies

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Abstract: A graduate level specialty track in learning technologies was approved in 1998 in the College of Education at Florida International University. It is offered as a track under the Master of Science in Urban Education degree program. The first group of students enrolled in the program during the Spring 1999 semester. This paper provides an overview of the

program, including comments made by students who will have graduated by the time this paper is published.

Introduction

The College of Education at Florida International University in Miami, Florida has been offering a Master of Science in Urban Education degree program for a number of years. In response to a perceived need, a specialty track in learning technologies was proposed in 1998, and was approved and added to the urban education degree program in the same year. The District Director of the Division of Instructional Technology and Media Support Services of the Miami-Dade County Public Schools (M-DCPS) provided a letter in support of proposal to start the program. A majority of the graduates of the College of Education teach in the Miami-Dade County Public Schools, which is the fourth largest school district in the United States. Many of the students enrolled in the learning technologies specialty track teach in the M-DCPS. The purpose of this paper is to provide an overview of the learning technologies specialty track. Excerpts from written comments submitted by students who were enrolled in the program at the time this paper was written are also included.

An Overview of the Specialty Track

The College of Education at Florida International University places a great deal of emphasis on learning technologies, as indicated by the following statement that appears in the strategic plan developed by the faculty of the College:

> The teacher of the 21st-century must be as comfortable with technology as a learning tool as he/she is with the chalk board, textbooks, etc. Teacher education institutions must therefore play a vital role in the preparation of such kinds of teachers and other school personnel (Florida International University, College of Education, 1996, p. 11).

As stated in the document *Technology and the New Professional Teacher* (National Council for Accreditation of Teacher Education, 1997)

> Classroom teachers hold the key to the effective use of technology to improve learning. But if teachers don't understand how to employ technology effectively to promote student learning, the billions of dollars being invested in educational technology initiatives will be wasted (p. 1)

The purpose of the specialty track in learning technologies is to make educators, especially classroom teachers, comfortable with the idea of using various technologies to facilitate learning, teaching, and professional development. As their comfort level grows, students in the program also become capable and knowledgeable about how to use various technologies in their own classrooms, and to further their own professional development. Extensive knowledge of or proficiency with technology is not a prerequisite for admission into the program. However, by the time students are ready to graduate from the program, they will have developed sufficient technological expertise and gained adequate knowledge to enable them to use various technologies in educational settings.

The beliefs upon which the master's degree program is based are as follows:

1. Technology is not an end in itself, but a means to an end, the end being learning.
2. All students, irrespective of their social, economic and ethnic backgrounds can learn with the help of technologies such as computers, CD-ROMs, videodiscs, the Internet, and the World Wide Web (WWW).
3. Given adequate experiences and opportunities, all students (males and females) can learn equally well with the help of various learning technologies.
4. A 'hands-on' approach to preparing teachers to teach with technology will better equip them with the skills to facilitate learning in technologically rich classroom environments.
5. Teachers who are encouraged to reflect upon and continuously improve their practice will discover better ways to use learning technologies to facilitate learning in the classroom.

The beliefs upon which the proposed program is based, are in turn based on the following assumptions:

1. Technologies will continue to change at a rapid pace.
2. The availability of learning technologies in K-12 schools will continue to increase.
3. The potential that advanced technologies have for facilitating learning will also increase.
4. Learning technologies will be used in schools in fair and equitable ways.
5. Newer and better technologies will become available in the future.
6. Teachers will have the freedom to experiment, explore, and discover new ways of facilitating learning using technologies.
7. Teachers who are taught using a 'hands-on' approach will develop positive attitudes and become more confident in utilizing technologies to facilitate learning in their classrooms.

In order to graduate from the program, students have to complete 36 hours of coursework, including 18 hours of coursework in the area of learning technologies. The other 18 hours of coursework consists of core courses that are a part of the Urban Education master's degree program, and consist of courses in research and foundational graduate level courses in education. If students take two courses a semester, they can complete the program in six semesters or two years, including summer sessions. In addition to making students more comfortable with technology, the program also provides them with a strong foundation in research.

A Hands-on, Project-Based Approach

The learning technologies courses in the track are taught using a hands-on, project-based approach. All the learning technologies classes have so far been taught in computer labs. Assuming that computer labs are available in the future, such classes will continue to be taught in computer labs where each student has access to a computer. Students work individually or with others to complete various projects, that sometimes involve creating products and at other times result in presentations. They are also given the option of gearing the content of their projects towards the grades and the subject areas in which they are interested. A student stated, "I have engaged in many hands-on projects that I was able to create specifically for my teaching discipline. I feel the major advantage has been the ability to actually complete projects using technology and take them back to the classroom." Another student noted, "Creating projects gave me a clearer picture of what I should be doing with my students to help increase their motivation and learning. I have seen that there is so much available to help teachers and students. Participating in this learning technologies track has helped me see how important it is to expose students to a tool that will enhance their learning, and how I can become a change agent in helping other teachers to integrate technology in their classrooms as well." According to a third student "The most important skill I have received from this unique program is the project-based learning, the hands-on experiences."

Instructor is a Facilitator

The theme that defines the College of Education (COE) at Florida International University (FIU) is stated as follows: "The Professional Educator and/or Related Professionals as Facilitator of Learning and Change Within Diverse Populations and Environments" (Florida International University, College Of Education, 1996, p. 28). The theme implies that "the graduates of any program in the College should be disposed to view teaching as the act of being a <u>facilitator</u> of student growth rather than a source of information to be learned" (Florida International University, College Of Education, 1996, p. 28). The College's stated theme suggests that the emphasis of proposed master's degree track should be on a facilitative approach.

The learning technologies courses that are a part of the specialty track have been taught up to this point in time using an approach that can be best described as a facilitative approach. The instructor acts as a facilitator, setting the stage for learning. The instructor plays the role of a 'guide on the side' rather than the so called 'sage on the stage.' In this approach, the instructor is in charge and in control of the course at the beginning of the semester. Slowly but surely, students begin to get more involved in the course and in their own learning. Students are encouraged to share ideas and resources with each other in all the learning technologies courses. According to one student "The courses are designed to build confidence, allow for sharing of information and knowledge regarding practical applications for the use of technology in the classroom."

Some Challenges

Adequate technology resources are not always readily available. Even when such resources are available, they are not available for use during class. Since many of the students in the program are teachers, the learning technologies classes for this program are generally offered in the evenings. Since the offices on campus that provide technology support services usually close at 5:00 p.m., it is sometimes difficult to get access to the necessary resources during class hours. It must be pointed out that many of the staff members who work on campus in offices that provide technology support services, have been extremely helpful to and supportive of students enrolled in the learning technologies track. On a couple of occasions, the university support personnel have even stayed in their offices a little late and taken the time to demonstrate technologies to students.

At this point in time there is only one full-time faculty member who is responsible for teaching many of the learning technologies courses in the track. One or two other faculty members have occasionally taught courses in which students from the track have enrolled. However, such help cannot be taken for granted since these faculty members have other responsibilities and may not have the time to teach learning technologies courses every semester. Since the learning technologies program is relatively new, and the student numbers are growing at a slow pace, the college cannot justify hiring more faculty members until the program grows some more and becomes larger in terms of student enrollment. This situation will hopefully improve as more teachers become aware of and enroll as students in the learning technologies program and as the college hires more faculty members.

Future Plans for the Specialty Track

A few prospective students have called and expressed a need for online offering of some of the courses within the specialty track. When more resources, especially personnel resources become available, some of the courses will be offered partially online. This will make it more convenient for teachers in M-DCPS and other nearby school districts to pursue the program.

It would also be nice to have dedicated lab space for use by faculty and students in the learning technologies specialty track. The availability of such space and equipment would make it possible for students to learn more about various technologies that can be used to facilitate learning, teaching, and professional development.

Conclusion

The learning technologies specialty track is a small but steadily growing program. It is also a relatively new program. Initial indications are that the program is beginning to make an impact, albeit on a small scale. One student stated "After two years in the LT program I have gained valuable information on how to use technology not only in the classroom but also for my own personal use. When I first started I only thought of my computer as a $2,000 deck of cards. . . . Two years later I now feel extremely comfortable using different programs. I am also no longer afraid to try different programs in my computer. While I still use my computer to play cards that is only while I'm waiting for my information to be downloaded." As another student put it, "In my first class, I had to ask the professor how to save a file on a PC Disk. I was a Mac person who had always dragged and dropped files. I had no idea that a mouse had a left side and a right side. Two years later, I can edit movies, create charts, graphs, PowerPoint presentations, Hyper Studio presentations and Web Pages. I have set up an entire distance learning class and a database." There is a need to monitor the effectiveness of the program on an ongoing basis.

References

College of Education, Florida International University. (1996). *Strategic Plan.* Miami, FL: Florida International University.

National Council for Accreditation of Teacher Education. (1997). *Technology and the New Professional Teacher*. Washington, DC: National council for Accreditation of Teacher Education.

Using Communities Of Practice Strategy To Enhance Mentoring

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Abstract: The current model for mentoring doctoral students is based on apprenticeship; but this process may result in the insufficient development, application and spread of knowledge. Other mentoring models have been proposed, but none have addressed online professional development. Communities of practice (CoP) have the potential to be conducive to mastery of new knowledge. Several successful reform projects have supported this concept. This paper describes a CoP model that combines on-line and face-to-face (FTF) elements designed to enhance mentoring and professional development strategies. The goal is to evolve a sustainable CoP for the graduate education of professionals, learning the intricacies of their profession, implement practices, and apply new content knowledge. This study demonstrates how a CoP model supports doctoral students' learning. It concludes with a discussion of the attributes of CoPs and guidelines for construction of effective mentoring models for learning reforms.

Introduction

The current model for mentoring doctoral students is based on apprenticeship; but this process may result in the insufficient development, application and spread of knowledge. Other mentoring models have been proposed, but none have addressed online professional development. Communities of practice (CoP) have the potential to be conducive to mastery of new knowledge (Lieberman, 1996; McMaster, 1999; Renyi, 1996). Several successful reform projects have supported this concept (National Science Foundation, 1997; Stokes, Sato, McLaughlin, & Talbert, 1997). This paper describes a CoP model that combines on-line and face-to-face (FTF) elements designed to enhance mentoring and professional development strategies. The goal is to evolve a sustainable CoP for the graduate education of professionals, learning the intricacies of their profession, implement practices, and apply new content knowledge. This study demonstrates how a CoP model supports doctoral students' learning. It concludes with a discussion of the attributes of CoPs and guidelines for construction of effective mentoring models for learning reforms.

Communities Of Practice

Quintessentially, "communities of practice are groups of people who share similar goals and interests; and, in doing so employ common practices, work with the same tools and express themselves in a common language. Through such common activity, they come to hold similar beliefs and value systems (Collaborative Visualization (CoVis) Project , 2000)." These groups of professionals are informally bound to one another through exposure to a common class of problems, a common pursuit of solutions, and embody a store of knowledge (Peter+Trudy Johnson-Lenz, 2000). A common sense of purpose and a real need to acquire the knowledge of each other holds these professionals together. Members of CoP collaborate directly, use one another as sounding boards, and teach each other. They are not merely peers exchanging ideas who share and benefit from each other's expertise, but members committed to jointly develop better practices. Thus, developing a "community that learns" rather than just a "community of learners." In fact, many CoPs have occurred naturally in learning and/or working environments.

Three Dimensions of CoP

Three dimensions of CoP, knowledge, community, and integration, are proposed by McDermott (1999).

CoPs, whether spontaneous or intentional, share both knowledge and information. CoPs have both individual and community relationships, and integrate the individual's work in many different ways. They vary a great deal concerning how much they focus on each of these dimensions. Some focus more on sharing tacit know-how and others on explicit information (knowledge dimension). Some build relationships among individuals; others build a common identity (community dimension). Some are tightly tied into people's everyday work; others are distinctly separate from it (integration dimension). By understanding these dimensions, one can determine the kind of learning community that will likely be most effective for a given situation. None of these dimensions are mutually exclusive.

Knowledge

There are many different kinds of knowledge, data, information, tools, procedures, know-how, and understanding. Some knowledge can easily be written down or drawn and made "explicit." Tools, procedures, templates, are examples of explicit knowledge. Other knowledge is "tacit," things known by people, but not documented anywhere. The know-how, understanding, mental models, and insights of an individual or discipline are examples of tacit knowledge. Since explicit information is written down, it can be organized, distributed, and managed. Know-how, on the other hand, includes a vast store of knowledge that people are unaware they possess. To become aware of this knowledge, people often need a problem or issue to draw it out, such as problem-based knowledge building. Know-how is difficult to communicate in a way that is useful to others. It rarely translates well into explicit procedures. In fact, it is often shared through "war stories," observations, reflective discussions, and other person-to-person connections. Understanding which kinds of knowledge a community needs to share is key to selecting the forums, structures and systems that will be most effective.

Community Identity

The second dimension is the strength of the community's sense of identity. This identifies how people participate socially in the community and the boundaries that hold the community together. In a strong community people interact frequently, both individually and as a unit, and share a common identity and purpose. This is a community of practice. In a weak community there is very little interaction, common identity, or purpose. Both extremes and the variations between them can be useful in disseminating learning.

Integrated with the Work

Documenting and sharing knowledge with other communities often feels like an imposition on "real work." Problem solving and applying insights form the core of the work of most communities. It is usually hard for them to step back and document their insights for others or break to solve another communities' problem. Requiring documentation is not a resolution. Even when required, documentation is often seen as an afterthought and frequently does not contain the richness, subtlety, and meaning of the communities' thinking.

When sharing knowledge is naturally integrated with work, people often naturally share ideas and insights without thinking of it as separate from their normal work. When sharing knowledge is seamlessly integrated into work it is unobtrusive.

CoP And Learning

CoP has a strong influence on pedagogical designs (Collaborative Visualization (CoVis) Project , 2000). The concept of CoP can enhance learning in a social interaction environment (Brown & Duguid, 1996; Lave & Wenger, 1991; Wenger, 1998). This concept is familiar to most educators and is based on several educational theories. The focus on learning through "participation" in CoPs is reminiscent of John Dewey's learning by doing. The underlying assumption is that people gain new abilities and knowledge through efforts to attain goals. The second focus on learning through participation in the community is reflective of many efforts, past and present, to bring the social learning and doing, so often found in the workplace, into the classroom. Learning in CoPs includes efforts to integrate collaborative learning, apprenticeship, mentorship, and tutoring as a part of classroom education. The concept of CoP suggests that it is the combination of these endeavors, rather than the isolated application of any one of them, that will allow students the widest access to opportunities for learning (Collaborative Visualization (CoVis) Project , 2000).

When CoP is applied to academia, novices in the CoP must participate in and must be assisted by the community to acquire the goals, values, language, and techniques of practice. Novices and experienced-members are constantly acquiring complex abilities and knowledge through their regular participation in professional, recreational and daily living CoPs (Collaborative Visualization (CoVis) Project , 2000). A key component of becoming a member of a CoP is that learning takes place through working with others toward a common goal. One must have a commitment to continuing learning to be a part of the community. One exceptional technique in learning is to be engaged in teaching others and in developing new approaches to old challenges. Fully participating in a CoP increases the ability to learn individually and also increases the knowledge of the whole community (McMaster, 1999). Debates and contentions are key components that drive community activity and the evolution of that activity over time.

Building Informal Communities

Although CoP is naturally created, it can be fostered. Sharp (1997) suggested several factors to facilitate the development of informal communities. Members of the community should work together, train together, and stay together long enough to provide a fertile environment for the development of CoPs. However, just being together is not enough; personality, judgment of competence, and style need to be included, as well. Therefore, trust, cooperation, friendship and community are essential to community discourses.

FTF interactions increase the likelihood of a CoP developing among members; but they are not required to foster CoPs. Generating occasional social interaction is the key to advancing a CoP. Computer-mediated communication (CMC) is able to deliver social interaction and is; therefore, a viable means to construct CoPs. In building social interaction, trust and mutual recognition of competence, developed over time, are critical to supporting professional groups (especially using CMC) and CoPs. According to Sharp (1997), frequent reassignment or promotion of professionally skilled people may inhibit or degrade CoP development.

Sharp (1997) argued that improved learning would often come from encouraging development both of CoPs and CMC Communities of Discourse. Both FTF meetings and CMC forms are critical to foster CoPs. A CoP can be maintained through supplemental non-FTF forms of communication. Arranging a time, place, and agenda for a FTF meeting can be cumbersome. However, the informal nature of communities and the possibilities of modern technology make the formation of communities easier to accomplish. CMC can help professionals sustain and deepen relationships that they initiate through more conventional channels.

Technological designs exert a strong influence on CoP (Schlager et al., 2000). Several guidelines are proposed to foster CoP through the use of CMC forms: (a) Facilitate and publicize "Schelling Points": Enhance and widely publicize the ability to easily create mailing lists, Web pages, phone lists, online bulletin boards, real-time discourses, and other communication facilities that can support communities of discourse; (b) Seek active support from one or more CoPs when using CMC forms: The more "water-cooler" CoPs using a particular CMC form, the greater the likelihood of a successful sharing of information; (c) Explore the use of "Agent" technology to enhance signal-to-noise ratio, giving participants more relevant messages: Use cognitive (content) and social (rating) systems of intelligent agents to filter information.

Method

Participant observation method with a dramaturgy perspective was used to understand the building CoPs from the student's point of view. The community was composed of eight students enrolled in the Distance Education Seminar, a doctoral level course offered by a university in the Southwest United States, were the subjects. Students were allowed to take from one to three credits. All eight students were enrolled in the course continuously over two years. One instructor served as the coordinator. The group met once a month for two hours. FirstClass, a computer conferencing system, was used for group communication. It provided e-mail, bulletin board, and real-time chat functions.

The data were collected over two-semesters through casual conversation, in-depth interview, direct observation, and document analysis. At the twelfth week of the second semester, four semi-structured in-depth interviews were conducted with students to explore particular concepts in the CoP. Document analysis included all messages delivered on FirstClass and outside e-mail received by group members.

RESULTS & DISCUSSIONS

Several guidelines were generated from the qualitative data analysis.

Determine Community Knowledge

If the community which shares tacit knowledge has a strong sense of identity and needs to integrate new knowledge related to their work, FTF meetings and many opportunities to link together one-on-one via CMC are necessary. The sharing of explicit information (documents already written) that is not vital to the community identity and that does not need to be immediately integrated as new knowledge for the work of the community can be accomplished by the development of community databases that are managed by a select group of community members, such as web-based databases.

Build Important Topics

Organizations frequently cast "too wide a net" and ask teams to share or document too much information. As a result, they end up building stockpiles of underutilized information. To leverage knowledge effectively, communities of practice need to understand what knowledge is strategically important to the communities.

Build Background Context

Sharing insights is not simply a matter of transmitting information from one to another. To be useful, information needs to be translated from the context in which it was developed to the context in which it will be applied. It is in the human interaction that people build enough common contexts to understand each other, enough trust to be willing to share ideas, and enough initiative to draw out the "tacit" knowledge.

Most CoPs have many different kinds of knowledge to share. Since data, information, and know-how travel best in different media, most CoPs need multiple ways to connect and share knowledge. When a community relies too heavily on a single medium it tends to get clogged with inappropriate information.

Pull Insights from Each Other

Most people have had the experience of sitting through long discussions that were not immediately relevant. People learn best when faced with a problem and need ideas to solve it, when they "pull" information currently relevant. Whether using person-to-person forums or CMCs, knowledge sharing should be designed to respond to "pull" rather than "push" information out to people.

If the organization values learning and sharing knowledge, it should provide a rich ground for growing CoPs. But that means people need to give the time and encouragement to reflect, share ideas with others, and think through the implications of others' ideas. Rather than creating a new "program" for sharing knowledge learning, find the networks that already exist, enable them, and link them to other communities.

Conclusions

Community of practice can enhance learning through mentoring. Several factors identified in this study serve as a model for building a CoP for education reform. First, one must to decide what kind of connections to make between learners, to understand what kind of knowledge to share; what kind of community it is inclined to be; and how tightly sharing knowledge needs to link with work. To enhance learning one does not need to create and build them from the ground up because CoPs arise spontaneously in most organizations. However, one needs to identify and nurture them with the resources, structure, and systems they need to flourish. Developing CoPs is closer to husbandry than architecture.

When building communities on natural networks, coordinators must be generated to organize and maintain the community activities, such as building important topics, initiating simple knowledge sharing activities and arranging social activities. The coordinators also need to provide the members with the time and encouragement to reflect, share ideas with others and think through the implications of other ideas. Because communities are organized and supported differently, community development requires a different set of tools and approaches. CoPs often require time to develop. Because they are organic, CoPs need time to find the right kind of information to share, the right level of detail, the right participants and the right forums. Individuals must support the community in making these discoveries quickly; but, since information, level of detail, participants, and right forums will be different for different communities, each community will need to discover their own appropriate forum.

References

Brown, J. S., & Duguid, P. (1996). Practice at the periphery: A reply to Steven Tripp. H. McLellan (Ed.), Situated learning perspectives (pp. 169-174). Englewood Cliffs, NI: Educational Technology.

Collaborative Visualization (CoVis) Project. (2000) Communities of practice. Retrieved July 11, 2000 from World Wide Web: http://www.covis.nwu.edu/info/philosophy/communities-of-practice.html

Lave, J., & Wenger, E. (1991). Situated learning: Legitimate peripheral practice. New York: Cambridge University Press.

Lieberman, A. (1996). Creating intentional learning communities. Educational Leadership, 54(3), 51-55.

McDermott, R. (1999). Nurturing Three Dimensional Communities of Practice. Knowledge Management Review, Fall. Retrieved July 11, 2000 from World Wide Web: http://www.co-i-l.com/coil/knowledge-garden/cop/dimensional.shtml

McMaster, M. (1999) Communities of practice: An introduction. Retrieved July 11, 2000 from World Wide Web: http://www.co-i-l.com/coil/knowledge-garden/cop/mmintro.shtml

National Science Foundation. (1997). The challenge and promise of K-8 science education reform. National Science Foundation Foundations: A monograph for professionals in science, mathematics, and technology education, volume 1 . Washington, DC: National Science Foundation.

Peter+Trudy Johnson-Lenz, A. T. (2000) Community of practice. Retrieved July 29, 2000 from World Wide Web: http://www.awaken.com/at/Awaken.nsf?

Renyi, J. (1996) Teachers Take Charge of Their Learning: Transforming Professional Development for Student Success . Retrieved July 29, 2000 from World Wide Web: http://www.nfie.org/takechar.htm

Schlager, M., Fusco, J., & Schank, P. (2000). Evolution of an on-line education community of practice. Paper presented at the Annual Conference of American Educational Research Association, New Orleans, LA.

Sharp, J. (1997) Key Hypotheses in Supporting Communities of Practice. Retrieved July 11, 2000 from World Wide Web: http://www.tfriend.com/hypothesis.html

Stokes, L., Sato, N., McLaughlin, M., & Talbert, J. (1997). Theory-based reforms and the problem of change: Contexts that matter for teacher's learning and community. Stanford, CA: Stanford University, Center for Research on the Context of Teaching.

Wenger, E. (1998). Communities of practice: Learning, meaning, and identity. New York: Cambridge University Press.

The Learning Lab: Teaching and Learning In An Online Information Technology Environment

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Abstract: *The Learning Lab* is an online professional development program for teachers who want to upgrade their information technology skills and learn more about integrating technology into teaching and learning. The program is based on self-directed learning. It includes prior learning assessment and development of personalized learning plans as core components of the program. A wide range of learning paths, modules, learning objects, and resources are provided to meet the needs of teachers whose skill levels range from emergent technology learners to education technology leaders. *The Learning Lab* provides opportunities for teachers to work at their own pace, in the curriculum area of their choice, and to apply their research and their learning into the classroom. Offered as both a non-credit and credit program, *The Learning Lab* provides an easily accessible, media-resource rich, mediated model for teacher professional development programs that meets international standards and strives to address key issues in ITC training.

Introduction

The emergence of network technologies and the evolution and rapid growth of the World Wide Web in the mid-1990s has had significant implications for teacher and learner access to information and learning resources. This situation has not gone unnoticed by learners, their parents and the pubic, all of whom are demanding greater access to learning technologies within schools. Since the mid-1980s, access to and use of computer technology in schools has grown rapidly but unevenly. In Canada, successive technology funding programs at the provincial and federal levels have provided schools with access to hardware and wiring but until recently little attention has been paid to the development of appropriate educational content, teacher training, and technology support within schools. As a result, individual teachers often struggle with the implementation of technology due to a lack of curriculum-specific software, training, and support. Of greatest concern to individual teachers and teachers' associations is the lack of training and professional development resources and approaches available that enable educators to successfully integrate computer technology into their practice.

A number of pilot and small-scale attempts have been made in various jurisdictions across Canada and the United States in recent years to address this problem. These pilots indicate that adult training models work effectively with teachers and that the most effective approaches to teacher professional development in the use of computer technology are ones that emphasize contextualized learning. This means, for example, that if one is a social studies teacher, effective integration of technology is likely to occur when the training received by the teacher is connected to the pedagogical and instructional plan that the teacher has within the classroom.

Of equal importance in teacher education is the use of educational models that provides teachers with ample opportunity to direct their own learning within a resource-rich environment. In 1999, the Council of Ministers of Education of Canada published a series of research documents that outlined educational issues and provided a framework for evaluation of teacher education programs in information technology.[1] The issues identified in this research and elaborated in the resulting framework document clearly showed that across Canada teachers were recognizing the need to increase the scope and quality of professional development programs in information and communications technologies (ICT). Primarily, they were looking for contextualized, self-directed, and collaborative professional development models through which they could enhance their ICT skills.

Key Findings That Guide The Learning Lab Program

Key findings about teacher needs with respect to ICT professional development are listed below:

1. Time, within the school schedule, to learn how to use the technology, experiment with the technology, and learn how to integrate it into the curriculum.

2. Proof that technology integration makes a difference in teaching and learning and can be academically justified in terms of improved student learning.

3. Practical "how to" knowledge and first-hand, experience-based skills with respect to using and operating technologies to support teaching and learning.

4. An organized, ongoing, varied program of professional development activities to reach all teachers "where they are at".

5. Time and opportunity for reflective thinking about the place of learning technologies as tools for learning and teaching and about how they change the teacher's role.

6. In-depth knowledge of learning and instructional theories – constructivism, cognitivism, behaviourism, andragogy, facilitation skills, etc.

7. Teachers using learning technologies as students and developing standards, benchmarks, and accreditation processes for pre-service and in-service training with instructional technologies.

8. Access to learning technologies in sufficient quantity and quality that activity can be undertaken within classrooms and with student groups.

9. Ongoing and on-demand access to peers, mentors, or colleague networks where expertise can be obtained and discussion can take place on issues related to pedagogy and/or technology.

10. An organized support system to ensure that school-based technology and networks are serviced or can be serviced with quick response.

[1] Roberts, J.M., & Porter, D. (1999). Integration of information and communications technologies (ICTs) through teacher professional development: Issues and trends in Canada. Report prepared for the Council of Ministers of Education, Canada. Toronto: Council of Ministers of Education, Canada. Available: http://www.cmec.ca/international/forum/itr.canada.en.pdf.

History of the Program

In 1997 the Open Learning Agency (British Columbia) and Simon Fraser University (British Columbia) collaborated on an innovative post-baccalaureate diploma program for teachers that focused on self-directed learning and the use of online resources and interactive collaborations in teaching and learning called *Teaching and Learning In An Information Technology Environment* (TLITE). This 2-year, 30 credit program was innovative as well in the way it utilized local expertise and experience through the development of cohort agreements with school districts, and in the flexible accreditation that was made possible through the use of field-study credits. However, the program was and is designed to work well with a great deal of face-to-face interaction and ongoing local support by school district mentors. As a face-to-face model, the program was extremely popular and was well received by teachers in British Columbia. The number of teachers who were able to participate in the TLITE program was small (fewer than 400), while the number of teachers who needed to upgrade their information technology skills and their professional practice with information technology in their classrooms was large (more than 40,000).

British Columbia is a large, geographically diverse province with the majority of the population concentrated in the southwest corner and the rest distributed throughout the vast interior and mountainous northern regions or along the rugged shoreline with its many small islands. Training teachers in BC is a daunting task. However, we believe that all teachers and students have an equal right to high quality education, with equitable access to resources and technologies. The Province of British Columbia has spent many millions of dollars over the past 15 years in research and development through such programs as the *Community Learning Network*, and in networking all the schools, universities, colleges, and libraries of the province through the *Provincial Learning Network.*

Similar problems are evident across Canada, and the federal and provincial governments are trying to meet the challenges that face Canada's education system. To that end, the federal government through Industry Canada (a federal ministry) has established Canada's *SchoolNet*, Canada's *Campus Connection*, and Canada's *Learnware* programs. *The Learning Lab* is partially funded through Canada's *Learnware* program, as the teacher education component of an experimental educational portal, *The Learning Window,* designed by Ingenuity Works, with partners IBM and Telus.

The Learning Lab takes the lessons learned in the TLITE post-baccalaureate diploma program and applies them to asynchronous, online, mediated, mentored, resource-rich learning for teachers. The teacher may be in pre-service programs or can be practicing teachers who need to upgrade their technology skills or enhance their use of technology in their professional practice. The program focuses on self-directed learning as the learner (teacher) strives to increase competencies in particular areas of either skill or application.

The Learning Lab is built upon the notion that adults prefer to learn in their own way, at their own pace, to meet their own individual needs. It assumes that the prior learning that people bring to the educational experience is valid and provides opportunities for every participant to complete a Technology Self-Assessment Inventory and revisit that self-assessment as often as needed throughout the program. It provides tools and opportunities for participants to design their own learning path, based on their individual curriculum areas, grade levels, and interests. It is designed to meet the needs of a wide variety of learners - from beginning technology users to educational technology leaders. And, it makes used of sophisticated, web-based competency management system to guide learners through their self-designed program of study.

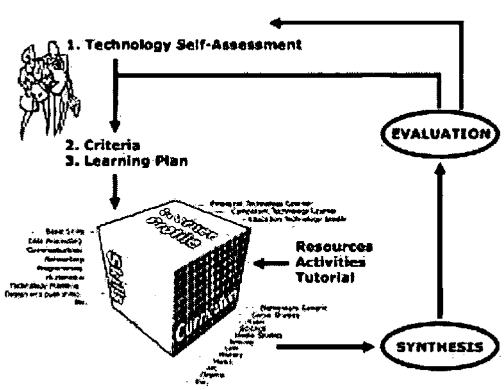

Figure 1.0: *The Learning Lab* - Self-directed Learning Model

The Learning Lab provides opportunities for participants to address standards and competencies developed by their school districts, states, provinces, or themselves. It provides interactive online tools to assist educators to design their individual learning plans as well as to participate in pre-defined learning plans. It provides ways for participants to demonstrate that they have met learning outcomes for credit through those individual learning plans.

It is based on competencies originally described in the collaborative venture by OLA and Simon Fraser University's Faculty of Education called the TLITE program, as well as on standards defined by the International Society for Technology in Education (ISTE) and accepted by the National Committee for the Accreditation of Teacher Education (United States). It uses those competencies and standards to provide opportunities for educators to increase competence in the use of technology, as a teacher, and as a learner. However, teachers participating in the program will be able to set their own standards, and define their own goals.

An advisory board is being assembled and currently includes two participants from U.S. universities, Mississippi State and University of Georgia. Dr. Lynne Schrum (Schrum, http://www.uga.edu/) and Dr. Larry Anderson (Anderson, http://www2.msstate.edu/~lsa1/) are advising the development and delivery team on educational models, content development, and evaluation of the program.

The Learning Lab content is developed in SGML and XML. The delivery environment is designed using very innovative technologies – a Zope object database on a Linux server.[2] This development provides the Open Learning Agency with a prototype XML object repository using open source tools. The SGML/XML development environment allows us to provide content in the form of granular learning objects, aggregate them to form pre-designed learning paths, or provide them to the users to design their own learning paths.

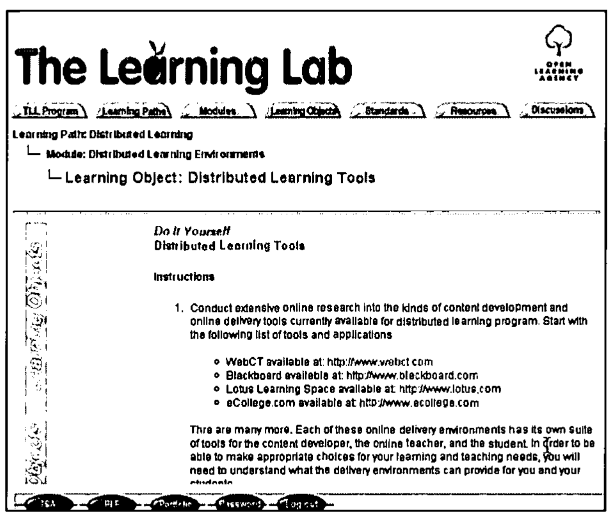

Figure 2.0: A Learning Path in *The Learning* Lab is made up of granular learning objects aggregated into modules.

It will be possible for each program participant to get accreditation for the same program using entirely self-designed and unique "course-like" content. The binding factor is the assessment and accreditation tools based on demonstrations of competence that meeting learning outcomes and established competency benchmarks.

The Learning Lab is available online at http://tll.ola.bc.ca.

[2] Klassen, P., Maxwell, J., & Norman, S. (1999). Structured information and course development: An SGML/XML framework for open learning. Open Learning Agency.

References

Klassen, P., Maxwell, J., & Norman, S. (1999). Structured information and course development: An SGML/XML framework for open learning. Open Learning Agency.

Roberts, J.M., & Porter, D. (1999). Integration of information and communications technologies (ICTs) through teacher professional development: Issues and trends in Canada. Report prepared for the Council of Ministers of Education, Canada. Toronto: Council of Ministers of Education, Canada. Available: http://www.cmec.ca/international/forum/itr.canada.en.pdf

Learning to Learn in Online Courses

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Abstract: What strategies do students use to cope with challenges in the online learning environment? Written surveys and verbatim interview transcripts of 94 online learners in five online graduate courses were analyzed. Students describe a variety of metacognitive, motivational and social strategies tailored to the online environment. These strategies include goal-setting, pacing, planning, notetaking, summarizing, self-monitoring, early navigation practice, self-talk, humor, networking, help-seeking, writing, and listening.

When learners are first oriented to online learning, often much attention focuses on the technical issues which can be major barriers to learning in this environment (Mory, Gambill & Browning, 1998). Surprisingly, little attention is paid to critical psychological factors that can be equally important. Current views of learning and motivation suggest that one of these psychological factors is self-regulation of the learning process (Olgren, 1996; Zimmerman, 1986; 1990). Zimmerman (1986) describes self-regulated learners as those who are "metacognitively, motivationally and behaviorally active participants in their own learning processes." Metacognitively, they "plan, organize, self-instruct, self-monitor and self-evaluate at various stages of the learning process." Motivationally, these students believe themselves "competent, self-efficacious and autonomous." Behaviorally, they "reflect, structure and create environments that optimize learning." While there have been many studies of self-regulation in traditional K-12 learning environments (e.g. Zimmerman , 1990), there has been little exploration of this construct in the online learning environment in higher education. Furthermore, although there is a growing literature about various managerial, pedagogical and social strategies that instructors need to use in the online environment (Berge, 1996; Everett, 1998; McKenzie, Kirby, Newbill & Davidson, 1998; Mory, Gambill & Browning, 1999), there has been little discussion of how students can maximize the environment for learning.

The online environment can offer particular challenges to a learner (Eastmond, 1995; Hiltz,1994). In addition to technical access, problems most often mentioned in the literature are the absence of traditional communication cues, asynchronicity, multiple conversations happening at the same time, information overload, isolation of the learner, and a predominantly text-based environment. In a rare close-up study of a small group of learners in a computer conferencing environment, Eastmond (1995) found that although some learning strategies were suggested by their instructor, more "typically these students borrowed from their 'bag of learning tricks' the approaches, strategies, and tactics that had worked for them in other situations" (p. 124). Clearly, more study of how self-regulation works in an online environment might encourage online instructors to offer students more support for this critical factor in learning.

For the past three years we have been offering online courses in a masters program for practicing teachers at a large private midwestern university. The study reported here took place during the fall of 1999. It was designed to extend Eastmond's (1995) case studies of online learners by using Zimmerman's (1986; 1989; 1990; 1994) framework for self-regulation of learning to study a wider pool of students taking online courses. The study posed these questions: What is most challenging to students in the online learning environment? What specific strategies do students use to cope with these challenges? Primary data sources included: anonymously written surveys of 94 students who have successfully completed at least one of five online courses offered over a two year period and verbatim transcripts of face to face interviews with 14 of those students. Surveys and interview transcripts were read several times to identify challenges and strategies identified by these students. The strategies were then grouped under Zimmerman's categories for self-regulated learning (metacognitive, motivational, and behavioral).

Besides technical issues, the greatest challenges cited by these students in order of frequency were: time management, slow pace of discussions, isolation, work overload, and writing anxiety. Students identified metacognitive and motivational strategies similar to those discussed in literature on self-regulation (Zimmerman, 1986; 1990) but tailored for use in an online environment. They described strategies for goal-setting, pacing, planning, notetaking, summarizing, and self-monitoring that include anticipation of technical problems, server delays and the need to work both online and offline. The motivational strategies they described focused largely on beliefs about their technical competence. Many students acknowledged their initial anxiety about taking an online course but explained how early, even before the course officially began, they entered the course frequently to practice navigating and working in the new environment. Some developed special self-talk strategies to promote a positive mindset about learning online; others used humor both online as they interacted with other students and the instructor and offline as they worked on assignments. They also spoke of how they developed what they viewed as critical attitudes for online learning: patience, flexibility, and persistence.

Student discussion of behavioral strategies needed in the online learning environment focused primarily on social and communication strategies. The social strategies that students described included a variety of networking and help-seeking strategies that they used to reduce the isolation of online learning and access needed emotional and technical support early and often. Students reported networking with other students in the course, colleagues and friends. Frequent communication with the instructor and technical support people as well as consultation with printed and online "help" materials were also often mentioned. Some students also spoke of the need for specialized writing and “listening” strategies in the online environment. These included use of humor, graphics, informal speech, emoticons, and cut/paste methods to personalize communication in the online environment.

References

Berge, A.L. (1997). Characteristics of online teaching in post-secondary, formal education. *Educational Technology, 37*(3), 35-47.

Eastmond, D.V. (1995). *Alone but together: Adult distance study through computer conferencing.* Creskill, NJ: Hampton

Everett, D.R. (1998). Taking instruction online: the art of delivery. In S. McNeil, J.C. Rice, S, J.Willis (Eds.)*Technology and Teacher Education Annual*, 1998. Charlottesville, VA: Association for the Advancement of Computing in Education,

Hiltz, S.R. (1994). *The virtual classroom: Learning without limits via computer networks.* Norwood, NJ: Ablex.

McKenzie, B.K., Kirby, E., Newbill, S., Davidson, T.J. (1998). What are the most important teaching behaviors for distance instructors? Perceptions for facilitiators, instructors and coordinators. In S. McNeil, J. C. Rice, S, J. Willis (Eds.). *Technology and Teacher Education Annual*, 1998. Charolottesville, VA:Assocation for the Advancement of Computing in Education.

Mory, Gambill & Browning (1998). In S. McNeil, J. C. Rice, S, J. Willis (Eds.). *Technology and Teacher Education Annual*, 1998. Charolottesville, VA:Assocation for the Advancement of Computing in Education.

Olgren, C. (1998). Improving learning outcomes: The effects of learning strategies and motivation (pp. 77-95). In C.C. Gibson (Ed.) *Distance learners in higher education: Institutional responses for quality outcomes*. Madison, WI: Atwood.

Zimmerman, B.J. (1986). Development of self-regulated learning: Which are the key subprocesses? *Contemporary Educational Psychology, 15*, 307-313.

Zimmerman, B.J. (1990). Self-regulated learning and academic achievement: An overview. *Educational Psychologist, 25*, 3-17.

Computers are Ready But How About Teachers: An Assessment of Turkish Basic Education Teachers' Inservice Training Needs

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Abstract

Recently, the Turkish government has started a new project for Basic Education Schools (partially financed by the World Bank) in order to take a major step for Turkey to leap to an information society. The purpose of this study is to investigate 592 basic education schools teachers' competency on computers and training needs. Analysis of data indicated that teachers do not feel competent on and ready for computer. Finally, this study offers recommendations for effective inservice training programs and technology integration strategies for the teachers.

Introduction:

Swiftly developing technology offers new opportunities for educational practice in schools. Increasing needs and expectations of the societies from information technology require according changes in the school curricula. Studies have shown that effectively used technology has the potential to improve the educational system (Jonassen & Reeves, 1996; Means, 1994). In recent years the agenda for educational development of many countries include the integration of computer technology into education (Plomp, Anderson & Kontogiannopoulou-Polydorides, 1996). Policy makers of those countries are forming decisions with respect to the introduction of computers in education to prepare children for a life in a technological society. But, for most of those countries the current situation of computer use in education can be considered as only a beginning stage of a process that could last many years (Plomp, Anderson & Kontogiannopoulou-Polydorides, 1996). For example, at USA, for years, schools have purchased large amounts of technology in hopes that students and teachers could use these tools for improving their teaching-learning process. Public schools are increasing access to these tools by putting more software and hardware in schools; connecting schools to Internet and providing cable and satellite capabilities (Zehr, 1997; Zehr, 1998). Despite this huge investment, few of the teachers actually use technology in their teaching (OTA, 1995). The main reason for the failure of integrating technology in USA educational system is defined as, although technology access has improved, teachers have been given little support in their efforts to use and integrate technology in their classrooms (OTA, 1995; Sheingold & Hadley, 1990).

The decisions of bringing computers to the schools deal with more than questioning what type of hardware and software should be used in schools. They also address curricular concerns such as technology's desired effects on education, needs for inservice training of teachers, and sometimes even the necessity of rearranging or adapting the physical facilities of the schools to accommodate computer use (Collins, 1990). Different visions about the place of information technology in education may lead to different emphases in policy goals and consequently, in actual policies.

IT Integration Efforts of Turkey:

Parallel to the international practices in reforming preservice teacher education for the new millennium, the Turkish Council of Higher Education has developed a new teacher training curricula for schools of education in 1998. According to the new curricula, a computer literacy course became a must course for all preservice teachers to fulfill the requirements for teaching credential. This new course is designed to improve and enhance teachers' IT skills.

In the same year, the Turkish government has started a new information technology project (partially financed by the World Bank) in order to take a major step for Turkey to leap to an information society. The main goals of the project are:

1. to bring the Internet connection and computers to the basic education schools,
2. to prepare the teachers about the use of technology, and
3. to start the integration of information technologies to the educational system.

In terms of its budget (1.1 billion USD) and its scope (15.000 basic education schools of Turkey) this is a very important and large-scale project for Turkey.

The success of such a project depends mostly on the teachers who will be the key people in enacting the curriculum. Teachers shape "the eventual success or lack of success of any computers-in-education initiative " (Collins 1996, pp.22; Yildirim & Kiraz 1999). Thus, type and quality of training teachers receive shapes the future of computers in education. In the related literature, effective IT training for teachers has the following features:

(a) educational technology training needs to be integrated into the entire teacher education program so that effective technology integration is modeled for pre-service teachers;
(b) the training should link technology with curriculum;
(c) the training should provide hands-on practice so that teachers become comfortable with them; and
(d) the training needs to be in-depth (Dell & Disdier, 1994).

Teachers are naturally involved in the educational use of computers and any educational innovation is filtered through them. Therefore, their decisions directly affect computer usage in schools. Teachers are the key players for a successful integration of computers to educational system (MacArthur and Malouf 1991; Yaghi 1996). As each teacher has her/his own way of using blackboard or any other tool in their teaching, how to use technology in education and how to integrate technology with education also changes from teacher to teacher. So, the success or failure of integrating technology in education depends largely on experience and attitudes of the teachers (Yildirim, 2000; Andris, 1995; Marcinkiewicz, 1993; Moursund, 1979; Stevens, 1980). Integrating technology in their educational system is very difficult task for the teachers, because not only they have to learn the new technologies but also, change the way they teach. Still helping teachers to learn technology may be the most important part of the technology integration reforms (OTA, 1995).

The Purpose of the Study

Unfortunately, not enough research on the factors that influencing the teachers use of technology in their teaching is done in Turkey. Being aware of teachers' problems and concerns for integrating technology to their teaching will help in the decision making towards a successful integration of technology into the curriculum and will guide the teacher preparation and in-service training programs for preparing the 21st century's teachers. With these issues in mind, the purpose of this study is to investigate basic education schools teachers' current attitudes towards computers in the school, their computer competency and training needs.

Research Questions:

For this study, we collected and examined relevant data to address the following issues:

1. What is the teachers' level of competency in using computers?
2. What are the teachers' inservice training needs?

Methods and Data Sources

Subjects:

A survey was distributed The study included 592 basic education school teachers in 7 provinces representing the 7 geographic regions of Turkey to determine their demographic information, level of computer use for instruction and administration, and their feelings toward computers in education.

Instruments:

Initial Survey:

The initial quantitative survey attempted to explore such issues as how teachers use computers for teaching and administration, what variables are correlated with computer use in the classroom, and whether a relationship exists between certain demographic information (age, gender, highest degree, and number of years teaching) and computer use.

Number of Computer Use:

Teachers were asked to report on the number of ways they use computers. Teachers were asked to rate their computer use in the following areas: preparing tests/handouts, homework assignments, administrative tasks, grading, testing and evaluation, demonstrations and simulations, drill and practice, and tutorials.

Computer Competency Scale:

A Computer Competency Scale (CCS) with nine categories of computer applications commonly used by teachers was developed. The CCS was found to be a reliable measure of competency (Cronbach $\alpha = 0.87$). Teachers were asked to rate their competency in the following areas: word processing such as Microsoft Word or Word Perfect, database management such as Access, spreadsheets such as Excel, presentation software such as PowerPoint, telecommunications (e-mail, CU-See Me), web browsing (Netscape, Explorer), education (discipline specific software), desktop publishing (PhotoShop), and Operating Systems (Windows). Competency in each area was rated from 0 (not familiar) to 3 (proficient).

Findings:

Descriptive Profile:

Data were collected from 592 (274 female, 318 male) basic education school teachers in 7 provinces of Turkey. The participants in this study were predominantly male (53,7%, n=318), and their age ranged from 22 (minimum) to 62 (maximum), and their year of teaching experienced varied from less than one year to 40 years. Their computer access is presented in Table 1.

	N	%
Home Computer		
Yes	99	16,7
No	492	83,1
Computer at Work		
Yes	164	27,7
No	420	70.9

Table 1. Teachers' access to computers at home and at work

Number and Type of Computer Use:

As Presented in Table 2, teachers used computers mostly for drill & practice applications and least for telecommunication tools in the classroom. When they are asked how they use computers out of the class, they ranked administrative and other instructional purposes as highest, and e-mail as lowest.

	N	Mean	SD
IN CLASS USAGE			
Highest (Drill Practice)	439	1,17	.51
Lowest (Telecommunications)	427	1,04	.22
OUT of CLASS USAGE			
Highest (Administrative)	434	1,30	.80
Lowest (E-mail)	427	1,08	.33

Table 2. Type of computer use

Computer Competency:

Teachers felt most competent on word processor and least competent on Internet applications as presented in Table 3.

Type of Application	N	Mean	SD
Word	555	1,90	1.02
Dbase	478	1,50	.88
Excel	449	1,62	.90
Internet	529	1,12	.48
Instructional Software	535	1,26	.65
Presentation Software	525	1,25	.63
Operating System	536	1,35	.71
Maintenance	532	1,16	.50

Table 3. Teachers' competency on computer applications

Previous Training:
When teachers were asked whether they received previous training on computers, 65,9% of them reported having previous training. (See Table 4).

Previous Training	N	%
No	181	32,1
Yes	350	65,9
Total	531	100,0

Table 4. Previous training

Discussion and Recommendations:

The purpose of this study was to investigate basic education schools teachers' computer competency and training needs. Data were collected from 592 basic education school teachers in 7 provinces of Turkey. Analysis of data indicated that teachers did not consider themselves as competent users of computers even though almost 66% of them had previous computer training and experience. Another important finding of this study is that teachers did not have adequate access to computers either at home or at schools. This finding explains the reason why teachers felt incompetent users even more than half of them had previous training. It should be noted that computers should be ready for teachers after they receive inservice training on using them. Otherwise, teacher would not be able apply and advance their computer skills that they acquired during the inservice training. Such a problem would also prevent teachers from moving one step further and integrating their IT skills into their teaching.

Basic education program (BEP), which the Ministry of National Education (MONE) of Turkey launched in 1998, aims to furnish all basic education schools at least with one computer lab. This effort, of course, will increase teachers' access to computers. However, integration of computers into curricula requires more than presence of one computer lab in each school site. Therefore, BEP should also provide new infrastructure and strategies for bringing computers into each class, school library, and teachers' launch. For example, the analysis of data revealed that teachers use computers mostly for administrative purposes. This finding clearly indicates that teachers do not consider computers as an inevitable part of their classroom or their teaching profession. Therefore, inservice training programs that the MONE will provide should not only put emphasis on computer skills but, most importantly, on technology integration skills as well.

Results also indicated that teachers are least competent on using the Internet. Beyond and doubts, this is a challenging problem for the BEP. It should be noticed that the Internet has not only changed the way people access information, but also reformed the way that people teach and learn. Therefore, the MONE should give the highest priority to Internet skills in their inservice training programs. Additionally, teachers should have access to Internet both at home and at schools. Considering the annual income level of teachers in Turkey (approximately 3,000 USD), teachers will not be able use or integrate their Internet skills in their profession unless the government provides them with free or low-coast Internet access.

Another important finding of this study indicated that teachers had different backgrounds (more 40 different majors) and subject matter expertise even all of them held a teaching certificate. This remains as a challenging problem for the MONE to provide appropriate training for all teachers due to their varying backgrounds.

Therefore, the MONE should inservice provide training that is designed for each teacher's current skills, needs, and background.

Finally, the MONE should realize that IT in education is more than buying computers. In order for this program to be successful, the ministry should provide effective inservice training and continues support for teachers that will suit their background and satisfy their needs in the class. Additionally, the ministry should prepare a technology plan that prescribes educational benefits of computers and a roadmap for teachers to bring these benefits in to their classroom. Otherwise, either the ministry or the teachers will realize the role of computers for providing better education for the children.

References:

Andris, M.E. (1995). An examination of computing styles among teachers in elementary schools. *Educational Technology Research and Development*, 43(2), 15-31.

Cagiltay K., Askar P., & Ozgit A. (1995). Setting up a computer mediated communication network for secondary schools. Paper presented at the INET-95 Hawaii http://ww.isoc.org/HMP/PAPER/103/abstract.html

Collins, A. (1990). Restructuring for learning with technology. *Center for Children and Technology Technical Report* Issue No. 9, January, 1990. Educational Development Center, Inc.

Collis, B. (1996). The internet as an educational innovation: Lessons from experience with computer implementation. *Educational Technology*, 36(6), 21-30.

Dell, A. G. & Disdier, A. (1994). Teaching future teachers to enhance teaching and learning with technology. In D. Willis, B. Robin, & J. Willis (Eds.), *Technology and Teacher Training Annual-1994* (pp. 178-182). Charlottesville, VA: Association for the Advancement of Computing in Education.

Jonassen, D. & Reeves, T. (1996). Learning with technology: Using computers as cognitive tools. In D.H. Jonassen (Ed.), *Handbook of research on educational communications and technology* (pp. 693-719) New York: Macmillan.

MacArthur, C.A. & Malouf, D.B. (1991). Teachers' beliefs, plans and decisions about computer-based instruction. The Journal of Special Education, 25(5), 44-72.

Means, B. (1994). Using technology to advance educational goals. In B. Means (Ed.), *Technology and education reform: The reality behind the promise* (pp.1-22) San Francisco: Jossey-Bass Publishers.

Moursund, D. (1979). Microcomputers will not solve the computers in education problem. *AEDS Journal*, 13(1), 31-40.

OTA, (1995). *Teachers and technology: Making the connection*. (Publication No. OTA-EHR-616). Washington, DC: U.S. Government Printing Office.

Plomp, T., Anderson, R. E., & Kontogiannopoulou-Polydorides, G. (1996). *Cross National policies and Practices on Computers in Education*. London: Kluwer Academic Publishers.

Stevens, D., (1980), How Educators Perceive Computers in Classroom, *AEDS Journal*, 221-232.

Yaghi, H. (1996). The role of the computer in the school as perceived by computer using teachers and school administrators. *Journal of Educational Computer Re*search 15 (2), 137-155.

Yildirim, S. & Kiraz, E. (1999). Obstacles to Integrating On-line Communication Tools into Preservice Teacher Education. A case study. *Journal of Computing in Teacher Education*. 15(13) p.23-25.

Yildirim, S. (2000). Effect of an Educational Computing Course on Preservice and Inservice Teachers: A Discussion and Analysis of Attitudes and Use. *Journal of Research on Computing in Education*. 32(4), pp. 479-95.

Zehr, M.A. (1997). Teaching the teachers. *Education week*: Technology Counts. 17(11). 26-29.

Zehr, M.A. (1998). The state of the states: Many still haven't dealt with the most difficult policy issues. *Education week*: Technology Counts.'98. 18(5).

INSTRUCTIONAL DESIGN

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"As we stand at the edge of this new millennium, gazing out into its uncharted expanse, some of us feel as if we are stepping out onto a launching pad; others feel at the brink of an abyss. Some see the challenges and the marvels to come and are exhilarated; some see only the certainty of change and its uncertain outcomes and are apprehensive. How amazing it is that the influence of technology is a primary force shaping both perspectives. All of us recognize the vital role computers and other electronic tools have played in bringing us to the place where we stand now" (p. v, Roblyer & Edwards, 2000).

As the field of technology continues to develop at an accelerated rate, it brings new opportunities for teacher educators to share skills and information. The importance of instructional design during this growth has not been overlooked as shown by the quality and quantity of papers included in this year's section. There are three main categories of papers represented: (1) the discussion of theoretical constructs supporting different instructional design models, (2) the application of instructional design models in various learning situations, and (3) the assessment of how these models work.

In the past, instructional design has largely been based on behavioristic premises; however, it is adjusting to new methods and computer design tools which allow for greater flexibility in the creation of learning environments (Wilson, Jonassen, & Cole, 1993). In this section, some authors explore traditional behavioristic designs, while others investigate constructivist and cognitive possibilities as well. Many theoretical foundations of instructional design are represented here.

The application of design ranges from web-based instruction to traditional classroom settings. How should teachers be taught? Which methods of design are appropriate for the content being taught and the delivery system be utilized? Are old methods being used in new situations with a new kind of student? It is questions like these that are addressed in the following papers.

To complete the design process, several papers discuss evaluation techniques used to assess the application of instructional design models employed. Both qualitative and quantitative methods of assessment are represented.

References

Roblyer, M. D., & Edwards, J. (2000). *Integrating educational technology into teaching (2nd ed.).* Upper Saddle River, NJ: Merrill/Prentice Hall.

Wilson, B. G., Jonassen, D. H., & Cole, P. (1993). Cognitive approaches to instructional design. In G. M. Piskurich (Ed.), *The ASTD handbook of instructional technology* (pp. 21.1-21.22). New York: McGraw-Hill.

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Toward an Adaptive e-Framework for Teacher Education

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Abstract

The Italian Ministry of Education in collaboration of the Italian National Research Council are engaged in joint activities concerning the modeling, design and prototype implementation of an adaptive e-framework supporting the interactions of various actors of the national teacher training system. The framework includes patterns of static and adaptive versions for resources-services allocation and management.

Introduction

In the knowledge society, knowledge is a primary resource at various levels including: the know what, the know how and the know why. The processes acting on knowledge: creation, acquisition, processing, evaluation, storing and transmission, and their interrelationships contribute to determine a new social dynamics. The education systems are complex organizations in the knowledge society: they offer services based on the exchange of knowledge between "knowledge providers" (research centers, universities, laboratories, museums, etc...) and "knowledge clients" (school students, enterprise employees,) by means of "knowledge intermediaries" (teachers, pedagogical resources, etc...). Teacher training can be considered as the interaction between providers and intermediaries in education systems.
The information and communication technologies are enabling factors for the development of the knowledge society and hence of the education systems. In particular teacher training is becoming a strategic issue that requires new advanced web based solutions.
The Italian Ministry of Education and the Italian National Research Council are engaged in joint activities concerning the modeling, design and prototype implementation of an adaptive e-framework supporting the interactions of various actors of the national teacher training system.
The e-framework includes patterns of static and adaptive versions for resources-services allocation and management: a teacher training system can be modeled by composing patterns, according to its complexity: In particular:

- the static resources-services allocation: services are provided by teaching agencies to the teachers;
- the adaptive resources-services allocation: the system takes care of the teachers and training agencies profiles for matching their respective needs and supply;
- the static management of the system behavior according to the cycle: planning, monitoring, evaluation, change management and planning
- the adaptive management of the system dynamically coordinates the planning, monitoring, evaluation and change management subsystems.

Up to now a prototype of information dissemination of teacher training services, called SIF and based on the static resources-services allocation pattern, has been realized with a high degree of scalability scalabilty: (around 25.000 teachers and 250 training agencies). Design and implementations of advanced teacher training systems, based on more complex patterns, are in progress.

1. Resources-Services Patterns

1.1 Static Resources-Services Pattern

Training agencies and teachers interact trough the matching between training resources offering and training services request. The matching is realized according to a matching schema associated to a kernel component which is specified once for all w.r.t the evolution of the overall system (i.e. "statically").

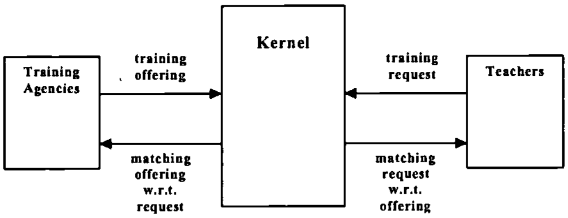
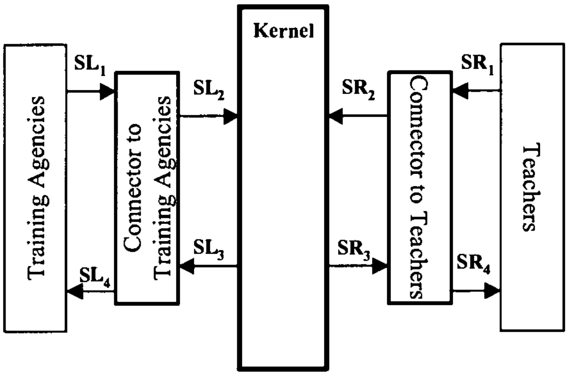


Figure 1: ***Static Resources-Services*** **Pattern**

1.2 Adaptive Resources-Services Pattern

Training agencies and teachers interact trough the matching between training resources offering and training services request. The matching is realized according to matching schemas chosen by the connectors among those available from the kernel component (i.e. "dynamically"), as specified in the following figure.



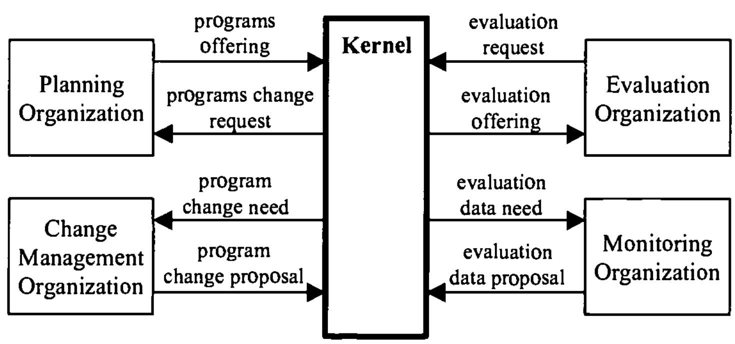
L-labels	Flows	Flows	R-labels
SL_1	training offering	training request	SR_1
SL_2	available training offering	available training request	SR_2
SL_3	matching offering-request availability	matching request-offering availability	SR_3
SL_4	matching offering-request	matching request-offering	SR_4

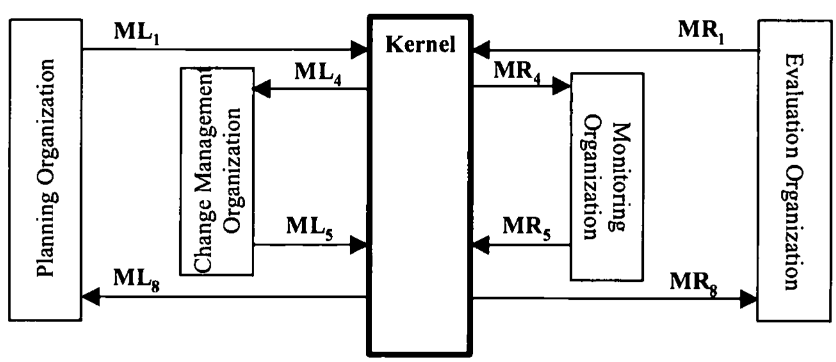
Figure 2: ***Adaptive Ressource-Services*** **Pattern**

2. Management Patterns

2.1 Static Management Pattern

The global management of a teacher training system is obtained by composing local interactions of four organisms (planning, monitoring, evaluation and change management) with the kernel component. The interactions rules are specified once for all w.r.t the evolution of the overall system (i.e. "statically").



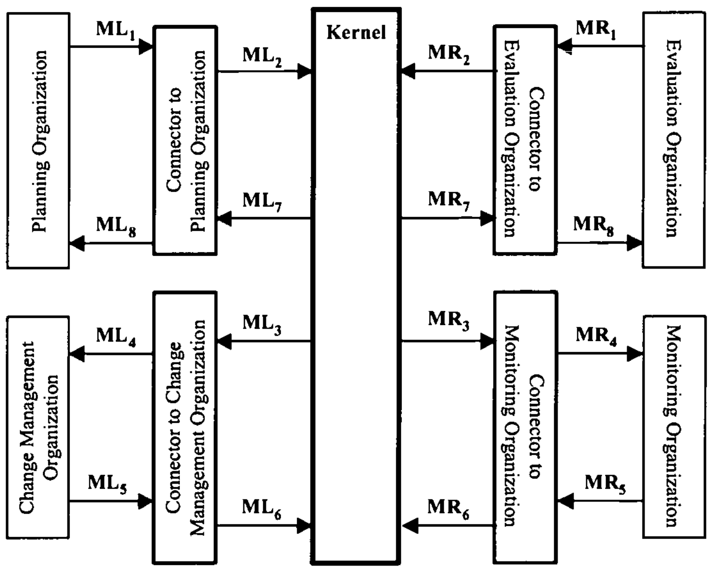


L-labels	Flows	Flows	R-labels
ML_1	programs offering	evaluations request	MR_1
ML_4	program change need	evaluation data need	MR_4
ML_5	program change proposal	evaluation data proposal	MR_5
ML_8	program change request	evaluation offering	MR_8

Figure 3: ***Static Management*** **Pattern**

2.2 Adaptive management Pattern

The global management of a teacher training system is obtained by composing local interactions of four organisms (planning, monitoring, evaluation and change management) with the kernel component. The interactions follow rules chosen by the connectors according to the availability for interaction from the kernel. (i.e. "dynamically").



L-labels	Flows	Flows	R-labels
ML_1	programs offering	evaluations request	MR_1
ML_2	actions offering	indicators request	MR_2
ML_3	matching actions-indicators availability	matching indicators-actions availability	MR_3
ML_4	program change need	evaluation data need	MR_4
ML_5	program change proposal	evaluation data proposal	MR_5
ML_6	actions change proposal	indicators data proposal	MR_6
ML_7	actions change request	indicators data offering	MR_7
ML_8	program change request	evaluation offering	MR_8

Figure 4: ***Adaptive Management*** **Pattern**

3. Patterns-based Teacher Education Systems

Teacher education systems can be modeled by composing the previous patterns: the more complex model is obtained by composing the adaptive resources-services pattern with the adaptive management pattern, as illustrated in the following diagram.

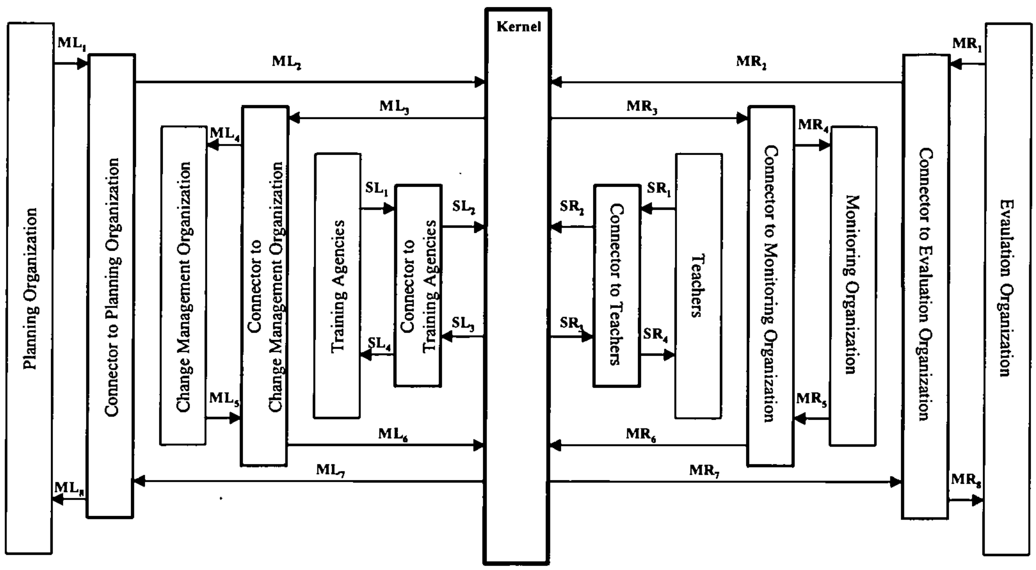


Figure 5: ***Adaptive Resources-Services and Management*** **System**

The design of such kind of complex system requires a rigorous modeling methodology. A long way in front of us !

References:

[1] IEEE 1999: LTSA Specification - Learning Technology Systems Architecture (http://edutool.com/ltsa/)
[2] Association for the Advancement of Computing in Education (www.aace.org)
[3] University of Massachusetts - Center for Computer-Based Instructional Technology (http://ccbit.cs.umass.edu/ccbit/)
[4] B.P. Woolf, V. Lesser, C. Eliot, Z. Eyler-Walker, M. Klein: "A Digital Market Place for Education", SSGRR 2000, L'Aquila (Italy) 2000
[5] G.F. Mascari: Frameworks for Complex Adaptive Systems, in preparation

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Assessing the Integration of Technology Into the Curriculum

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Abstract: An online, self-assessment is being used to measure the amount and type of technology integration by the faculty of the Troy State University College of Education. Usage of this instrument has created baseline data to track individual and group levels of technology integration. Measures of presentation, administration, collaboration and research are gathered for both faculty and students. Technologies such as Internet, e-mail, discussion boards, chat, PowerPoint, word processing, spread sheet, database, digital camera, video camera, and video tapes are measured. Analysis of the first academic year's data is presented in this article. This project was funded in part by a PT3 grant and is designed to gather data congruent with NCATE and ISTE standards for technology integration.

As I look into my crystal ball I can see that your school has invested thousands of dollars and hours into the purchasing of technology for your campus. I can also see that you have also well invested in the training of your faculty and staff to use the equipment and software. Something else is also coming into view ... You have also assessed your faculty's technical competencies and designed training to meet their needs. But is the technology actually being integrated into your curriculum? To what degree are your faculty members really using it in their teaching? Oh, I wish I could tell you, but that information is very gray and fuzzy. All that I can see is that most faculty members are saying that "sometimes" they are using it. I'm sorry I wish I could give you a more specific answer.

Do you feel like the assessment of the integration of technology into your curriculum is gray and fuzzy? Do you wish that you could gaze into a crystal ball and get specific answers?

As Director of Instructional Design and Technology for the College of Education at Troy State University I felt the same way. We have invested well in the infrastructure, implementation, and training of our faculty to use technology. But when asked if it was really being used in the classroom, the best I could say was, "I think so." But as you know, budget requests based on "I think so" do not continue to be funded. I needed authentic, quantifiable data to document our usage of technology.

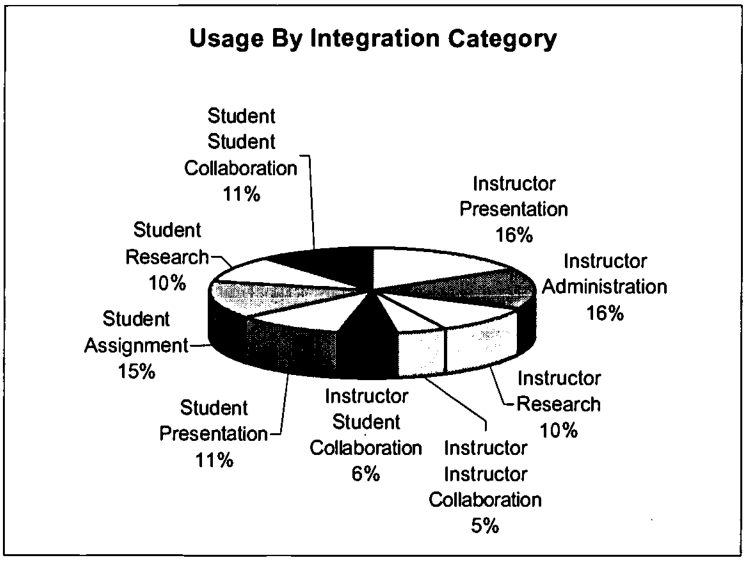
So I developed the Technology Integration Assessment. This online, self-assessment allows faculty members to quickly and conveniently report the integration of various technologies into each of their courses. The instrument not only measures what technology items are being used, but also how they are being used. The real data resulting from this authentic assessment has guided our data-driven decision process for future technology purchases and training.

Several similar assessments currently exist which measure an individual's current technology competency levels. Assessments also exist which measure faculty and student perceptions of the impact which technology is making. But instruments designed to measure precisely which pieces of technology are being and how they are being used were lacking. This void led to the development of the Technology Integration Assessment.

The online instrument is located at http://spectrum.troyst.edu/~coe/departments/technology/integration.htm. Each faculty member is asked to complete the instrument for each course they are teaching. The instrument is administered near the beginning of each semester. Through the use of checkboxes arranged in a grid, the faculty members can quickly identify which technologies are being used in what ways. This format allows the instrument to be quickly completed thus resulting in higher response rates. The average time to complete the assessment is less than five minutes per course.

The information submitted by faculty members is automatically sent to a database. After the submissions have been received, the Technology Integration Report is prepared for that semester. A sample of the data can be seen above. The complete report is available at http://spectrum.troyst.edu/~coe/departments/technology/TIR_5-11-00.doc. This report allows information in the following categories to be reported: Usage By Technology Item, Usage By Integration Category, Technology Integration Index By Faculty By Term, Technology Integration Index By Faculty, and Technology Integration Index By Faculty.

We identified the following twelve technology items for which we wanted to track integration: Internet, e-mail, discussion boards, chat, PowerPoint, word processing, spread sheet, database, digital camera, video camera, and video tape. We also identified the following nine integration categories: instructor presentation, instructor administration, instructor research, instructor-instructor collaboration, instructor-student collaboration, student-student collaboration, student presentation, student administration, student research. **Figure 1**: Usage by integration category.



The assessment also allows us to establish baseline data in the form of a faculty integration index. This quantifiable information allows us measure increases in integration for each faculty member over a period of time. This serves as an authentic assessment of the results of our faculty technology training program. Some of the conclusions drawn from the data include:

- Internet usage has almost equaled word processing usage for course preparation.
- Technology usage categories of presentation, administration, research and collaboration are roughly equivalent for faculty and students.
- The technology integration index for faculty members ranged from 5 to 38.33. The average was 19.58.
- Email usage surpassed Internet usage. This indicates that faculty members are using their network connections largely for communication and collaboration.

This instrument was developed specifically for the Troy State University College of Education but it can be tailored to measure specific technologies being used by any school. In the presentation I will provide the history of the development of the assessment, demonstrate the use of the assessment, show the resulting report from the assessment, and report how this data has been used in the decision making process of the College.

PROMOTING INSTRUCTIONAL PLANNING: AN EXPERIMENT

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Abstract: This study investigated the impact of the Instructional Planning Self-Reflective Tool (IPSRT), on students' attitudes toward instructional planning with 114 pre-service teachers from seven sections of an introductory educational technology course. All participants in the experimental and control groups were taught how to develop an instructional plan as part of the course. For the intervention, the experimental group was provided with instruction how to use the IPSRT while instructional planning, whereas the control group received a review of instructional planning. It was hypothesized that the IPSRT would positively affect students' performance, attitudes, and self-efficacy beliefs towards instructional planning. It was found that the experimental group showed greater skill acquisition, more positive attitudes and higher perceived importance of instructional planning. In terms of self-efficacy, participants who were initially high in self-efficacy reported significantly lower self-efficacy following the tool intervention. In contrast, participants initially low in self-efficacy showed significantly higher self-efficacy following the tool intervention. Findings are discussed from a social-cognitive perspective.

Many teachers learn to systematically design instruction through methods of instructional planning. A number of instructional planning models have been developed (e.g., Dick & Reiser, 1989; Dick & Carey, 1996; Seels and Glasgow, 1990) with the goal of improving teacher instruction. Reiser & Dick (1996) state that instructional planning consists of the six following phases: goals, objectives, instructional activities, assessment, revision, and implementation. Four key principles underlie these six instructional planning phases: 1) identifying goals and objectives that students will be expected to attain; 2) planning instructional activities that correspond with the objectives; 3) developing assessment instrument to measure attainment of objectives; and, 4) revising instruction based on student performance and attitudes.

While it is widely believed that instructional-planning skills are critical for instructional effectiveness in the classroom, there is no strong evidence that teachers (or even superior teachers) actually use these processes (Martin, 1990; Young, Reiser, & Dick, 1998). Research evidence suggests that teachers typically do not follow procedures acquired in pre-service teacher education programs (Kagan, 1992; Reynolds, 1993). However, Neale, Pace & Case, (1983) indicate that experienced teachers believe in the value of instructional planning and that it should be taught to novice teachers. Along this line, Reiser (1994) indicates that pre-service teachers taught to use systematic instructional planning express more enthusiasm in using these skills in the future.

Based on this research evidence, how can we better prepare pre-service teachers to both incorporate and increase their awareness of critical instructional planning components? One possibility is by providing them with tools that promote self-regulation. Self-regulation refers to self-generated thoughts, feelings, and actions that are systematically designed to achieve a goal (Zimmerman, 2000). Two core components of self-regulation are self-monitoring and self-evaluation. Self-monitoring refers to tracking one's performance whereas self-evaluation refers to comparing one's performance to a standard.

The purpose of this study was to test the effectiveness of the IPSRT (see Baylor, Kitsantas, & Chung, in press), a self-regulatory tool designed to promote monitoring and self-evaluation in instructional planning on skill acquisition, attitudes and self-efficacy beliefs of pre-service teachers regarding instructional planning. It was hypothesized that the pre-service teachers presented with the IPSRT would report a) greater skill acquisition, b) more positive attitudes, c) higher self-efficacy beliefs, and d) greater perceived instrumentality regarding instructional planning than the control group participants.

Methods

Sample

The total sample consisted of 92 pre-service teachers, in seven sections of an "Introduction to Educational Technology" course. The mean age of the sample was 20.43 years (SD=2.68). Of those reporting ethnicity, 81% were Caucasian, 8% were Hispanic, 7% were African American, and 4% were of other groups. Of those reporting gender, 22% of the sample were male and 78% were female.

Measures

Post-test achievement

All participants developed an instructional plan as a post-test measure of achievement that was implemented as a graded quiz as part of the class. Each instructional plan was scored according to three sub-components on a scale of 1-5: goals/objectives, procedure, and assessment. The overall quiz score was the compilation of these three sub-scores. After satisfactory inter-rater reliability for scoring the quizzes was established, one researcher scored the remainder of the instructional plans. The scorer was blind as to the conditions of the participants.

Attitudes

To assess pre-service teacher attitudes toward instructional planning, all participants were asked to list two adjectives to "describe what you think about instructional planning." These adjectives were coded as -1 if both were negative, as 0 if 1 was negative and the other positive, and as +1 if both were positive. The items were coded by two raters independently. There were disagreements about two sets of adjectives which were resolved through discussion. Two adjective pairs were discarded because they could not be classified.

Self-Efficacy

This scale measured the students' self-efficacy beliefs about instructional planning. It was developed based on Bandura & Schunk's (1981) guidelines. All participants were asked, "how sure are you that you can write a lesson plan" on a scale from 10 being not sure to 100 being very sure. The inter-item reliability of this scale was alpha= .96.

Perceived instrumentality

To assess the participants' perceived importance of instructional planning, the participants were asked to rate "how important is writing a lesson plan to you as a future professional" on a scale of 1 to 5, 1= not important, 2=fairly important, 3=important, 4=very important, and 5=extremely important.

Procedure

All participants answered a demographics questionnaire including questions regarding gender, ethnicity, age, and grade point average. Following this questionnaire, the participants' attitudes were assessed. Self-efficacy beliefs regarding instructional planning were assessed at two different times for both groups. For both the experimental and control groups, self-efficacy was assessed initially to establish a baseline. In addition, for the experimental group it was assessed again after the quiz and for the control group it was assessed following the introduction of the tool. Next the instructor demonstrated writing an instructional plan; additionally, for the experimental group, s/he modeled the use of the IPSRT while writing the instructional plan. Following this demonstration, all participants were instructed to write a lesson plan. All participants were given a case study for which to write a lesson plan for homework, and were notified of a quiz the next week. The next week, before the quiz, participants were queried about their self-efficacy. For the quiz, the experimental group had the IPSRT attached to their quiz while the control group did not. Following the quiz, all participants were asked about self-efficacy beliefs, perceived instrumentality, and attitudes regarding lesson planning. The control group's lesson plans from the quiz were xeroxed and returned to them. Next, a demonstration regarding use of the IPSRT was conducted for the control group students and they were allowed to modify their xeroxed lesson plans using a red pen. Following their modifications to the quizzes, they were queried about their self-efficacy perceptions regarding writing future lesson plans.

Results

Independent sample t-tests were conducted to determine differences between the two groups (experimental, control) and paired-sample t-tests were conducted to determine differences within each group over time.

Achievement

In terms of the effect of the IPSRT intervention on achievement, it was found that the experimental group ($\underline{M}$=11.27) outperformed the control group ($\underline{M}$=9.32), $\underline{t}(53)=-3.53$, $\underline{p}<.001$. Achievement was based on the overall quiz scores of participants in both groups.

Attitude

A t-test was performed to determine initial differences between the control and experimental group regarding attitudes toward instructional planning. There were no statistically significant differences between the two groups regarding their attitudes about instructional planning initially, $\underline{t}(74)= -.999$, $\underline{p}>.3$. However, following the intervention, there were significant differences between the two groups $\underline{t}(69)= -2.64$, $\underline{p}<.01$. Specifically, participants in the control group ($\underline{M}$=-.094) were slightly negative towards instructional planning whereas the experimental group participants were positive ($\underline{M}$=.41), where the possible range of scores was from -1 (negative) to 0 (neutral) and 1 (positive). See Table 3 for examples of positive and negative attitudes.

Self-efficacy

The mean score for self-efficacy regarding instructional planning for all participants following the intervention was $\underline{M}$=80.35, with a standard deviation of 15.37. Given this distribution, low self-efficacy was defined as 70% or below ($\underline{N}$=28) and high self-efficacy beliefs as above 80% ($\underline{N}$=31), so participants who scored 80% were not included.

In the experimental group, those who had <u>low</u> self-efficacy ($\underline{N}$=17) regarding instructional planning prior to the intervention ($\underline{M}$=60.67) reported significantly <u>higher</u> self-efficacy beliefs regarding instructional planning ($\underline{M}$=72.00) immediately following the quiz, $\underline{t}(14)=-3.52$, $\underline{p}<.01$. In contrast, those who had <u>high</u> self-efficacy beliefs ($\underline{N}$=15) regarding instructional planning prior to the intervention ($\underline{M}$=94.62) reported significantly <u>lower</u> self-efficacy beliefs regarding instructional planning following the quiz ($\underline{M}$=83.85), $\underline{t}(12)=3.48$, $\underline{p}<.01$.

Similar results were found with the control participants when the instructor demonstrated the IPSRT tool and they used it to modify their already-submitted quizzes, see Table 2. Of the control participants with low self-efficacy regarding instructional planning (N=11), it was found that their self-efficacy beliefs significantly improved from the initial self-efficacy assessment (M=62.73) to the final self-efficacy assessment following their presentation with the IPSRT tool (M=71.82), t(10) =-3.62, p<.01. Of the control participants with high self-efficacy (N=16), it was found that their self-efficacy beliefs significantly decreased from the initial self-efficacy measure (M=95.00) to following their presentation with the tool (M=90.63), t(15)=2.78, p<.01.

A paired t-test was conducted to determine whether there were practice effects over time for the control participants' initial reports of self-efficacy beliefs with their self-efficacy beliefs following the third instructional plan (the quiz). It was shown that there were no significant differences in self-efficacy beliefs about instructional planning over time by the control group (M=82.5 vs M=83.13), t(31) =-.403, p=.69.

An additional t-test was performed to examine differences in quiz performance between the low and high self-efficacy groups. It was shown that those with higher self-efficacy scored significantly higher on the quiz (M=13.18) than those lower in self-efficacy (M=7.53), t(32)=-16.83, p<.000.

Perceived instrumentality

For perceived instrumentality, a measure of utility value, the experimental group reported higher perceived instrumentality (M=4.06) than the control group (M=3.64) following the quiz t(84)=-1.706, p<.10. While it was only marginally significant, the difference in the means indicated that the experimental group participants viewed instructional planning as more important to them as future teachers than did the control group participants.

Discussion

The results confirmed that the IPSRT improved pre-service teachers' performance and attitudes, and perceived instrumentality regarding instructional planning. However, the results regarding instructional planning self-efficacy were different from what was hypothesized. Participants that were initially high in self-efficacy beliefs reported significantly lower self-efficacy beliefs while those initially low in self-efficacy reported significantly higher self-efficacy beliefs following IPSRT intervention.

Findings showed that pre-service teachers who were instructed to use the IPSRT scored higher on the quiz than the control group participants. Baylor & Kitsantas & Chung (in press) and Baylor & Kitsantas (2000) found that the IPSRT is perceived as valuable by pre-service teachers because it encourages them to self-monitor and subsequently to self-evaluate their performance. Consequently, given that both groups were instructed in a similar manner, we attribute the students' better performance on instructional planning to the self-monitoring and subsequent reflection of the IPSRT. Similarly, Schunk (1983) suggests performance feedback (such as the IPSRT) provides individuals with information on how well they are performing. Studies conducted in other areas (e.g., writing, math achievement) have found that self-monitoring enhanced students' achievement (e.g., Zimmerman & Kitsantas, 1999; Schunk, 1996)

It was also found that the IPSRT positively affected pre-service teachers' attitudes regarding instructional planning. Specifically, following the intervention, the pre-service teachers using the IPSRT tended to use more positive adjectives (e.g., "important," "helpful") to describe instructional planning than their counterparts in the control group. In fact, the control group was slightly negative about instructional planning (e.g., using adjectives such as "time-consuming," "pointless"). Perhaps the IPSRT, by facilitating reflection and illuminating the underlying systematic process of instructional planning, elicited more positive attitudes. Similarly, Driscoll & Klein & Sherman (1994) found that pre-service teachers taught to employ a systematic planning process expressed more enthusiasm about using these skills in the future.

Concerning self-efficacy, of interest was that those who were initially high in self-efficacy reported significantly lower self-efficacy regarding instructional planning following the quiz. In contrast, those who were initially low in self-efficacy reported significantly higher self-efficacy regarding instructional planning following the quiz. In confirmation of these findings, similar results were found for the control group, who received the tool at a later time.

These results suggest that for the high self-efficacious group the IPSRT highlighted the complexity and comprehensiveness of instructional planning; thus, leading them to re-evaluate their self-efficacy beliefs regarding instructional planning more negatively, or perhaps more realistically, following use of the IPSRT. On the other hand, the use of the IPSRT may be detrimental for high self-efficacious participants because it leads them to be less optimistic about their instructional planning capability.

On the contrary, the low self-efficacious group participants reported significantly higher self-efficacy perceptions following the quiz. This suggests that those initially low in self-efficacy became more confident in their ability to write an instructional plan given the IPSRT. By enhancing pre-service teachers' self-efficacy perceptions it is expected that they would be more likely to engage in systematic instructional planning in the future. In support of this interpretation, Bandura (1986) proposes that self-efficacy beliefs influence the choices that individuals make, the effort that they expend, the perseverance they apply, and the emotional reactions they experience. Further, consistent with Bandura's (1997) theory of self-efficacy, high self-efficacious participants performed better on the quiz than the low self-efficacious participants.

In terms of perceived instrumentality, or utility value, of instructional planning, results showed that instructional planning was more important to the experimental group than the control group although it was only marginally significant. The tool enabled them to view instructional planning as a more substantive and significant part of instruction, and engendered more respect for the instructional planning process. Consequently, use of the IPSRT may increase the likelihood to change pre-service teachers' attitudes regarding the importance of instructional planning.

Conclusion

This study indicated that self-regulatory processes such as self-monitoring and self-evaluation, promoted through the IPSRT, guided students' learning, enhanced their performance, and improved their attitudes regarding instructional planning. In terms of self-efficacy, the IPSRT facilitated the high self-efficacious pre-service teachers to realize the depth and complexity of instructional planning whereas it facilitated the low self-efficacious pre-service teachers to feel more competent.

Additionally, the IPSRT promotes a reflective dialogue for the pre-service teacher instructional planner, fulfilling the role of Moaellem's (1998) description of teacher reflection-in-action. Given that instructional design is a highly complex and spontaneous task and cannot be reduced to a set of procedures, this reflective dialogue is critical. These findings are important for instructors who must prepare their students to practice writing instructional plans effectively on their own.

Future research should examine the value of the IPSRT for more experienced teachers, and/or pre-service teachers later in their academic careers. Follow-up structured interviews would be useful to determine the specific reasons for the changes in pre-service teachers' existing self-efficacy beliefs. In addition, longitudinal studies could examine whether the pre-service teachers' instructional planning-related attitudes and beliefs change once they enter the classroom.

References

Bandura, A. & Schunk, D. H. (1981). Cultivating competence, self-efficacy, and intrinsic interest through proximal self-motivation. Journal of Personality and Social Psychology, 41, 586-598.

Bandura, A. (1986). Social foundations of thought and action: A social-cognitive theory. Englewood Cliffs, NJ: Prentice Hall.

Bandura, A. (1997). Self-efficacy: The exercise of control. New York: W. H. Freeman.

Baylor, A. L., Kitsantas, A., & Chung, H. (in press). The Instructional Planning Self-Reflective Tool (IPSRT): A Method for Promoting Effective Lesson Planning. Educational Technology.

Baylor, A. L. & Kitsantas, A. (2000). Enhancing Students' Instructional Planning Performance: A Strategic Approach. Manuscript submitted for publication.

Dick, W. & Carey, L. (1996). The systematic design of instruction. Addison-Wesley Longman.

Dick, W., & Reiser, R. A. (1989). Planning effective instruction. NJ: Englewood Cliffs.

Driscoll. M. P. & Klein, J., & Sherman, G. (1994). Perspectives on instructional planning: How do teachers and instructional designers conceive of ISD planning practices? Educational Technology, 34(3), 34-42.

Kagan. D., & Tippins, D. (1992). The evolution of functional lessons among twelve elementary and secondary student teachers. Elementary school journal, 92(4), 477-489.

Kitsantas, A. (2000). The role of self-regulation strategies and self-efficacy perceptions in successful weight loss maintenance. Psychology & Health, An International Journal (forthcoming).

Martin, B. (1990). Teachers' planning processes: Does ISD make a difference? Performance Improvement Quarterly, 3(4), 53-73.

Moallem, M. (1998). An expert teacher's thinking and teaching and instructional design models and principles: An ethnographic study, Educational Technology Research and Development, 46(2), 37-64.

Neale, D.C. Pace, A.J. & Case, A.B. (April, 1983). The influence of training experience, and organizational environment on teachers' use of the systematic planning model. Paper presented at the annual meeting of American Educational Research Association, Montreal, Canada.

Reiser , R. A.(1994). Examining the planning practices of teachers: Reflections on three years of research. Educational Technology, 34(3), 11-16

Reiser, R. A. & Dick, W. (1996). Instructional Planning: A Guide for Teachers. Allyn and Bacon.

Reynolds, A. (1993). What is competent beginning teaching? A review of the literature. Review of Educational Research, 62, 1-36.

Schunk, D. H. (1983). Progress of self-monitoring: Effects on children's self-efficacy and achievement. Journal of Experimental Education, 51, 89-93.

Schunk, D. H. (1996). Goal and self-evaluative influences during children's cognitive skill learning. American Educational Research Journal, 33, 359-382.

Seels, B. A. & Glasgow, Z. (1990). Exercises in instructional design. Columbus, OH: Merrill Publishing.

Young, A. C., Reiser, R. A. & Dick, W. (1998). Do superior teachers employ systematic instructional planning procedures? A descriptive study. Educational Technology Research and Development, 46(2), 65-78.

Zimmerman (2000). Attaining self-regulation: A social cognitive perspective. In M. Boekaerts, P. Pintrich & M. Seidner (Eds), Self-Regulation: Theory, Research and Applications. Orlando, FL: Academic Press.

Zimmerman, B. J. & Kitsantas, A. (1999). Acquiring writing revision skill: Shifting from process to outcome self-regulatory goals. Journal of Educational Psychology, 91(2), 241-250.

Learning and Using Web Page Construction as a Vehicle to Teach Preservice Teachers How to Develop and Design Integrative Middle School Curricula Appropriate for Early Adolescents

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Abstract: This research paper examines a unique curriculum design project that was introduced to teach web page construction in the context of an undergraduate middle grades teacher education course. College students, some novice and some experts, developed learning components for a theme based technology driven unit whose lessons met the developmental needs of early adolescents. The process used by the preservice teachers to develop and construct the website proved that when technology is used in a risk free, supportive environment to build a high interest unit it empowers students and guarantees their further use of technology.

In a sense, we are all preservice teachers. At some point in our lives we will teach another how to do something. Research supports the view that to do this teaching we will fall back on the model used to teach us. For this reason, my Foundations of Middle Level Education course examines preservice teachers' memories of their middle school classes and teachers. They study best and worst practices in teaching and learning, as well as early adolescent development characteristics, in the context of their own experience. Their findings suggest everyone has a different style and stage of learning and teaching, thus validating Gardner's multiple intelligences (Gardner, 83), Piaget's concrete and abstract learning (Piaget, 72) and Vygotsky's cognitive socialization (Vygotsky, 78). Another finding, the importance of service learning to build character and establish a sense of place, echoes Arnold & Beal (Arnold & Beal, 95), Garbarino (Garbarino, 83) , Erikson (Erikson, 68) and Kohlberg (Kohlberg, 72). Once students have become familiar with teaching and learning styles, developmental characteristics and the nuts and bolts of writing a lesson plan, they tackle the issue of integrating technology into their classroom. So they don't see technology as an add on or gimmick to capture the students' attention, they work in teams to prepare a totally integrative theme based unit that blends all core subjects and delivers the unit via technology. At this point, I should own up to the fact that curriculum design is my passion and technology is not. However, like my students, I fully appreciate the power of technology and am learning, as my students learn, to incorporate it into my lessons.

Because of our earlier study, students already have a firm foundation in middle level teaching and learning before we begin our project. Teams discuss the theme, study grade specific curriculum and brainstorm ways to weave the unit together. Besides the technical aspects of webpage construction, both the students and I must consider the following:

1. Audience: The material must be developmentally appropriate, of high interest and deal with big questions and issues that would interest and inform early adolescents, be colorful, and be in an easy to read format.
2. Mechanics: The page must be easy to navigate, have clear instructions, an easy to read font, a reasonable text size and a print color that shows up well on a colored background.
3. Community outreach: The unit must incorporate service learning.
4. Team work: In addition to college students experiencing team work, the unit must provide opportunities for the middle school students to work together.
5. Learning outcomes: The unit must provide alternative forms of assessment.
6. Finally, the overall experience both in development and use of the unit must be positive and empower students to continue to learn and use instructional technology.

For this particular class, the teacher education students investigated a global environmental issue, the world's use of water resources, on a trip to the Exploris Childrens' Museum of the World. Ostensibly, they were at the museum to study how to put together a meaningful field trip, but were intrigued at how a teacher, whose class was visiting the museum, could make a world issue relevant to the lives of children in North Carolina. Because of the hurricanes, floods, local water shortages, runoff of hog waste and the appearance of dangerous organisms in rivers in North Carolina, the students decided to address the issue of use and abuse of water resources in North Carolina.

The class attended a research retreat at the Trinity Conference Center in Salter Path, NC. This was sponsored by NCSU's Humanities Extension Publications, a department of the University that supports education in southern coastal issues. At the workshop, students spoke with experts in the field of water resources. NCSU graduate students and professors helped the students research their topics and learn about the technology that would enable them to construct their web pages. Students learned how to use digital cameras and make a panoramic display. Laptops enabled teams to begin their web page construction. Time together away from the university enabled greater team bonding. Upon returning to the university, the students spent the rest of the semester researching their topic and learning about how to construct a website.

Teams, following the six points already noted, made their components stand-alone lessons. After numerous critiques and corrections, they combined them into one large website called SwimDog. SwimDog was the character that appeared on the homepage and helped students navigate through the entire website. Website components include: household tips on how to conserve water, study of specific local waterways, hurricanes and their effect on the coastal plain and beyond, the impact of the hog industry on the economy and the environment, the use of water by coastal NC Native Americans, young adult literature dealing with the coast and how to help your parents landscape the yard to retain moisture and conserve water. Students did much of their own research about their topic on the web, incorporated maps, photos and graphs into their activities, used digital pictures and built a variety of assessment forms into the lessons. They posed reflective questions that addressed moral considerations and the seriousness of the use of water resources issue.

This exercise demonstrated that a unique and meaningful topic can be a hook that makes learning basic technology exciting. It also illustrated that teachers do not have to be driven to incorporate technology for technology's sake, but that technology can be used as a vehicle to enable students to expand their approaches to teaching. Data collection by this researcher showed that by the end of the semester students had greater comfort and skill level in using technology. Those who were initially lacking in technology confidence felt better able to use it and incorporate it in their own teaching. Finally, the complete product, tailored for early adolescents, enabled students to see theory become application in dealing with adolescent development, integrative unit construction, team building and technology integration.

References:

Arnold, John, Beal, Candy. (1995). *Service with a Smile: Service Learning Projects in North Carolina Middle Level Schools*. Raleigh, North Carolina: North Carolina Middle School Association.

Erikson, Erik H. (1968). *Identity, Youth and Crisis*. New York, New York: W.W. Norton, Inc.

Gardner, H. (1983). *Frames of Mind: The theory of multiple intelligences.* New York: Basic Books.

Garbarino, James, (Ed.). (1985). *Adolescent Development, An Ecological Perspective.* Columbus, Ohio: Charles Merrill Publishing Company.

Kohlberg, Lawrence, Mayer, Rochelle. (1972). Development as the Aim of Education. *Harvard Educational Review, 42*(4), 449- 496.

Piaget, Jean (1972). *The Child and Reality, The Problems of Genetic Psychology*. New York, New York: Grossman Publishers.

Vygotsky, Lev. (1978). *Thought and Language.* Cambridge, MA: The MIT Press.

Innovative Course Design as Action Research: Instructional Technology for Teacher Education

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Abstract: This paper reports on an innovative approach adopted in the training of tertiary education teachers in instructional technology. An integrated approach was adopted to increase the motivation of teachers to use Information and Communication Technologies (ICTs) in their teaching-learning practices. The researchers describe their 'action research' efforts to design a course where participants learn and apply new ICT skills in a context of becoming 'designers' themselves of online learning resources. The notion of 'course design as action research' provided a focus for a flexibly structured course relevant to students needs and responsive to ongoing feedback in terms of a more proactive reflective practice. The paper argues that in the fast changing Internet age all teachers need to go beyond traditional approaches if they are to use ICTs well in their educational practices.

Introduction

The ability to use ICTs has become-is becoming as fundamental to a person's ability to navigate through both school and society as traditional skills like reading, writing, and arithmetic. In Moore's (1991) words, teachers awaken one day with computers in their rooms without having requested them. Most colleges and universities have Internet connections that provide students and faculty access to a world of information resources. The challenge for teachers and the administrators is integrating these resources into the curriculum.

According to 21st Century Teachers Network (21CT) Director Wade D. Sayer, persuading teachers to use new technologies has been tough. Unlike the GenX or NetGen of younger students, most teachers did not grow up around computers and the Internet. So using technology does not come naturally to them. Indeed, the thought of presenting a lesson in PowerPoint or of creating an interactive Web-based lesson is alien to many (Kurkowski, 2000).

McKenzie (1999) designates teachers in particular as late adopters and reluctant technology users. He outlines the following strategies for reaching late adopters and reluctant users: clarify the bottom line, focus on student performance, deliver a complete package eliminate, risk and surprise, speak their language, emphasise teams, find out what turns students on, provide rewards and incentives, and don't rely on pioneers alone to plan for reluctants. Similarly, we have discussed elsewhere our strategies for converting reluctant or intimidated students (especially teachers) into keen users of Internet in education (Richards & Bhattacharya, 2001a).

Effective integration of 'instructional technology' (IT) in teaching and learning demands the teachers to flexible, innovative, and effective reflective practitioners ready to trial and apply ICTs within their own educational setting. In other words, rule-based and transmission approaches to teaching are no longer sufficient in the "internet age" to productively address changing educational needs and requirements.

Background Information

All the participants in this course were teachers of English as a second language in China. These in-service teachers were invited to come to National Institute of Education, Singapore to pursue a Postgraduate Diploma Course in English Language Teaching. They were also required to undertake a unit on instructional technology. Many of these teachers were reluctant to learn about ICTs.

The strategic approach we adopted for this unit represented a refinement of our previous 'action research' experience and projects in and outside the classroom in India, Japan, and Australia teacher education Program. Both of us were newly arrived when asked to work together to take this particular course almost immediately. Little background information was available to us about the course-content for the course on "Instructional Technology". Some prior information about the participants was collected through casual conversation with the faculty members who had taught this course before and from the computer laboratory technicians. The gathered data was not very encouraging. As one source put it: "Some of these participants never handled a keyboard. It would be enough if they learn to do word processing".

All these bits and pieces of information served as a challenge for us to come up with an innovative course where the planned activities would act as motivator as well as help the participants to understand the relevance and application of ICT in education today. Also the course design aimed to have participants develop a core range of generic 'learning technology' skills relevant to the internet age especially, and applicable in various educational contexts. For instance, culminating activities in the course had participants upload and publish their animated presentations on web pages.

Design Procedure vis-à-vis Action Research

Traditionally, 'instructional design' refers to the process of instructional program development from start to finish. Many models exist for use by different levels of instructional designers and for different instructional purposes. However, the process can be summarized into five general phases as summarized by Braxton (1995): Analyze, Design, Develop, Implement and Evaluate (Fig. 1). Sometimes phases overlap and can be interrelated. The evaluation phase measures the effectiveness and efficiency of the instruction. Evaluation should actually occur throughout the entire instructional design process - within phases, between phases, and after implementation.

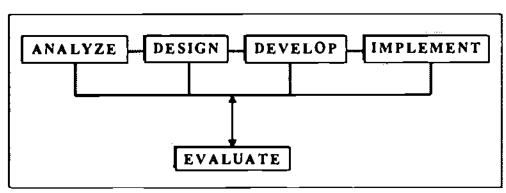

Figure 1: General Instructional Design Phases

According to Norman (1999) the focus of action research should be a specific problem in a specific setting. The emphasis is on precise knowledge for a particular situation and purpose. A proactive model of action research is concerned with innovation, change, and the ways in which new approaches; methods or even ICT programs may be implemented in on going systems. Such a framework of reflective practice is appropriate to any context where a specific problem needs solving.

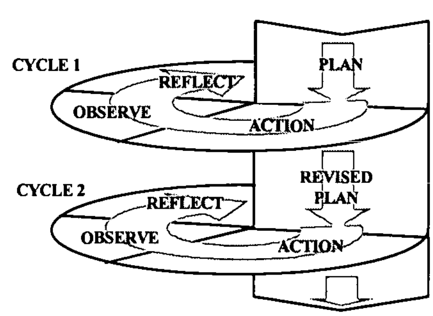

Figure 2: Action Research Design

Therefore, an action research approach was most appropriate to the situation described above where there was no prior preparation time was available for the design and development of the course.

The cycle of an action research project involves the identification of a problem, the collection and analysis of information, plan the action or intervention for implementation, followed by implementation and finally, monitoring the outcomes (Hitchcock & Huges, 1995). A representation of an AR protocol by Kemmis (cited in Hopkins, 1985) is given in Fig. 2. The protocol is iterative or cyclical in nature and is intended to foster deeper understanding of a given situation, starting with conceptualizing and particularizing the problem and moving through several interventions and evaluations.

In the present study we have used the action-reflection cycle as a means of in-service teachers' training, and thus a context for equipping teachers with new skills and methods. We came up with an innovative design procedure, which is a hybrid form of traditional instructional design and the action research design (Fig. 3).

Innovative Course Design

In accordance with the traditional instructional design, phases the we started with a pre-course survey questionnaire in order to establish the participants' previous experiences in computer and Internet usage in their day-to-day teaching situation. This established that the participants of the course consisted of mixed ability (mostly low ability) group of people in terms of computer skills and knowledge. We concentrated on the following conditions for effective adult learning (Engel, 1991) in the framing of an 'innovative course design model':

- Active learning through posing own questions and seeking the respective answers.
- Integrated learning, learning in a variety of subjects concurrently through learning in the context in which the learning is to be applied in real-life situation.
- Cumulative learning to achieve growing familiarity through a sequence of learning experiences that are relevant to the learner's goals, experiences that become progressively straightforward but more complex, as well as less non-threatening but progressively more challenging.
- Learning for understanding, rather than for recall of isolated facts, through appropriate opportunities to reflect on their educational experiences, and through frequent feedback, linked with opportunities to practice the application of what has been learned.

We faced a number of problems in the process of designing the activities and assignments in accordance with the conditions for effective adult learning. For example, the participants were not well known to each other, and did not seem enthusiastic about the idea of working together on a project or even helping each other. Therefore, group activities were organized in such a way as to allow the participants to become familiar with each other and work collaboratively towards a common goal. It took us some time to establish a rapport with participants, and for the participants to develop their confidence with ICTs.

Motivational strategies used for designing a model of instant course delivery were based on ARCS Model of Motivation developed by John Keller. According to Keller, 1983 there are four categories of motivation – namely; attention, relevance, confidence, and satisfaction. These categories represented a useful model for increasing the motivation of our course participants.

An action research methodology became the basis for strategically developing the course to the stage where it was increasingly being seen by participants as relevant and useful. An action-observation-reflection cycle was followed in the process of course design, development, implementation and evaluation.

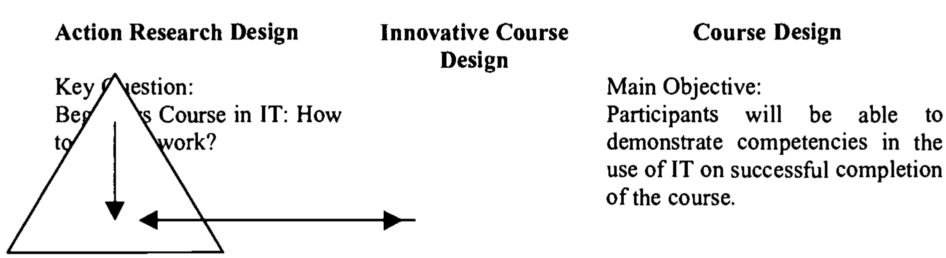

Figure 3: Innovative Course Design

The course design was an ongoing process of refining approaches to, and connections between, some of the core skills and knowledge in terms of ICTs. This process also involved motivational strategies for emphasizing realistic practical relevance, and promoting confidence and a sense of achievement in learners.

Our own enthusiasm and belief in the materials we were using was crucial in convincing the participants that instructional technology is a useful, important and relevant component of their teaching. A list of about twenty activities was made including the following: composing text in Microsoft word, demonstrating of skills such as cutting and pasting, opening email account and sending emails to the members of the group by forming mailing list, searching the internet for information on certain topics and listing the search strategies used, booking marking internet site for resource development and converting the same as a web page, evaluating web pages and learn about web page design, preparing slide show on MS power point, developing own homepages, uploading files in the web pages, etc..

Every week a hand out containing a short description of activities was given to the participants. The link between the different activities was crucial. Different activities listed according to Tab. 1 were skillfully interwoven to reinforce each other. The role of the 'teacher' in this course involved being part of a learning community as well as a general facilitator of learning.

What We Actually Did in the Course
Administration of Pre-course survey and test: • To establish the entry profile of the students • To survey the availability and usage of IT facilities in the actual work place.
Formulation of objectives: • To Develop a list of topics • List the skills and competencies related to each topic • Link different activities with the skills and topics • Ensure the internal link among the various activities.
Implementation of the course: • Catch attention through various activities • Show relevance by linking the activities • Monitor and observe students performance • Communicate continuously through email • Provide immediate feedback on students work • Establish rapport with the students • Provide support through help sessions for improvement • Facilitate learning and give confidence • Look back and modify objectives, strategies and activities.
Students' role: ➢ Demonstration of competencies by accomplishment of various activities individually and through group work ➢ Presentation of major task (integration of skills and competencies) established through group activities ➢ Completion of reflection survey, teaching and course evaluation forms.

Table 1: The Implementation Process of the Course

Typical examples of some of these activities are described in another publication (Richards & Bhattacharya, 2001b). While the activities are presented in an order, the sequence in which they are undertaken in practice is likely to be far less ordered. Recursion to previous stages in the process was possible because of the flexible nature of the framework, which avoided imposing arbitrary constraints. This was important to cater for the different skill levels, and the different stages of temporary frustrations encountered by learners.

Assessment and Feedback

The achievement of various ICT skills and general knowledge was assessed in terms of different activities and assignments to be completed or demonstrated by the participants within a stipulated time frame. This was necessary to bring all the participants up to a certain desired level of ICT competency at a particular period of time. Help sessions were provided whenever required for establishment of the given task. Formative evaluation was carried out through out the course. Finally, the demonstration of learning outcomes, i.e., the integration of ICTs in various educational activities, was done through both online and classroom presentations by the participants.

In addition to responding to all the problems faced by the participants throughout the process of teaching-learning, we also carried out a 'course and teaching evaluation' at the end by collecting feedback from the participants about the design and delivery of the course. An evaluation of 'innovative course design' was done by analyzing and interpreting the results of ongoing action research as well as student artifacts and feedback. The data was collected through various means such as questionnaires, email communications, classroom observations, task performance, and semi-structured interviews. This provided a basis for the research focus on the three key domains of learning: cognitive, psychomotor and affective including attitudinal changes and development of interpersonal skills.

Discussion

Even though educational institutions are busily filling classrooms with computers, a large percentage of teachers remain reluctant and skeptical. Unfortunately, much of the technology professional development of the past two decades was designed by technology enthusiasts with little empathy for reluctant learners - who have failed to convert reluctance into enthusiasm, and to address the very real concerns of many reluctant learners (McKenzie, 1999).

In this study we undertook the challenge of developing a course, which more effectively catered for reluctant ICT learners (the teachers). As a result, we came to appreciate more fully that these teachers have special needs, interests, and learning styles, which must be addressed with respect and ingenuity if we expect to see such teachers embrace the new technologies being placed in their classrooms.

In the training of teachers the main concern should be to make them more confident and enthusiastic about learning technologies so that they in turn apply the skills and knowledge in their own classrooms and outside the classrooms. In the "information age" our instructional methodologies must change from that of the "industrial age". Tab. 2 shows, what and how we, teachers, need to shift our educational paradigm from "old" to "new" according to the demand of the society.

INDUSTRIAL AGE	INFORMATION AGE
Standardisation	Customisation
Centralised control	Autonomy with accountability
Adversarial relationships	Co-operative relationships
Autocratic decision making	Shared decision making
Compliance	Initiative
Conformity	Diversity
One-way communications	Networking
Compartmentalism	Holism
Parts-oriented	Process-oriented
Teacher as "king"	Learner (customer) as "king"

Table 2: Shift from an industrial age to an information age (Reigeluth, 1996)

We must replace the piecemeal assembly of educational knowledge and develop larger chunks of expected knowledge and skills to be mastered in an integrated fashion (Andrews, 2000). We recommend instead a focus on demonstration of applied knowledge and skills.

It is unrealistic to seek "universal solutions" to implement ICTs into courses across different disciplines and subjects. Therefore a flexible 'action research' design complements the requirements to increasingly customise ICT courses for particular audiences and contexts. In sum teachers need to be designers of new courses integrating ICTs as well as effective reflective practitioners.

Conclusions

Integrating technology can be very rewarding for both teachers and students. It need not be daunting as it might appear at first sight. The crucial component of effective ICT integration is a framework, which adequately recognises and caters for learner motivation. The introduction of ICTs into education generally requires more innovative approaches to the teaching and learning situation as well as course materials and learning activities. This paper has argued that an innovative course design is required which is structured, developed and applied as 'action research' in the sense of proactive reflective practice.

References

Andrews, R. (November 29, 2000). A prescription for improving teacher preparation. *Education Week on the Web* from World Wide Web: http://www.edweek.org/ew/ewstory.cfm?slug=13andrews.h20

Braxton, S. (1995). *Models of instructional design*. George Washington University, Washington DC: School of Engineering and Applied Sciences from the World Wide Web: http://www.seas.gwu.edu/student/sbraxton/ISD/general_phases.html

Engel, C.L. (1991). Not just a method but a way of learning, in D. Boud & G. Feletti (eds.) *The challenge of problem based learning*. London: Kogan Page Ltd.

Hitchcock, G., & Hughes, D. (1995). *Research and the teacher-a qualitative induction to school-based research.* London: Routledge.

Hopkins, D. (1985). *A teacher's guide to classroom research*. Philadelphia: Open University Press.

Keller, J.M. (1983). Motivational design of Instruction. In Reigeluth, C. (ed.) *Instructional design theories and models*. Hillsdale, NJ: Lawrence Erlbaum.

Kurkowski, C. (Oct., 2000). *The Internet challenge: Teachers learn to balance Internet and classroom learning* from World Wide Web: http://currents.net/articles/1910,1,4,2,1001,00.html

McKenzie's J. (1999). *How teachers learn technology best*, The Twiggs Company.

Moore, G. F. (1991). *Crossing the chasm: Marketing and selling high-tech products to mainstream customers.* New York, NY: Harper Business.

Norman, E. (1999). Action research concerning technology for design and associated pedagogy. *Educational Action Research,* 7 (2), 297-308.

Reigeluth, C.M. (1996). A new paradigm of ISD? *Educational Technology,* 36 (3), 13-20.

Richards, C., & Bhattacharya, M. (2001a). Silk purses out of pigs' ears?: The conversion of reluctant or intimidated students (especially teachers) into keen users of the internet in education. *Proceedings of Society for Information Technology and Teacher Education International Conference, 2001,* Charlottesville, VA: Association for the Advancement of Computing in Education.

Richards, C., & Bhattacharya, M. (2001b). An introductory ICT skills program for teacher education: A case study. *Proceedings of Society for Information Technology and Teacher Education International Conference, 2001,* Charlottesville, VA: Association for the Advancement of Computing in Education.

Designing Web-Based Inquiry Simulations: Carolina Coastal Science

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Abstract In this paper, the design of Web-based inquiry simulations used in science classrooms for students to explore coastal science issues is discussed. In response to the demand of reform efforts and the lack of an appropriate design model approach, the Carolina Coastal Science project commenced with an idea to develop a Web site that was an organized, non-linear information resource in the context of an inquiry-based constructivist learning environment. Several modes of learning and teaching strategies were developed to be available to the users, including a role-playing simulation-debate, open-ended inquiries, guided inquiries, independent research, and cooperative group learning. The paper concludes with the claim that creating an instructional system in an online environment promotes the use constructivist theories in student learning due to the nature of their engagement within a hypermedia environment.

Introduction

An instructional system may be defined as an arrangement of resources and procedures used to promote learning (Gagne, R., Briggs, L., and Wager, W., 1992). The Dick and Carey (1990) systems approach model for designing instruction is the most well-known systematic instructional design model (Table 1). Traditional systems approach to instructional design by itself is not compatible with the concept of inquiry-based learning required in an online learning environment. The traditional systems approach is most directly applicable to the development of print instruction used in linear environments. The systems approach is being challenged by constructivist theories and models which recognize that social context, roles, and relationships are central to learning (Jones, Kirkup, & Kirkwood, 1993). Non-linear development models also recognize that learning is dynamic and unpredictable and that learners can and do make their own decisions about learning tasks (Thorpe, 1995). The systems model approach can be modified with the application of constructivist tenets to fit the conditions of non-linear, Web-based instruction. Constructivism is based on the premise that knowledge is not something that can be transferred from one person to another, but instead must be built by an individual. In a constructivist Web-based instructional system, students learn by doing. Knowledge is constructed through experience and learning is an active process.

In a constructivist Web-based instructional system, learning is based on students' active participation in problem-solving and critical thinking regarding a learning activity that they find relevant and engaging. The student's role is active, not passive in this setting. The Web-based medium becomes a learning environment that offers more than just text to read followed by a multiple-choice question to answer. This article describes how we used the systems approach model to provide a base for the design and development of an instructional system for an online learning environment for science education.

Reform movements in science education

New reform efforts taking place in science education today are framed by the tenets of constructivism. Constructivist theorists regard learning as an active process in which a learner constructs knowledge and understanding in an active manner through personal experience or experiential activities. Constructivism has its roots in twentieth century psychology and philosophy and the developmental perspectives of Piaget (1954), Kant (1959), Bruner (1966), and Vygotsky (1978).

Another focus of the current reform movement in science education is to develop students' ability of inquiry as well as understandings of inquiry (NRC, 1996). The national standard on scientific inquiry defines scientific inquiry as "diverse ways in which scientists study the natural world and propose explanations based on the evidence derived from their work" (NRC, 1996). Inquiry also refers to the activities of students in which they develop knowledge and understanding of scientific ideas, as well as an understanding of how scientists study the natural world. The process of scientific inquiry can be embedded in a Web-based instructional system. In such a system, the learning process is facilitated by an environment that emphasizes active student involvement. The Web-based medium becomes a learning space where students can make observations, classify objects, communicate observations and data, make measurements, formulate inferences, and make predictions. Furthermore, online scientific inquiry can be facilitated by resources students explore from distant geographical locations, including remote environments, laboratories, museums, and reference libraries.

Initial ideas for developing the Web-based instructional system

In response to the demand of reform efforts and the lack of an appropriate design model approach, the Carolina Coastal Science project commenced with an idea to develop a Web site that was an organized, non-linear information resource in the context of an inquiry-based constructivist learning environment. Most of the content would be original, created specifically for the site, while other material would be available via links to other sites.

One of the main goals of this project was to create an online environment for primary, middle school, and upper secondary students of varying abilities to engage in authentic scientific inquiry including: identifying questions that guide scientific investigation, using technology to improve investigations and communications, formulating scientific explanations using logic and evidence, recognizing and analyzing alternative explanations and models, and communicating and defending a scientific argument. This instructional system was created on the World Wide Web due to the fact that the nature of hypertext mark-up language (HTML) supports a user-centered learning environment through a non-linear information landscape. Also, a Web site is not a static entity. It can be a dynamic, changing entity in ways that are simply not possible with traditional printed material. Designing effective materials for science educators that provide instructional strategies based on constructivist approaches and various uses of technology was a challenge of this project.

Another important goal of the design and development process was to create a user-friendly interface that would make it easy for novice teachers and students to navigate within the Web site. Several modes of learning and teaching strategies were chosen to be available to the users, including a role-playing simulation-debate, open-ended inquiries, guided inquiries, independent research, and cooperative group learning.

The Carolina Coastal Science Web site

The resulting Web site, Carolina Coastal Science (available online at http://www.ncsu.edu/coast), contains 6 separate areas to engage students in different types of inquiry including:

1. An inquiry simulation in which students investigate the issues concerning the fate of the Shell Island Resort and then debate the future of this and other oceanfront structures threatened by coastal erosion;
2. An interactive photojournal that students can use to construct their own set of inquiry questions to explore;
3. An inquiry exploration in which learners investigate the issues concerning the relocation of the Cape Hatteras Lighthouse.
4. A section of "Inquiry Images" which can be used as whole class guided inquiry activities;
5. A "Coastal Research Technology" section that students can use to identify the scientific instruments used by oceanographers and coastal geologists to collect data;
6. An educator's guide with a variety of teaching suggestions to assist teachers with incorporating the Web site into primary, middle, and upper secondary school classrooms. The educator's guide also shows the correlations of the activities in the Web site with the goals stated in the National Science Education Standards and the North Carolina Science Curriculum Standards.

The Shell Island Dilemma simulation

The Shell Island Dilemma is a simulation, in which students investigate the issues concerning the fate of the Shell Island Resort and then debate the future of this and other oceanfront structures threatened by coastal erosion. As students engage in the investigation, they identify the social, political and scientific issues with which different stakeholders must deal. Students place themselves into the role of one of the stakeholders. Questions are used throughout the instructional system to focus student's thoughts during their exploration: "As you explore the resources, remember that you are in the role of a stakeholder. Think about the current North Carolina policies regarding the placement of hard structures in public trust areas such as the beach. How does the current coastal policy affect your vested interests as a stakeholder?"

Students are first presented with a video clip that introduces the dilemma. After being introduced to the problem, students are to select their stakeholder role. The roles for this simulation include: the Shell Island Resort homeowners, the Wrightsville Beach town manager, North Carolina Coastal Resources Commission members, coastal engineers, coastal scientists, and members of the environmental advocacy organization, the North Carolina Coastal Federation

Each stakeholder role Web page includes a brief description of the role and a recommended list of important resources to review. The resources include authentic documents and photographs, including aerial photographs illustrating the recent history of the migration of Mason's Inlet, photographs of the Shell Island Resort, a QuickTime Virtual Reality panorama of the inlet hazard zone, newspaper articles, statements from coastal engineers, permit applications to construct a hard structure, and meeting proceedings from the North Carolina Coastal Resources Commission. After students review the resources, they are to prepare a statement to decide what should be the next course of action regarding the Shell Island Resort. Students present their statement in a debate to decide the future of the Shell Island Resort. Each student also completes a "Position Statement Handout". After students have had enough time to review the resources and prepare their position statements, a class debate is held to decide the next course of action. When the debate is complete, students take a vote on the proposed solutions and conclude the debate when a consensus of 2/3 of the class agrees on a proposed solution. A "Student Record Sheet Assessment" is completed by each individual student at the conclusion of the debate. Both the "Position Statement Handout" and the "Student Record Sheet Assessment" can be easily adapted to be used with other controversial environmental topics such as solid waste disposal, water pollution, and air pollution issues.

Modifying a linear instructional systems model to the Shell Island simulation

Although this instructional system was designed to be delivered in a nonlinear environment, each stage of the Dick and Carey model was applied to the design. The Dick and Carey model was then augmented with constructivist components. The following explains how each component of the Dick and Carey model was implemented with regard to the instructional design and development of the Shell Island Dilemma simulation:

1. Determine Instructional Goal

The instructional goal arose out of a need for good environmental science teaching curricular resources that align with North Carolina Department of Public Instruction instructional objectives within the framework of the National Science Education Standards. There is currently a lack of inquiry-based simulations that North Carolina secondary school teachers can use in their classrooms that pertain to real-life problems in the state of North Carolina. The instructional goal of the system is for learners to identify the social, political and moral issues that different stakeholders must deal with in a current environmental science issue - the fate of the Shell Island Resort.

2. Analyze the Instructional Goal

When students are performing the goal, they investigate the issues concerning the fate of the Shell Island Resort. Students take a position for or against building a hard structure to protect the Shell Island Resort. Students develop a personal view of the issue. Students also identify environmental and economic concerns of various stakeholders regarding the issue.

3. Analyze Learners and Contexts

Learners use technology skills to explore an online Internet resource of information and use data to construct a reasonable explanation for an unresolved issue. Students must use critical thinking skills to explore an issue that is currently unresolved. Learners take a position in their role-playing that they may not necessarily agree with.

Students understand and act on personal and social interests that facilitate development of decision-making skills while experiencing science in a form that engages them in active construction of ideas and explanations. They also communicate investigations and explanations.

4. Write Performance Objectives

• Students will identify.environmental and economic concerns that may result from building a hard structure to protect the Shell Island Resort.

• Students will list the 3 strongest arguments in favor of building a hard structure to protect the Shell Island Resort.

• Students will list the 3 strongest arguments against building a hard structure to protect the Shell Island Resort.

• Students will identify all individuals, interest groups, or organizations that are in favor of building a hard structure to protect the Shell Island Resort.

• Students will identify all individuals, interest groups, or organizations that are opposed to building a hard structure to protect the Shell Island Resort.

• Students will prepare a statement to decide what should be the next course of action regarding the Shell Island Resort.

5. Develop Assessment Instruments

Two different assessment instruments were designed to parallel and measure the learner's ability to perform the listed objectives.

1. After students review the resources, they prepare a statement to decide what should be the next course of action regarding the Shell Island Resort. Students present their statement in a class debate to decide the future of the Shell Island Resort. Each student completes a "Position Statement Handout" which is designed to assess the stated objectives before the class debate occurs.

2. A "Student Record Sheet Assessment" is to be completed by each individual student at the conclusion of the debate.

6. Develop Instructional Strategy

The strategy used in the instruction to achieve the terminal objectives was to design a role-playing activity. A current unresolved issue is selected - the fate of the Shell Island Resort, which is in danger of being destroyed by the migrating Mason's Inlet. Background information is collected. A real-life scenario is then developed. Stakeholder roles of real people are identified. Student roles are developed. An online research resource is created. A debate format is selected with set time limits. A time limit of two days (assuming 90-minute block periods) is given for student research and a period of 1-2 days is required for the actual debate.

7. Develop and Select Instruction

The instructional materials are developed in the context of a Web site called "The Shell Island Dilemma" which is a section of the Carolina Coastal Science Web site. An Educator's Guide is provided which recommends teaching strategies and assessments for implementing the instructional unit. A web site was chosen as the delivery mechanism of instruction because many resources students can explore such as newspaper articles are readily accessible in an online environment.

8. Design and Conduct Formative Evaluation of Instruction/Revise Instruction

The Shell Island Dilemma's formative evaluation was conducted in a small group setting with a group (n=13) of primary, middle, and upper secondary school educators enrolled in a graduate course on instructional design and evaluation of educational materials at North Carolina State University. According to Reiser and Kegelmann's (1994) review of current methods of evaluating instructional software, teachers are recommended as the individuals who should be responsible for rating software designed for delivery in classroom settings. Our evaluation group was presented with an overview of the activity and was then instructed to review the activity as a teacher and then as a student. Each reviewer completed an evaluation sheet of the Shell Island Dilemma activity. The evaluators were asked to rate the individual program features of the activity using a Likert-type scale, indicating the degree to which the feature is present. The features evaluated included instructional design, content, learning considerations, documentation, and the goals and objectives of the activity. The evaluators were also asked to look at the activity holistically and reach an overall conclusion based on their impressions. After the evaluators completed the evaluation form, a focus group discussion was conducted to discuss the strengths and weaknesses of the activity. The focus group made recommendations to modify the instructional program, including creating a specific description of each stakeholder within the instructional system and developing a "Student Record Sheet Assessment."

The Shell Island Dilemma debate simulation was field tested with a 10th grade environmental science class. The teacher of this class served as the evaluator. The students (n=30) spent two days in the computer lab gathering information on their stakeholder role and one day debating in the classroom. The evaluator stated that "the Student Record Sheet Assessment made sure that they (the students) were well-prepared for the debate." The evaluator also stated that the students' attitudes towards the activity were positive. Additional recommendations after the field test resulted in the creation of a "Position Statement Handout" to be utilized by students during their investigation.

9. Conduct Summative Evaluation

Summative evaluation was conducted by a marine education specialist, a coastal geologist, a university professor with expertise in curriculum and instruction, and two secondary school environmental science teachers. The evaluators were asked to examine the instructional effectiveness of the Web-based activity and provide their overall impressions. Each reviewer was requested to pay attention to science content issues, Web site navigation, Web site design, performance, and multimedia issues. The marine education specialist and the coastal geologist were asked to pay particular attention to the accuracy of the scientific facts and issues presented in the activity. The evaluators were requested to use the North Carolina State University's SERVIT Group's (Science Education Research in Visual Instructional Technologies) "Evaluating Science WWW Resources" paper as a guideline during their review of the Shell Island Dilemma. Reviews were returned to the instructional designer via e-mail. Each review was positive and no further recommended changes to the activity were stated. One reviewer even commented that this activity would be an effective tool for a social studies teacher to discuss the handling of social issues.

Constructivist Elements

The following elements were incorporated into the Dick and Carey model to create a constructivist environment within the instructional system:

- Learning occurs with the context of an authentic learning environment in which students use real information and make decisions in a learning environment.
- Learning occurs within the context of a social experience.
- Learners are provided an experience from multiple perspectives.
- Learners are provided with experience in a knowledge construction process.
- Learners are aware of their knowledge construction process.

Conclusion

The Carolina Coastal Science Web site is an instructional system defined as an arrangement of resources and procedures used to promote learning. Although the Dick and Carey systems approach model for designing instruction was designed for linear instruction, this approach can still be used as part of the instructional design and developmental process in an inquiry-based online learning environment. Creating an instructional system in an online environment promotes the use constructivist theories in student learning due to the nature of their engagement within a hypermedia environment. Although the systems approach is currently being challenged by constructivist theories and models which recognize that social context, roles and relationships are central to learning, the Shell Island Dilemma on the Carolina Coastal Science Web site illustrates that the traditional systems model continues to provide a base for the design and development of instructional systems in an online constructivist environment for science education.

References

Bruner, J.S. (1966). Toward a theory of instruction. New York:W.W. Norton.

Dick, W., & Carey, L.M. (1990). The systematic design of instruction. Glenview:IL: Harper Collins.

Gagne, R., Briggs, L., and Wager, W. (1992). Principles of Instructional Design (4th ed.). New York: H arcourt, Brace, and Jovanovich.

Jones, A., Kirkup, G., & Kirkwood, A. (1993). Personal computers for distance education: The study of an educational innovation. New York: St.Martin's Press.

Kant, I. (1959). Critique of pure reason. London: Dent/Everyman.

National Research Council (NRC) (1996). National Science Education Standards. Washington, DC: National Academy Press.

Piaget, J. (1954). The construction of reality in the child. New York: Basic Books.

Thorpe, M. (1995). The challenge facing course design. In F. Lockwood (Ed.), Open and distance learning today (pp. 175-184). New York: Routledge.

Vygotsky, L. (1978). Mind in society: The development of higher psychological processes. Cambridge, MA:Harvard University Press.

Principles for Designing Online Instruction

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Abstract: Integration of technology in teaching and learning is part of the unique mission of Florida Gulf Cost University (FGCU) to increase access to higher education, not only in Southwest Florida, but beyond. To gain a better understanding of the web in education, the University organized a study group to review learning theories, and to reflect on the courses designed and taught at FGCU. The group identified guiding principles and best practices for teaching, managing, and supporting web-based instruction at the university. This presentation will address issues in web course design and development, web course management and institutional support. The issues will be examined from the perspective of faculty, administrators, and support staff. The goal of this work is to bring a better understanding of the use of the web in higher education, its impact on teaching and learning, and implications for support staff, faculty, and administrators in the university.

Introduction

Florida Gulf Coast University, America's newest, is part of the Florida State University System and has been chartered as a center for innovation. The state-of-the-art campus, opened in 1997 in a pine and palmetto forest in southwest Florida, weds technological sophistication with a fragile coastal ecosystem. As part of the founding faculty and staff we participated in the development of over 200 courses using the Internet as a major or supplementary part of the course designs.

After two years of operation, a study team of experienced on-line faculty and instructional designers from the colleges and the Department of Instructional Technology reviewed the literature and reflected on their own experiences. This helped to identify a set of principles for online instruction to guide continuing design, development and delivery of online courses at FGCU. This brief article gives a summary of four major topics - instructional design, course management, visual design, and support. The full text of the *Principles for Online Instruction* has been posted at www.fgcu.edu/onlinedesign

Instructional Design

Instructional design is one area in which guidelines are recommended for web-based online instruction at FGCU. After reflecting on our own practices and reviewing related literature, we identified a set of guiding principles for online instructional design. It is recommended that instructors conduct instructional, content, and audience analyses for online courses. The analyses can provide baseline data for online course design and lead to the formation of instructional goals and objectives.

To implement the principles in web-based online instruction design, we ensure that every online course at FGCU is created with clearly defined instructional goals, well thought-out learning activities, and appropriate assessment methods. We suggested using Bloom's (1956) taxonomy to define instructional objectives and determine areas of knowledge and skills for a course. In one online course, for example, we clearly related each instructional goal to 3 levels of learning hierarchy: information, application, and evaluation. This clarified the instructor's expectations and provided a student-centered learning environment in which they can appropriately allocate their time and energy to the course and take responsibility for their own learning.

Clearly defined instructional goals, on the other hand, enable the instructor to design specific instructional activities that are directed toward reinforcing and practicing skills and knowledge. While recommending that instructors engage students in active learning and provide students with meaningful learning experiences, we suggest a list of possible learning activities such as test/quiz, case study, journal, portfolio, simulation/games, and authentic projects for online instruction. Each activity facilitates students' achieving a specific learning goal in a course. For example, a self-assessing quiz in the Health Assessment course in College of Health Professions helps students to recall information such as concepts, principles and rules of health assessment. It draws students' attention to key concepts of the course and directs students to further readings and reinforcement activities if they fail to understand. The case study method is used in the Client Education in Health Care course where critical thinking and problem-solving skills are main course goals. Students were plunged into an authentic learning environment provided by case studies. They were not only asked to recall information, but analyze cases, identify problems, and find possible solutions.

In addition to the learning objective and hierarchy analysis, instructional analysis also involves content analysis, which usually determines the selection and sequence of a course content. Course content analysis for online instruction examines a course's suitability for online delivery. For example, an anatomy course in Arts and Sciences has both lecture and lab sections. Without a sophisticated online lab for students to engage in hands-on manipulation of each anatomic part of a human and assemble/dissemble parts, students will lose the opportunity to reinforce and integrate information learned in lecture sections. Student learning will suffer as a result. Such a course is not the most appropriate candidate for online instruction with present technology. As online labs become reality rather than dreams, the situation may well change. For the courses that are deemed not suitable for online instruction at present, a number of methods can be taken to meet the needs of distance students. Some of these courses are delivered in a flexible mode with both online and campus lab sections. In most cases, the course instructor is the most qualified person who can recommend the suitability of a course for online instruction.

Audience analysis for online instruction goes beyond traditional learner's personal characteristics, intellectual skills, and subject knowledge level. In audience analysis, we try to find students' technology skills and previous experiences with online instruction. For instance, a large number of online courses at FGCU are designed with a technology skill assessment and preparation module. Students are usually required to go through the module during the first week or prior to the first week of a course. Knowing students' technology skills, the instructor can direct students to technical support services for workshops, one-to-one training sessions, or online tutorials according to an individual's skill level. The instructor can even advise those whose technology skills are below the required level to take the course next semester. Since students are coming with different level of technology skills, it is suggested that the instructor should plan for naïve users of technology and provide basic instruction throughout the course so that all students have the same chance of succeeding.

While course design, which consists of instructional, content, and audience analyses, lays the foundation for an online course, appropriate interaction and course management ensure that students follow the course plan and achieve the instructional goals specified in a course.

Course Management

Planning for course management during the development and design stages may alleviate some problems encountered during the delivery of the course. We considered the following factors in the delivery of a successful on-line course: time commitment; tracking and evaluating student progress; providing adequate feedback; and communication.

An increased time commitment exists for both students and instructors. Instructors interact with every student on a regular basis, while students become independent, self-directed learners. Since a sizable amount of our instructors' time is spent on course management once the semester begins, we encourage the completion of total course design and development prior to Internet delivery.

Tracking and evaluating student progress starts at the beginning of the course by ensuring our students are capable of utilizing technology and by presenting consistent, organized lessons and assignments. Most of our students are required to attend face-to-face technology orientation sessions or participate in an on-line technology orientation. The on-line technology orientation is incorporated as the first lesson or part of the first lesson of the Internet course. Student progress is tracked through the course using on-line or hard copy grading grids. Students are evaluated by various methods: projects, homework, examinations (on-line testing or proctored), and on-line discussion.

When providing feedback to students, we use any available method such as e-mail, on-line discussion, telephone, or face-to-face meetings. We establish a clear pattern of response time that students can recognize as being efficient. Some of our on-line instructors tell students how long they can expect to wait for responses to e-mails. For example, some instructors tell students they can expect an e-mail response within 24-48 hours. We also notify students when assignments are received with a simple response of 'got it.' We have found students look for the 'got it' message. If they do not receive it within a reasonable time frame, the students will resubmit the assignment or check with the instructor as to whether or not it was received.

Communication is necessary to create and promote an atmosphere of caring and sharing. By setting clear expectations for students' on-line activity and allowing opportunities for social contact through chat cafes, face-to-face orientations, personal welcome letters, personal photographs, and student web pages with direct links to e-mail, a vibrant and orderly learning community can emerge.

Visual Design

Internet design is neither art nor science, but there is a 200-year history of design theory that informs online design. This theory suggests that form should not be separated from content and design should serve learning (Bull 1998).

Our experiences confirmed some suggestions from the literature. For example, information on a course web page should be organized to enhance learning and artistic design should not be the prime purpose. Navigation devices should also be carefully designed to orient the user and provide a sense of direction. Graphics should be used to support learning by presenting additional information without unnecessarily extending download time.

In the fast changing world of multimedia our designers not only had to determine the optimum use of text and pictures, but also consider various methods of incorporating audio and video. Numerous questions resulted. Should media be linked or streamed? Should web pages incorporate linear media such as PowerPoint presentations? Should web sites or pages be narrated and/or streamed? When are animations effective or irritating? The limitations of both student and equipment are critical when multimedia elements are incorporated. Do students have the right "plug-in" to display the multimedia? If not, can they install or download the plug-in? Are student modems fast enough to transfer information? An error in judgment here can create an absolute barrier to learning (Pavio, 1971).

Support

At FGCU we learned very quickly that the integrity of our on-line instruction, directly related to the support services we provide to the faculty and students who were involved in these courses. We divide our support services into three categories: Technical Services and Support, Academic Services and Support, and Library Support Services. Each one of these categories offer faculty and students help in facing the challenges of learning and succeeding in our web-based education programs. You will find specific examples of this support system at the following URL: http://www.fgcu.edu/onlinedesign/techsup.html

We provide **technical support services** to our faculty through: 1) workshops on using the technology to develop and deliver courses via the Internet; 2) individual training sessions (house calls) providing one-on-one instruction, and 3) instructional design assistance to faculty requesting their collaboration. Some examples of our technical support services for students are; 1) on-line tutorials, 2) class mentors who assist new students in navigating through the technology, 3) computer labs that provide instruction to students through workshops and lab assistance, and 4) demo courses for students to review prior to taking a web course

Academic support services provide our on-line users with admission forms, registration, and financial aid through the Internet. In addition, on-line tutoring, proctoring services, and on-line book ordering forms support those students who cannot come to campus. Students attending the University through distance receive a *Guidebook for Distance Learning*. This document assists them in their journey from admission to course completion. To assist DL students as they progress through their course of study, academic advisors in each of the colleges provide on-line orientation and advising through email and phone.

Library support services at Florida Gulf Coast University provide reference services and information-literacy instruction appropriate to meet the needs of distance learners. Providing course material on electronic reserve is a primary function provided by the library. In addition students have easy access to the library catalog, WebLuis. The FGCU library provides students with remote access to some full text journal articles directly through the Library web site. Students may use the form on the web site to request information or contact the reference staff for further assistance.

Implications

There are now over 200 web-based or web-enhanced courses being taught at FGCU and the whirlwind of activity that characterized our inaugural years has settled into more predictable routines allowing us to reflect on our experience and identify the implications of our work. First, the *Design Principles* provide a benchmark for quality assurance to guide the continuous improvement of web-based course materials. In addition the *Principles* provide a theoretical framework for designing faculty development activities that can people develop a working mental model of web-based instruction. For example, how can you incorporate an impassioned classroom debate into cyberspace? What will it look like, how will it work, and can it be as powerful a learning experience as its classroom equivalent?

The *Design Principles* also inform the decision-making and policy development tasks. What kind of technical support is adequate? How can we build a development team that provides the complementary skills for online course development while the faculty learn to work as online instructors and students become online learners? Online learning is fast becoming a fact of life in higher education and it requires that some time-honored practices be reconceptualized. It is our hope that the *Principles for Online Instruction* will inform the work of faculty, staff and administrators as they answer the question, "How might I use the Internet to enhance teaching and learning?"

References

Bloom, B. S. (Ed.). 1956. *Taxonomy of educational objectives.* New York: McKay.

Bull, K. S., S. Kimball & S. Stansberry (1998). *Instructional design in computer mediated learning.* (Report No. RC-021-439). Oklahoma State University. (ERIC Document Reproduction Services No. ED 417 885).

Pavio, A. (1971). *Imagery and verbal processes.* New York: Doubleday.

Effective Presentation Design ____

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Abstract: Presentation software tool are powerful and adaptable products for creating custom lesson and presentations. Electronic presentations are used for education in three delivery formats: Teacher to Audience; Teacher to Individual; and Student to Audience. Effective presentations follow established design principles and include interactivity such as brainstorming, organizing, and reviewing. Benefits of interactive presentations include sensory engagement through multimedia and easy reuse and updating of saved files. Tutorials, interactive lessons with feedback, review, and even testing, can be created as presentations. Using this approach, people can work at their own pace, and can experience individual remediation or enrichment. As a powerful learning activity, students can share their learning with their class, their parents, their community and the world. By developing a presentation or electronic portfolio, learners gain extensive experience with organizing information, and they experience the real-world task of communicating knowledge to others.

Desktop presentation creation software applications have become more than linear presentation tools. Software such as web page editors, *Inspiration* and *PowerPoint* now support branching navigation, custom buttons, interactive menus, program control, and web interactions. These features can make a presentation software tool a powerful and adaptable product for creating custom lesson and presentations. Realism is enhanced with multimedia elements such as sound, graphics, animation, photos, and movies into a presentation. In addition, a presentation can include Web links, and files such as databases, spreadsheets, and charts.

Presentation software can be used for education in three general formats: Teacher to Audience; Teacher to Individual; and Student to Audience. Teacher to Audience presentations involve the teacher or presenter sharing information with a group in the room or lecture hall or even across the web. A presentation can be used to do more than just to share information; it can also become interactive with brainstorming, organizing, and reviewing. Benefits of interactive presentations include sensory engagement through multimedia and easy reuse and updating of saved files. Teacher to Individual presentations are often delivered by way of a hands-on computer station. Here learners or small groups can work on tutorials, interactive lessons with feedback, review, and even testing. Using this approach, people can work at their own pace, and can experience individual remediation or enrichment. This type of program can be run in a computer lab, through a school's network, or on the World Wide Web. Student to Audience presentations allow a student or group of students to share their learning with their class, their parents, their community and the world. By developing a presentation or electronic portfolio, learners gain extensive experience with organizing information, and they experience the real-world task of communicating knowledge to others.

When creating a presentation, some design considerations are important. The effective application of these considerations make presentations easier to follow and understand and make the presenter appear more professional. A rule of thumb for designing a presentation slide or screen is known as the rule of threes: a slide should contain three base elements. The elements are generally a title or topic, text, and illustration such as diagram or chart. Slides are best understood when they are limited to a maximum of six text items as phrases or bullet points. Any more causes the text to become too small or presents too many points for the audience to keep in mind. More than five or six points should be grouped or "chunked" into subtopics, and then further information can be presented on its own side. Slides should include plenty of white space to avoid clutter. Material should not extend from edge to edge. People read faster and comprehend better when there are margins around material. Using a few high-contrast colors works best for a presentation: too many colors can become confusing, and a lack of contrast between text and background can render a presentation unreadable. While people prefer to read dark text on a light background, light text and dark backgrounds are also acceptable. The contrast must be sufficient.

One of the most basic elements to consider is the structure of text. Text should flow from left to right and down from the top. When adding moving text to a slide, place text so that it moves from the right to the left, because viewers are accustomed to reading from left to right. Younger readers prefer a simple font such as Arial, a sans serif font. Experienced readers change their preference to a serif font such as Roman or Times New Roman. It is best to use clean fonts and large font sizes. Decorative fonts should be avoided; classic Arial or Roman font types are preferable. A 20-36 point font size is effective for distance reading. A small increase in font size may make written material much easier for viewers to understand. While the larger words will occupy more space, the slide will look less crowded, therefore making viewers feel more comfortable. It is recommended to use both upper and lower case letters. The shape of the written word produces an image to a reader that helps in decoding, by providing clues to words. Avoid using multiple fonts within a document or presentation. A change in font or use of bold'should be used to make important information stand out. Common word processor functions of bold, italicize and underline text can help viewers recognize important words and phrases. Research has found that the contrast that exists between yellow and black is greater than the contrast between black and white, making items highlighted in yellow much easier for most people spot and recognize. Since web use has become very common, it is advisable to be sparing in the use of the underline and limit it to URLs and references only, so that underlined words will not be interpreted as hyperlinks. Fonts should be clear and simple to read.

Multimedia is the combination of more than one form of media together to create a more powerful message. The media that are combined include: text, sound, graphics, and video. Multimedia is an excellent way to enhance a presentation. Graphics, sound, video, animation, and charts can all add to the message. Multimedia files should be kept small, since they will have to load into the presentation computer's RAM before being displayed and therefore may cause delays or pauses in the presentation. Additional media should be added to a presentation when they improve the quality, increase the impact of the message, or present information better than text alone. No image or sound should be included in a presentation just because it exists or it is possible to do so. An image or sound that has no bearing on the presentation can be more distracting than helpful.

Images included in a presentation should relate to the topic. Images may inform about the topic, to entertain, or to create an emotional response. The developer of the presentation must decide upon the goal of the presentation and which type of image or mixture of images is appropriate. Otherwise, the image may cause confusion, or it may distract from the message. The use of pictures will motivate viewers to read the text by breaking up the slide and creating more white space. Pictures should not be added to the content material in such a way that they interfere with the reading flow. It is not effective to place pictures in the middle of text; instead they should be located near the edges and some white space should be left around a picture to separate it from the text.

Moving pictures can be very disruptive because when we look at a slide our brains and eyes are automatically attracted to the moving object. As a viewer is reading across the screen, attention will be constantly drawn to the moving object. Motion can be added to a presentation in order to demonstrate action. Motion files include digital video, animations, morphs, and virtual reality. Any motion clip should be set to play once or a limited number of times. This approach provides the presenter with more control, and allows viewers to focus attention on other items on the slide after the motion segments stops. It is recommended not to set video clips to automatically start in a slide, but instead to allow the presenter to choose when to start the video segment. It may be better to have a small still image to click on that will start the video in a new window.

Sound adds realism and should be limited to uses that enhance the presentation. Avoid repetitive sound because they usually distract from the purpose of the presentation. A short tone is usually acceptable, but something longer that repeats is often disruptive and distracting.

It is best to test the presentation on other computer platforms and settings from the computer with which it was created. Different computer platforms and settings can cause changes in the display, and can cause disruption of the presentation by having a different contrast level or changing how the images appear. A presentation should also be tested on how it displays on with a projector or television. Computer monitors usually have a much better picture quality and show colors and contrasts much better than television screens or video projectors. A developer should be careful about including new features with a software program without knowing for sure that the presentation computer will have the same features. Also, if possible, test microphones, speakers and any other peripheral multimedia equipment needed before a presentation starts.

Letting teachers to interact with the idea of "Interactivity": What is "Interactive?"

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Abstract: This report is the findings of the research on Interactivity, to find the possible characteristics, contexts, limitations, and ideals, of Interactive Learning Environments for future mathematics and science education areas respectively. A web-based survey was used to gather data on diverse views of the academicians, researchers, and teachers. With the help of their answers and our own questioning, we were able to come up with a four-leave model for Interactivity, with social, intellectual, technical, and physical dimensions constituting the four leaves. We hope that this research would give an idea to teachers for what they should expect from "Interactivity" or not.

Introduction

The main question of this study is "How could we characterize an interactive learning environment?". Recently, interactivity sounds like a magical machine as if when you put something into it, it changes the entire nature of that thing to a something wonderful. We may choose to be puzzled by this "big" idea or we may choose to decide how to use this big idea for the benefit of effective instruction and learning of students through any kind of medium. With extensive research, we were able to come up with a huge range of divergent uses of the same term, in classroom, a textbook, a instructional program, a design issue, feedback-corrective loop, or even metacognitive act (Kirsh, 1997; Rose, 1999; Cezikturk, Kahveci, & Cirik, 2000).

One could be able to find an array of theories underlying the idea and its use in the educational practices. Vygotskian social constructivism stresses the importance of interaction between learners, their peers and teacher for an effective learning environment. One of the first tenets of cognitivism is "metacognition" and it stands for interaction within each person's mind for their own thinking. Informational processing theory points to the both interaction between components of thinking process (short-term memory, long-term memory and senses), and interaction between several media to have a general understanding of something. Behaviorism favors feedback, which can be thought as interaction, either (Duffy & Jonassen, 1992; Pressley & McCormick, 1995).

Procedure

What is Interactivity or what should it be? The answers to this question is thought to be achieved both through the data collection via a web-based survey over Internet (one of the mediums that is generally thought to be "Interactive") and also with some direct questioning and discussions with researchers and teachers. Last year, we have asked to two distinct samples of researchers (one group was our listeners on MSET, 2000, and the other group was ACRIDAT* members in University at Albany, SUNY) on their ideal "Interactive Learning Environment" for students, and faced with a pile of innovative responses ranging from an environment for communication in a variety of learners in which the learners have the capability of observing, experimenting, debating, playing, navigating with and within a huge information system to a learning environment, which looks like star trek module; a holographic n-dimensional shared environment, very powerful palm sized computers, with a lot of opportunities for hands-on experiences or manipulatives.

The survey has included two main web pages, first being the title page, second being the main survey. In the second part there have been two main parts; one for detecting demographics of our sample, and one for main items related to Interactivity. Part two included 19 items, 7 open-ended and 12 closed-ended items respectively. We have thought that close-ended, highly rank order or checklist items would give the respondent a chance o see our stance, and open-ended items would enable them to state their own views directly to researchers. Main items functioned to identify the contexts (social interaction research, technology integration, programmed instruction) in general as well as the specific contexts as discussions, lecture, debates, simulations, narratives, problem solving, etc, the place of occurrence (student to medium, student to teacher, student to content, computer to computer, a novice and an expert, etc.), and the context which would stimulate most (real time and time-delayed, as well as WWW and IRC, MUDs, MOOs, as much as Virtual Reality. Items also designed to identify the examples for both instructional methods, and activities for most Interactivity. We have decided our respondents to be academicians, researchers as well as teachers of subject domains as mathematics and science. Although our study is situated in the context of mathematics and science education, the results of the study may perfectly serve for the purposes of other subject domains as well.

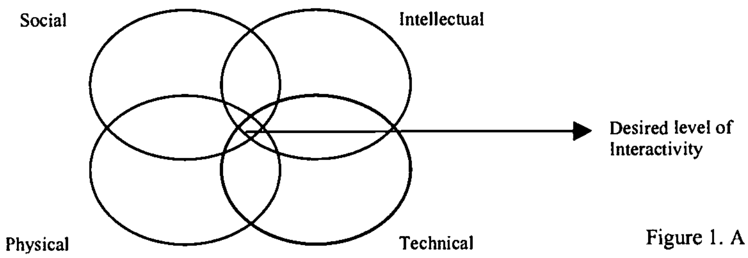

Figure 1. A four leave model for interactivity

Results

Survey data indicated that there are mainly 4 dimensions to Interactivity. *Social* dimension is thought to be including one to one (student to teacher, novice to expert) as well as a group activity (discussions, debates). *Intellectual* refers to interaction with content, or with text. *Technical* is meant to be between computers, human-computer, and between soft wares. Finally, *physical* refers to stimulus-response in especially experiments, student-centered learning, action, movement, etc. These are not distinct categories. They should have in common, as well as different aspects than the others. Figure 1 shows that those 4 leaves can be thought as 4 intersecting sets. Their utmost intersection indicates where Virtual reality lies. It is energetic, it is supposed to be a copy of the reality, hence social (think about role playing, MUDs, & MOOs). It is technical since it requires a highly developed interface of human-computer interaction. And it is intellectual, since it is partly not real. It needs to be interpreted by the brain for common elements to the reality, and differences. It is physical, since it requires movement, and active student engagement as well. We are certainly aware the cost of time, and material of VR technique in the classroom. Even with narratives in a classroom, teacher can make students to learn by doing, with the help of at least a poster, a relevant schema, or a computer with Internet for achieving technical interactivity, with discussion groups and making students to reflect on the narrative, a lot more can be achieved. However, VR can be used for modeling real classroom experiences, and for impossible experiences. The remaining part is to find a way to model VR in a classroom.

References

Cezikturk, O., Kahveci, M., & Cirik, G. (2000). Interactivity in Mathematics and science education. *MSET 2000.*, Association for the Advancement of Computing in Education, San Diego, CA.

Duffy, T. M. & Jonassen, D. H. (1992). *Constructivism and the Technology of Instruction: A conversation.* Lawrence Erlbaum Associates: London, UK

Kirsh, D. (1997). Interactivity and multimedia interfaces. *Instructional Science, 25*, 79-96.

Rose, E. (1999). Deconstructing interactivity in educational computing, *Educational Technology, 1,* 43-49.

Pressley, M. & McCormick, C. (1995). *Cognition, Teaching and Assessment,* Harper Collins College Publishers, NewYork, NY. s

Qualitative Data Analysis to Ascertain the Benefits of a Web-Based, Teacher Oriented Project

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Abstract: Qualitative data is often overlooked when judging the success or failure of a web-based project, but can be a valuable resource in evaluating the potential needs and experiences of the participants. Research has determined that the use of both qualitative and quantitative data as an analysis tool to determine the success or failure of a venture provides a holistic look that provides insights that may not have been obvious in a quantitative only type evaluation. This paper will analyze the use of qualitative data to determine the benefit of a teacher oriented web-based project. The participants, who were upper level elementary, middle and high school teachers, participated in the web project in one of two ways. One, by attending a three-hour workshop in which they were introduced to the online project and instructed in its use. Secondly, they could participate online, by completing a registration form and receiving a password that allowed them to access a web tutorial as an introduction to the project. The purpose of this analysis is to determine if and to what extent peer-to-peer interaction and face-to-face interaction with a workshop leader affects the involvement and participation in a teacher oriented web-based project.

Introduction

Qualitative data is often overlooked when judging the success or failure of a web-based project, but can be a valuable resource in evaluating the potential needs and experiences of the participants. Patton (1980) feels that qualitative data "permits one to understand the world as seen by the respondents." By using a form of open-ended questioning, the respondents are free to express their opinions and needs without the predetermination that often is associated with questionnaires and surveys. An example of open-ended questioning associated with this project is a question that gave the participants an opportunity to explain how they planned to use the project in their classroom once they completed the workshop or the web tutorial. This type of question contains none of the predetermination that would be associated with a question that provides a list of options from which the participant can choose. This type of questioning also provided the researcher with the opportunity to evaluate the respondents' comments and place the responses in a category designated by the researcher, if necessary. This is not to say that quantitative data is not useful in evaluative situations, but a combination of both quantitative and qualitative data provides a holistic view of the respondents' use and involvement in the project (Levin, 1990).

Data Collection

The data, which was analyzed, included field notes compiled by the researcher who acted as a participant observer in the role of workshop leader, videotapes of workshop participants, listerv interactions, and individual emails. Videotape data was compiled with the field notes as a means to determine the types of interactions between participants. For example, the formation of work groups as opposed to working individually during the course of the workshop (Winschitl, 1998). The participants took part in the project in one of two ways: by attending a workshop or by participating online with the use of a web tutorial. In the latter case, the data was submitted on a form via email or regular mail depending on the type of data being collected.

The researcher acted as a participant observer, which increased the opportunities for interaction and also allowed a view of the project as seen through the eyes of the participants. As a participant-observer, Patton (1980) feels that the direct personal contact and experience in the project provides the researcher with valuable insights that would otherwise be lost in a quantitative only type evaluation. Patton (1980) feels that the role of a participant observer may change over a period of time. The researcher may begin as an onlooker, almost an outsider, and gradually become involved to the point that he or she may begin to fully experience the program in a similar manner to the participants. This allows the researcher the opportunity to develop an insider's view so that they can see as well as feel what is occurring throughout the duration of the project. In observing and participating in any type of project, it is of the utmost importance to avoid equating the success of the project with only the formal activities of the program.

Patton (1980) also states that a qualitative approach provides a researcher with the opportunity to look at informal patterns and "unanticipated consequences." An example of such an "unanticipated consequence" may be the creation of a teacher support system in which teachers have the opportunity to interact and share resources. Since teaching is traditionally known as an isolating profession, this type of interaction is often not available to teachers during their daily routines. But this type of interaction is necessary for the continual growth and development, which should be an integral part of the teaching profession.

These types of interactions were noted frequently among the workshop participants. For example, as the teachers interacted throughout the course of the workshop they began talking about resources they use or contact people for specific items, oftentimes exchanging email addresses and phone numbers before the workshop concluded. In addition, participants who often seemed to prefer to work alone at the beginning of the workshop were interacting and discussing their findings and results by the end of the workshop.

The participants, both workshop and online, were also subscribed to a listserv as a way to interact with their peers and also the researcher. The researcher sent out messages approximately twice a month to encourage participation by the collection of water quality data and its submission to the water quality database. Participants were encouraged to use this venue as a means to exchange information or ask questions of the other participants. The following is an example of a request from a web participant:

> "Hi-we are testing local stream water in Wilmington DE using the materials from the water what ifs workshop. When we are done we will post the results on the web site. A very capable 6th grade student is helping run the water quality tests. He posed an interesting question: Is there a maximum safe level of dissolved oxygen in a given body of water? Feel free to respond. Thank you!"

This particular request for help received three responses about dissolved oxygen levels. This type of interaction helps to reduce the isolation of the teaching profession and opens doors for teachers to interact not only with other teachers, but also students who may be involved in independent type projects where help is needed after school hours. In addition to the listserv, individual email was also used as a means of contact and enabled the researcher to request information from the participants who were not responding in a timely manner.

Conclusion

For workshop participants to have increased interaction and to form working groups, the number of participants needs to be increased. An increased number of participants tend to facilitate the need to work together due to the size of the facility or the available lab materials. One three participant workshop group worked individually for the majority of the workshop and interacted more often with the workshop leader than the other participants, whereas a workshop group of ten interacted primarily with each other rather than the researcher. As the number of workshop participants increased, so did the number of interactions among the participants. A larger number of participants allowed the workshop leader to maintain the role of a coach or a guide as the participants' questions were normally addressed by their peers.

A major part of the impact of the program may be occurring in the informal, unstructured portion of the project, on the periphery of the structured activities, outside the formal workshop setting. The listserv was one of the activities that occurred on the periphery of the structured activities, but provided a way for the teachers and the researcher to stay connected after the initial interaction. This gave the teachers the availability of a support system on which they can rely for additional help if the need arose. Both the use of the listserv and the availability of the researcher via email, were a support system that was utilized primarily by the web participants in this project. In addition, the majority of the water quality data collected and posted to the database came from the web participants. Interaction between the researcher and the workshop participants was minimal after the initial interaction in the actual workshop. By collecting and evaluating qualitative data, these types of activities and interactions can be evaluated and added to the researcher's report as an additional component in conjunction with the quantitative data analysis. In conclusion, by looking at the informal activities associated with this project, the researcher was able to see that it did provide benefit to a number of the participants in the form of a peer support system. These benefits would not have been established in a quantitative only type study.

References

Brand, G.A. (1998) What Research Says: Training Teachers for Using Technology. Journal of Staff Development, 19 (1), 10-13.

Gagné, R.M, Wagner, W. & Rojas, A. (1981) Planning and Authoring Computer-Assisted Instruction Lessons. Educational Technology, 21, 17-26.

Levine, H.G. (1990) Models of Qualitative Data Use in the Assessment of Classroom-Based Microcomputer Education Programs. Journal of Educational Computing Research, 6 (4) 461-477.

Patton, M.Q. (1982) Qualitative Evaluation Methods. Beverly Hills: SAGE Publications

Windschitl, M. (1998) The WWW and Classroom Research" What Path Should We Take? Educational Researcher, 27 (1) 28-33.

Yekioyd Statistics and Their Interpretation

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Abstract: This paper introduces a family of statistics for item analysis. Their construction is based on a model of perfect internal consistency between each item and the test as a whole. Weighted versions of the statistics mirror the concerns of an educator in evaluating test items. In addition to identifying flawed test items, these statistics also indicate something of the nature of the flaw. Another advantage of the statistics is that their interpretation can be derived directly.

In these two pages, we will introduce three item analysis statistics. We refer to an exam item with difficulty statistics p and q that is answered by n students. In a case of perfect item consistency, the np top scoring students will answer correctly and the nq lowest scoring students will answer incorrectly. Such a situation describes what we will call the Yekioyd model. The cliché that you either knew it or you didn't is the source of the acronym Yekioyd.

Deviations from the model occur when either a student in the nq lower scoring group answers correctly or a student in the np higher scoring group answers incorrectly. The statistic described below, YB, has a value of zero in a situation of no deviation from the model. Its design leads to a value of one in the situation of maximum possible deviation from the model. The students are ranked in descending order by their overall percentage scores on the test and divided into two ranges. These ranges are the upper np students and the lower nq students for the p and q of the question. The maximum possible number of deviations is the smaller of 2np and 2nq. Half of the deviations must necessarily occur in each range. For each range, the deviation variable D is constructed. Its value is one for all upper range students who answered incorrectly and all lower range students that answered correctly. Otherwise, its value is zero. Since the Yekioyd model is a model of perfect internal consistency, the YB statistic is an internal consistency measure. The basic Yekioyd statistic YB is given by:

1. YB = Σ[i=1, n] Di ÷ [the smaller of 2np or 2nq]

Imagine a rank ordering of the scores of the higher scoring np students followed by a rank ordering of the scores of the lower scoring nq students. Deviations are of severe concern if they distant from the dividing boundary and of nearly no concern if they are near that boundary. The shortcoming of the YB statistic is that it treats a deviation as equally important no matter where it occurs. The desired construction is a weighted statistic that reflects the greater undesirability of deviations that occur far above or far below the line of division between the upper and lower ranges. Such weights should reflect the distance from the line of division to the number line location at which the deviation occurred. This division point will be calculated by the average of the scores of the two students on the boundary of the np/nq division. This average serves as the boundary value, B.

Once it matters where in the rank order a deviation occurs, deviations in two ranges take place in noncomparable environments for any value of p other than .5. For this reason it is necessary to treat the two ranges separately. Two Yekioyd statistics, an upper range YU and a lower range YL, are the result of this separation. This division brings additional benefits. The measures indicate two different types of question flaws and directions for improving questions (See the discussion of interpretation below.).

For each student, a value of the weighting variable W is constructed from the student's score and B. In the upper range, B is subtracted from the student's score. In the lower range, the student's score is subtracted from B. W is not a weight in its own right. The actual weight given to a deviation occurring with a particular student is the W value associated with that student divided by the base for the weighting. In each range, the base for weighting will be the summation of W values in that range.

Both statistics will be scaled by a factor reflecting the number of locations for deviations divided by the number of possible deviations. Multiplication by the scaling factor provides for a maximum possible value of one for YU for all possible p values. The result of this treatment is that the statistic treats questions with different p values comparably. The scaling factor has a value of one for YU if $p \leq .5$ or for YL if $p \geq .5$. In these situations, the number of possible deviations is equal to the number of rank order locations. It was noted earlier that the maximum number of possible deviations in each of both ranges was the smaller of np and nq. We will represent this smaller one of the two values with [np:nq].

Let i be the index of the rank order of student scores, with 1 assigned to the highest student score and n assigned to the lowest student score. The value of the upper range Yekioyd, YU, is given by:

2. YU = (Σ[i=1, np] Wi(Di) ÷ Σ[i=1, np] Wi)(np ÷ [np:nq])

The value of the lower range Yekioyd, YL is given by:

3. YU = (Σ[i=np+1, n] Wi(Di) ÷ Σ[i=np+1, n] Wi)(nq ÷ [np:nq])

The contribution of a question to the consistency of a test can be measured in terms of deviations. Deviations occurring are a negative contribution. Deviations not occurring are a positive contribution. A YB value of one means that the question contribution to the test is entirely negative. A value of .5 means that a question is adding to and taking away from the consistency of the test in equal measures resulting in a zero net contribution. At .25, the contribution of the question to the consistency of the test is half of its potential. These statements apply equally in interpreting YU and YL. The table below further summarizes interpretation of the Yekioyd statistics.

Y Value	Deviations Not Occurring	-	Deviations Occurring	=	Net Contribution
1.0	0		2nq		-2nq
.75	.5nq		1.5nq		-nq
.50	nq		nq		0
.25	1.5nq		.5nq		nq
0.0	2nq		0		2nq

(* The table applies the assumption that nq < np. Otherwise, np would appear instead of nq, with no change in implications.)

YU, the upper Yekioyd, primarily responds to 'trap' characteristics or vagueness in a test question that are throwing well prepared students off the correct answer. YL, the lower Yekioyd, primarily responds to weak distractor answers and question structure that points out the correct answer. Questions that are easily guessed are identified by the YL statistic.

In this paper, we have introduced three item analysis statistics. Software for calculating these statistics has been developed by Kevin Zachary. Longer versions of this paper are available. Contact Steven Dickey at ecodicke@acs.eku.edu for further information.

gLearning: The New e-Learning Frontier

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Emerging technologies have always had an innovative impact upon the language : horse-less carriage became car ; steamship became ship; wireless cell phone is becoming just phone. Eventually the "distance" portion of distance learning will also fall away and become just "learning". But, will e-learning be the same mode of learning? Or will it necessarily take on a new meaning; hence, a new linguistic form?

There are three problems associated with translating a face-to-face classroom into a Web-based one. First, there is the CONTENT problem of rendering traditional content suitable for Web delivery. Second, there is the DELIVERY challenge of distributing the learning material anywhere, anytime. Lastly, there is the PARTICIPATION aspect of ensuring that everyone is optimally involved in the learning process .

By learning it is typically meant the process of Recognition, Re-organization , and Regurgitation or sharing of some knowledge object. For example, an ESL learner might learn to recognize the distinction between /f/ and /v/ ; re-organize his or her native phonology system so as to adapt /f/ or /v/ into the new English system ; regurgitate that new knowledge in a reflective test or through peer interaction. The context or the physical setting of this learning experience has been since antiquity a room, seats, a writing board, and written or oral tests of some sort or another.

Imagine that day when you had the perfect teaching experience as a teacher. Or that day when you had the peak learning experience as a student. When all the students are a buzz of activity, the teacher's teaching plan unfolds like an orchestrated piece, and all the pedagogical elements are in harmony. When there are no tardy students, no absences, and no daydreaming. Imagine a day when students smoothly break into groups and help each other learn. A day when the students madly scribble notes as the teacher speaks and fill in those blanks in knowledge so that that magical "learning moment" crystallizes and sends the students out of the classroom with an exhilarating warm glow that has positively transformed lives.

Dream on. The perfect days are rare. The difficulties inherent in having twenty-five students rendezvous at a definite point at the same time and in the same ready-to-learn frame of mind pose daunting barriers. Cars, jobs, babysitters all intervene to thwart the perfect learning moment. On the other hand, the efforts thus far to harness the power of technology to affect the perfect learning moment have been wanting. A simple transfer of the architecture of the face-to-face classroom to a Web-based environment has not been a cure-all for the deficiencies of the onground classroom it was intended to replace. Indeed, the early attempts at distance education have been marked in common by a lack of imaginative re-engineering.

In fact, the "distance" has yet to fall away from "learning". A plethora of terms have been proposed for this new form of e-learning: "Learnativity", "e-Learning", "CALL", "CBT" and so forth. In a linguistic turn, we propose the term "**gLearning**" for a re-engineered learning experience befitting the full, unleashed power of the Internet. The new coinage is composed of "***glean***"—picking up nuggets of sustenance after a rich harvest and "***learn***"—the personal ownership of knowledge. The "g" also harkens to "global" or invokes the phonetic intensive words "gleam", "glint", "glisten" and has connotations of shimmering light; hence, enlightenment through learning.

The definition of "gLearning" [pronounced either "gee-learning" or "glurning"] revolves around three principles: gLearning is <u>Adaptable</u>; gLearning is <u>Ubiquitious</u> ; gLearning is <u>Uniform</u>. In short, "gLearning" is not Learning—it is not place-bound, role-bound, or time-bound. In fact, it is a new form of Learning and Teaching where both learner and teacher assume new, exciting roles.

<u>Adaptable</u>. In the earth-bound, role-bound classroom, whether it be grammar, pronunciation, or math, the teacher delivers a lesson that is new material for some and known material for others. It is the "shotgun " approach. In the gLearning classroom each student receives only the particular lesson or incremental learning step as required. Customized learning objects are filtered to the learner in a hierarchy that maximizes acquisition of new material. Moreover, the student owns this customized material and can interact with it individually until the lesson has been

mastered. Each student owns and controls their personal "Bell Curve" for learning and mastery of a subject area. (Figure 1).

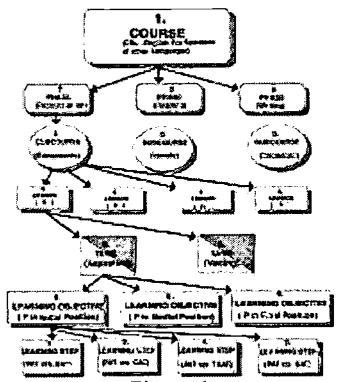

Figure 1

Ubiquitous. The traditional classroom is necessarily place-bound and time-bound. The catchword is that they are "synchronous" or in real time. The online classroom can operate outside of the constraints and be "asynchronous." However, the true power of the Internet has not been realized because the architecture of most course management systems looks suspiciously like the place-bound classroom, and the roles of the teachers and learners eerily echo the role-bound onground class. (Figure 2)

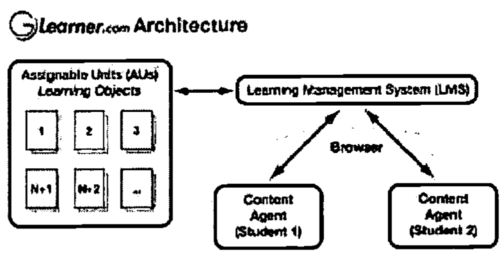

Figure 2.

Uniform. The unevenness of the conventional classroom is a multivariate problem that defies solution. Teachers, students, text, assignments, grading rubrics, exigencies, and policies all conspire to make each class a unique "pot luck" experience. In the gLearning environment the roles of the student and teacher are radically altered. Moreover, their rights are clearly stated and delineated in an Online Gleamer's Bill of Rights. [see note]. With the gLearner, the students exchange purposeful, standardized, pre-formed "Participation Units" or "e-Learning Currency" that must be spent and which ensure that all students cooperate in teams, circles, communities and so forth. (See Figure 3)

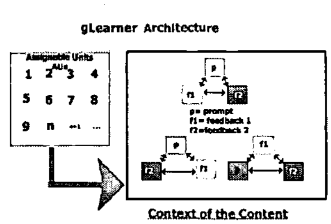

Figure 3.

gLearning sounds great, but how does it work?

Computer-Based Training and Testing (CBT) and has been around almost since computers have been invented. CBT has been used to teach and test everything from accounting to zoology, from how to perform surgery to how to talk to customers on the phone. CBT got a big push in 1974, when the National Science Foundation awarded grants to two universities to further the use of computers in learning. This grant eventually spawned several CBT-based authoring systems (the hardware and software used to create CBT) and through those several thousand courses.

With the advent of the Web in the early 90s, CBT began to move to the Internet, transforming into Web-Based Training (WBT). Whereas CBT was usually delivered over closed networks in an organization or distributed on CD-ROM, WBT allowed a course to be created and placed on one computer (a "server") to which anyone in the world with the proper authorization could connect and learn.

This new approach has provided several distinct advantages, not the least of which is easy maintenance of a course. If a problem is found and fixed, no new CD-ROMs need be sent. A change is made on the server, and that's that.

Normally, learners who are taking a web-based course stay connected to the Internet for the duration of a session, during which time the lesson materials are "streamed" to the user. Streaming refers to the downloading of course materials to the user a little at a time, so that it appears that the course is running smoothly.

Unfortunately, this is easier to envision than to make a reality, especially for those who live in areas where connections to the Web are slow or sporadic. A constant connection may not be possible or the connection may be slow. Other methods must then be employed.

One method is to download an entire lesson at a time. This, however, can be time consuming and the user is not able to study the lesson until it has completed downloading, an obvious disadvantage. In addition, if the connection to the Internet is interrupted during the download, the partially downloaded file would normally have to be scrapped and the download restarted the next time the user connects.

I-CALMS: Adaptable

A more viable approach includes that employed by the gLearner system— I-CALMS : **I**ntelligent **C**ontent **A**daptive **L**earning **M**angagement **S**ystem. Here, the user downloads a small diagnostic test first, after which the Internet connection can be broken. After answering the questions, gLearner will determine which items the user needs to study. After checking to see if any of those items are already resident on the user's system, it will proceed to reconnect to the Internet and download in the background any items the user still needs. When it has finished downloading those items, it can then disconnect from the Internet again and the user is able to continue studying. If the Internet connection is accidentally broken (for whatever reason), items already downloaded will not need to be retrieved again.

I-CEGS: Ubiquitous

This basic approach is encompassed in I-CEGS : **I**ntelligent **C**ontent **E**ngine **G**enerator **S**ystem , an " intelligent content engine" which can work with any collection of lesson content files. Following some basic rules, it takes content pertaining to the current lesson and arranges it correctly for the user to study. It also collects data regarding student progress and question item analysis. The "intelligent" part of the content engine is the new role for the teacher or content expert who consult on a page-by-page basis to rapidly "glearn" a course and adapt it to the Web. The role of the teacher has been radically changed. In the recent past, the terms facilitator and coach have been used to describe this new, emerging online role for the teacher. In gLearning, the teacher helps define what is the "learning moment" for a particular knowledge domain. The gLearning teacher becomes a "Participation Expert" who pre-defines the "e-Learning Currency" that must be spent during the course of a particular online course.

Through an Intelligent Content Engine, the teacher helps create "twinned" software that enables them to follow a student's learning progress on a page-by-page basis. It is as if the student and teacher collaborate and create a living and breathing text that contains knowledge mutually constructed. A living text co-constructed out of a vast sea of Internet information, which has been discovered, gleaned, and "gleamed". Thus, the locus of where learning takes place has been radically altered. Teaching shifts from just delivering packet of information to mutually exploring the best way to use that knowledge.

I-PALMS: Uniform

But learning is sharing what a student has acquired. Through I-PALMS: Intelligent Participation Adaptive Learning Management System students are matched with other students in units ranging from Buddies, to Teams, to Circles, to Communities to work on collaborative, competitive, and cooperative tasks that re-enforce learning. The participation involves a variety of tasks: Competitive, Cooperative, and Collaborative in ascending higher order thinking skills. Course content for the most part is standardized with interchangeable learning objects. So the English pronunciation course is more or less the same in Boston or San Francisco.

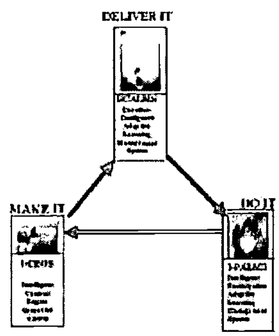

Fig. 4

Why are CBT and WBT so popular? It should be made clear that they can never completely take the place of a live instructor. However, CBT/WBT can be effectively used to teach many of the more elementary lessons, reserving instructors for the higher order thinking tasks.

The best CBT/WBT courses capture the best minds in a discipline of study and present a consistent and rich experience to learners. Learners are able to take lessons anywhere and at any time, even on a small pocket PC. In addition, a well-made CBT/WBT course will customize itself to each learner's need, something that is very difficult for an instructor to do in a classroom setting. Each learner can move at his or her own pace because the computer has infinite patience.

Do we have to wait for fast lines?

Because users will be connecting to the Internet at varying speeds, an elegant WBT will accommodate the different speeds by presenting materials in different ways. For instance, a high-bandwidth (fast) connection will allow the use of digitized video files. The same course when confronted with a narrow-bandwidth (slow) connection may opt to use still pictures and limited audio instead. While the effectiveness of the learning materials may not be as rich, the instruction may be almost as effective. Certainly, at narrow bandwidth connections, a course without video and audio is better than no course at all.

In the gLearning environment , a student and teacher enter into a life-time learning environment. The learning environment is ambient and can be accessed through learning instruments such as PCs, Cell phones, PPCs, and Pagers. In the gLearning environment the learner can begin a lesson in the morning on their home PC, continue the lesson on a mobile phone in a traffic jam, do more on the lesson on the work PC, and finally finish the lesson at night back at home. The course follows the student ; not the other way around. Knowledge objects are acquired in packets at the learner's convenience. A learner's lifetime learning accomplishments are instantly available on an individual URL which can be accessed publicly, as a student wills.

Conclusion

Technology has taught us that there is a critical mass that is necessary for an invention to work. All the ingredients must be in place for a new form to work. When the steam engine was invented, wooden sailboats burned up. The invention would not work until steel hulls were utilized. The analogy is similar to the online classroom. The makers of horse carriages built the same horse-designed vehicle only equipped with an engine. However, not a single horse-less carriage manufacturer went onto become a car maker.

Preliminary results from using the gLearner at Broward Community College this semester show that improvement in mastering English pronunciation is improved on the order of two standard deviations. Raising achievement by two standard deviations in equivalent to raising the performance of 50th percentile students to that of 98th percentile students. In other words, virtually every student is getting an "A". Perhaps, with the help of technology we can say "adios" to the Bell Curve! (Figure 5)

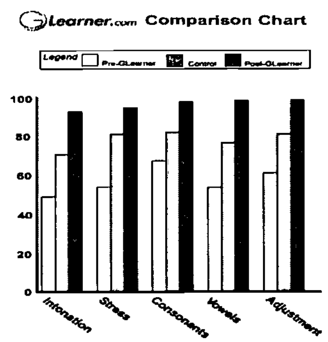

Figure 5

While the future form of online learning is still unclear, it is not going to fail or go away. It will probably look something like the gLearner—Adaptive, Ubiquitous, and Uniform. And teaching and learning will never be the same.

Orchestrating Virtual Learning

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Abstract: One case study of instruction in a virtual learning environment (VLE) was presented. The instruction was aimed at adult learning as part of a professional development initiative for practicing K-12 teachers. Further, this research concerns the use of the Internet as a text medium for supporting synchronous communication and the coordination of learning activities between teacher and students. The aim is to provide some conclusions useful for the future, as the Internet becomes a knowledge and learning resource. This paper focuses on the challenges that instructional designers must consider and teachers must manage in order to make sure that the students get the benefits of learning in virtual environments.

Teaching in a distance learning environment places many challenges on the instructor and student. In a synchronous virtual learning environment (VLE), many things happen simultaneously. Teaching in this environment may be compared to conducting, playing, and listening to an orchestra at the same time. The role of the instructor is like the role of a music conductor. The conductor must attend to the details of each orchestra section and individual musician, while providing the entire orchestra with a direction for tempo and harmony, based on the outline of the musical score, tempered with the conductor's own interpretation of the music selection. The music conductor uses many tools, extensive planning, leadership skills, instrumental technical knowledge, and an interpretation of the musical score to accomplish a successful performance. What do teachers need for orchestrating a virtual synchronous learning environment?

The Environment

The virtual learning environment used in this study was built on a Multi-User Domain (MUD)-client, called TappedIn (http://www.tappedin.org). This environment enables people to write to one another simultaneously as in a so-called "chat-channel." It offers much more however, such as objects, which participants can use to communicate, interact and share information. It also offers a spatial layout that can be used for moving around to different rooms, libraries, and individual office space.

Hurdles

From this case study, the researchers examined the implications of four (4) hurdles, which were identified as part of the case analysis. Through an examination of these hurdles we begin to see the vision of what is involved with learning today and in the future. This study demonstrated ways in which VLE facilitators can design online coursework so online learners can overcome these hurdles.

Technical Knowledge

Most K-12 teachers in the United States know about computers, yet they are not well versed in the use of the Internet as a knowledge and learning resource. In using the Internet, teachers encounter technical problems and may see these as insurmountable. This frustration leads to increased computer anxiety and anti-technology behaviors.

A key to minimizing this anticipated fear is to carefully select software and Internet sites which require a low learning curve. Since the instructor will not always be logged on when students use a VLE, a strong support network is essential for novice computer users. Online assistance, accompanied by a useful guide (print version) means students can get assistance in navigating the virtual environment and performing object-oriented tasks. A face-to-face start up meeting is recommended if possible.

Online Learning is No Different

Teachers and students engage in computer-mediated learning undergo a paradigm shift in their understanding of thr virtual learning environment. It is the students who will be leading themselves through the online course, built on the framework for learning, which the instructional designer and course instructor have mapped out. Online is different and students must acknowledge this.

There are a number of general guidelines to follow. The assignments for each module of an online course need to be grouped into categories, which are used as advanced organizers for each module of the course. Instructors should scaffold the course with a broad selection of resources to support each module topic or learning unit. It is advisable to diversify the instructional strategies used in the online course to meet the learning needs and technology competencies of each student.

Online Communication

In a text-based, synchronous environment, multiple speakers may submit messages in a short time. Students learn to dissect multiple, interwoven threads of conversation as a class discussion evolves. The role of the teacher becomes one of facilitation. Specific leader strategies may be incorporated to guide the discussion or "conduct the orchestra" in a synchronous environment. As a participant in synchronous discussions, students must learn to listen to the chorus of simultaneous and seemingly chaotic voices.

In a VLE, the communications skills must be learned first. Equip students with distinct tools for the varied types of communications in which they will engage. For each virtual class meeting, it is useful to have a set plan for how you plan to use that time. Safeguards should be in place for the students who arrive late, have schedule conflicts, or encounter technology problems when you have a scheduled virtual meeting.

Use of Objects

Objects are an essential part of many virtual learning environments. Some of the objects have practical applications in that they are used to facilitate communication, instruction, and learning. Other objects are designed to more for entertainment, which may help to relieve some anxiety about the technology intensive atmosphere.

Students should receive object-use introduction and practice in a face-to-face technology orientation session. Print guides and access to online helpdesk professionals is critical to a successful VLE as well. The teacher should work with the instructional designer to develop a progressive object skill acquisition plan for the objects you plan to use in the course.

Conclusions

Various online teaching methodologies can help instructional designers and online teachers to meet the demands of the virtual learning environment. Through careful course design, instructional planning, and training, these methodologies can break down the barriers to creating a successful virtual learning environment. There is no single best method of coping with the hurdles listed in this paper instead, a complement of strategies must be used.

Constructing an Enhanced Instructional Presentation

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Abstract: In this document we describe the development of an Enhanced Instructional Presentation (EIP). "If a good educational presentation is like a fine string of pearls, then an Enhanced Instructional Presentation puts that fine string of pearls, along with access to any supplementary information needed, into the hands of the learner in order to ensure full appreciation." (Pelton & Francis Pelton, 2000)

Enhanced Instructional Presentations

Although the traditional linear presentation (exposition, demonstration, activity sequence, etc.) is often a useful instructional method, and may be effective for a large portion of the target audience, improvements are possible. We have identified five different issues leading to the loss of learning opportunities or a reduction in learning efficiency in the context of a traditional fixed linear presentation:

1. Presentation rate is either too fast or too slow for individual learners causing selective attention or inattention to presentation content.
2. Short term memory overload or processing delays cause concepts, context, questions and even answers to be dropped before they can be committed to memory (Miller, 1956).
3. Verbal ability in the domain is insufficient to allow the learners to articulate the questions they have.
4. Social constraints (pride, consideration of others) prevent the learners from expressing the questions they have formulated in a classroom setting.
5. Answers to learners' questions are not available in real time.

To overcome these difficulties, and improve learning efficiency from linear presentations, we suggest the construction of an Enhanced Instructional Presentation (EIP). Our EIP model is a hybrid extension of the linear presentation that addresses the learners' needs for organized and synthesized content while providing for individual differences in background experience, learning orientation, and cognitive abilities.

In this paper we present an outline of the plan for constructing a specific EIP to teach the concepts and skills associated with "*Constructions with a Straightedge and Compass*". We add two caveats: First, the process of constructing an EIP is a process, and multiple iterations are intended. We present only the first iteration. Second, only a few of the potential media types and interactive features that might be used in an EIP are included in this example. Ultimately, the EIP model is a hypermedia instantiation of van Merrienboer's 4C/ID model (van Merrienboer, 1997), and is moldable to meet many different educational needs.

The Traditional Linear Presentation of: "Constructions with a Straightedge and a Compass"

0. Introduction to Constructions with a straightedge and a compass
1. Duplicate a line segment
2. Duplicate an angle
3. Duplicate a given triangle
4. Bisect a line segment
5. Bisect an angle
6. Construct a perpendicular line through a point on a line
7. Construct a perpendicular given a line and an external point
8. Construct a line parallel to a given line and through a given point
9. Construct square, rt. triangle, equilateral triangle, parallelogram etc.
10. Construct various angles (90, 60, 30, 45, etc degrees)

Now although we would agree that the ideal presentation of this topic might be more hands-on, we will for the sake of example imagine it being presented as an instructional video. In this format, only a few really quick learners and those with significant background in the topic area would be able to capture all of the concepts and procedures mentioned and demonstrated. For many of the students, the pace of the video would be too fast and their background knowledge too limited to allow them to capture much at all.

The Development of an EIP for: "Constructions with a Straightedge and a Compass"

The conversion of the linear presentation into an EIP involves identifying start/stop points in an existing presentation, generating a supplementary content network and designing a feedback and interaction mechanism. These elements are combined with the EIP shell (under development) to generate the working EIP.

Identifying start/stop points in an existing presentation

We break the video presentation into content segments and describe each with a short statement. A good starting point would be the outline given above, but to enhance the accessibility and playback control further, we would find the start/stop points for each sub-activity. For example:

4. Bisect a line segment
   i. Set compass width > 1/2 of line length
   ii. Place compass point on end of line segment
   iii. Draw an arc above and below the estimated midpoint
   iv. Repeat ii and iii from other endpoint of line segment
   v. Draw a line between the intersections of each arc pair

A control matrix (spreadsheet) is constructed with a row for each content segment. With each row containing: item number, item type, file name or URL, start/stop points, description, outline level, confusion rank, and an array of links to other segments. The potential for learner confusion rank will be used by the prompting mechanism to stop the regular playback at key points and prompt the learner with the supplementary content linked to that segment. Segments may be individual files or portions of larger video files (or other internally addressable media files)

Generating a supplementary content network

Our preference is to build an EIP with only a few hyperlinks for anticipated questions, challenges, assessments, etc, and then in a trial of the EIP, collect and respond to authentic questions from learners in order to augment the EIP further. Some anticipated questions and challenges for the segments described are:

A. Why does the compass width have to be >1/2 of the line segment?
B. What do I do if my compass can't stretch that far?
C. Is there another way?
D. Why does this work?
E. Now you try it!

Presentations are generated for each of these supplementary segments (videos, powerpoint presentations, simulations, text, narrated stills, web pages, etc.). These segments are also entered as individual rows into the control matrix with the same parameters as above. Finally, links between segments (original and supplementary) are added to the control matrix to define the supplementary content network.

Design a feedback and interaction mechanism

The feedback and interaction mechanism is accomplished by building a web page containing forms, assessments, surveys, links to other web sites and discussion forums etc. An additional line is added to the control matrix to identify the location and type of the feedback page. Two types of feedback pages can be specified. The first will only be loaded when the learner requests it, and the second will be loaded after each content segment (to facilitate the collection of learner questions or participation in some related activity).

In the current example, we might begin by building a form to collect questions from the learners and send them to the instructor via email. As the supplementary network grows and the demand for additional resources wanes, the feedback page might be replaced with a page offering formative evaluations and links to related geometry sites.

The content segments are then placed in a directory (on a local hard drive, CDROM, or on a server) along with the control matrix. The resulting EIP can be updated as frequently as needed, and adapted to the needs of individual learners by setting the prompting level (confusion parameter). For additional information on the EIP shell please contact the authors.

References:

Miller, G. A. (1956). "The magical number seven, plus or minus two: Some limits on our capacity for processing information." Psychological Review **63**: 81-97.

Pelton, T. W. & Francis Pelton, L.. (2000). The Enhanced Instructional Presentation Model. Society for Information Technology and Teacher Education International Conference, Orlando, FL.

van Merrienboer, J. J. G. (1997). Training Complex Cognitive Skills: A Four-Component Instructional Design Model for Technical Training. Englewood Cliffs, NJ, Educational Technology Publications.

Metaphorical Representation Within a Distributed Learning Environment

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Abstract: The design and development of preservice and inservice teacher education distributed learning environments, specifically World Wide Web-based (Web-based) courses, emphasize the need to think through numerous issues that may not be apparent within traditional face-to-face environments. A metaphorical representation that emphasizes the conceptual framework through out the Web-based course environment offers the preservice and inservice teacher educators a consistent with the knowledge being presented and based upon the prior knowledge of the learner.

Introduction

The design and development of preservice and inservice teacher education distributed learning environments, specifically World Wide Web-based (Web-based) courses, emphasize the need to think through numerous issues that may not be apparent within traditional face-to-face environments. Since Vannevar Bush "invented the foundation for the World Wide Web in 1945 and founded much of the early thinking about human-centered computing" (Nielsen, 1999, paragraph 2) and Ted Nelson as a "pioneering and vocal advocate of users' right to simple computers that everybody can figure out and use as a communications medium rather than a glorified calculator" (Nielsen, 1999, paragraph 2), the design and development of a nurturing, creative learning environment has been at the forefront of enlightened thought. The creation of a Web-based communal learning environment is one that has gained momentum over the previous five year period, and shows no sign of slowing.

One issue within the online learning environment is the emphasis placed upon developing a conceptual framework through which the learners will begin to develop an understanding of the knowledge presented. A metaphorical representation that emphasizes the conceptual framework through out the Web-based course environment offers the preservice and inservice teacher educators a consistent with the knowledge being presented and based upon the prior knowledge of the learner. Therefore, the three areas of emphasis pertaining to the design and development of preservice and inservice teacher education distributed learning environments shall be Web-based learner support within a preservice candidate's curriculum of study, the building of a learner's conceptual framework, and the developmental importance of a metaphorical representation.

Web-Based Learner Support Within a Preservice Candidate's Curriculum of Study

The design and development of Web-based preservice teacher candidate's professional development curriculum lends a supportive environment through which the preservice teacher can further develop her knowledge within key areas of the curriculum of study. This is also true of the inservice teacher educator's professional development opportunities that may be available online. The creative and nurturing aspects of the learning environment not only model the desired learning environment for the PreK-12 learners, but also create an environment in which the preservice and inservice educators develop a level of comfort and freedom through which to learn. The design of such an environment is of utmost importance to the success of the learner. Design is an imperative aspect associated with an online learning environment, wherein "the key issues in interaction design and the main determinant of usability is: what to say" (Nielsen, 2000, paragraph 5). Usability and appropriate interactive activities are the main concern within an online environment, second only to the content provided to the learner. As has become a distinct feature of discussions surrounding the use of the Web, "People often talk about how the Web changes on 'Internet time', but usability issues seem to change much more slowly since they stem from human capabilities and interests" (Nielsen, 1994, paragraph 2).

Conceptual Framework

The learner's conceptual framework of understanding is imperative towards the creation of a firm knowledge base through which the learner develops a view of the world. The conceptual framework is created through not only the knowledge that is "input", but also deals primarily with the creation of a mental model, a framework, of understanding that is associated with the knowledge acquisition and the melding of the knowledge into the already created and constantly changing conceptual framework. Such a framework through which the learner develops an understanding of the knowledge being attained, and forming this knowledge into useful information within a conceptual understanding of the world and where this knowledge lies within the "larger picture", can be aided through the use of a metaphorical representation. This metaphorical representation can be integrated within the learning environment to aid the learner in constructing appropriate frameworks of understanding. Conceptualizing the knowledge being obtained with in an appropriate framework.

Metaphorical Representation

The emphasis placed upon the metaphorical representation of the information within the Web-based course environment at the beginning of the course design and development will lead to a tightly bound, cooperative, understandable course framework at the conclusion of the course design, development and implementation processes. The preservice and inservice teacher educators must rely upon prior knowledge within any course environment, independent of the subject matter presented; however, the uncomfortable levels of stress and strain felt by many preservice and inservice teacher educators when faced with a Web-based course can impact the learning environment as well as the course objectives. For this reason, the inclusion of a metaphorical representation within a Web-based course emphasizes a heightened level of comfort on the part of the preservice and inservice teachers, which re-focuses the attention towards the information presented and away from the Web-based course environment. Therefore, a discussion surrounding the inclusion of a metaphorical representation within a distributed learning environment, specifically a Web-based course for preservice and inservice teachers, is essential to accentuate the importance of such a necessary technique.

Conclusions

The design and development of preservice and inservice teacher education distributed learning environments, specifically World Wide Web-based (Web-based) courses, emphasize the need to think through numerous issues that may not be apparent within traditional face-to-face environments. A metaphorical representation that emphasizes the conceptual framework through out the Web-based course environment offers the preservice and inservice teacher educators a consistent with the knowledge being presented and based upon the prior knowledge of the learner.

References

Nielsen, J. (1994). *Report form a 1994 Web usability study.* Available Online: http://www.useit.com/papers/1994_web_usability_report. Html

Nielsen, J. (December 29, 1999). *Ten biggest thinkers of the 20th century.* Available Online: http://www.useit.com/papers/thinkers20century.html

Nielsen, J. (2000). *Will voice interfaces replace screens?* Available Online: http://www.developer.ibm.com/library/articles/nielsen1.html

What We Wish Our Teachers Knew: Eighth Grade Students Speak Out

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Abstract: What do teachers need to know and be able to do with technology in a middle-grades classroom? This research project by four middle-grades students set out to accomplish two objectives: 1. Survey the staff of a middle school to develop a table of main themes taught during a school year, and 2. Find and organize outstanding resources from a student's point of view that would support learning across the curriculum. Secondary objectives of the research included 1. Providing students with a chance to apply what they had recently learned in an online course "Introduction to html" and 2. Demonstrating that both students and teachers can learn something new about teaching with technology. Parents, working with online resources, have been the impetus and primary supports for the project. The school administration also assisted by making time and space for the activity to be included during the school day.

Introduction

How can teachers better incorporate technology into the school curriculum? This is a paper prepared by 8th grade students at Stowe Middle School in Stowe, Vermont, who have analyze the problem and helped to incorporate technology into their school. The paper discusses what they wish all teachers knew and could teach to other students and compares their thinking to national technology standards for teachers. It also offers some creative and helpful ways to bring technology into the school curriculum to improve learning experiences for students and teachers.

Why Do We Need Better Use of Technology in School?

Technology has become a prevalent driving force that affects every person in the world directly and indirectly, economically, socially and culturally. Students need to understand the impact of technology on the world, and know how to critically evaluate social changes resulting from technology. Therefore, schools today have the responsibility of preparing students for an emerging information-based global society.

According to the Information Technology World Congress, 209 technology jobs are created every hour in the U.S. Additionally, many more jobs use or incorporate computer technology. Students need to be ready to take advantage of these technology opportunities. Technology thus needs to be incorporated into as much school curriculum as possible.

The International Society for Technology in Education (ISTE 2000) has developed a set of standards that can help point the way for teachers to develop the skills we wish they had. In what follows, we first brainstormed what we wish our teachers knew or would teach more thoroughly. Then, our project advisor looked at our work and compared it to the ISTE standards, giving a preference wherever there seemed to be a good fit. We decided to leave the organization in terms of how we thought about things, allowing the standards references to weave throughout our text. Our text is followed by a closing piece by our project adviser, talking about what standards in ISTE we did not mention in our narrative.

Searching and Search Engines

In some of our academic classes, we are expected to do research outside of the classroom using the Internet. For example, we might have to look up an important historical figure for social studies. The students who don't have Internet access at home have to sacrifice other school time to do their research project. *ISTE 6. e.* If teachers brought the students to the computer lab or the library, it would be helpful if he or she could help them get the necessary research completed. *ISTE 3. d.* One way that they could help would be to teach us how to use search engines effectively. *ISTE 3. a.* Many times, students will type in the subject, then randomly choose one site out of a few hundred sites on the topic. Most students don't really know what the best site is. We know how to do "dumb" searches, but we don't know how to do "smart" searches, or advanced logic searches. A dumb search is like flipping through a big resource book trying to find a single subject. A smart search is like using the index.

For example, when of our classmates was recently researching Puerto Rican art. She went to a search engine and typed in " Puerto Rico Art. " She found no good sites but, she did find a site about a person named Art from Puerto Rico. If she had done a "smart" search, she probably would have found more useful web sites.

When using computer encyclopedias and references, teachers need to teach students how to get quotes effectively and use them in their work, as well as find and use primary and secondary sources, a thesaurus, dictionaries, and translators. *ISTE 3. a.*

How to Use Technology to Become More Productive in the Classroom

Instead of handwriting that may make documents or instructions harder for the students to understand, teachers should post clear computer-generated documents. *ISTE 2. a.* For example, a teacher might hand write a math sheet assignment, but a typed one would be easier to read. *ISTE 5. c.* Also, teachers could type papers when discussing an important topic. If there were an area that students didn't understand, computer-generated documents would be much easier to comprehend. Students can generally learn more by *seeing* a complex idea has opposed to *hearing* it in a lecture. *ISTE 3. c.*

Teachers also need to know how to correctly use the technology that is provided for them or available for their use. *ISTE 1. a.* Our classrooms need better incorporation of technology in everyday studies. Some examples might be satellite images and video microscopes. Satellite images can be used in geography to document forestation, light pollution, or cloud cover. Video microscopes can be used in biology to display cells. These are just two small examples of how technology can be used. One thing that might help would be contacting students from other places to share and work with ideas. *ISTE 2. b.*

Teachers Need to Ask Students to Use Technology in Classroom Assignments

One teacher who uses technology often asked us to create a Powerpoint presentation or a computer-generated brochure. It was fun and interesting to learn how to use the programs. However, that has been our only technological opportunity. *ISTE 3. b.* Other technological opportunities could easily be provided. For example, Photoshop could be utilized for science or social studies graphics. iMovie and multimedia productions could be incorporated into our studies.

Middle school education has not moved very far from the traditional way of learning. For example, language arts assignments typically include essays and work sheets. Language arts might not seem like a subject to use technology, but students could be asked to write newsletters, create play scripts, produce page layouts, use e-mail to communicate and get feedback from other students, write in on-line journals, and publish electronically. *ISTE 2. d.* Graphics, movies and multimedia productions will motivate students who don't like reading or writing.

Computer Use Should be Taught Throughout All Grades *ISTE 2.*

Kindergarten, first grade, second grade and third grade children should start using technology. They could use drawing programs, Jump Start programs, CD-ROM games, Thinking Things, and interactive CD books. Typing should start in second grade.

4th and 5th grades should be typing fluently, using word processing and more complex programs. These could include simulations such as Sim City; applied math like Operation Neptune, Operation Express, Oregon Trail, Spellbound, African Trail, Widget Workshop, Adventure series, Carmen San Diego, and other logic games. They should be using spreadsheets in science, be able to make and sort lists, and create number spreadsheets that do simple math.

6th through 8th grades should have already mastered the basics of technology. They should have mastered word-processing, fluent typing, creating indexes, formatting, integrating pictures and graphs, spreadsheets, simple databases, and telecommunications, (Internet, email, Instant Messenger). They should be able to do image processing including scanning photos, importing and exporting photos, and image manipulation. Movies should be used and students should be familiar with animation and editing. Scientific images could be used, such as satellite photos and medical images (body scans X-rays).

Teachers Need to Address the Ethical Issues of Internet Use *ISTE 6. a.*

Teachers need to help students understand the difference between "good" information and "bad" information from the Internet. *ISTE 6.* Students should always compare information from the Internet to multiple sources to be sure of its accuracy. *ISTE 2. c.* These could include books, different web sites, primary sources, or person-to-person interaction. Students need to be able to tell when someone is promoting his or her personal views. Using the knowledge students have learned from writing persuasive essays, they should be able to tell if a piece sounds one-sided. Persuasive writing often only brings up one idea that actually works and shoots down all other ideas that might be mentioned; therefore, you don't know if you are getting all of the truth or just what someone picked to sound supportive of their view. When searching for information on a web site, students should consider who owns the site: a university, business, or a private or nonprofit organization. *ISTE 6. b. & d.*

For example, if a breast cancer cure sponsors a web site, and the content is women's health, the web site will concentrate upon how good the company's treatment is and not present side effects of that company's treatments. It might not display other useful treatments by other companies.

Teachers Need to Use Technology to Let Students Learn Outside of the Classroom

If teachers cannot provide information in some subject area, then technology could help them offer additional resources or classes in that subject. These could include on-line classes or courses. *ISTE 2. c.* Teachers should know how to use technology so they can help students learn independently. Student projects could include extra credit, visits to other schools to see how they use technology, and use of CDs and multimedia programs. *ISTE 3. d.*

What the Students Didn't Say...

What the 8th graders didn't say is revealing too. Not a word was mentioned about "assessment and evaluation." *ISTE 4.* It is perhaps not surprising that students might not think of this area, since "grades" and "doing homework" belongs to "school work" and so much learning with technology does not, as yet. I wonder if that might not be a good thing. However, there is one thing I regret. I feel badly that students do not work every day in an environment where high quality feedback gives them more ideas, helps them improve their work to very high levels, and teaches them concepts and techniques "just in time" to use them effectively in a real context. If they did work in such a setting, I bet that they would ask for more feedback. Assessment and evaluation would not go unmentioned if it were helping them to learn, achieve and maintain a high level of interest and motivation.

The 8th graders also didn't mention several aspects of "productivity and professional practice." *ISTE 5.* They expect a basic level of productivity, but do not expect or perhaps know about the teacher as a lifelong learner. This too, I feel, is a shame. What would their perceptions be if they had many teachers who were actively learning and growing in front of them, so they could see what an adult learner looks like? I'm afraid that more often, what they see is an adult who is controlling the flow of events, saying what can and can't happen, talking most of the time except when asking a direct question, then responding to the student who answers before any other student can.

There are notable exceptions. When I interviewed the students during a long car ride on our way to a statewide conference on technology, all of their examples kept coming back to essentially two teachers in the school. I pointed this out, saying, "Has anyone else during your three years at the middle school used technology to teach? Let's see. You've had about six to eight teachers each year, about 24 teachers. Are there just 2 who are teaching with technology? They replied, "That's about it." The two notable exceptions used outstanding approaches and gave multiple opportunities for students to learn with and use technology in expression and exploration. Most important, these were "core academic" teachers of history, science and language arts in their small school where teachers often do double and triple duty. But clearly, we need to find a way to raise the expectations that all teaching must follow their example, or else our students will not be as prepared as they need and want to be.

Conclusion

What do we wish our teachers knew? That technology is vitally important to our future and our world. That working with technology is fun and helps us learn. We wish they knew that we students are highly motivated to learn with technology. We wish they understood that we like to be stretched to our highest skills and that by letting us show what we can do, we feel good about our academic achievements.

References

ISTE (2000) National educational technology standards for teachers. International Society for Technology in Education. Author.

Implementation of an Electronic Tutorship Support System in a School of Business Administration: a Case Study

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Abstract: This paper analyses and describes the implementation of a tutorship system based on a telecommunication network that pays attention to the different interests and requirements of students and teachers of the School of Business Administration (University of Valladolid – Spain). The system has been designed to modify and improve the traditional tutorship system by the use of Internet. In this way, the system supports the "learning process" without the necessity of physical presence of the different agents implied. Using the electronic tutorship support system it is possible to solve problems and queries related to academic subjects of the Business Administration Degree. Actually, we are evaluating and analyzing the impact and acceptance of the system for both, students and teachers. Besides, we are attempting to involve as professors as possible in the test and evaluation phase, as well as in the redesign and implementation of other telematic services applied to education in a collaborative form.

Introduction

At the end of 1998, the Spanish Government offered the possibility to provide economic support to those investigation projects related to the design of educational systems as support and improvement of teaching skills.

Many professors of the School of Business Administration (University of Valladolid – Spain) were aware that two of the main problems of their students were the overcrowding in classrooms and the high number of students that could not attend class (they are usually full-time workers). A good solution could be the implementation of a tutorship support system using a telecommunication network as well as the design of complementary didactical hypermedia material, which could facilitate not only the learning process of different disciplines, but the potential use of Internet as well (Bouras, 1998, Davies, 1997).

Besides, students could use the system in order to get access to all general and academic information that is normally displayed on a notice-board.

Identifying the Problem

The School of Business Administration of the University of Valladolid has just ended an auto-evaluation process made by some university specialists, professors and Business Administration students (assisted by an extern-committee of evaluation).

One of the conclusions obtained by all agents implied was the conviction that the traditional tutorship system was inefficient, hardly used and almost exclusive for the query of doubts or concrete questions just before the exams. Two important drawbacks were found.

On the one hand, the fact that an elevated number of enrolled students for this degree (in comparison with other degrees of our University) are full-time workers, makes that they have a lot of difficulties attending lessons and asking for help in the resolution of questions related to their studies.

On the other hand, the possibility to maintain a close interaction between professor and students without dependence on time and physical presence could facilitate a more flexible communication and, therefore, improve the promotion of equal opportunities (Verdú, 1998a).

Fortunately, an element which could help to introduce, innovate and, by the way, stimulate the professor's work, is the introduction of computers in the teaching process and, of course, the possibility of access to Internet in the sense not only of information transmission and retrieval but also as a communication channel (Penfield, 1996, Verdú, 1998b).

So, the School of Business Administration has made a great effort in order to implement the electronic tutorship support system described in this paper as part of the teaching process.

We hope that students use the system (Fig. 1) and improve the situations or processes they consider not sufficiently developed in the classroom. We believe that this system can become a great help in the sense of getting new habits in the teaching skills. Moreover, students can obtain a better quality of learning than the one that professors can offer right now with only traditional teaching methods (Flur, 1996, González, 1998).

The complete analysis of the system will be carried out on May 2001.

Objectives and Contents

The developed project can decrease some of the deficiencies found in the report about the quality of the Business Administration degree. In this sense, we could enumerate the following general objectives:

- **Create a new professor role**, not only as source and transmitter of knowledge to the students but also as a collaborator and guide.
  Students, with the guidance of professors and the interactions with the rest of the group, can develop a new "active role", which additionally provides a better adaptation to the professional world (very important in future) (Dix, 1997).
- **Integrate several activities of the current classes**, where the traditional explanations, the resolution of problems on the blackboard and the exercises based on the use of the computer in the laboratory are clearly separate issues.
  As last objective, we could consider an electronic classroom where it were possible to integrate different issues such as information search, queries, collaboration ways, theoretical and practical contents, design of study alternatives, etc., (using the telematic infrastructure of the open system) (Khasnabish, 1997).
- **Extract the common characteristics of several subjects** in order to design a generic system applicable not only to subjects imparted by the participants in this project, but also to the whole Business Administration degree.
  So, we are attempting to involve as professors as possible in the research, design and implementation of telematic systems applied to education in a collaborative form (Boutaba, 1997).

Using the general objectives described before we can conclude the following concrete objectives of the project:

- **Elaborate didactic hypermedia material** that includes practical examples and theoretical help to the classroom knowledge. This material must be designed in two ways:
  - first, as a complement to the traditional lessons (it will allow students to apply classroom knowledge to real-world situations) and,
  - second, as a support that facilitates a close interaction with faculty and classmates.
- **Implement a mechanism of electronic tutorship,** looking for:
  - support, guide and evaluation of the learning process;
  - a flexible way to suggest new academic activities, and;
  - feedback to the learning process regarding the starting level of knowledge, the results of the evaluation and the acquired information by the tutorship action (Abdulla, 1997, 1998).
- **Maintain and create an efficient Web environment** where students can access to sources of information referring to the different courses: programs, examination dates, qualifications, activities to develop at the School, didactic material, etc.

If we are able to complete these objectives, we will motivate students, implying them in the development and resolution of the proposed tasks. Besides, it will permit a better assimilation of the theoretical concepts explained in the classrooms.

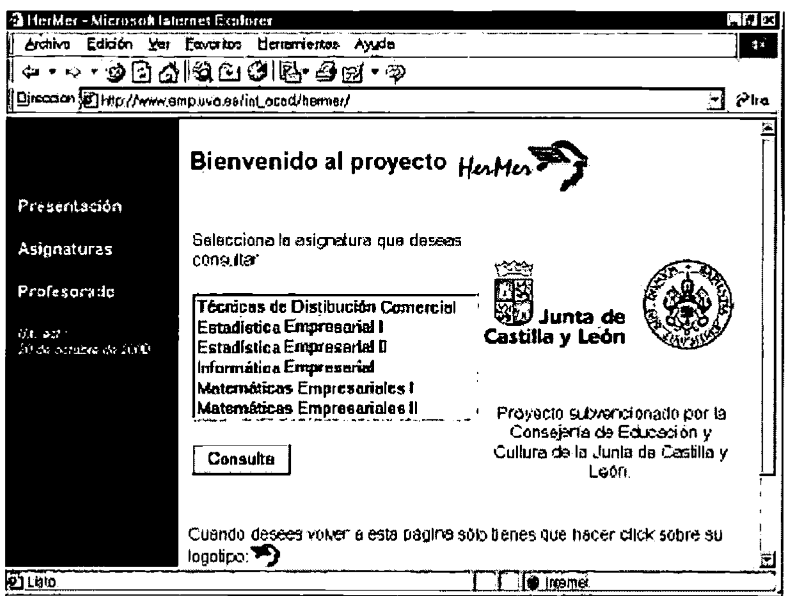

Figure 1: *Homepage (in Spanish) of the tutorship system (http://www.emp.uva.es/herner/)*

Methodology

During the implementation phase the next six points were considered in an integrated way:

- **The technology** used for the development of the system.
- **The selection of appropriate contents of the main courses** that were included in the proposed material.

  For doing this, it was considered the experience of both, professors and specialists in distance learning.

- **Task postings.** The experimental character of some subjects included in the project forced to design new exercises that could be included in the system in an easy way.
- **Supervision of the academic tasks** through the network. Professors should response at most 48 hours later the student request.
- **Encourage of the use of Internet**
- **Resolution of the proposed exercises.** Students must be able to reach the solutions and/or get support in order to resolve the proposal activities. The interaction mechanism should be easy and, if possible, just in time.

Implementation Phases

It is very important to describe the different phases followed in the implementation of our system. In fact, this sequence could be used for the elaboration of other similar electronic tutorship systems.

Analysis of the professor's requirements

In a first phase, it must be analysed the learning requirements to be covered by the system. The perspectives and necessities can be studied through the academic programs.
In this sense, it is necessary to carry out meetings with professors and specialists in distance learning in order to study problems and solutions. The study would be the base to future enlargements (other courses or other University degrees).

Design of the electronic tutorship support

With the conclusions of the previous phase, next step would be the translation of the learning requirements to the telematic system. This is a design phase of functional characteristics and learning contents.

It is very important to specify the concrete subjects, the kind of questions to request and the type of tasks to include. It must be specially considered the use of the metaphor that we call *"the integrated classroom"*, which permits the integration of the different modules of the system.

Design and development of the hypermedia didactic material support

In this kind of systems it is very important to develop didactic material as support to the learning process. It should consist of a set of theoretical aspects and/or practical habits but focused in order to be used easily through the system.

One of the most important objectives is that students can feel more motivated by the high interaction grade, guide and supervision implemented. This would solve one of the typical problems of the traditional tutorship system because it offers an easy way to communicate alumni with faculty and classmates.

Development and implementation of the proposed system

The system must be able to give access to all students' requests. Also, the interaction with the professor should take place in an efficient and easy way, avoiding a complex interface. In our case study, a good solution was the use of the Windows environment because students are familiarised with this interaction mode.

Evaluation of the system

In a last phase, the system should be evaluated based on the observations and conclusions derived of its use. Profiting this accumulated experience in the design, development and application of the system, it could proceed in two directions: correcting the errors detected and studying its applicability in the total subjects involved in the University degree.

In this sense, we have designed a survey to be done at the end of the academic calendar by more than 1000 students. This survey has been designed by specialists, and the objective is to detect the problems with the use of the system and the validation of the contents provided as complement to the classroom knowledge.

Conclusions

This paper discusses the design, development and implementation of a new electronic tutorship support system, based on the use of Internet as help to the traditional learning process in the University of Valladolid. The system is being used at the School of Business Administration to solve the problem of overcrowding.

Based on our experience, it has been presented the characteristics of this kind of systems, the most important objectives, the proposed methodology and the different phases involved in the implementation.

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References

Abdulla, G. Abrams, M. and Fox, E. A. (1996). *Scaling the World Wide Web.* Department of Computer Science. Virginia Polytechnic Institute and State University. Blacksburg. USA. http://ei.cs.vt.edu/~succeed/96ieeeAAF/. 1998.

Abdulla, G. Fox and, E. A.Abrams, M. (1997). *Shared User Behaviour on the World Wide Web.* Association for the Advancement of Computing in Education (AACE). USA. http://ei.cs.vt.edu/~chitra/docs/97webnet/.

Bouras, Ch. Gkamas, A. Kapoulas, V. Lampsas, P. and Tsiatsos, Th. (1998). A Platform for the Implementation of the Services of an Educational Network. *IFIP World Computer Congress. Teleteaching'98: Distance Learning, Training and Education.* Part III. Short Papers XV. Vienna. 159-168.

Boutaba, R. El Guemhioui, K.and Dini, P. (1997). An Outlook on Intranet Management, *IEEE Communications,* 35 (10), 92-99.

Davies, G. (1998). *Teleteaching'98: Distance Learning, Training and Education.* Part I. Part II and Part III (short papers). XV. IFIP World Computer Congress. Austrian Computer Society (OCG). Vienna.

Dix., F. (1996). Challenges and Perspectives for Cooperative Work on the Web. *ERCIM workshop on CSCW and the Web.* http://orgwis.gmd.de/W4G/proceedings/challenges.html.

Flur, P. W. Lockhart, J.B. and Yalamanchili, S. (1996). Integrating Academic Services in a Modern Networked Environment. *IEEE Transactions on Education,* 39 (3), 409-414.

González , O.M.et al. (1998). Integrating Cooperative Learning in a Virtual Class: A case Study. *IFIP World Computer Congress. Teleteaching'98: Distance Learning, Training and Education.* Part III (short papers). Vienna. 373-383.

Khasnabish, B.and Saracco, R. (1997). Intranets: Technologies, Services, and Management. *IEEE Communications,* 35 (10), 84-91.

Penfield Jr, P. and Larson, R.C. (1996). Education Via Advanced Technologies. *IEEE Transactions on Education,* 39 (3), 436-443.

Verdú, Mª.J. et al. (1998a). Internet for Schools: a New Way of Learning and Working. In *Proceedings of the 10th World Conference on Educational Multimedia and Hypermedia,* 2. Freiburg, Germany. 1859-1860.

Verdú, Mª. J. et al. (1998b). Internet for Schools. *IFIP World Computer Congress. Teleteaching'98: Distance Learning, Training and Education.* Part III (short papers). Vienna. 131.

Activities for Integrating the Internet in Teacher Education Classes

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Abstract: A taxonomy of Internet activities may be useful for teacher educators who are new to using the Internet in instruction. In this paper, three categories of Internet activities are outlined: Direct, WebQuests, and Complex. Tasks, examples, and resources representing each of the categories are presented; examples from special education teacher education courses are emphasized. Instructors may begin with simpler activities and add more complex assignments as skills develop. Using different types of tasks increases student motivation and demonstrates variety in instructional planning. This taxonomy and the examples are being developed for use by a faculty "tech buddy" to aide in supporting colleagues participating in a PT3 Implementation Grant.

Activities for K-12 students utilizing the Internet are featured in many journal articles and teacher resources, websites, and books. These activities range from very simple to very complex and with descriptive titles from "Internet Fieldtrip" to "WebQuest." Teacher education classes also increasingly use the Internet and can benefit from utilizing the same sort of activities. A list and description of a range of Internet activities may be useful for teacher educators who are new to using the Internet as an instructional tool. Instructors may begin with simpler activities and add more complex assignments as their skills and students' skills develop. Using a variety of types of tasks both increases motivation through variety and demonstrates variety in instructional planning for teachers.

Three categories of Internet activities are outlined here: direct, WebQuests, and complex. Tasks representing each category will be discussed, including examples and resources. Examples from special education teacher education courses are emphasized. Unless otherwise stated, "student" refers to university students in pre-service or inservice teacher education classes. This taxonomy and the examples are being developed for use by a faculty "tech buddy" to aide in supporting colleagues participating in a Preparing Tomorrow's Teachers to Use Technology (PT3) Implementation Grant.

Direct Internet Activities

These activities are generally relatively simple and direct tasks: multi-media or integrative project products are not involved. They seldom require skills beyond knowledge or comprehension and seldom more than one skill at a time. Sample activities in ten subcategories include:

Site evaluation

Students are given a specific URL and complete a description and evaluation worksheet, which may include downloading a part of the site. An introductory example that could be investigated in less than 30 minutes is http://www.pcnafriend.com/, the site for Pen-A-Friend which facilitates penpals between people with and without developmental disabilities. (However, one hopes that reviewers might use it and establish a penpal relationship!) This type of evaluation task becomes more complex when websites with multiple components, menus, and links are the target. An involved example is the award winning mega-site www.ldonline.org, a service of The Learning Project at WETA (Washington Educational Television Association) in Washington, D.C., in association with The Coordinated Campaign for Learning Disabilities. It would require weeks to fully investigate and read all the documents and resources materials available. It would probably be a more realistic, yet still involved task, to require students to review specific parts of LDonline, such as "ABCs of LD and ADD" at http://www.ldonline.org/abcs_info/articles-info.html.

Required reading

Many valid and accurate sites exist which can be used as required reading. Such material is often very timely and less costly than textbooks. For example, in a class on classroom management with a component on legal aspects of suspension and expulsion, http://www.cde.ca.gov/spbranch/sed/susex.pdf has "Suspension/Expulsion Handbook," an excellent 60-page document describing best practices in California with narrative, education code, and suggested forms for the process.

Find a site and summarize it

Search skills are involved when students are given a specific topic or theorist related to course content and asked to find one or more pertinent websites. Brief summaries verifying pertinence may be required by the instructor.

Site worksheet

The instructor makes a worksheet of questions (multiple choice, T/F, fill-in, or short answer) pertaining to a specific website related to the course. There are several K-12 teacher resource books of such activities (Burgstahler & Utterback, 2000; Sherwood, 1998). For example, one blackline master by Burgstahler & Utterback, entitled "NetWork: The Ghost Train Letter," lists a website URL, directs students to a specific part of the site, and then has room with lines for primary students to write two words from a specific sentence having a silent letter "h." Such books are useful for K-12 teachers and can be used as a source of activities in teacher education classes to teach Internet skills while modeling K-12 activities and resources (Hegwer-DiVita, 2000).

Scavenger hunts

This activity is very similar to a site worksheet. Usually a list of related sites is specified by the instructor. The student is given a number of short answer or fill-in questions to complete using information from the site list (Rekrut, 1999). Questions tend to be factual in nature. Milwaukee High School has developed an excellent example of a well-developed scavenger hunt at http://www.teleport.com/~billf/Internet_Lesson_Plans/Navigating.the.Internet/Internet.in.the.Library.html for basic Internet skills. In a slightly different format, Tammy Worchester has developed a number of Internet activities, including a structured scavenger hunt useful in self concept and community building: http://www.essdack.org/tips/allaboutme.htm.

Online quizzes

While there are software products for creating paper- or disk-based test banks, there are also some sites with templates for online tests and quizzes. Quiz Center, originally developed by the University of Hawaii, is now housed at http://school.discovery.com/quizcenter/. Instructors and teacher education students can use this site to easily build online quizzes. The Hawaii site still lists other links to quiz programs at http://motted.hawaii.edu/et_tools/quizcenter/otherquiz.html. Instructors can make quizzes covering course material or ask students to make and share quizzes for each other or for K-12 students. Sites, such as http://www.myschoolonline.com/golocal/, will host online quizzes (and school web pages) in a commercial venue. Peirce (2000) has a brief overview of online tests in relation to critical thinking. The conclusions are appropriate for K-12 and teacher education classes.

WebBytes

Brief, specific tasks supporting course content may be assigned to document students' visits to a given site or pair of sites (http://www.learningspace.org/webbyte/). The assignments should be short and specific and cover only one or two closely related sites. An example from an assistive technology course is:

> a. Read "Section Two: NIDDR Research Agenda--Chapter 5: Technology For Access And Function" at http://www.ncddr.org/rpp/techaf/lrp_ov.html
> b. Read "A Call to Action" by Dave Edyburn at
> http://www.pappanikou.uconn.edu/edyburn2.html
> c. Select 3 of their research purposes &/or priorities and explain how they might guide the development of your course contract for this class.

Topic packets

Each student poses a question or topic pertaining to the teacher education course content. Then, each student finds 3-5 websites which, taken as a whole, respond to the question/topic. The student writes an integrated (not website by website) response/discussion, referencing the sites. To document the extent of their searching, students may also be required to list at least 5 sites which they encountered in their search and the reason they rejected each site. Students may be required to electronically share their packet with classmates and the instructor. For example, in a class on positive behavior support, an Adaptive PE student chose to investigate her rights as a teacher in a school with regard to violent and "acting out" behaviors. She used the following sites in writing and sharing an excellent paper: http://www.rppi.org/ps234.html, http://www.colorado.edu/cspv, http://eric-web.tc.columbia.edu/monographs/uds107/preventing_contents.html, and http://www.ideapractices.org/lawandregs.htm. She also briefly described why she had discarded 5 other sites, principally for being off topic and non-specific.

Internet fieldtrips

As discussed at http://teacher.scholastic.com/fieldtrp/tguide.htm, these assignments require K-12 students only to read brief descriptions or related sites and to use the links to visit the sites. Field trips at Scholastic's Field Trip site are in categories such as Children's Literature, Language Arts, K-2, Math, Science, and Social Studies. These field trips could be used as written in introductory teacher education courses or perhaps easily modified by adding requirements for student output.

Group bookmark set

Students could contribute website bookmarks and comment on such listings by using http://www.backflip.com, a free but commercial site that lets users setup a bookmark file that can be accessed or amended from different computers. A university instructor could easily setup a file, for example, on the topic of depression and suicide in children and adolescents. Students, from home, work, or lab, could access the bookmark file of sites listed by peers, add to the listing, and comment on the relative merits of sites, how they compare to course texts, or other summarizing or evaluative tasks. This site also has benefit to anyone trying to coordinate bookmark files between home and work!

WebQuests

The term "WebQuest" was coined in 1995 by Bernie Dodge. Since then, what appears to be an entire subculture has developed. (See the appendix for a list of select WebQuest Internet resources.) WebQuests may be characterized in their own 12 subcategories (Dodge, 1999): retelling, compilation, mystery, journalistic, design, creative products, consensus building, persuasion, self-knowledge, analytical, judgment, and scientific. WebQuests involve a practical task and, often, a complex product. Inquiry, application and synthesis skills are always involved. The instructor describes a task or gives a problem scenario along with a number of select Internet sites that will be useful in completing the project. Students are not limited to the sites given and non-Internet tools may also be used. Sharing the results, often through technology, is required. While WebQuests for K-12 students may take anywhere from a class period to a month to complete, teacher education student products qualifying as true WebQuests are more likely to be culminating course assignments or even sole course assignments because of the concept and resource integration required for completion. The apparent complexity of WebQuests does not prevent their use in special education (Kelly, 2000). A good place to begin understanding WebQuests is http://edweb.sdsu.edu/webquest/overview.htm.

Overall, WebQuests are better seen than described. An example of a short WebQuest on Positive Discipline is at http://www.guilford.k12.nc.us/webquests/pd/pd.htm. This activity is appropriate for any teacher education course related to classroom management and was developed by staff at Guilford County Schools in North Carolina. The Kentucky Department of Education and SERC at the University of Kentucky sponsor a much more complex example investigating interventions for an elementary student with behavior problems at http://ebd.coe.uky.edu/webquest/webquest.html.

Complex Internet Activities

This category is evolving as more creative ideas and integrations are fashioned. For instance, Teachers College, Columbia University, at http://www.ilt.columbia.edu/k12/livetext/curricula/general/webcurr.html, has many links and discussion of complex web design from a constructionist view. It is likely that any of the previous categories and examples could be made into complex tasks. Complex tasks are closely integrated with multimedia technology in presentation by the instructor or in the student's product. Synthesis, analysis, and evaluation skills will be evident in every complex activity.

HyperTasks

These project assignments make use of HyperStudio or other such commercial products for teachers or students to use as a vehicle for their presentation or for ultimate use by their own K-12 students. Plano Independent School district in Texas provides a site with tutorial information, resources, and links highlighting HyperStudio tasks: http://k-12.pisd.edu/HyperStudio/HyperInternet.html.

Web activity templates

Perhaps the best known of the easy-to-use website templates is TrackStar from the South Central Regional Technology in Education Consortium at http://trackstar.hprtec.org/. This site, in addition to having a step-by-step template for developing online lessons integrating websites, also has a library of such lessons developed by other teachers. Filamentality, at http://www.kn.pacbell.com/wired/fil/, is another excellent template for web-based activities and also includes tutorials and libraries of lessons.

Website publishing

Without getting into HTML programming, software products such as "HyperStudio" and "SiteCentral," make producing web pages fairly easy even for novice and intermediate users.

Interactive PowerPoint presentations

A brief article (Tomei & Balmert, 2000) outlines the use of PowerPoint for branching, interactive lesson development reminiscent of old Apple // software such as "Story Tree" by Scholastic. Basically, students are given information and a related question or choice. The choice they make takes them to the response slide and so on, branching depending on student responses. Such techniques may also be used by IHE instructors and K-12 teachers. The main advantage of this technique is that PowerPoint is commonly available in universities and schools and is increasingly being used for presentations in both environments. Consequently, many users already have familiarity with the software. Tomei and Balmert refer to an example from biology available at http://www.duq.edu/~tomei/skeleton. Such a technique could be an especially effective use of SmartBoard technology.

Conclusion

It is easy to say that these activities are nothing new and the computer is just being used as a fancy tool to complete good, old library research projects. While these activities all have their origins in such tasks as paper& pencil worksheets, library research, and drama, they do have some unique advantages. They utilize computer technology that is still new to some learners and rapidly developing or changing for all of us: novelty and motivation are valuable instructional variables! Internet material needs to be carefully evaluated, but can be more current than that in a textbook. Also, as more preservice and inservice teachers have computers and Internet access at home, they are able to use and develop such activities at home at a time that best fits their personal schedules. For many of our students, the best time for their personal study, research, or production time is late at night after traditional libraries have closed or are too far away.

This list of Internet activities is a work in progress. There are certainly variations and combinations of each of these activities and no doubt many other such activities. Perhaps by viewing simple Internet activities as part of a continuum of options, faculty who are just developing their own skills at incorporating technology in course requirements will be more encouraged to begin some activities to their courses.

References

Burgstahler, S., & Utterback, L. (2000). New kids on the net: Internet activities in elementary language arts. Boston: Allyn & Bacon.

Dodge, B. (1999). WebQuest taskonomy: A taxonomy of tasks. Available: http://edweb.sdsu.edu/webquest/taskonomy.html

Hegwer-DiVita, M. (2000). Modeling technology use in special education teacher training. In Willis, D., Price, J., & Willis, J. (Eds.), Proceedings of SITE 2000 (pp. 657-660). Charlottesville, VA: Association for the Advancement of Computing in Education.

Kelly, R. (2000). Working with WebQuests: Making the web accessible to students with disabilities. Teaching Exceptional Children, 32(6), 4-13.

Peirce, W. (2000). Online strategies for teaching thinking. Syllabus, 14(2), 21 & 24.

Rekrut, M. (1999). Using the Internet is classroom instruction: A primer for teachers. Journal of Adolescent & Adult Literacy, 42, 546-557.

Sherwood, W. (1998). Internet activities for math: Challenging. Westminster, CA: Teacher Created Materials.

Tomei, L., & Balmert, L. (2000). Creating an interactive PowerPoint lesson for the classroom. THE Journal, 28 (1), 69-71.

Appendix – WebQuest Internet Sites

http://edweb.sdsu.edu/webquest/webquest.html
Entry link to "The WebQuest Page;" still maintained by Bernie Dodge, San Diego State University

http://www.ozline.com/webquests/intro.html
Leads to more explanation and resources by Bernie Dodge and Tom March

http://faculty.nl.edu/mhan/NECC99Web/sdwebquest.htm
Sample of a WebQuest for practicing staff development skills and techniques

http://www.trumbull.k12.oh.us/resources/onproj.html
WebQuests of a global nature from Trumbull County Educational Service Center in Ohio; many links

http://www.guilford.k12.nc.us/webquests/UltimateWebSites.html
Nearly 100 WebQuests developed by staff at Guilford County Schools in North Carolina; they include resources for others building their own WebQuests.

http://curry.edschool.virginia.edu/curry/dept/cise/read/resources/webquests/hype/index.htm
An explanatory slide show about WebQuests by Raymond Jones of the University of Virginia; links to samples from U of V

http://www.teleport.com/~billf/Internet_Lesson_Plans/Hobbit.web/Hobbit.html
Lovely and complex site by Rob Aaldijk all about Middle Earth; probably not truly a WebQuest, but it could be very useful as an example of a complex web-based literature project. Asldijk used Vistapro 4.0, Paint Shop Pro 4, and Terrain Maker 1.1.

http://njnie.dl.stevens-tech.edu/currichome.html
Stevens Institute of Technology's Center for Improved Engineering and Science Education has primarily science projects utilizing real-time Internet data; perhaps some of the best projects making the most of the Internet's advantages and that could not be done otherwise!

Results of a learning software design competition

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Abstract: This paper presents the results of the first Learning Software Design Competition sponsored by the University of Minnesota. Results and observations from the process of the competition are included.

We established the University of Minnesota Learning Software Awards as a mechanism to identify and promote exemplary and innovative educational software. Our long-term goal is to establish an electronic forum featuring best practices in the field. We want to influence educational design by providing access to samples of work judged to be exceptional, and to create a form of eJournal that publishes active samples of exemplary practice-in-action, not simply written articles.

One criticism of our field is that we have not identified what we consider to be exemplary projects. Although many design professions have well established and easily accessible archives of their best work (e.g. art galleries, buildings, and books), the field of Instructional Technology has done little to establish resources where students or practicing designers can examine the best and most inspirational works.

During the fall of 1999 and spring of 2000, we solicited and received approximately 65 entries from across the United States. Judging involved a two-phase process. First, a pool of 35 judges screened entries. Twenty entries were forwarded for further consideration. Three expert judges conducted final judging: Tom Duffy (UNext), Lloyd Rieber (University of Georgia), and Stan Trollip (Capella University). The judges selected the following award winners and honorable mentions.

First place awards
The Writing Trek by Sunburst Communications
Math Problem Solving by Plato Education
Psychology Experiments by Kenneth McGraw, University of Mississippi
Off the Wall by Michael Gardner, University of Georgia

Runners-up
Research Assistant by Dan Schuch, Florida State University
Tuberculosis Case Management by University Research Co.

Honorable mentions
Claymation by Mary Beth Kiser, Edina Public Schools, MN
Probability Explorer by Hollylynne Stohl Drier, University of Virginia
Bohr's Atomic Model by Jeff Wilden, Weber State University

Although it was beyond the scope of the competition to provide full-access to the projects, all the winners provided resources that can be accessed and examined. Samples representing their projects are available at the competition website: http://design.umn.edu/learningcompetition In addition, each of the winners has submitted an article for a special issue of Tech Trends outlining the problems they addressed in their projects and commenting on how they designed their solutions.

Innovation:

Our primary goal was to support the development of innovative uses of technology. We focused on three dimensions of innovation for this competition. The first dimension involves using new capabilities of technology for educational advantage. For example, the very scale and accessibility of the Internet is used to the advantage of researchers and students alike through Psychology Experiments by Kenneth McGraw. There, the power of the Internet connects researchers and research subjects, and provides educational examples for study. Off the Wall by Michael Gardner uses the interactive capabilities of multimedia to investigate the artist Chuck Close. Users explore the work of the artist, interacting with elements of scale, brush stroke and subject. Jeff Wilden describes an interactive multimedia program titled Bohr's Atomic Model. This web-based interactive simulation allows students to build an atom using an atomic construction set.

The second dimension involves solving existing problems in a new or unusual way. Plato's Math Problem Solver and Sunburst's Writing Trek use unique capabilities of the computer and the Internet to assist learners while providing diverse and challenging learning environments. Plato's Math Problem Solving software uses real-world math problems and employs three levels of scaffolded support to guide the user through the solution process. Writing Trek includes a great variety of writing activities and provides the opportunity to publish student work on an Internet site. In contrast to these commercially developed products, Dan Schuch created Research Assistant, a database, to support the complex cognitive demands of graduate education. Not all winners were fully computer-based. Mary Beth Kiser's fifth grade class completed a learning activity involving clay, video, and the World Wide Web.

The third dimension includes new, under-addressed, or under-served problems. Tuberculosis Case Management by Elisa Knebel and Probability Explorer by Hollylynne Drier use the capabilities of the computer in this manner. Tuberculosis Case Management helps medical workers in the Third World, far from Silicon Valley, diagnose and treat a deadly disease. Probability Explorer is oriented to younger students. It engages children though probability experiments and exploration, and allows them to construct a more accurate understanding of the nature of chance.

Observations:

Our observations from the competition provide insight into the development of educational software. First, it is clear from the descriptions presented by the award winners that the design processes employed varied greatly across the projects. Some groups followed formal methodologies, and in some cases, the strategies employed are the result of a formal design process. In other cases, however, the innovation appears centered on the overlap between expertise in the subject matter and a use or interest in a technology. Often, creative inspiration appears to occur as sudden insight.

Second, access to development funds did not limit creativity. As noted above, three winners were graduate students. Apparently, innovation does not require large teams or budgets. Third, comments from the competition judges about the value of the judging process were overwhelmingly positive. Many people commented that the process of reviewing competition entries was enlightening and worthwhile.

The competition was funded by the Design Institute at the University of Minnesota. The second round of the competition is currently being planned. Information about the competition, including a video and samples of this year's winning entries, can be accessed at the competition website.

Interactivity: The Key to Successful Web-Based Learning Environments

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Abstract: The creation of online courses demand more attention to the paradigm of learner-focused instruction with high levels of interactivity. As a result, it is becoming increasingly important to suggest more precise methods of design and analysis of web-based instructional activities. This paper suggests criteria for designing interactive web-based student activities and gives examples used with pre-service and in-service teachers.

There is no question as to the value of interaction in the classroom. Students interact for understanding and faculty depend upon the interaction for feedback from students to determine success in achieving objectives. Interactivity in the online course becomes more critical as it is often the "life line" or connection between the distant student and instructor and the student and classmates. Currently, many faculty members have to transform their courses from the traditional on-site model to the web or web-enhanced model. In order to accomplish the transformation, faculty must often participate in a variety of professional development sessions. The immediate challenge for faculty is to become familiar with the mechanics of the computer delivery tools being used. However, in doing so, all too often the focus is on the technology itself rather than its effective use.

After the faculty has mastered the delivery tool, a critical problem becomes the effective use of online interactivity, especially in the area of high-level critical thinking. In order to have successful interactions in any course, requirements include physical and cognitive processing. And, successful interactions are often mediated by quantity and quality of effort (Hannafin, Hannafin, Hooper, Rieber, & Kini, 1996). What techniques can instructors use to be confident that interaction is required for the discussion of concepts, principles, and assignments? How can the instructor design the course so effective interaction occurs in web-based learning environments? Ensuring active, attending behavior in web-based learning environments is challenging for many instructors. Interactivity should engage the learner with the material, the ideas of fellow students, and the ideas of the instructor. The end result is to build a community of learners based on learning requirements that include the exploration and development of ideas, application of principles, refinement of interpersonal skills, and modification of attitudes.

It is the intent of the presentation to share techniques for designing web-based or web-enhanced learning environments that include a high level of interactivity that lead to successful learning communities. Examples of practical applications with undergraduate, pre-service teachers and graduate library science students in activities such as preliminary interest inventories, role playing, author visits, and debates will be presented and discussed. Examples will be categorized according to the learning requirement.

Interactivity as a Concept

The classic instructional theory definition of interactivity has its bases in behavioral theory. Basically, the meaning of interaction is that it provides a way for learners to receive feedback. One means of providing feedback, in the classical sense, is error correction. Identifying errors engages the learner in recognizing inadequacies in their mental models and motivates the learner for a deeper understanding of the concept, skill, or attitude. Errors that remain undetected are repeated and reinforced since there isn't any feedback. (Hannafin, Hannafin, Hooper, Rieber, & Kini, 1996). Giving the corrective feedback concerning the adequacy of the statement is often not enough information for the learner. Additional information or elaboration is needed for effectiveness and for the changing of mental models of concepts.

In Michael Moores' concept of "transactional distance", he discusses three types of interaction essential for any distance learning environment. These are learner-instructor, learner-content, and learner-learner interaction. Learner-instructor interaction is defined as the components of motivation, communication, and feedback between the instructor and student. Learner-content interaction is defined as methods by which the learners obtains cognitive information from texts, and other resource materials such as web pages, videos, or journal articles Finally, learner-learner interaction is defined as the communication and exchange among students about information, course content, assignments, and attitudes (McIssac & Gunawardena, 1996).

Muirhead defines interactivity as that which involves "participation by the learner in on-line communication between learners and their class tutors" (p. 1, 2000). Murihead further defines interactivity as having three components: communication, participation, and feedback.

Interaction is a complex variable that includes many different aspects and issues. These elements provide a fundamental for involving interaction in the design of the course. Variables to consider include the amount of interaction, type, methods (viz., asynchronously or synchronously), spontaneity, quality, and timeliness of the interaction.

Interactive Strategies in Online Learning communities

In order to create well-structured and meaningful interactive activities, several criteria for designing the learning environment must be considered. In other words, what the teacher must provide and the student must do. Reigeluth & Moore's (1999) comparison points for analyzing instructional theories are useful as a basis for the planning or analysis of an interactive class activity. Specifically, these criteria are: types of learning, control of learning, focus of learning, grouping for learning, interaction for learning, support for learning. An additional category, the online discussion technique, is added to clarify the computer conferencing tool implemented.

Several examples of interactive activities used in pre-service and in-service education online classes are analyzed below using the criteria suggested.

Activity One: Copyright

The goal for activity one is to gain a knowledge base of the copyright law and applications of the law for school library media centers. Students were given a list of questions about copyright. The number of questions equaled the number of students. Each student was randomly assigned one question. After a period of two weeks, each student was required to post an appropriate answer to the question and lead an online discussion on the issue. Each student was also responsible for responding to three additional postings. An analysis of this activity is outlined below:

- Types of learning:
  The type of learning involves building and application of knowledge

- Control of learning:
  The teacher controls the learning since the education goal is directed by standardized testing for the certification area. The teacher selects the content, selects the resources, decides the activity, how it will be accomplished, and in what order. In this particular case, students are to find appropriate answers, by visiting web sites and referring to their text, to copyright questions prepared by the instructor.

- Focus of learning:
  The focus of learning is centered on a particular topic, copyright.

- Grouping for learning:
The grouping for learning is individual with small group interaction. The assignment reads that each student is responsible for leading the discussion of one question. Three additional students are to extend and elaborate to the initial posting of the question.

- Interactions for learning:
The interactions needed for this activity is student with material and student with student. Students respond to guided questions and react to the posted response. Team membership is built since the whole class is responsible for building the database for the knowledge needed for the topic. Ownership of the information is vital since questions concerning the topic appear on the standardized test. Issues often arise in the discussions concerning fair use and the violation of copyright laws and as the law is implemented in schools. This provides students with real-life examples of application of knowledge to real life experiences.

- Support for learning:
The instructor provides cognitive support for the activity by providing appropriate textbook and web sites for the students to use in order to find appropriate responses to the guided questions. The teacher is also responsible for providing feedback to the whole group based on the accuracy of the responses. Emotional support is also provided for the standardized test since the students have access to a document that is easily reviewed prior to taking the standardized test.

- On line discussion technique:
Discussion forum is used in order for students to complete the assignment over a two-week time period.

Activity Two: Interviews with Authors

The goal for activity two was to gain an understanding of authors as individuals and the influences of their lives on their writings. An interview can occur with a live author or deceased author role-played by an expert. Either a guest or a student may be the expert and role-play a particular author.

- Types of learning:
The type of learning involves the understanding of authors and their ideas. In addition, conducting an interview strengthens interpersonal skills.

- Control of learning:
The teacher selects the content, decides the activity, and how it will be accomplished. In this example, students were to find an informational or biographical book focusing on Shakespeare. They were to develop questions they would like to ask him based on their readings of the book.

- Focus of learning:
The focus of learning is centered on a particular topic, Shakespeare.

- Grouping for learning:
The grouping for learning is individual with whole group interaction. The assignment reads that each student is responsible for reading one book and posting questions to a discussion forum in order that the whole group may review the questions. The whole group then participates in a chat session in order to conduct an interview with Shakespeare.

- Interactions for learning:
The interactions needed for this activity are student with material and student with teacher (viz., the expert). Students were to read a book and prepare questions they found important to further their

understanding of the author. Questions were shared so the students could review the types of questions prepared prior to the interview. A Shakespearean expert role-played the playwright. This provided students with a real-life experience in order to gain understanding of the author's life and works.

- Support for learning:
  The instructor provided cognitive support for the activity by stating the reasoning behind interviewing an author and choosing an appropriate book to read. Shakespeare was chosen for this activity since class discussions often focus on appropriate authors to read and study in the middle grades. Emotional, or attitudinal, support is also provided since most students recall reading Shakespeare only in high school and having little understanding of the language used in his works. The instructor also provides debriefing activities focusing on the meaningfulness of the experience and using similar activities in middle grade classrooms.

- On line discussion technique:
  Discussion forums were used to post questions and a chat session for the interview.

Activity Three: Debate

The goal for activity three is to gain an understanding of controversial topics. Applying an understanding of the topic is crucial since controversial issues, such as child abuse, AIDS, school violence, or drugs, are often at the height of discussion in educational settings.

- Types of learning:
  The type of learning involves the knowledge and understanding of controversial ideas and issues. Furthermore, in real-life situations, students need to be prepared to engage in a high-level of thinking as ill-structured problems arise in schools.

- Control of learning:
  The teacher selects the content and decides the issue. For this activity, students were placed in either a pro or con group. Learners have control over preparing the arguments, designing the environment, and determining how their argument will be presented.

- Focus of learning:
  The focus of learning is centered on a particular topic, challenging and censoring books.

- Grouping for learning:
  The groups were composed of seven or eight members. Each group worked independently in order to prepare their argument.

- Interactions for learning:
  The interactions needed for this activity are student with material and student with student. Working in small groups students were to prepare arguments for the debate.

- Support for learning:
  Supplying a list of web sites and appropriate textual materials for both sides provided cognitive support for the activity. The instructor also furnished cognitive support if students requested additional information. Cognitive and emotional support was provided in debriefing sessions as the arguments were reviewed and the energy necessary to implement a debate was reinforced.

- On line discussion technique:
  To prepare arguments, students used discussion forums and chat sessions. A chat session was used to conduct the debate.

Summary

Instructors can conduct an analysis of the activities in their courses using the criteria provided by Reigeluth & Moore (1999) to ensure confidence that interaction is embedded in the discussion of concepts, principles, and assignments. The criteria also provide a means for the instructor to reflect on the design of the learning environment in order that it may be learner-focused. In addition, the criteria enable the instructor to give appropriate support to their students in a web-based environment.

References

Hannafin, M. J., Hannafin, K.M., Hooper, S. R., Rieber, L.P., & Kini, A. S. (1996). Research on and research with emerging technologies. In D H. Jonassen (Ed.) Handbook of Research for Educational Communications and Technology (pp. 378 –402). New York: Simon & Schuster Macmillan.

Kearsley, G. (May, 1995). The Nature and Value of Interaction in Distance Learning. George Washington University, Washington, DC. Paper prepared for the Third Distance Education Research Symposium, May 18-21, 1995.] http://www.hfni.gsehd.gwu.edu/~etl/interact.html [November 1, 2000]

McIssac, M.S., & Gunawardena, C. N. (1996). Distance Education. In D H. Jonassen (Ed.) Handbook of Research for Educational Communications and Technology (pp. 403-437). New York: Simon & Schuster Macmillan.

Muirhead, B. (2000). Interactivity in a Graduate Distance Education School
Educational Technology & Society 3(1) 2000.
http://ifets.ieee.org/periodical/vol_1_2000/muirhead.html {November 1, 2000]

Reigeluth, C.M., & Moore, J. (1999). Cognitive education and the cognitive domain. In C. M. Reigeluth (Ed.), Instructional design-theories and models: a new paradigm of instructional theory, volume II (pp. 51-68). Mahwah, NJ: Lawrence Erlbaum Associates.

SCRIPTING A LESSON: A METHOD TO ASSIST THE DESIGNING OF PERSONALIZED LEARNING ENVIRONMENTS

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1. INTRODUCTION

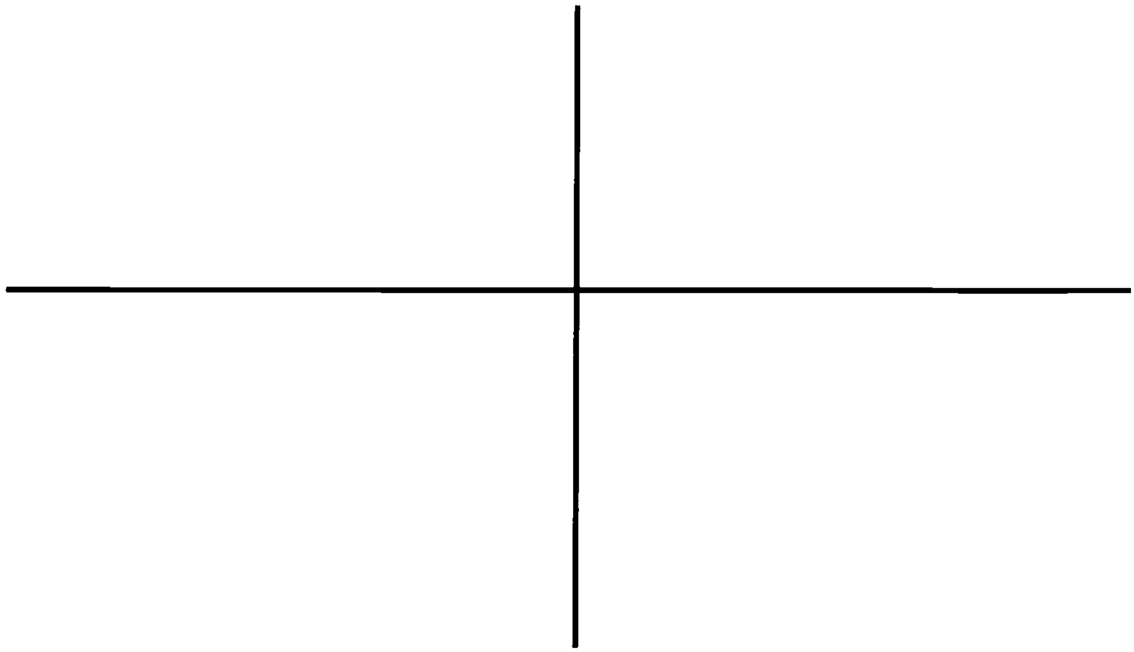
One of the challenges of teaching is to ensure the learning content is not only meaningful to learners, but also has the desired educational impact on the quality of their learning. All too often, however, carefully crafted teaching/learning materials tend to be presented in such a way that they have limited impact on learners. One explanation for this, is that many teachers feel unable to convert their expert knowledge to the needs of different learners because they do not have the appropriate preparation in integrating teaching tools into their lessons.

This paper describes a method to guide the designing of learning environments, based on the work of an interdisciplinary team of researchers and teachers at the *Université de Valenciennes* (France). The first part of the paper discusses research conducted at the University using Kolb's Learning Style Inventory (1984) to establish the perceived learning styles of 179 adult learners (Study 1). This is followed by giving the results of a study into learners' self-observation of their dominant learning style (Style 2). The second part of the paper outlines the historical legacy of different pedagogic models *via* six educational paradigms, cross-referenced to nine operational aspects of teaching. To put this analysis in perspective, a study was conducted into the expressed learning modes of 575 adults learning English as a Foreign Language (EFL) (Study 3). This is followed by a comparison of two dominant educational schools of thought, drawn from the work of Piaget and Vygotsky. The third part of the paper explains step by step how to draw up a scripted lesson *via* a series of interconnected pedagogic fragments. To do this we define key concepts such as: lesson, document, hyperdocument, lesson script, diagese, script, scenation, scenic, and setting up the situation. This process is called the scenistic approach to lesson planning. Finally, the paper proposes different personalized learning tracks based on two broad types of lesson scripts with their respective advantages and disadvantages in the classroom.

2. FOUR BASIC LEARNING STYLES

There is consensus about the idea that a lesson based essentially on the apparent convenience or fascination for teaching tools is doomed to failure. From an educational point of view, teaching tools are not neutral, if nothing else by the fact, for example, that they depend on the teacher's perceptions of learning styles and what s/he expects of learners in terms of the tools' capabilities. In this light, David Kolb's (1984) inventory of learning styles (viz. *Reflector*, *Theorizer*, *Pragmatic* and *Activist*, see Table 1 below) can help us to help understand what may be going on in the learning process. The advantage of using Kolb's inventory is its widespread use and cross-curricula application. In practical terms, a dominant learning style represents the likely starting point of how an individual marshals his/her resources. If this initial approach should fail, the learner might then turn to other learning modes.

To put Kolb's inventory into the context of continuing education, a study of 179 learners (Study 1) of EFL (September – October 2000) filled in a close-ended questionnaire at the *Université de Valenciennes* to establish a four-facetted profile of learners, with each one of the four facets representing a maximum score of 100% each. In this context, of the learners questioned: 70.8% describe themselves as *Reflective*; 67.2% see themselves as *Theorizers*; 66.1 % consider themselves as *Pragmatic*; and 58% perceive themselves as being *Activist*. In short, more than two thirds of the French adult learners asked for a pedagogic structure that allows them time to carefully weigh up the different sides of the question (*Reflective*), followed by their need to adopt the *Theoriser* (questioning) and *Pragmatic* ("get the instructions-then-do it on your own") learning modes (see Table 1 below).



After having filled in the initial questionnaire, 42 adult EFL learners (TOEIC average score of about 405 points) were personally explained what each of the four learning styles were and then asked to identify explicitly which particular style best described their approach (Study 2). The direct self report of perceived dominant learning style shows that: 40.5% of learners describe themselves as *Reflective*; 33.5% of learners see themselves as *Pragmatic*; 19% of learners see themselves as *Theorizes*; and 7% of learners see themselves as *Activist*. This study contrasts sharply to the results of the more indirect survey of perceived learning styles of their co-learners (Study 1). The impact of a directive (*jacobine*) and "rationalist" French culture on adult learners' perceived learning style could be an important factor in explaining the apparent gap between indirect (Study 1) and the more direct self-reports (Study 2).

Given that self-observation reflects learners' image of themselves and that of the social process (e.g. the educational/cultural system), several implications can be drawn from the studies into learner self-reports. First, teachers in (French) adult education need to take into account the needs of *Reflective* learners who tend to focus on, for example, gathering (consuming) information, rather than creating (producing) information (contrary to the *Pragmatist* and *Activist* modes). Second, how can the planning of lessons cater for other types of learning styles, notably that of *Theorizers* and *Pragmatists*. Finally, when compared to the results of the 179 learners polled (Study 1) a significant amount of learners seem not to be aware of their own probable "learning style" when directly questioned about the subject (Study 2). Failing to understand one's learning style, may explain, in part, some of learners' difficulties in attaining their learning objectives due to not being able to assimilate the data in an "appropriate" way in terms of their cognitive processes. How can they be made aware of their likely learning style?

3. SIX EDUCATIONAL PARADIGMS

For teaching to be effective as an act of mediation between what learners know and what they want to know, it is useful to have an overview of the achievements of previous generations of pedagogic style that inevitably influence current teaching practice. From the adult learner's point of view, this approach could explain, in part, their expectations and needs when (unconsciously) referring back to the educational experiences of their youth. For teachers, highlighting this legacy may bring out ideological self-interest, rarely made explicit, forming part of what Thomas Khun (1962) calls a "paradigm" or unquestioned theory or set of beliefs within a given scientific community.

Based on the initial work of Puren (2000), it is possible to expand his initial analysis into a broader nine-facetted table (Table 2 below) to present a mosaic (a series of non-related elements linked more for historical reasons rather than for any intrinsic causes) of various features of the teaching and learning approaches of the last few decades.

Paradigm	1. Reception	2. Impregnation	3. Action	4. Reaction	5. Construction	8. Interaction
Significant learning happens by	direct assimilation of knowledge transmitted by the teacher	intensive exposure to the source of knowledge	completing pedagogic tasks	reacting to pedagogic prompts of the teacher/ teaching tool	building up a personal system of knowledge	meaningful exchanges
Guiding model of mediation	teacher-centered	individual's needs & wants	physically active learners	linear & highly structured teaching content	self-awareness ("learning how to learn")	negotiation among learners & with the teacher
Preferred pedagogic mode	lectures	self-discovery, workshop activities	"laboratory" work	programmed teaching, e.g. drill work	self-monitoring activities	discussion groups, collaborative activities
Dominant pedagogic type of tool	teacher-led tools e.g. talk & chalk, commenting on written texts	"real- life" tools used in a personal context	real-life tools adapted to a pedagogic context[1]	machine-driven "teaching machines"	learner-driven pedagogic tools e.g. personal computer[2]	network-linked tools e.g. Internet
Dominant sensorial modes	aural[3]	visual[4], tactile[5]	aural, kinaesthetic[6]	visual, tactile, kinaesthetic	visual, tactile	aural, tactile
Dominant symbolic perceptual modes	verbal[7], sequential[8]	verbal, non-verbal[9], non-sequential[10]	non-verbal, sequential	non-verbal, sequential	verbal, non-verbal, sequential	verbal, non-verbal, non-sequential
Learners are primarily expected	to be attentive to the teacher	to maximize learning opportunities	to participate in class	to react in a set way	to produce verifiable statements in terms of their needs & wants	to balance out their needs & wants with the socio-cognitive demands of the learning task
Preferred learning style (cf. Kolb 1984)	reflective	activist	pragmatist	(reflective)	theoriser	reflective

Table 2. Mosaic of educational paradigms

To put this analysis of educational paradigms into the classroom context, a one-year study (September 1999 – October 2000) of the sensorial modes of 575 adult EFL learners, at the University (Study 3), reveals that of those who filled in the questionnaire: 67.3% feel they are teacher-dependant; 60.2% see themselves as needing to be physically active (*Kinaesthetic*); and 60.3% say they are able to learn by listening (*Aural*). It seems then that more than two thirds of adult learners expect explicit guidance from the teacher and 60 % of the learners want to be given an opportunity to be physically active and to learn by listening. In other words, even if being physically active and listening to what the expert says are important to learners, they expect even more to have the guiding hand of the teacher present. Given this need for pedagogic guidance, the work of Grangeat (1998:183) allows us

[1] Wiburg, K.M. (1995) An Historical Perspective on Instructional Design: Is it Time to Exchange Skinner's Teaching Machine for Dewey's Toolbox? http://www-cscl95.indiana.edu/cscl95/wiburg.html (consulted 28.10.2000)

[2] see: Edgar, R. (1995) PC is to Piaget as WWW is to Vygotsky at http://www.iconceptual.com/Siggraph.html (28.10.2000)

[3] Definition: Learners favouring the *aural mode* are specially sensitive to human values, like human warmth and a convivial environment. They tend to focus on communication, teamwork and respect for others in the group (Labour 1998:107). Aural learners represent around 30% of the population cf. http://www.demon.co.uk/mindtool/mnemlsty.html (consulted 27.10.2000), this reference is also used concerning *visual* and *kinaesthetic* oriented learners (see below).

[4]Definition: In learning by observing, a *visually oriented person* focuses on the details, and the applications of what is being observed. Visual learners make up about 65% of the population (see above). For McLuhan (1964:291) the visually-dominant mode tends to see all things as continuous and connected. This is done by nurturing a fixed point of view, an attitude of detachment & non-involvement, and in separating functions/stages/tasks in time and space (McLuhan 1964:217, 247, 291).

[5] Definition: *Tactile oriented learners* need to be in "direct" contact (*e.g.* the television, see McLuhan 1964: 233,290,292,295) with elements of the object of knowledge. Tactility is "the interplay of the sense, rather than the isolated contact of skin and objects" (McLuhan 1964:273). The related area of haptic technology, has become increasingly important in the development of the new technologies of information and communication (e.g. force feedback applications).

[6] Definition: *Kinaesthetic oriented learners* prefer learning according to how they perceive physical performance (e.g. paralinguistic communication involving body language, eye contact, hands and gestures in a given language-culture) in terms of effort, self-image, efficacy, etc. Kinaesthetic learners make up around 5% of the population (see above). This mode is not situated in any one particular part of the body, as those of seeing and hearing, and involves a nonlinear perceptual process.

[7] Definition: The *verbal mode* implies a system of communication that consists of statements with a syntax.

[8] Definition: *Sequentiality* implies a process that has a pre-set beginning, middle, and end.

[9] Definition: The *non-verbal mode* consists of statements with no obvious syntax (e.g. images, gestures, tones of voice, use of space, clothing cues, colours, taste) and assumes a high level of literacy. Studies show that nonverbal cues are 50% effective, while words are only 7% effective cf. http://www.trnty.edu/depts/education/teach/communication/nonverbal.htm ; http://mhhe.com/socscience/speech/commcentral/ mgnonverbal.html (consulted 27.10.2000)

[10] Definition: *Non-sequentiality* has no pre-set order, the person chooses how to organise the available segments of data

to look at how two dominant educational approaches, inspired by the works of Jean Piaget and Lev Vygotsky respectively, tackle the issues of how people acquire knowledge in terms of external teaching agents.

Jean Piaget : self-structuration	**Lev Vygotsky** : (guided) co-selfstructuration
a) biological view of learning where the individual first needs to have a certain level of mental development before being able to have meaningful contact with the social context - structuralist view of learning	social view of learning where it is the concepts from others in society that stimulate the individual's internal mental development - functionalist view of learning
b) discovering things by oneself and dialoguing with "objects" of learning	stress on social interactions and on the ability to get help from others
c) skeptical about the efficacy of (explicit) mediation ("Each time one explains something to a child, one stops him/her from inventing it.")	mediation is decisive ("If the child makes one step in learning, he advances two steps in his development.")
d) role of the specialist is to provide a rich environment and to facilitate cognitive conflicts that are the driving force of mental development	role of the specialist is to identify when the learner is in a *Zone of Proximal Development* and to help him/her complete a task first by being helped and then by him/herself
e) especially useful for error analysis and to plan how to overcome a learner's difficulties	especially useful for gradually building up (scaffolding) challenging teaching/learning units

Table 3. Brief comparison of some of Piaget's and Vygotsky's contribution to educational theory

4. THE CONCEPT OF SCRIPT CREATION APPLIED TO THE DESIGN OF A LESSON

It is not sufficient, however, just to know what information content is suited for learners. It is equally necessary to know how to present this information in an "appropriate" way. To do this the preparation of information content involves selecting and organizing data, in other words defining a planned structure consisting of sub-sections, itself able to be broken down to its most basic level. The term "document" designates this organized structure.

Definition: A *document* is an organized structure of lower level elements of information. A document is thus information content that can be applied to a given medium/tool. Hence, a computer screen, a cassette audio, a book, a piece of canvas, etc. is not in itself a document but only the material base/tool of the document.

Definition: "A *hyperdocument* is a content of information made up of a nebulosity of fragments, whose sense is constructed by each of the given reading routes" (Balpe 1990). This definition does not make any reference to a corresponding physical medium. It is linked to the concept of "document" mentioned above, but adds the dimension of the multiplicity of (reading) routes, presupposing the possibility for users to intervene in the distribution of the contents, in particular in the means of selection or in the numerous choices (interactivity).

Definition: A *lesson* is a hyperdocument with pedagogic or cultural aims. A lesson consists of having access to objects of knowledge available *via* the various teaching media as well as their technical variants (hyperdocuments, hypermedia, and more traditional tools like chalkboards, books, etc.). In short, the term "lesson" refers to the structure that controls the organization of the constituent pedagogic sub-elements while being totally independent of the physical object ultimately constructed.

When designing a lesson, it is often useful for the teacher to have a way to make explicit the intended structure of the lesson. This can be done by creating a mental/conceptual model of the lesson. Traditionally, teachers design a lesson plan based on a "document" structured into different interconnecting parts. The lesson plan can then be given to the learner by way of a "summary". With the summary, learners can then look up any section of the document wherever it be on the chosen medium/teaching tool. In this way, a distinction is established between the actual physical putting into practice of the (teaching) content, and the various aids used to look up the different parts of the lesson. Though a sequential style of reading is still the most common, with this technique different types of reading routes now become possible even in the case of a linear approach. For example, widely diffused written culture, i.e. the press, has diversified the ways of having access to knowledge in introducing parallel procedures of looking for data. Newspaper and magazine pages present with the body of the main article, clearly visible footnotes, cross-references, sub-titles, condensed margin texts, illustrations, boxes of information, etc. In this vein, when one wants to really use the possibilities of sound documents and moving pictures one may need to go even further than the written medium.

In the audiovisual world, the "script" is the working model of creation. The concept of script is complex, and yet has not been the object of much in-depth, critical reflection. The numerous specialized guides that do exist on how authors can improve their script writing techniques (e.g. Seger 1998) give the illusion that the notion of *script* is self-evident and thus does not need any further discussion. Yet, this is far from being the case today when the script can no longer remain at the level of lock-step linearity, inherited from the centuries-old written culture aided and abetted by a traditional audiovision approach in education which has remained the dominant model in the minds of many.

In the case of the cinematographic document, the script is a tool that aids the creation process from the initial idea to the continuity of dialogues. The extended script is able to integrate the different functions of interactivity and allows a break with linearity. In this context, the "lesson script" is not a physical model of data to be put on a given medium nor is it a model of interaction with the learner. The script is a way of *accompanying* the creation of the lesson from the initial idea to its finished state. It serves as a concrete translation of a teacher's mental representation of a given lesson. This type of script can thus evolve dynamically during the creation process. Between defining the lesson content and creating a complete lesson there is, however, a series of intermediary phases. Previous studies (Leleu-Merviel 1996) have introduced concepts that take into account the evolutive dimension of the script in the progression of the dynamics of the lesson creation process. The first phase, linked to the definition of the lesson content, corresponds to the concept of *diagese*.

Definition: The *diagese* includes everything that belongs to the imagined/proposed setting of the document as expressed through the *lesson content*.

Definition: The *script* refers to a structured content that progresses through a series of events. While the script develops the *logic of the different pedagogic events*, the *scenation* organizes these events together as interacting elements. It can be equated as the "route" (or path) that the learner takes within the structure defined by the script. The scenation is associated with the surface structure as opposed to the *deep structure of the script*. In particular, the impact of the interactivity modes is transformed by a scenation that, though predetermined, develops itself during the interactive session. It is in this sense that a teacher can interrupt the linearity of a prepared lesson to "spontaneously" present a part of the lesson, which should have been dealt with at a later time, in order to instantly and directly respond to a question.

Definition: The *scenation* (Colin 1992) implies the *organized structure of events* and/or states with which the learner actually interacts. It is made up of a body of fragments taken from the script to determine how the physical data is linked to the actual production of the script. When the creation of the script and the scenation's outline has been done, the lesson exists in an "abstract" way. It is, for example, the text of a play, or the musical partition. It is neither the play itself (the theatrical performance), nor the concert (the musical performance). The performance transposes the abstract document into a reality perceivable to the physical senses.

Definition: The *scenic*, or the concrete presentation, refers to the process that allows the transposition of the text into a *concrete reality*. It is the result of aesthetic choices, practical or financial constraints, conditions of usage, etc. The scenic deals with the choice of the medium for a given fragment taken from the scenation's structure: text, sound, or both together, etc. Similarly for the data of the document, the scenic affects the precise translation of fragments extracted from the script, given that one should carefully consider how the learner's interaction with the environment of the document will be translated in concrete, hands-on terms.

Definition: *Setting up the situation* defines the modes of the *concrete facilitative links between the user and the data* of the document. In the multimedia world, it is on the level of setting up the situation, and only on this level, that the creation of user functions will be linked to a button, an icon, a joystick, a click, a captor, a data glove, a virtual reality immersion headset, etc. In this way, we see how setting up the situation deals with the way that concrete means of action allows the user to navigate in an environment presented by the scenic in order to facilitate the acquisition of knowledge in a given context.

In short, our approach to facilitate the creation of a lesson implies: constructing the *diagese* linked to the description of the content ; constructing the *script* (architecture) in which the acquisition of knowledge progresses sequence by sequence though a series of organized events ; creating the *scenation*, as a constituted structure of fragments from a script with which a user is potentially placed in a real context of interaction ; choosing the *scenic*, which translates the text into a body of physical data, that the user's senses can perceive ; defining the degree of setting up the situation to establish concrete modes of relations between the user and the data of the document. The term "scenistic approach" of lesson planing thus designates using this approach in presenting of teaching content. Its novelty rests in distinguishing five levels of script writing (described above) which, in practice, are far too often misunderstood at the expense of the efficiency of the outcome for the learner.

5. DEVELOPING PERSONALIZED LEARNING TRACKS

Guided by the various educational paradigms (Table 2) and the insights of Piaget and Vygotsky (Table 3), two broad types of lesson scripts can be proposed. First, there is a lesson script based on *optional tasks* to ensure that learners who have had access to the same core data can, at various moments, supplement or refresh the input of data according to their personal preferences. This approach is particularly useful when dealing with areas of teaching/learning which are likely to cause difficulties (*learning black spots*). A practical example, of such a lesson script is that of proposing various pedagogic activities to be done in a *pluri-media resource center*. Using books, video tapes, audio-tapes, computer programs and network connections, a custom-made "database" can guide learners to appropriate sections of encyclopaedias, pre-recorded demonstrations, lesson summaries, exercises, etc. The danger with this type of script, however, is that it may ghettoize learners, or reinforce preferences and tastes which may not always facilitate a broadening of the learner's mind.

The second type of lesson script is that based on a *"tunnel" of multimodal activities* to get students to explore different ways of appropriating data. To do this, activities are proposed for learners to enter a pedagogic "tunnel" to try out, for example, different learning styles through a series of activities in order to complete the lesson. This approach implies that learners need to explore different ways of tackling a given subject. In this way learners are likely to do better in some activities, while in others they may need help. Such an approach can prove particularly useful in guided *project work* (*e.g.* case studies, simulations, co-operative activities), *evaluation activities* (e.g. France's innovative *Diplôme de Compétence en Langue* based on a standardised script to validate language abilities[11]) and with *innovative subjects* that demand a significant change in the habits of learners.

A well-laid out lesson scripts can thus: help those with apparent learning difficulties based on their cognitive and perceptual preferences (accessibility); encourage learners to make choices and/or to explore alternative ways of learning to surpass themselves (self-discovery); orchestrate different teaching/learning resources e.g. email, newspaper articles, videos, sound recordings (co-ordination); be adopted based on feedback from learners and acquisition of new resources (updating); demonstrate how financial investments are being used (accountability).

6. CONCLUSION

The underlying idea of our script-based tutoring system is that there is no ready-made recipe for successful learning. Any attempt at increasing the efficiency of a teaching/learning system ultimately depends on matching learner needs and expectations to the cognitive demands of the learning task and to the constraints of the teaching/learning context. But, before tackling the inevitable questions of logistics and costs in setting up such a tutoring system, it is vital to have in place a system of objective measures to evaluate the efficiency of the different types of tutoring schemes in terms of what learners do, what they feel they have learnt, and how feedback facilitates planning and decision-making. This preoccupation in establishing reliable measures linked to a quality assurance approach is the driving force of our ongoing research in this domain.

ABSTRACT

The audiovisual approach in pedagogics, so closely associated with a lock-step view of teaching in the seventies, has undergone a revolution in recent years. By way of examining how teachers can script a body of pedagogic sequences, or lesson, we look at the different phases of the lesson planning process and how a more innovative audiovisual approach can facilitate this process. First, we outline different learning styles as perceived by learners themselves. Second, we propose an overview of the different pedagogic approaches available to teachers. Third, the different phases of creating a lesson script are described based on a scenistic approach. Finally, we suggest two broad types of lesson scripts for the development of personalized learning tracks to demonstrate some of the advantages of having a common platform for apparently contradictory teaching methods, namely linking a narrowly sequential to a broader non-sequential style of teaching.

REFERENCES

Balpe J.P. (1990) Hyperdocuments, hypertextes, hypermedia, Paris: Eyrolles

Colin M. (1992) Cinéma, télévision, cognition. in Processus discursifs, langage et cognition, Nancy: Presses Universitaires

Grangeat, M. (1998) Lev S. Vygotsky (1896-1934): L'apprentissage par le groupe. in Ruano-Borbalan, J-C. (ed.) Eduquer et former. Auxerre: Sciences Humaines Editions, pp.177-183

Kolb, D. (1984) Learning Style Inventory Technical Manual, Boston, MA: McBer

Labour, M. (1998) Que pense l'apprenant de l'apprentissage guidé de l'anglais ? Panorama des représentations des adultes en formation continue, unpublished doctorate thesis. Université de Technologie de Compiègne, France

Leleu-Merviel S. (1996) La scénistique : méthodologie pour la conception de documents en media multiples suivant une approche qualité, unpublished post-doctorate thesis, Université de Paris 8, France

McLuhan, M. (1964) Understanding Media. The Extensions of Man. Mentor Book: New York

Puren, C. 2000. La didactique des langues face à l'innovation. 3rd Conference on the Use of New Technologies in Foreign Language Teaching, Virtual Environments and Language Learning, 23-25 March, Université de Compiègne, France

Seger L. (1998) Faire d'un bon scénario un scénario formidable, Paris: Editions Dixit

[11] http://www.education.gouv.fr/fp/dcl.htm (consulted 11.10.2000)

Analysis of Large Web-Based Courses at the University of Central Florida

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Distance education, as once described by a colleague, is sitting in the back row of a three hundred-seat auditorium. It has traditionally been thought that to successfully teach a large class, you needed to herd students into an auditorium, and proceed to lecture them for several hours. This provides the students with very little opportunity to interact with fellow students or the instructor.

Over the past few years we have discovered that, with the advent of the Internet, large classes (one hundred to one hundred and sixty students) can be successfully taught at a distance. Over the past several semesters we have collected data regarding student perceptions of these courses and the instructor, as well as demographic information. Our results show that not only do the students enjoy taking these courses, but that they are as, if not more, successful in them then in traditional large classes.

At the University of Central Florida, distance education was embraced in 1996 almost as a necessity. With 33,000 students in the fall of 2000, and 52,000 expected by 2010, UCF is growing faster than brick and mortar buildings can be constructed. Until recently, class space was rented during the day at a movie theater nearby.

Distance education provides some relief to this problem. UCF had divided its courses that have a web presence into three categories, enhanced (E), media enhanced (M), and web-based (W). The E courses provide the instructor with the ability to use the web without reduced seat time. The M courses use the web as an integral part of the course and reduce the seat time by 1/3, 1/2, or 2/3. The W courses have no regular class meetings. Some do however have an optional orientation and/or proctored examinations. These course designations are designed, in part, to inform students of the modality of the course. The designations and explanations are listed with the course, as well as instructor contact information, in the course schedule.

Survey Results

Our survey (UCF, 1999) looked at student demographics and perceptions of entirely web-based courses. Three courses were examined over two semesters. Two under graduate courses, with between 110 and 125 students, and one graduate course with 35 students.

The demographics determined from the survey responses indicated a higher percentage of female students then males compared to university norms. 77.6 percent female compared to overall University norms of 54.9 percent female. 49.3 percent of the respondents were employed full time and 37.3 were employed part-time.

The students were asked of their overall satisfaction with the course, from very satisfied to very unsatisfied. 87.8 were satisfied with the course and only 12.2 percent were neutral or un-satisfied with the course. When asked of their likelihood of taking another on-line course, 65.9 percent indicated that they definitely would, 26.5 percent said they probably would, and only 7.6 percent were unsure, or did not wish to take another web-based courses.

Students were also asked to assess the amount and quality of their interaction with other students compared to similar face-to-face courses. 64.7 of the respondents found no difference, or an increase in the amount of interaction. 71.8 of the students found no difference or an increase in the quality of interaction with other students.

Similarly, students were asked to assess the quantity and quality of interaction with the instructor. 67.9 percent of the respondents found no difference, or an increase in the amount of interaction. 77.2 percent of the respondents found no difference or an increase in the quality of the interaction with the instructor.

Methodology

Teaching a large web based course takes quite a different approach then teaching the traditional class. It becomes very much a team effort. The support of all levels of administration, colleagues and teaching assistances is iatrical to the success of the course. The University of Central Florida has put their full weight behind this endeavor. Several new non-academic departments have been developed to support faculty in the creation and development of their courses. Course Development and Web Services provide training and resources for faculty in the form of classes, instructional designers, graphic artists and web programmers. The Center for Distributed Learning oversees the administration and planning of on-line courses as well as other modalities, such as video and interactive television. The Research Institute for Teaching Effectiveness (RITE) was created to lend support to faculty who wish to do research regarding distance education. (Sorg, et. al., 1999).

In addition to support, a better understanding of the learner is needed. Where does learning occur? Does it occur during the lecture, the reading of course text, or in the research of a term paper? How about the library, in study groups or even last minute cramming for an exam? Learning occurs with all of those activities, and more. Learning does not necessarily occur in any one of those activities more then another. Technology's role in the learning process is to enhance the instructor's ability to convey the subject matter to the learner. Distance learning can be used to supplement the traditional course or, in many instances, replace it completely. (Lytle, et. al., 1999)

Learning Tools

The software we use to deliver course content, WebCT, allows the instructor to choose from list of available learning tools. We have found that the use of five to seven of these or other tools is ideal for teaching a totally web based coursc. The ones we have chosen are all asynchronous, never requiring students to meet or work at the same time as one another. Some of the most successful of these are E-mail, forums (discussions), electronic grade book, calendar, quizzes, drop-box, On-line glossaries and a simulated hospital.

While the Asynchronous Learning Network we have developed allows the learner the freedom to work at his or her own pace, the course is still highly structured. Course materials are divided in to "themes". Each theme has reading materials, an activity, homework assignment and quiz. Each theme activity, homework assignment and quiz has a due date during the semester. The student is given between one and two weeks to complete the assignments and take the required quiz. The student also communicates via e-mail and the forums with other students and the instructor. The created illusion of autonomy gives the students confidence. The instructor trusts them enough to work at their "own pace" yet they have other students and the instructor available to support them.

This structure is not only important on the student side, but necessary on the instructor side as well: We have developed a set of standard operating procedure (SOP) for dealing with each of these courses. We know what we need to do and when, to stay on schedule. The students also know from this, what to expect from us.

Ralph Waldo Emerson once said "the years teach much which the days never knew." Time has taught us, through trial and error and trial again, what works for the courses we teach, and what doesn't. What may work for one discipline, may not work for another. What works for us today, may not work tomorrow. It is only through trial and error, and an understanding of the learning process that education may grow with students.

References

J. S. Lytle, B. Lytle, K. Lenhart, L. Skrotsky. (1999). Large-Scale Deployment of Technology-Enhanced Courses. Syllabus, 13 (4), 57-59.

Sorg, S., Truman-Davis, B., Dziuban, C., Moskal, P., Hartman, J., & Juge, F. (1999). Faculty Development, Learner Support, and Evaluation in Web-based Programs. Journal of Interactive Learning Environments, 7(2-3), 137-155.

UCF Distributed Learning Initiative Student Survey. (1999). Orlando, FL: University of Central Florida, Research Initiative for Teaching Effectiveness.

Perceived Difference Between Classroom and Distance Instruction

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Abstract: In an effort to compare the perceived degree of learning and application between different groups of students in terms of gender, instructional delivery formats, length of study time, and learner motivation level, an HRD course of a university was studied. Data analysis was conducted to compare the learning and application difference and the reasons for high or low learning and application were identified and categorized. From the findings, issues in distance learner, instructor, and instructional design to enhance learning and application were discussed.

Introduction

In comparing the learning difference between classroom instruction and distance education method, several studies have revealed that there is no significant difference between the two (Relan, A. & Gillani, 1997: Russell, 1999; Wentling & Johnson, 1999). Even though comparing the learning difference between different delivery formats has been a major research focus in distance education, seldom has been conducted to identify the difference in learning application between classroom and distance instruction (Ravitz, 1997; Wentling & Johnson, 1999). One problematic situation in higher education is that most classroom and distance instructions have focused not on the application of learned subject content but on the conceptual understanding of the subject content. From several research studies, it was identified that a high degree of learning does not always result in a high degree of application because there are many factors inhibiting application of the learning during and after the instruction (Foxon, 1997; Lim, 1999).

Along with this learning application issue, promoting a high degree of learning and learning application in virtual environment has become another important issue in higher education as more universities and colleges try to develop and deliver quality distance instruction. While we can apply many of the learning application strategies for classroom instruction to designing an applicable distance instruction, it is still a fact that distance instruction requires unique strategies to meet the needs of distance learners' learning and application of their learning in virtual environment. Different delivery formats such as satellite-based and web-based instruction within distance education even may have to adopt different instructional strategies to satisfy unique learning needs of each delivery format.

Methodology

To address the issues of learning and application in classroom and distance instruction, finding the reasons why certain delivery formats (i.e. web-based, satellite-based system) incur a high or low learning and learning application and deploying appropriate instructional strategies to enhance students' learning and application seem critical to assure high quality distance learning. In order to identify these instructional needs, the purpose of this study is to compare the perceived degree of learning and application of learning made by different groups of students in terms of gender, delivery format, study time, and motivation level and identify instructional strategies and design factors promoting higher learning and application.

The subjects for the study included nineteen undergraduate HRD (Human Resource Development) major students who took an instructional systems design course through the three different delivery formats (web-based instruction, classroom, satellite-based instruction) respectively at a mid-western university. Among the students, eight students had taken the course through web-based instruction, six students through satellite-based instruction, and five students through classroom instruction respectively. All students were given an option to select one of the three delivery formats voluntarily during the course registration period.

The instructional systems design course was designed for the three delivery formats and delivered by an instructor. The classroom instruction was delivered in a multimedia classroom equipped with satellite-based delivery capability where the classroom and the satellite-based instructions were implemented simultaneously. The satellite-based system utilized one-way video and two-way audio communication system for instruction.

An online questionnaire was developed to obtain the students' perceived degree of learning and application for the thirty-four learning objectives extracted from the instructor's lesson plans that were used during the semester. The questionnaire also asked reasons for high or low learning and learning application made by the students during the class. The question items used a five point Likert-type scale to measure the perceived degree of learning and application. Students were asked to complete this online survey at the end of the semester. The study times spent by the students who took the web-based instruction were assessed by asking each student's study time for one learning module in a logout form at the end of each learning module.

The data analysis of the study utilized both quantitative and qualitative analysis. The differences in the degree of learning and application were analyzed using Kruskal-Wallis Test for the three student groups of different delivery formats. Mann-Whitney Test was used for other comparison groups such as gender, motivation, study time since the mean scores of the perceived degree of learning and application for the comparison groups did not show normal distribution. The reasons for high or low learning and application were identified and classified into categories.

Findings

Learning and Application

In order to identify what was learned or not learned from the course, the students were asked to rate their perceived degree of learning for each of the 34 learning objectives of the course. As a group, the nineteen students indicated a fairly high perceived degree of learning. The population mean score for the perceived degree of learning was 4.04 on a 5 point scale (scale range was 1 to 5), which indicates "mostly understood" in the rating scale of the questionnaire. Further analysis was conducted to examine the differences in the degree of perceived learning between the different student groups in terms of gender, delivery format, study time, and learner motivation. In general, it was found that there were no significant differences in the perceived learning between the groups as shown in Table 1. As a whole group (8 students in the web-based instruction), the average time to study a learning module (one learning module was equivalent to one week's study load) was 83.2 minutes.

The mean scores of all students' perceived degree of learning application was 3.89, which can be interpreted as "frequently applied". Regarding the perceived learning application differences between the groups, it was found that there was no significant difference. In comparing the perceived degree of learning and learning application made by the students, there was a high relationship between the two. The Pearson's correlation between the mean scores of learning and learning application showed a high degree of relationship (.896) at the 0.01 level (2-tailed).

	N	Mean	SD	p^b
Male	10	4.11/4.05[c]	0.76/0.70	.968/.604
Female	9	4.05/3.80	0.74/0.91	
Internet	8	4.07/3.97	0.60/0.58	.995/.828
Classroom	5	4.01/4.06	0.91/0.92	
Satellite	6	4.16/3.80	0.85/1.09	

Shorter	4[a]	3.75/3.64	0.60/0.42	.343/.114
Longer	4[a]	4.40/4.30	0.46/0.56	
Higher motivation	11	4.32/4.04	0.64/0.85	.152/.351
Lower motivation	8	3.76/3.79	0.77/0.80	

[a] The number of students who took the web-based instruction.
[b] Exact significant value (1-tailed significance).
[c] Left and right values indicate the mean scores for learning and learning application respectively.

Table 1: Perceived learning and learning application differences

From the qualitative analysis, several reasons have been identified as the factors to promote high learning. Among them, instructional effectiveness, instructor effectiveness, and learner motivation were found as the major categories for the reasons to enhance students' learning (accounted for 70% of the reasons for high learning). Some example reasons of the instructional effectiveness are: instructional design, interactive interface, and learning activities. According to the different delivery formats, certain reasons were more frequently replied from a certain group. For example, reasons in instructional effectiveness were mostly replied from the web-base instruction group while reasons in instructor effectiveness were mostly replied from the satellite-based instruction group. Several reasons were found to inhibit the student learning. Some instructional design factors (unclear content, not applicable content, too much information for a class), personal reasons (miss the classes, lack of interest, short of time to study, short attention span), and lack of opportunity use the learning are those reason categories that negatively influence the student learning.

The reasons for high application of the learned content varied. First, the most frequently replied reason was that the learning content was constructed in such a way that it could be applied to students' studies and current job tasks. Opportunity to use the learning on the jobs and during the instruction was another major category of reasons for high application. High understanding and interest toward the learning content were also found as another category of reasons promoting high application of the learning. Regarding the reasons to negatively affect the application of student learning found, those were low degree of learning, not applicable to the students' jobs and tasks, lack of opportunity to use, and lack of interest.

Instructional Design Issues

When the students were asked to provide their specific learning experience from the instruction, diverse opinions and feelings could be collected and categorized. The first category was the interaction and interface design of the instruction. Some representative comments made by the students were:

- need to reflect students' dominant learning style to designing the instruction,
- appropriate grouping of student work groups,
- more time to practice the learning during instruction,
- alternate way to complete group project in case a group work didn't work well,
- more instructor/student and student/student interaction, and
- weekly chat session to promote more interaction between students.

The second category of the students' responses was issues in delivery and student support. Some expressed concerns were:

- fast feedback of the assignment and questions raised during self study,
- fast technical assistance,
- timely announcements of class activity on the web page, and
- providing basic computer skills class before the class starts.

For asking the general quality of web and content design of the instruction, most students replied that the web design was good and constructed in a user friendly manner so they could move around the learning module web pages easily. Regarding the content design, several students indicated that the text was designed clearly so they can find the main points at a glance. The layout of the text content was said to provide clear instructional cues for student's learning process. Other comments were also added that the text layout was structured to display plenty of information into meaningful chunks and units. The graphics used in the instruction were said to be very attractive and represent appropriate information for the instruction. Multimedia components of the instruction were indicated to be effective since they were used only when the multimedia content was needed for students' learning.

Discussion

Learning and Application

From the data analysis, it was identified that there was not a significant difference in the perceived degree of learning between the groups. This finding supports Russell's (1999) research study claiming there is "no significant difference" in learning between the classroom and distance instruction in general. One valuable finding from this study is the fact that the "no significance" symptom occurs even in the application of learning for the comparison groups. From this finding, it can be argued that attaining certain level of learning and application of learning from a course may not be severely influenced by the different types of delivery formats. Rather, it may be influenced more frequently by instructional design factors and strategies that decide the quality of the instruction.

One major benefit of using web-based instruction in higher education was found to exist from this study. The finding of no significant learning and application difference between the shorter and longer study time groups may be interpreted as an evidence that each student could study the lessons by their own pace and competency level, which resulted in different study times between the students while attaining the same level of learning and application. This finding provides a rationale to use self-paced and individualized learning method for web-based instruction. The no significant difference between the higher and lower motivation groups, however, seemed contrary to the general notion that higher motivators learn and apply better. One possible reason for this finding might be because the small sample size does not have enough power to detect the difference between the higher and lower motivation groups.

Instructor Effectiveness in Satellite-based Instructional System

Instructor effectiveness was identified as one of the major factors affecting student learning and learning application for the satellite-based instruction group. Nine out of the eleven responses regarding the reasons for high learning were replied from the students in satellite-based instruction group. This finding seems natural since the instructor of any satellite-based system, as a subject matter expert and facilitator of the learning, becomes the major conduit to deliver learning content to the students. Among the several factors in instructor effectiveness, clear presentation is the most frequently replied response. This finding leads to a recommendation to provide appropriate training of presentation skills for the instructors using satellite-based system. Other competencies required for the instructors might include instructor's command of the subject matter, use of class time, way of summarizing or emphasizing important ideas in class, use of examples and illustrations, use of challenging questions, and listening skills.

Instructional Design Issues

The study findings also raise several issues and problems related to web-based instruction. When delivering instructional content through web-based delivery method, the quality of instructional design factors seems to be critical for student learning and application. Among the reasons for high or low learning, reasons in instructional design factors were ranked as the top reason category for making student learning successful or unsuccessful in web-based instruction group. A recommended instructional strategy to promote high learning and application for web-based instruction is adopting diverse learning activities such as case studies, scenario analysis, simulations, individual and group project, and frequent short quizzes checking students' learning progress to retain student motivation throughout the course.

Applicability of learning content is another instructional design issue found from the study.

Applicability of learning content was indicated as one major reason category for both high and low application of learning. To make a learning experience meaningful for students in higher education, the learning content needs to be "applicable." Several recommendations are advised to enhance learning application. First, instructional content need to be constructed plain and simple enough to be applied to students' studies and current tasks involved. In many cases, heavy use of text presentation to explain theories, principles, and concepts in web-based instruction is not effective for student's application of learned content. The learning activities to solve this problem are case studies, short fill-in question items asking application examples of the learning content, scenario analysis, peer evaluation of class assignments, web searches for application examples, and group and individual projects. Second, as Baldwin and Ford (1988) recommend, the learning content needs to be identical or at least similar to the actual application settings. Developing class assignments that have similar construct and procedure with the learning content is one effective way. Providing individual practice followed by a step-by-step guided practice after a segment of instruction is another strategy to promote application of the learned content not only to similar but even to different context.

Conclusion

This study has identified several facts about college students' learning and application experience occurred in an HRD course from a mid-western university. Even though the size of the population limits the generalization of the study results, several issues in instructional design were stemming from the study findings and possible solutions and recommendations were seek to enhance student learning and learning application. One major contribution of this study to the related study fields is that the symptom of no significant difference between face to face and distance instruction is found not only from the learning but also from the learning application. The generalization of this finding, however, may need another set of studies using a broader population in national level.

One distinct benefit acquired from this study is that the findings provide basis to choose various instructional strategies to improve the technology-based instructional delivery methods. As instructors or instructional designers, our major concern is then to test and wisely apply these instructional strategies to design an effective instruction. The effectiveness of the instruction, however, will be dominantly affected by the level of our experience and insight toward these instructional strategies and concerns for more meaningful application of these strategies in our instruction.

References

Baldwin, T. T., & Ford, J. K. (1988). Transfer of training: A review and directions for future research. *Personnel Psychology,* 4(1), 63-105.

Foxon, M. J. (1997). The influence of motivation to transfer, action planning, and manager support on the transfer process. *Performance Improvement Quarterly,* 10(2), 42-63.

Hagman, J. D., & Rose, A. M. (1983). Retention of military tasks: A review. *Human Factors,* 25(2), 199-213.

Huczynski, A. A. (1989). Training designs for organizational change. *Management Decision,* 27(4), 27-35.

Lim, D. H. (1999). Organizational and Cultural Factors Affecting International Transfer of Training. *Performance Improvement,* 38(3), 30-36.

Ravitz, J. (1997). Evaluating learning networks: A special challenge for web-based instruction. In B. H. Khan (Ed.), *Web-based instruction* (pp. 361-368). Englewood Cliffs, JN: Educational Technology Publications.

Relan, A. & Gillani, B. (1997). Web-based instruction and the traditional classroom: Similarities and differences. In B. Khan (Ed.), *Web-based instruction*. Englewood Cliffs, JN: Educational Technology Publications.

Romiszowski, A. (1997). Web-based distance learning and teaching. In B. Khan (Ed.), *Web-based instruction*. Englewood Cliffs, JN: Educational Technology Publications.

Russell, T. L. (1999, September 15). No Significant Difference Phenomenon [WWW document]. URL http://cuda.teleeducation.nb.ca/nosignificantdifference

Wexley, K. N., & Nemeroff, W. (1975). Effectiveness of positive reinforcement and goal setting as methods of management development. *Journal of Applied Psychology*, 64, 239-246.

Wentling, T., & Johnson, S. (1999). The design and development of an evaluation system for online instruction. In P. Kuchinke (Ed.), *Academy of Human Resource Development Annual Conference, 1999*, Academy of Human Resource Development, Washington, D.C. 548-553.

Yamninll, S., & McLean, G. (1999). Theories supporting transfer of training. In P. Kuchinke (Ed.), *Academy of Human Resource Development Annual Conference, 1999*, Academy of Human Resource Development. Washington, D.C. 1116-1123.

On-Line Delivery of Multimedia Courseware

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Abstract: This paper introduced some methods of using the Web as a template to deliver multimedia courseware, including CBI (computer-based-instruction) applications created with multimedia authoring tools and tutorials accompanied with the applications. The author converted CBI applications created with *ToolBook, HyperStudio,* and *Director* into the Web version and then delivered them on the Web as an on-line courseware package. From the perspective of instruction, this project extended the concept of computer-based-instruction to a Web environment. From the perspective of technology integration, this project increased the uses of technology in school classrooms and, meanwhile, it reduced the equipment requirements to schools. From the perspective of information delivery, it used the Web as the template or organizer to deliver the courseware, instead of using certain particular software environment.

Introduction

Multimedia learning environment has been found effective to stimulate students' thinking and memorizing process, and to enhance learning (Wadsworth, 1992; & Alessi, & Trollop, 2001). In the field of education, the term "multimedia" indicates computer-controlled interactions of information from different media—text, sounds, images, graphics, video, and recently, Web resources; and computers control the multimedia via authoring tools (Simkins, 1999; & Grabe & Grabe, 2000). Computer-based-instruction (CBI) refers to the use of multimedia authoring tools such as *ToolBook, HyperStudio, or Director* to develop a lesson, drill, or test for the purposes of presenting information, reinforcing or assessing instruction and learning, which are implemented in that particular authoring environment (Criswell, 1989; & Gibbons & Fairweather, 1998). When we talk about multimedia courseware, it refers to a package consisted of CBI components, the use of other media, or paper-print of course documentations/materials (Ivers & Barron, 1998; Elin, 2001; & Lockard & Abrams, 2001). Originally, courseware—that appeared as educational software—was designed and implemented by computer software experts. Teachers could only use the existing products. One common issue was that teachers had difficulty in finding appropriate existing software that could fit the particular learning/teaching purposes, no matter how well developed the software was (Tiene & Albert, 2001). Therefore, a practical idea was that teachers develop their CBI programs themselves to achieve specific goals/objectives of learning/teaching. This became possible while more and more multimedia authoring tools were available (Zahn, Azhn, Rajkuma, & Duricy, 1999; & Alessi, & Trollop, 2001).

Using self-developed CBI programs brought out many critical issues to teachers and students, among which courseware delivery was a major one that we need to deal with. After the CBI program was completed, how can our students access them (Tiene, & Albert, 2001)?

The author taught three graduate level multimedia design courses offered by the Instructional Technology Master program. In these courses, students learned three authoring tools (*ToolBook, HyperStudio,* and *Director*) and developed courseware packages. Most students in these classes were school teachers. They hoped they could use their courseware for their classroom teaching. However, their schools did not have the software for their classrooms, and most public schools were lack of budget to purchase these expensive multimedia authoring-tools for students' use. Therefore, the author started the current project trying to convert the courseware packages into Web version, and put them on the Web. The purposes of this project were to (1) explore the effective and convenient methods to do so, and (2) develop instruction modules for students/school teachers to learn the methods.

Products from Three Instructional Technology Courses

The first course was titled "Computer Assisted Instruction." The purpose of this course was to apply the principles of instructional systems development to the design of instruction and training to be delivered via a computer-based model. The computer laboratory tasks focused on the construction of a lesson using an authoring tool—*ToolBook*. In Figure 1, "The Types of Graphs" is one "page" from a lesson unit "Construct Graphics" developed by student.

"Theory and Design of Computer Based Instruction" was an advanced course that investigated several theoretical strategies appropriate to development of computer-based instruction (CBI). Principles and methodologies of information systems development were applied in the context of instructional systems design process. Computer laboratory tasks enabled students to use the more complex functions of authoring tools and Web based applications in constructing a CBI lesson. *Director* was the major tool for the CBI project. In Figure 1, "Charting a Filling" is one "stage" of a training unit (*Director* program) "Dental Charting" developed as a team project.

The third course was "Technologies in Reading" -- A course designed to help teachers develop technology-based reading instruction. Emphasis was on integrating current computer technologies and software applications into reading curriculum design. Course content included designing reading segments on phonemic awareness, vocabulary development, comprehension, and writing, using presentation, graphics, and multimedia authoring software *HyperStudio*. In Figure 1, "Can You Identify a Setting?" is one "card" of a lesson unit (*HyperStudio* program) "Read a Good Book and Write a Good Story" developed to assist children's reading and writing.

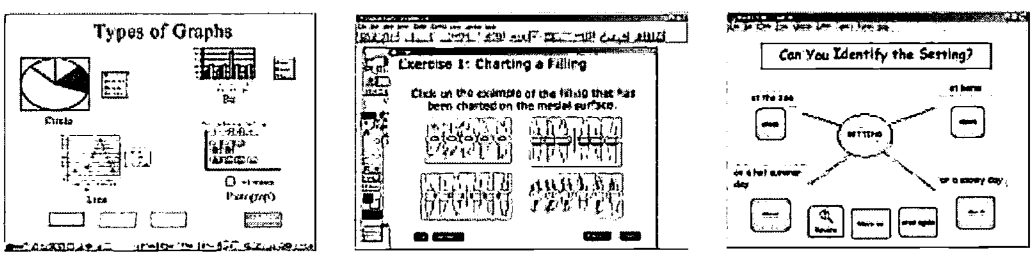

Figure 1. Sample CBI Projects Developed with Authoring Tools

In the three courses, at the phase of project planning, students had the options, and were encouraged, to choose the topics that they could use in their real life teaching or work. At the point they completed this course, some of them implemented a complete short program; some of them well developed a structure of a huge program and completed one or two sections as the lesson units. They were anxious to test the programs in a real life setting, rather than the final project presentation, and to examine students' learning effect. Then, came the problem to deliver the program to the classrooms.

Issues of Courseware Delivery

Traditionally, these CBI programs only can run in the same environment in which they were developed. That is, for example, as in the above sample projects, the "Construct Graphics" only can run in the *ToolBook* environment, the "Dental Charting" only in *Director*, and the "Read a Good Book and Write a Good Story" only in *HyperStudio*. In order for students to use the CBI programs or the courseware packages in classrooms, they must have the particular authoring software installed in their computers. Therefore, the issue is whether or not our schools can afford to purchase enough copies to support each classroom. The educational site license price of *ToolBook* is around \$300 per copy, around \$240 per copy for *Director*, and around \$90 per copy for *HyperStudio*. There is no statistics that shows the distribution of software in schools. But, the interesting situation was: there were around 48 students in the three classes; none of them had the authoring software available in classroom or at work.

Some other issues, such as hardware capacities and Mac-PC compatibilities, are also need to be considered. Are the hardware capacities powerful enough to support the software? Can we use the programs across different platform?...

So, what is the point if our students worked through the courses and learned to develop course packages but there is no environment for them to use their knowledge, skills or products? The search for a technique solution led us to the Web; with the rapid development of World Wide Web, Web applications have been available in almost all the areas (Khan, 1997; Niederst, 1999; & McCormack & Jones, 1998). Online courseware delivery may provide a new or different conceptual framework for "computer-based instruction."

Online Courseware Delivery

There are four major steps to deliver the courseware on the Web:

1. Converting CBI program into HTML files
2. Editing HTML files
3. Uploading the courseware HTML files on the Web
4. Downloading, installing, and setting the properties of multimedia Plug-Ins

In each step, some technique problems need to be considered and dealt with carefully. The procedures were written into several lab modules that can help our further students, or school teachers, learn the techniques of online courseware delivery. From the experience of converting project files created with the three authoring program, the author found that the following tips were very useful and sometimes were very easy to be ignored.

Converting HTML Files

First step is to convert the CBI programs into Web version--HTML files. Programs developed with the three authoring tools require different conversion procedures. To convert *HyperStudio* stack to HTML, from Extras menu, choose Export Webpage, and in the Save Web page dialogue box, save the file as HTML file.

Converting *Director* programs (movies) is called "making movies for the Web." Before you convert the movie, make a back copy of it. Because after you convert it, there is no way to decompress it and recover the original file. Next, set up the movie playback properties (See Figure 2). Then save the file as *ShockWave*

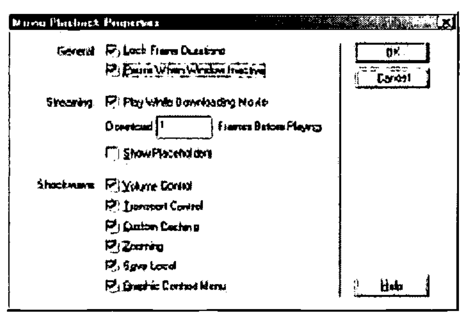

Figure 2. Set Movie Playback Properties to Convert Director Movies into HTML

file, as well as generate it into HTML. You should have one *ShockWave* file and one HTML file.

To convert *ToolBook* files (books), the complex procedure is to set up the HTML Export properties. Different from Director movie conversion, each page in the "book" is saved as one HTML file. That is, if we have 30 pages in the program, we will have 30 HTML files—similar as the conversion of *PowerPoint* presentation slides.

Editing HTML Files

After the program is converted into HTML file, some editing work is necessary before uploading them on the Web. For example, the title appears on the first page of the converted *Director* movie is automatically converted using the original file name. As in Figure 3, the title is "web-standardtest.dcr" that is the original file name of the CBI program. We need to edit this HTML file changing it an appropriate title. Also, we need to develop a Web page as the organizer to navigate the *HyperStudio, ToolBook* and *Director* CBI applications and necessary course materials.

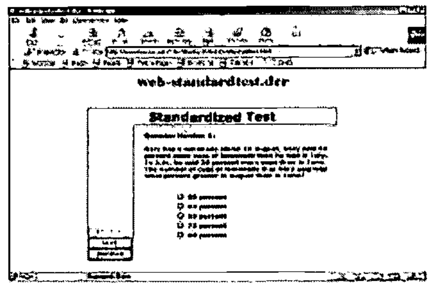

Figure 3. Director CBI Web Version

Uploading HTML Files onto the Web

We can use FTP to upload the HTML files on the Web. One thing different form uploading common Web pages is that both the HTML files and original files (*HyperStudio, ToolBook* and *Director* CBI files) should be uploaded onto the Web and in the same folder. For Director, all HTML file, ShockWave file, and the original movie file should be uploaded.

Working with Multimedia Players—PlugIns

The last step is to download and install PlugIns. To obtain the multimedia interactive effects, we need multimedia players in the computers that the users/students worked on. Even though all the necessary files are on the Web, the online programs won't work without the required PlugIns installed in the computer. In Table 1, listed are the URLs for free downloading all the PlugIns for running *HyperStudio, ToolBook* and *Director* CBI courseware on the Web.

Table 1. Multimedia Players—Plug-Ins for Running Online CBI Programs

Plug-Ins	Download Site URLs
Neuron-for *ToolBook*	http://home.click2learn.com/products/neuron.html
For *ToolBook 7.2*	ftp://ftp.asymetrix.com/pub/tb2/neuron/72/neuron.exe
For *ToolBook 6.5*	ftp://ftp.asymetrix.com/pub/tb2/neuron/6x/cbtsystems/neuron65.exe
For *HyperStudio*	http://www.hyperstudio.com/resource/hsplugin/plugin.html
Shockwave and *Flash 5* Player—for *Director*	http://sdc.shockwave.com/shockwave/download/triggerpages_mmcom/default.html
Quicktime 4.1.2	http://www.apple.com/quicktime/download/

It seemed, to the author, that the most complex portion of this project was to deal with plug-ins. Each program required different plug-ins to run it. The latest versions of browsers have the built-in plug-ins for most multimedia programs. But, the users/learners' computers may run different versions of the browser. Therefore, downloading the multimedia players from the web sites of each software company was the important step before the courseware could run on the Web.

Figure 4 shows some examples of the online CBI projects developed by students from the three classes:

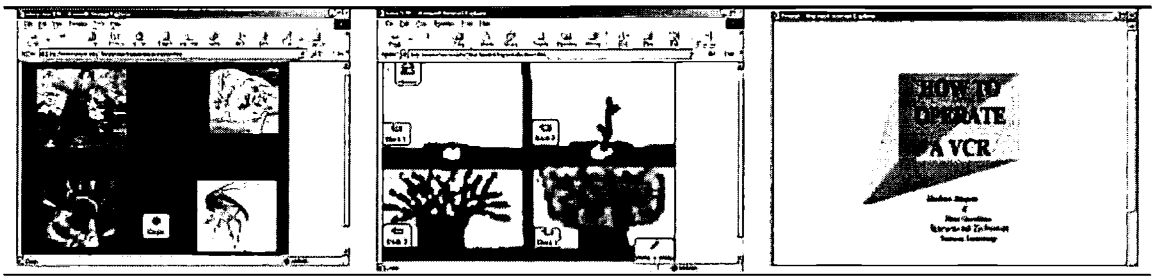

Figure 4. Examples of Online CBI Projects

Outcomes

Because contents and schedules of the three courses did not allow enough time to add one more project like this, the author provided students the modules to the classes as an optional project. Some students tried it and students tried their online programs: one did with her third grade class; the other one shared with her colleagues. Some feedbacks indicated that students showed more interests in learning with the on-line courseware, they were motivated to spend more time on the learning topic/concepts through the courseware than they did in traditional learning, and their interaction with the program provided them more opportunities to rehearsal what they learned. Also, some other schoolteachers felt that this was convenient, and especially those non-technology teachers felt that using technology in classroom was not something in the air.

This project also resulted in the revision of the three instructional technology courses and advanced the technology levels of the three courses to keep up with the contemporary technologies. The author revised the course syllabus adding the online delivery contents into course work.

Summary

Overall, this project was implemented in two dimensions: (1) technically, the author explored the necessary techniques of designing a multimedia courseware package in the Web environment, develop a technical model of implementing such courseware, and design a sample interactive on-line lesson including CBI designs (using authoring tools) and course materials, and (2) instructionally, the author developed instructional modules for students to learn the techniques to create such on-line courseware.

This project went beyond the normal scope of courseware design in three ways. First, from the perspective of instruction, it extended the concept of computer-based-instruction into a Web environment.

Second, from the perspective of technology integration, it increased the uses of technology in school classrooms for more students and in a wider range and, meanwhile, it reduced the equipment requirements to schools.

Third, from the perspective of information delivery, it used the Web as the template or organizer to deliver the courseware, instead of using certain particular software environment.

Further experimental study would be conducted to examine the learning effect of on-line courseware. Also, we are expected to explore or deal with more technique issues that might occur because of the continuous development of new technologies.

References

Alessi, A. M., & Trollop, S. R. (2001). Multimedia for leaning: Methods and development. Boston: Allyn and Bacon.

Elin, L. (2001). Designing and developing multimedia. Boston: Allyn and Bacon.

Grabe, M., & Grabe, C. (2000). Integrating the Internet for meaningful learning. New York: Houghton Mifflin.

Criswell, E.L. (1989). The design of computer-based instruction. New York: Macmillan.

Gibbons, A. S., & Fairweather, P. G. (!998). Computer based instruction. Englewood, Cliffs., NJ: Educational Technology Publications.

Khan, B. H. (1997). Web-Based instruction. Englewood, Cliffs., NJ: Educational Technology Publications.

Ivers, K. S., & Barron, A. E. (1998). Multimedia projects in education: Designing, producing, and assessing. Ehglewood, CO: Libraries Unlimited.

Lockard, J. , & Abrams, P. D. (2001). Computers for twenty-first century educators. New York: Longman.

McCormack, C., & Jones, D. (1998). Web-based education system. New York: Wiley Computer Publishing.

Niederst, J. (1999). Web design in a Nutshell: A desktop quick reference. Paris: O'Reilly.

Simkins, M. (1999). Project-based learning with multimedia. *Thrust for Educational Leadership, 28*(4), 10-14.

Tiene, D., & Albert, I. (2001). Exploring current issues in educational technology. Boston: McGraw-Hill.

Wadsworth, B. J. (1992). Piaget's theory of cognitive and affective development. New York: Longman.

Zahn, S. B., Azhn, C. J., Rajkuma, T. M., Duricy, M. D. (1999). Using multimedia as a communication tool. *International Journal of Instructional Media, 26*(2), 221-229.

Teaching with Geographic Information Technology

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Abstract: This paper highlights curriculum designed to train pre-service and in-service teachers to teach with geography technology. Because geography, like many disciplines, has evolved into a field that implements technology into many areas of research, teacher educators must incorporate the teaching of geographic technology into their education curriculum. One particular area of geography, which has developed over the past decade is known as Geographic Information Science (GISci) and involves the gathering, manipulation, analysis, and display of spatial information. The burgeoning of this new science presents geography educators with several challenges: how do we teach pre- and in-service teachers to implement the new technologies in their classrooms, can in-service teachers use the new technologies to help create educational materials for the changing geography curriculum, can new geography technologies help present and future educators better understand the field of geography, and can we help educators to use the technologies to build geographic resources for their classrooms.

Introduction

All disciplines are part of the information age; the extent to which information technology is adopted varies from field to field. Geography is the study of the surface of the earth and includes the study of people, the environment and their interaction; it "combines a description of places with the formulation of principles and concepts [and] it promotes an understanding of patterns, processes, and the resultant landscapes on the planet (Hardwick and Holtgrieve, 1996 p.6). As a result, the focus of the discipline is volatile; we witness in the evening news everyday the massive changes occurring around the earth, from natural events, such as hurricanes, floods, volcanoes, or earthquakes to cultural events, such as political coups, massive immigration, or medical disasters. Because of the volatility of what geographers study, the field itself has seen major theoretical and philosophical shifts throughout its academic history. The most recent shift is occurring today, as society moves even further into the information age. Geography is at the forefront of technological development and implementation and has developed the new sub-field of GISci. The development affects the way geographers view geography and, therefore, the way geographers are teaching geography.

GISci Defined

GISci is the study of spatial information, utilizing various technologies. In its most simplistic definition, this area of study includes three components: remote sensing (the data gathering component), Geographic Information Systems (GIS) (the data manipulation and analysis component), and cartography (the data display component); each is defined below.

Remote Sensing

Remote sensing may be defined as reconnaissance from a distance; what makes the data collection intrinsically remote sensing is that the instrument used to gather the data is not in contact with the object of study. Several instruments may be used in the process of remote sensing, but the two most common platforms are aerial photography and satellite sensors. The sensors compile images in two primary ways, by either actively sending signals or by passively receiving light (Lillesand and Kiefer 1994). First, some sensors transmit radar signals, which hit an object on the earth and return to the instrument, providing a visual image of the objects on the surface. Second, sensors can detect the length as well as amount of electromagnetic radiation emitted or reflected from objects on the earth. The EMR received by the sensor forms a photograph of sort of the objects on the surface. Scientists identify various features based on the varying amounts of EMR they emit or reflect. All of these images allow for geographic studies including analyzing the changes in areas of ecological concern such as the Brazilian rainforest or the polar ice caps. Time series images captured in these areas allow scientists to ascertain the land use or land cover changes in the rainforest or the change in area of the ice caps.

Data gathering is also accomplished with Global Positioning Systems (GPS) and remote sensors to aid in data gathering. GPS allows geographers to record with accuracy within centimeters the absolute and relative position as well as attribute data of spatial objects. GPS units, which may be small hand-held units up to large field-grade units receive time signals transmitted by a constellation of about 24 satellites maintaining separate orbits, each approximately 11,000 nautical miles above the surface of the earth (Campbell 2001). Each satellite signals at the speed of light in all directions; the signals include the time the signal was sent (measured on highly accurate atomic clocks) as well as the exact location of the satellite in its orbit. The GPS unit receives signals from multiple satellites (ideally from at least 4) and determines the unit position based on the linear distance calculated between the unit and each satellite from which signals were received.

GIS

Through computer software specifically designed for GIS, scientists use spatial data to solve geographic problems. A spatial database includes objects' x,y locations and attributes (qualitative and quantitative). A GIS program provides an organizational framework in which links between the attributes and locations allow the GIS user to conduct spatial analyses. Organizational structures include attribute tables that store data for points, lines and polygons, a map area that allows the user to see a graphic depiction of the data, identifier tables that reveal the results of a query, and layered data that may be analyzed independently (per layer) or wholly (per project). Environmental data such as soil type, ground cover, and water table data entered into a GIS program could help scientists determine the best location for a landfill, an animal refuge, or a commercial development.

Cartography

Cartography is the art and science of mapping and provides a data display method that allows all geographers to represent their spatial information using continually advancing mapping technologies. As a separate discipline, cartography has a rich and long history (over 2000 years) and many researchers conduct cartographic research completely outside the domain of GIS and remote sensing. However, most applied cartographic work is now conducted with GIS software and in conjunction with GIS or remote sensing research or projects.

Educational Applications of GISci

While GISci is a burgeoning sub-field within geography, much of the focus of GISci instruction and research reveals the building blocks of the entire discipline of geography, in general. Pre- and in-service teachers, in particular, would benefit from additional instruction in GISci. Traditionally, the geographic education or teachers was conducted in a classroom over the course of a term. However, because of the nature of GISci, the discipline is well-suited for teaching and learning in the format of a workshop or seminar series. Presented below are four ways in which pre- and in-service teachers may be trained in the area of spatial information technology.

1. Teach pre-service and in-service teachers how to incorporate geographic information technology into their curriculum.

Global Positioning Systems (GPS) may be used to help teachers enforce basic geographic concepts. World coordinate systems, such as latitude and longitude, as well as mapping are part of the geography curriculum as early as the third grade. Teachers can use GPS units with students on the school grounds to illustrate coordinate systems. With units set to a navigate position, students can walk north, east, south, and west routes and observe how the direction, distance, and latitude/longitude coordinates change as they walk. Also, GPS units can record coordinates for points (fire hydrant, mailbox, or lamppost), lines (sidewalk, slide, or path), and areas (pond, sandbox, or parking lot). The recorded points, which are stored in the unit, may be downloaded easily into any geographic information systems program. With the GIS program, the teacher and students can color-code each attribute to create a GIS database of the school. Students can also enter spatial attribute information on the school community available from sources such as local governments or the US census bureau (the bureau provides community level socio-economic data throughout the US in digital format called TIGER files) to create a database for the entire school district. These data can be used to solve hypothetical geographic problems, such as where to locate new schools, fire stations, or soccer fields. In addition, the data in the student-created community GIS database may be used to design thematic printable maps of the community.

Remotely sensed satellite images are publicly available from a variety of sources. Agencies such as NASA or SPOT (a private French company) provide images for purchase or free. The quality and resolution vary by price, but high-resolution images of many areas are available for nominal charge or free through the US government. In fact, NASA maintains a link on their web-site designed to provide materials specifically for educators and includes a table of contents of images, instructions for downloading, and suggestions for classroom use (see Figure 1).

Teachers can use these images in many areas of the geography curriculum. For example, remotely sensed images taken throughout the year show the browning and greening process of deciduous vegetation. They can also show the land use patterns of local communities and land cover changes, such as deforestation or desertification. Figure 2 contains images gathered in 1984 and 1990 by the NOAA satellite. These images illustrate the reduction the Sahara Desert experienced after four years of steady and significant expansion. Also, thematic maps created from the geographic information systems technology can be overlaid on remotely sensed images of the same area to create orthophotographs, which help students understand the concept of spatial distribution and mapping (Figure 3).

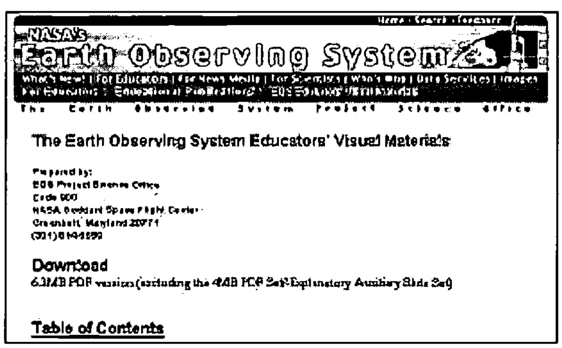

Figure1: NASA educational materials (http://eospso.gsfc.nasa.gov/eos_edu.pack/toc.html)

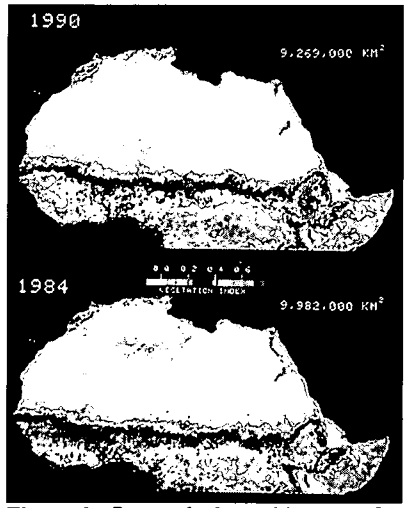

Figure 2: Remotely Sensed images of Sahara Desert Reduction

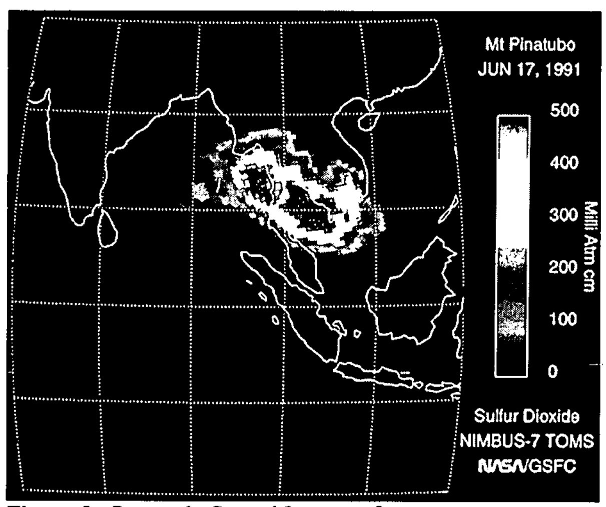

Figure 3: Remotely Sensed Images of
Sulphur Dioxide Released from the Eruption of Mt. Pinatubo

2. Teach present and future teachers to use spatial information technology to create educational materials for their classrooms.

   GIS software, such as ESRI's ArcView can be used quickly and easily to create many types of maps for use as supporting educational materials. These GIS programs make available a plethora of empty basemaps (counties, states, countries...) that can be printed and used for geography projects such a map development or place-name exercises where students can draw their own map symbols and include missing data (drawing in missing rivers, streams, or lakes for example).

   In addition, GIS programs allow for easy incorporation of thematic data, which may be used to create thematic maps showing specific socioeconomic or physical data distribution. These maps provide an invaluable resource for teaching human, cultural, or physical geography. A linguistic map can accompany a lesson on cultures; a population distribution map can provide graphic display for a lesson on US migration; or, a map representing the flow of goods can help students better understand the topic of world trade.

The thematic data are widely available from national sites such as the USGS (www.usgs.gov), the census (www.census.gov) as well a local or state sites such as state DNRs. Also, the data are often accessible in a format that can be opened directly in a GIS program. Acquiring ready-made data sets significantly streamlines the task of creating maps. With a reasonable working knowledge of ArcView, the thematic map in Figure 4 is very quickly created, from beginning (locating the data) through the creation (opening in ArcView and highlighting the desired theme) to printing the final map.

3. Use GISci technology to help teachers better understand geography.

Geographers in all areas amass and analyze a great deal of information. Throughout the discipline, scientists are turning to GISci as a method of data collection, analysis, and display. The basic principles of GISci are geographically universal and an understanding of these principles provides the foundation for basic geographic theory. Geography is necessarily the study of all things spatial and GISci provides the theories and methods behind the gathering, analysis, and display of spatial information. An understanding of the application of spatial information technology provides a basic understanding of geography, itself. As a result, introductory level courses in GISci are required in most teacher preparatory programs. These courses introduce teachers to basic concepts such as data gathering methods, data measurement, data manipulation, data visualization, analyses, mapping, and distinguishing between the concepts of location and attribute. Geographic technology is employed in the teaching of these concepts in a variety of ways. For example, while discussing data gathering methods, teachers gather data using GPS units, which require distinguishing between location (UTM or latitude/longitude coordinates, for example) and attributes (point, line, or area features, such as trees, roads, or lakes, respectively). The data gathered are down-loaded into a computer and a GIS program allows the teacher to explore the data and apply geographic theory from nearly any area of the discipline (landuse planning, cultural, economic, medical or physical geography) while conducting geographic analysis. In addition, the program allows the teacher to map the data.

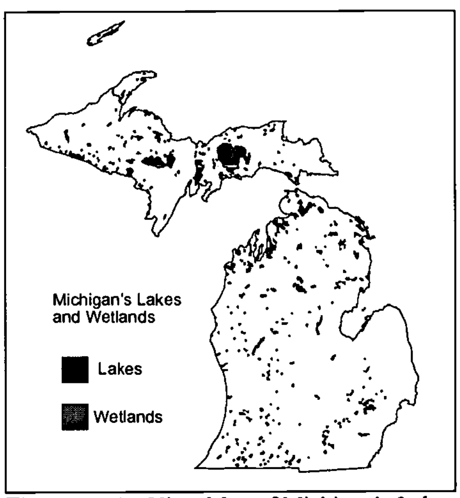

Figure 4: ArcView Map of Michigan's Lakes and Wetlands

4. Build geographic resources for classrooms using information technology.

GIS programs such as ArcView provide a platform for easy storage and retrieval of geographic information gathered by the teacher for instruction or gathered by the students in learning activities. A classroom database can be created, maintained, and queried by students and teachers. By maintaining a robust set of geographic data, including maps, location, and attribute data, the classroom may be a stage of geographic exploration.

Also, because many geographic data are available from government web-sites, the classroom computers provide an ideal storage device for such information. The World Wide Web is arguably the largest and most accessible source of information, today. Hundreds of quality geography sites are available. Many of these sites not only provide geographic information, but also provide activities that may be completed at home or in the classroom. Information provided at the sites includes quality maps, aerial photographs, and environmental and cultural data. Teachers and students can create a valuable classroom resource simply by creating a class web page containing categorized links to useful geography web-sites. In effect, they can compile an interactive annotated bibliography of geographic references.

Conclusions

While the benefits of the new spatial information technology provided by GISci have been enjoyed by geographers over the past several years, geographers instilled with the responsibility of educating tomorrows teachers should begin to incorporate the new technology into the teacher education curriculum. This incorporation has been slow, as GISci is itself, struggling to define its position in the field. In addition, and probably the most important factor of the slow merger of GISci into teacher education is the lack of academic geographers trained in the new area. Finally, those academics who are trained devote much of their time and research to furthering the new area through theoretical and applied research.

But, the spatial information technology utilized in the study of geographic information science can be a valuable resource for the in-service geography teacher. Not only does the understanding of the new field in geography improve the teacher's understanding of the entire discipline, but the technology may also be used to help teachers improve and expand their existing curriculum by applying it to develop student projects, to provide classroom resources, and to create educational materials for classroom use.

The suggestions outlined in this paper provide a starting point for GISci teacher education instruction. But, teacher educators need to design a geography curriculum that incorporates geographic information technology and, unfortunately, often the most useful courses are not within the list of "required" courses in a teacher education program. Due to the changing nature of this as well as other information technology based disciplines, the curriculum should advance and morph to mirror changes in the field, itself.

References

Campbell, J. (2001). *Map Use & Analysis*. Boston: McGraw-Hill Higher Education.

Hardwick, S. & Holtgrieve, D. (1996). *Geography for Educators: Standards, Themes and Concepts*. Upper Saddle River, NJ: Prentice Hall.

Lillesand, T., & Kiefer, R. (1994). *Remote Sensing and Image Interpretation*. New York: John Wiley & Sons, Inc.

Developing Web Pages to Supplement Courses in Higher Education

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Abstract: This paper presents some issues in the use of web pages as supplements to traditional, on-campus courses. It also presents some technical and design problems currently found in such pages, as well as some suggested solutions. Some of these problems can be rectified by better use of hypertext markup language (HTML), while others are more pedagogical in nature. Attention is given to ensuring that pages are accessible to individuals with disabilities.

Introduction

The World Wide Web is in the process of revolutionizing almost every element of worldwide culture, and, because of the incredible speed of its growth in size and popularity, it began to do so before most of us had an inkling of its true importance. An index of the unprecedented growth of the web is the fact that there were fewer than 50 web pages in existence when President Clinton took office. Today, in the last few weeks of the Clinton presidency, there are over 1 billion web pages, and, according to a joint study published by Inktomi and NEC Research, at least 67,000 new sites are added each day (Sullivan, 2000).

Growth in access and popularity have also been phenomenal as measured by the number of people who use the Internet and the Web. The Computer Industry Almanac (Juliussen & Petska-Juliussen, 2000) estimates that in 1999, there were nearly 260 million users, 110 million of them in the United States. The Almanac goes on to note that by 1999, there were 25 countries where over 10 percent of the population were Internet users. The Almanac predicts that there will be 490 million worldwide users by the year 2002 (79.4 per 1,000 people) and 765 million users by year-end 2005 (118 per 1,000 people worldwide). In such a rapidly changing environment, up-to-date figures are impossible to obtain. NUA Limited (2000), in a slightly more recent study, estimates that by September of 2000, there were at least 377.65 million Internet users in the world, with over 161 million located in the U.S. and Canada. By the year 2000, 50% of U.S. homes had a computer (UCLA Center for Communication Policy, 2000), nearly 50% used the Internet, and 700 new households were being connected to the Internet each hour (Office of the White House Press Secretary, 2000).

With so many people using the Internet and the Web, and with such incredible growth in size and popularity, it was inevitable that the influence of the web would begin to expand exponentially. In fact, the growth and popularization of the Internet and the Web has been, and will continue to be so important, that this phenomenon may be remembered as the single most influential development of the second half of the Twentieth Century (Maddux, Johnson, and Willis, in press).

Because changes in education typically take place only after changes in the culture at large, education in general was slow to respond, and computers began appearing in K-12 schools only after they were firmly entrenched in businesses, in homes, and in most other walks of life. Access to the Internet and the Web was even slower to reach public schools, and remains spotty to this day. Nevertheless, schools continue to acquire technology at a rapid pace. In 1999, the most recent year for which reliable statistics are available, over 870,000 additional instructional computers were installed in U.S. schools and the ratio of students to school computers improved to 5.7 to 1. Furthermore, 90% of schools gained Internet access, and of those, 71% had access within instructional classrooms (Market Data Retrieval, 1999).

Higher education has been even slower than K-12 education to make use of the Internet and the Web in teaching and learning. Although most professors now have computers and Internet access in their offices, higher education classroom use of technology in general and the Internet and the Web in particular is not common. However, within the last few years, educational administrators at all levels, particularly those in higher education, have begun to show greatly increased interest in the Internet and the Web for use in distance education. This interest has been motivated by greatly increasing competition for students by private entrepreneurs, especially those known in academic circles as "diploma mills." These organizations are mounting massive commercial distance education programs in diverse fields of study that are beginning to erode the dominance of traditional colleges and universities in attracting students, especially non-traditional students who continue to make up increasing proportions of the U.S. higher education student body. This widespread entry of the private sector into higher education has taken place because the business world has suddenly become aware of the potential educational power of the Internet and the Web, the increasing cost-effectiveness of related technology to carry out distance education, and the potential student demand.

> (Business leaders) are licking their entrepreneurial chops in ravenous expectation of the profit-taking gorge to come. Everywhere one turns, they are waxing eloquent about the new opportunities, and making estimates of the profit potential in terms of not millions, but billions of dollars per year. (Maddux, in press)

Given the huge profits now being realized, and the even greater ones being predicted, it is not surprising that the private sector wants into the act. Last year, private, online learning companies took in about $500 million dollars. More importantly, Merrill Lynch estimates that by 2003, online higher education will gross 7 billion dollars a year and will then grow at the rate of 55 percent a year (McGinn, 2000). Other estimates are even more extravagant, with some running as high as 9 or 10 billion dollars a year by 2003. In any case, the U.S. is now spending a total of 810 billion dollars a year on education, and the business community is gambling that the portion devoted to distance education, both public and private, will continue to increase rapidly. That seems a safe bet, as students are signing up in record numbers for courses delivered completely online, and even for completely online degree programs offered by a variety of public and private institutions and organizations.

I cannot help but believe that the current rush to completely online distance education will, in the long run, harm higher education. Quality control problems are obvious, and the temptation to sell courses and degrees with little if any rigor or respectability has already proved irresistible to many providers. Ironically, some of these providers are colleges and universities themselves, many of which are now maintaining completely online courses and programs in direct competition with their own on-campus offerings.

Part of the problem, it seems to me, is a failure on the part of many students, professors, businessmen, and administrators to distinguish between *information* and *education*. The web is a fantastic resource for information location and retrieval, but education, although it includes information, requires much more than hardware, software, and a medium. Nevertheless, as web-based, multimedia technologies evolve, improve, and become even more cost effective; distance education is sure to expand its involvement with completely web-based courses and programs.

Although it appears that the marriage of the web and distance education may be largely unfortunate and ill-conceived in its completely online incarnation, I believe the web has considerable potential to improve on-campus offerings. Since the web is a highly efficient and incredibly vast repository of information, its potential is considerable as a supplement to, rather than a replacement for, traditional on-campus courses.

Unfortunately, many colleges and universities are not building an infrastructure or support system to encourage web sites as supplements to on-campus offerings. Instead, web consultants and other campus technical support personnel are often assigned to help develop completely online courses while professors who want to provide supplementary websites for their courses are left to teach themselves how to design and maintain web pages. Many have done so, but most do not have the time, the motivation, or the ability to become proficient webmasters. Partly because of this, and partly because the web is so new that widely accepted style and design standards have not evolved, many supplementary pages are not as effective as they could be, and some are so poor that they are worthless.

The purpose of the present paper is to present a variety of aids and cautions for developers of web pages that are intended to be supplementary to traditional courses.

HTML and HTML Editors

Web pages are written in a simple markup language that evolved from the editorial marks placed on pages before they were sent to the printer for typesetting. The language is called HTML (hypertext markup language). Although HTML is easy to learn, there are a variety of editors and translators on the market, and these are widely used. HTML editors and translators are intended to make it possible to produce web pages without the need for learning HTML. Instead, the user enters text in more or less traditional format, and the software converts it to HTML.

There are many problems with HTML editors. One of the most serious is that there is no such thing as a WHAT YOU SEE IS WHAT YOU GET (WYSIWYG) editor, and consequently, it is almost always necessary to make modifications to the code produced by editors. However, those who have not learned any HTML are unable to do this. Consequently, they often end up with a page that is not really what they wanted, or a page with many technical problems. Another problem is that the code produced by editors is typically highly compressed, lacking in sensible line spacing and white space, and without comment code to clarify difficult sections. Therefore, it is difficult for anyone, even experts in HTML, to edit code produced by such software, thus making even simple and minor modifications almost impossible to accomplish quickly and easily, if at all. A third problem is that the complexity of many editors is such that it is as difficult and time-consuming to learn to use it as it would be to learn HTML in the first place. Finally, those who rely on editors can work only if the computer they are using has the editor installed, while those who learn HTML itself can work on any computer that has a word processor.

Web Accessibility

Another common problem with many web pages is lack of accessibility for individuals with disabilities. The scope of the problem can be appreciated in light of the fact that there are 35 million people with disabilities in the U.S. and around 740 million people worldwide (Lazarro, 1998). Accessibility is an issue, because many people with disabilities must use adaptive aids in order to use the Internet and the Web. The World Wide Web Consortium has recently published a document entitled Web Content Accessibility Guidelines 1.0 (1999). The document presents an excellent explanation of the need for special consideration of web access for individuals with disabilities:

> For those unfamiliar with accessibility issues pertaining to Web page design, consider that many users may be operating in contexts very different from your own:
>
> They may not be able to see, hear, move, or may not be able to process some types of information easily or at all.
>
> They may have difficulty reading or comprehending text.
>
> They may not have or be able to use a keyboard or mouse.
>
> They may have a text-only screen, a small screen, or a slow Internet connection.
>
> They may not speak or understand fluently the language in which the document is written.
>
> They may be in a situation where their eyes, ears, or hands are busy or interfered with (e.g., driving to work, working in a loud environment, etc.).
>
> They may have an early version of a browser, a different browser entirely, a voice browser, or a different operating system.
>
> Content developers must consider these different situations during page design. While there are several situations to consider, each accessible design choice generally benefits several disability groups at once and the Web community as a whole.

The document goes on to describe specific methods for web page design that will maximize access for individuals with disabilities.

There is an excellent web site that should be used by all web page developers. The site, entitled Bobby (http://www.cast.org/bobby/), will check web pages for disability access and provide a comprehensive report of any problems found as well as suggestions for solutions to these problems.

Problems and Solutions

HTML codes are called "tags" and are located between "greater than" and "less than" brackets. Many HTML codes are "containers," requiring one tag to activate a function and one to terminate it.

The TITLE tag is such a tag, and many web pages written by novices lack a good, descriptive title. The web page title should be placed between <TITLE> and </TITLE> tags. Omitting an HTML title causes search engines and directories to list these pages as "UNTITLED" or with titles that are incorrect or misleading.

Another problem is that beginners often omit META tags (tags containing a brief narrative description and list of keywords for use by search engines and directories). This may cause search engines and directories to list such pages in the wrong categories, or to provide descriptions that are not accurate. Two excellent web pages that will write the HTML for good META tags is (a) The Meta Tag Generator (http://www.web-source.net/meta.html) and (b) The META Tag Builder (http://vancouver-webpages.com/META/mk-metas.html). These sites present a form for users to fill out in which they specify keywords, descriptions, and other information about their page. The site then writes the HTML for good META tags and presents the code so that it can be copied and pasted into the user's HTML.

Many pages do not optimize their use of graphics. One the most common problems is the tendency to use too many graphics. Graphics take time to load, and the more graphics in a page, the longer it will take to load fully. Web users are notoriously impatient, and pages that take more than half a minute or so to load will often be abandoned before they are even viewed. There are a number of HTML verifier pages on the web. These sites will prompt for a URL, then examine the underlying HTML and provide a report of any problems found. Some of these sites will provide an estimate of the number of seconds a page will require to load given a connection of a specific speed. An excellent example of such a page is Dr. HTML (http://www2.imagiware.com/RxHTML/).

Whenever possible, web designers should re-use graphics rather than making use of many different graphics. Such a technique is practical for graphics such as line dividers, and is good practice because once a graphic has been loaded into a user's browser, it can be used again on that page without reloading time.

Other good practices with regard to graphics include the following:

1. Always include a text description for any information communicated with a graphic (for users with adaptive aids and for users with browsers that cannot display graphics),.

2. Always specify height and width of all graphics (in order to permit a browser to display text while the graphics are loading),

3. Always use the ALT= attribute to specify a description of the graphic. (Any elementary HTML manual will explain exactly how to do these things, or interested individuals may consult the author's website at http://unr.edu/homepage/maddux/prog/sylcp411.html.)

A sample of the HTML code for displaying a graphic of an elephant in a file called "elephant.gif" that is 75 pixels in width and 100 pixels in height is:

<IMG SRC="elephant.gif" WIDTH=75 HEIGHT=100 ALT="Picture of an elephant">

4. For large images, provide small, "thumbnail" images that are links to the full-size image. Since large images require longer to load, the long wait will result only for those users who wish to view the large version of the graphic.

5. Developers should never make use of an image that is stored only on another server. Instead, developers should copy the image into their own accounts and display it from there. Displaying images on someone else's server slows down loading and places a load on the other server. (Of course, no image should be used in any fashion unless it is in the public domain, or the owner has granted written permission for its use on another's site.)

6. The use of "image maps" should be avoided. These are graphics with special areas that function as links) Many web users may not realize that areas of graphics can be made to function as links, and, at the present time, adaptive aids cannot cope with image maps.

7. Refrain from using "frames." (an HTML strategy for dividing the browser window into separate displays or windows.) Bookmarking a page with frames is problematic, adaptive aids have difficulty with them, and some individuals dislike them so much that they will not visit pages that employ them.

8. Every page should contain a link to the e-mail address of the developer. The link should display the full e-mail address.

9. All pages should contain a link at the bottom of the page to permit a quick return to the top of the page.

10. All pages should contain a link back to the home page. This is essential because most users find pages through a search engine. If there is no link back to the home page, such users may be unable to find that home page, since they cannot simply click on the browser "back" button, as they could if they had found the page by "surfing" to the home page and then choosing a relevant link.

11. Content of the page should be current, and there should be a line at the top or bottom of the page giving the date the page was last modified. It is especially important that links presented on the page be tested often to be sure they still function. Users who discover that many links on a page no longer work will leave the page and never return.

12. Limit the length of pages to two or three screens at the most. Long sections should be broken into "chunks" and placed in separate files that can be reached through links.

13. Develop a color scheme for each course for which there are supplementary sites. That way, students will always be aware of which supplementary page they are viewing.

14. For lecture courses, lecture notes should be included, and should be posted as quickly as possible after each class. My experience and the result of several informal surveys shows that students view lecture notes as the single most useful part of a web page.

15. Do not promise to post specific information and then neglect to do so.

16. Include a page of links to other pages on the web that deal with course-related topics. However, be sure to carefully preview all such sites to be sure the content is accurate and otherwise appropriate. Links that lead to irrelevant or improperly described pages will soon be ignored by students.

17. Include links for downloading all class handouts. This is viewed by students as next in importance only to lecture notes. Then too, such links will relieve the instructor of the tedious chore of locating handouts and arranging copies to be made for students who were not in class or who have lost important handouts. Handouts can be placed on one's server in word processing format, and students can choose a link to the file, save it on their own computers, or print it out.

18. Include a full syllabus that includes all grading policies and criteria.

19. Ensure that all pages employ correct mechanics of writing including spelling, punctuation, grammar, etc.

20. Ensure that all information is correct and presented in understandable ways.

21. Do not expect that supplementary web pages will result in instructor time savings. Web pages are time consuming to construct and maintain properly. Although some time will be saved by avoiding the need to search paper files for handouts that students have lost, giving "private lectures" to students who were ill, etc., the time required for web maintenance will more than make up for time saved. The purpose of a supplementary page should be to improve teaching and learning, not to save time.

22. Be prepared for students to quickly come to expect and to depend upon supplementary web pages. It is amazing how quickly many students progress from gratitude about access to a supplementary page to an attitude of entitlement.

Conclusions

Web pages that are supplementary to traditional, on-campus courses can be highly beneficial to students and professors. However, there are many common problems that can limit the usefulness of such pages. This paper has presented a few of these problems as well as some simple solutions. For a complete discussion of these and other recommendations, readers are referred to Maddux (2000), Maddux and Cummings (2000), and Maddux and Johnson (1997). Interested readers are also encouraged to visit the first authors' supplementary web site for his course on web site design and maintenance. The home page can be found at http://unr.edu/homepage/maddux/prog/sylcp411.html, and HTML instructional pages can be accessed from links at http://unr.edu/homepage/maddux/prog/demo.html.

References

Juliussen, E. & Petska-Juliussen, K. (2000). *U.S. tops 100 million Internet users according to Computer Industry Almanac.* Arlington Heights, IL: The Computer Industry Almanac, Inc. Retrieved March 20, 2000 from the World Wide Web: http://www.c-i-a.com/199911iu.htm

Lazarro, J. (1998). *Web accessibility: Making the Internet accessible for persons of all abilities.* Retrieved February 1, 2000 from the World Wide Web: http://webreview.com/wr/pub/98/09/04/feature/index.html

McGinn, D. (2000, October). Biz men on campus. Grok, 76-84.

Maddux, C.D. (in press). The Web in education: Asset or liability? *Computers in the Schools.*

Maddux, C.D. (in press). Solving accessibility and other problems in school and classroom web sites. *Rural Special Education Quarterly.*

Maddux, C. D., & Cummings, R. (2000). Developing web pages as supplements to traditional courses. In B. Abbey (Ed.), *Instructional and cognitive impacts of web-based education*, pp. 147-155 . Hershey, PA: Idea Group Publishing.

Maddux, C.D. & Johnson, D.L. (1997). The World Wide Web: History, cultural context, and a manual for developers of education information-based web sites. *Educational Technology*, 37 (5), 5-12.

Maddux, C.D., Johnson, D.L., and Willis, J.W. (in press). *Educational computing: Learning with tomorrow's technologies* (3rd ed.). Boston, MA: Allyn & Bacon.

Market Data Retrieval (1999). *Technology in education 1999.* Shelton, CT: Author.

Masotto, T. (1995). *CommerceNet/Neilsen Internet demographics survey executive summary* [Web document]. URL http://www.commerce.net/work/pilot/nielsen_96/exec_95.html.

NUA Limited (2000). *How many online?* Retrieved November 28, 2000 from the World Wide Web: http://www.nua.ie/surveys/how_many_online/index.html

Office of the White House Press Secretary (21 January, 2000). *Information technology research and development: Information technology for the 21st Century.* Retrieved March 23, 2000 from the World Wide Web: http://www.whitehouse.gov/WH/New/html/20000121_2.html

Sullivan, D. (2000). *Search engine sizes.* Retrieved March 20, 2000 from the World Wide Web: http://searchenginewatch.internet.com/reports/sizes.html

UCLA Center for Communications Policy (2000). Landmark UCLA study will explore the evolution and impact of personal computers and the Internet. Los Angeles, CA: Author. Retrieved March 22, 2000 from the World Wide Web: http://www.ccp.ucla.edu/press_release.htm

World Wide Web Consortium (1999). *Web Content Accessibility Guidelines 1.0.* Author. Retrieved November 30, 2000 from the World Wide Web: http://www.w3.org/TR/WCAG10/

Toward an Adaptive e-Framework for Teacher Education

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Abstract

The Italian Ministry of Education in collaboration of the Italian National Research Council are engaged in joint activities concerning the modeling, design and prototype implementation of an adaptive e-framework supporting the interactions of various actors of the national teacher training system. The framework includes patterns of static and adaptive versions for resources-services allocation and management.

Introduction

In the knowledge society, knowledge is a primary resource at various levels including: the know what, the know how and the know why. The processes acting on knowledge: creation, acquisition, processing, evaluation, storing and transmission, and their interrelationships contribute to determine a new social dynamics. The education systems are complex organizations in the knowledge society: they offer services based on the exchange of knowledge between "knowledge providers" (research centers, universities, laboratories, museums, etc...) and "knowledge clients" (school students, enterprise employees,) by means of "knowledge intermediaries" (teachers, pedagogical resources, etc...). Teacher training can be considered as the interaction between providers and intermediaries in education systems.

The information and communication technologies are enabling factors for the development of the knowledge society and hence of the education systems. In particular teacher training is becoming a strategic issue that requires new advanced web based solutions.

The Italian Ministry of Education and the Italian National Research Council are engaged in joint activities concerning the modeling, design and prototype implementation of an adaptive e-framework supporting the interactions of various actors of the national teacher training system.

The e-framework includes patterns of static and adaptive versions for resources-services allocation and management: a teacher training system can be modeled by composing patterns, according to its complexity: In particular:

- the static resources-services allocation: services are provided by teaching agencies to the teachers;
- the adaptive resources-services allocation: the system takes care of the teachers and training agencies profiles for matching their respective needs and supply;
- the static management of the system behavior according to the cycle: planning, monitoring, evaluation, change management and planning
- the adaptive management of the system dynamically coordinates the planning, monitoring, evaluation and change management subsystems.

Up to now a prototype of information dissemination of teacher training services, called SIF and based on the static resources-services allocation pattern, has been realized with a high degree of scalability scalabilty: (around 25.000 teachers and 250 training agencies). Design and implementations of advanced teacher training systems, based on more complex patterns, are in progress.

1. Resources-Services Patterns

1.1 Static Resources-Services Pattern

Training agencies and teachers interact trough the matching between training resources offering and training services request. The matching is realized according to a matching schema associated to a kernel component which is specified once for all w.r.t the evolution of the overall system (i.e. "statically").

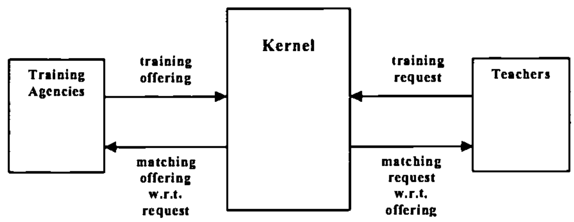
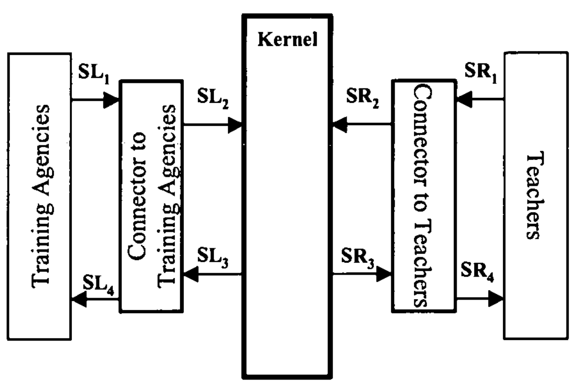


Figure 1: ***Static Resources-Services*** **Pattern**

1.2 Adaptive Resources-Services Pattern

Training agencies and teachers interact trough the matching between training resources offering and training services request. The matching is realized according to matching schemas chosen by the connectors among those available from the kernel component (i.e. "dynamically"), as specified in the following figure.



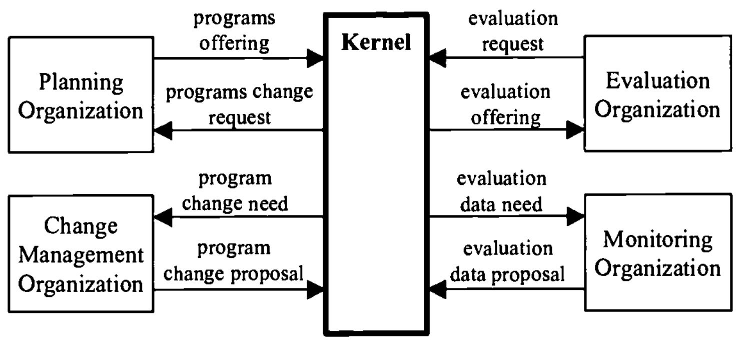
L-labels	Flows	Flows	R-labels
SL_1	training offering	training request	SR_1
SL_2	available training offering	available training request	SR_2
SL_3	matching offering-request availability	matching request-offering availability	SR_3
SL_4	matching offering-request	matching request-offering	SR_4

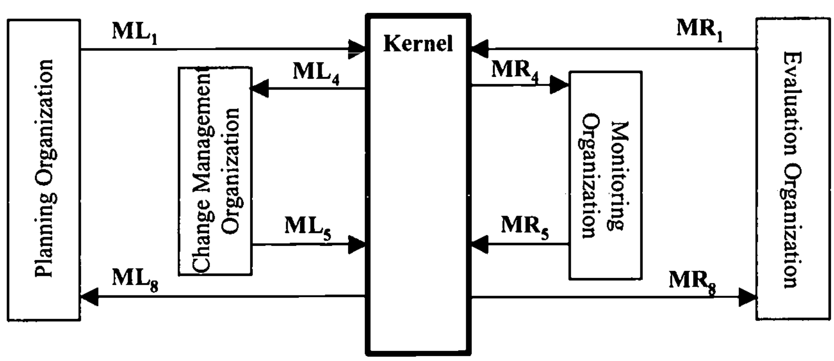
Figure 2: ***Adaptive Ressource-Services*** **Pattern**

2. Management Patterns

2.1 Static Management Pattern

The global management of a teacher training system is obtained by composing local interactions of four organisms (planning, monitoring, evaluation and change management) with the kernel component. The interactions rules are specified once for all w.r.t the evolution of the overall system (i.e. "statically").



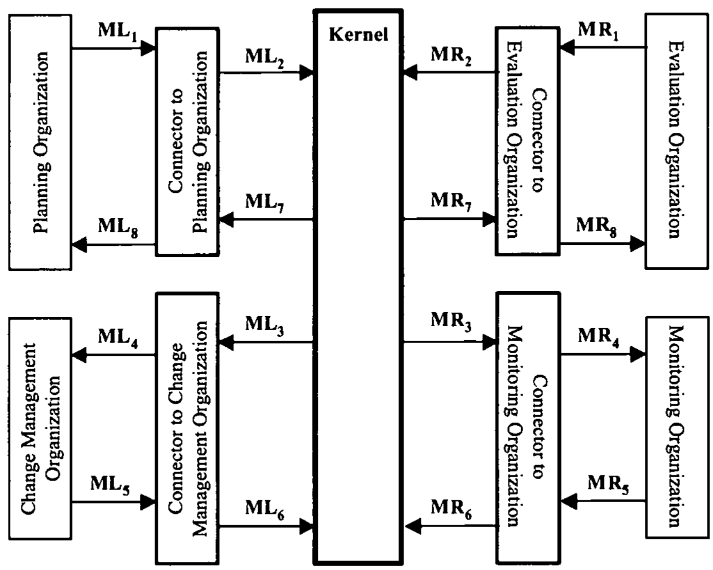


L-labels	Flows	Flows	R-labels
ML_1	programs offering	evaluations request	MR_1
ML_4	program change need	evaluation data need	MR_4
ML_5	program change proposal	evaluation data proposal	MR_5
ML_8	program change request	evaluation offering	MR_8

Figure 3: ***Static Management*** **Pattern**

2.2 Adaptive management Pattern

The global management of a teacher training system is obtained by composing local interactions of four organisms (planning, monitoring, evaluation and change management) with the kernel component. The interactions follow rules chosen by the connectors according to the availability for interaction from the kernel. (i.e. "dynamically").



L-labels	Flows	Flows	R-labels
ML_1	programs offering	evaluations request	MR_1
ML_2	actions offering	indicators request	MR_2
ML_3	matching actions-indicators availability	matching indicators-actions availability	MR_3
ML_4	program change need	evaluation data need	MR_4
ML_5	program change proposal	evaluation data proposal	MR_5
ML_6	actions change proposal	indicators data proposal	MR_6
ML_7	actions change request	indicators data offering	MR_7
ML_8	program change request	evaluation offering	MR_8

Figure 4: ***Adaptive Management*** **Pattern**

3. Patterns-based Teacher Education Systems

Teacher education systems can be modeled by composing the previous patterns: the more complex model is obtained by composing the adaptive resources-services pattern with the adaptive management pattern, as illustrated in the following diagram.

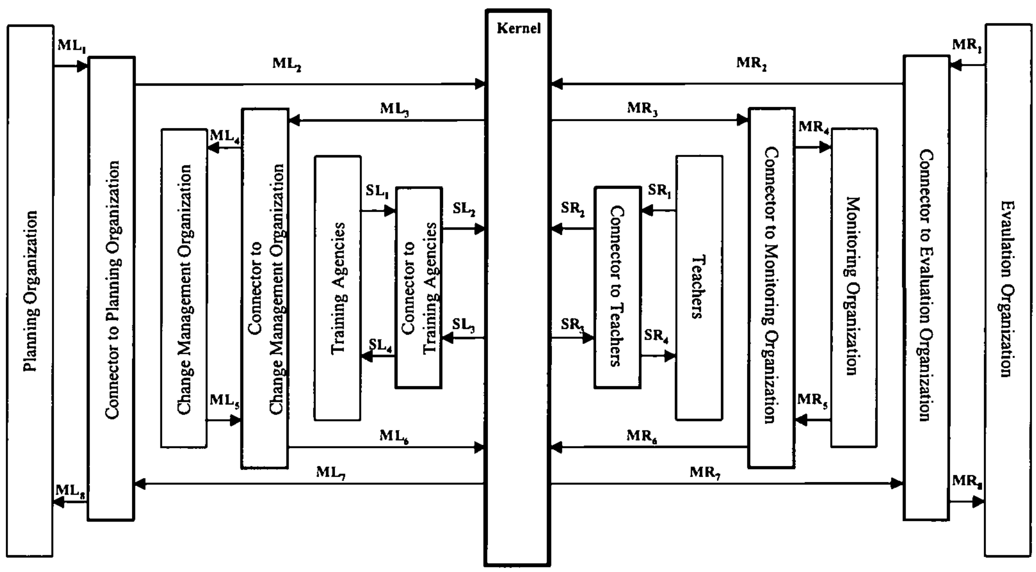


Figure 5: ***Adaptive Resources-Services and Management*** **System**

The design of such kind of complex system requires a rigorous modeling methodology. A long way in front of us !

References:

[1] IEEE 1999: LTSA Specification - Learning Technology Systems Architecture (http://edutool.com/ltsa/)
[2] Association for the Advancement of Computing in Education (www.aace.org)
[3] University of Massachusetts - Center for Computer-Based Instructional Technology (http://ccbit.cs.umass.edu/ccbit/)
[4] B.P. Woolf, V. Lesser, C. Eliot, Z. Eyler-Walker, M. Klein: "A Digital Market Place for Education", SSGRR 2000, L'Aquila (Italy) 2000
[5] G.F. Mascari: Frameworks for Complex Adaptive Systems, in preparation

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Problem-Based Learning Using Web-Based Group Discussions: A Positive Learning Experience for Undergraduate Students.

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Abstract: The purposes of this study were to incorporate computer technology into parts of an undergraduate exercise physiology course, to motivate students, to get them actively involved in the learning process and to enhance learning. Two classes of third year students were studied; the first was taught using problem-based learning (PBL) activities with on-line discussions on a course web page while the second was taught using traditional lectures. Student perceptions about the use of technology and PBL were collected. Data related to student knowledge, comprehension, and application of course material were collected. The teaching methods resulted in similar grades on exam questions and final course marks with only one significant difference, that being a higher score (15%) in the PBL and technology group's answer to a question of "application of knowledge" (p=0.02). Lastly, this project verified the viability of these teaching methods and demonstrated their acceptance by undergraduate students.

Introduction

Many believe that the use of computer technology to support teaching activities in university settings contributes significantly to student learning (Blumberg and Sparks, 1999; Levine et al., 1999; Carroll, 1998; Todd, 1998; Wiemer, 1998; Davis et al., 1997; Dwyer et al., 1997; Richardson, 1997). Acadia University provides unique opportunities for faculty to incorporate computer technology into their teaching. Since the implementation of the Acadia Advantage program in 1996, all Acadia University students have received an IBM laptop computer with rental cost included in tuition fees. Faculty members are encouraged to use the computer and associated features to provide learning opportunities, which integrate the technology into their courses. The Acadia Institute for Teaching and Technology (AITT) is a new unit, which has as its purpose to provide technical support to Faculty at Acadia University. The AITT has developed a web-based Automated Courseware Management Environment (ACME) program, which is heavily used by faculty. Each course has a web-site with numerous features including course information, class email, access control, notes, discussions and tests. Students have unlimited access to their course pages.

Attempts have been made to integrate problem-based learning (PBL) into traditional lecture-based undergraduate courses (Béliveau and Martel, 1995; Edwards et al., 1999; Finch, 1999; Lim and Chen, 1999; Niederman and Badovinac, 1999; Purdy et al., 1999; Sullivan et al., 1999; Barrows, 1998;

McInerney, 1998; Huang and Carroll, 1997; Stern, 1997; Cliff and Wright, 1996). It has been suggested that regular use of PBL is a valuable addition to traditional methods of lectures, textbook readings, and laboratory exercises for the teaching and learning of physiology (Des Marchais, 1999; Galey, 1998; Stern, 1997; Cliff and Wright, 1996). Problem-based learning in undergraduate courses is student-centred rather than faculty-centred (Saarinen-Rahiika and Binkley, 1998), thus supporting the cognitive learning theory (Svinicki, 1998). Furthermore, problem-based learning is believed to develop problem solving skills in undergraduate courses (Dalton, 1999; Lim and Chen, 1999).

Purpose

The goals of this study were to incorporate the technology available to parts of an undergraduate exercise physiology course, to motivate students, to get them actively involved in the learning process and to enhance learning. The aims of this initial research project were to compare students' knowledge and retention of course material taught using traditional methods and taught using problem-based learning (PBL) activities utilizing computer technology, to evaluate students perceptions of the two teaching methods and learning activities and to identify teacher actions and/or learning activities that help or motivate kinesiology students to learn exercise physiology. Finally, this project could provide pilot data on the usefulness of these strategies in teaching a variety of similar undergraduate courses.

Methods

All procedures were approved by the institution's research ethics review process. Two classes of third year students were studied; course material was taught using lectures and laboratory exercises, however one section of the course was taught using supplemental problem-based learning (PBL) activities with on-line discussions on a course web page while the other section was taught using only traditional lectures. Both groups received identical laboratory experiences. Students randomly selected one of the course sections and lab sections during the registration period and were not aware of the instruction methods to be used.

At the beginning of the semester, the study was outlined to all prospective participants. All students agreed to participate (ie. allow use of GPA, course/ exam marks in reporting group data, course evaluations, etc). To ensure that groups were similar, grades in the prerequisite courses, as well as overall GPA, were compared and no significant differences were found between the group taught with technology and PBL and the group taught with lectures (see Table 1).

A subgroup of students from each class also volunteered to participate in other parts of the study. Student perceptions about the use of technology and PBL were collected using the Nominal Group Technique (Delbeck et al., 1975) and the Evaluation by Group Animation Technique (Talbot and Bordage, 1985). These students were subsequently compensated financially for their participation. Data related to student knowledge, comprehension, and application of course material, were collected using identical exam questions in both course sections at the end of the semester. Retention over time will be assessed using the same exam questions administered one year after the end of the courses. The questions used to evaluate knowledge and comprehension of key concepts as well as ability to apply course material to specific situations were "Name and describe the different methods by which body heat is lost during exercise in a hot environment. Identify the major heat loss mechanism and the physiological problems that the prolonged use of this mechanism imposes." and "Your grandparents are leaving for the hot and humid climate of the Caribbean islands for the Christmas break. They would like to exercise during their trip and ask you, an expert in exercise physiology, what they should do before, during and after the exercise sessions in warm environment. Explain why you recommend these procedures." respectively.

A one-way analysis of variance was used to compare group means. Significant differences were accepted at the 0.05 level of probability. All data are expressed as group means and standard deviations.

Results

Random selection of course and lab sections by students during the registration period prevented bias from the researchers. However, to ensure that the groups were similar, grades in prerequisite courses (2^{nd} year Anatomy and Physiology) were compared for each group. Group average GPAs at the end of second year also were compared. There were no significant differences between the two groups on any of the variables (Table 1).

Table 1. Groups

	Number of Students	Grades in prerequisite courses (mean ± SD)		GPA after 2nd year (mean ± SD)
		Course #1	Course #2	
PBL and technology	26	2.45±1.03	2.37±1.10	2.63±0.64
Lectures	34	2.56±0.89	2.44±0.90	2.82±0.54

The two teaching methods resulted in similar grades on exam questions and final course marks with only one significant difference, that being a higher score (15%) in the technology and PBL group's answer to a question of "application" of knowledge (p=0.02, PBL vs lectures). This was not surprising as the problems were developed to encourage students to apply the basic exercise physiology concepts to real life situations. The PBL and technology group also performed slightly better in the exercise physiology course (Table 2) although this did not reach significance. These preliminary findings suggest that students may benefit from the use of technology and PBL in exercise physiology.

The result of this first experience, using a web-based program to teach exercise physiology employing PBL and technology, was overwhelmingly positive. Student comments included: "Not only does the incorporation [of technology and PBL] help to add to my learning, I feel like without it I am being cheated". Students also indicated that this teaching method "allowed the use of the computer" and "online discussions are more effective". The majority of students who participated in the PBL problems suggested that it made the material "more relevant and meaningful". It appears that the majority of students enjoyed and appreciated this teaching style and were positive about its use in undergraduate curriculum.

Table 2. Effects of the teaching methods on grades.

	Knowledge/ understanding question (/10)	Application question (/10)	Final grade in course (%)
PBL and technology	6.19±3.12	6.43±2.07*	73.3±13.1
Lectures	6.71±2.63	5.43±1.55*	70.0±15.5

Data are reported as means and standard deviations. * indicates significant difference between groups.

Discussion

The most important findings of the present study are that students who were involved in the PBL and technology course responded very positively to the method and that this teaching style was similar to the traditional style (ie. lectures and laboratory exercises) in teaching effectiveness as assessed by exam answers and grades. Technology education has been designed to reduce the number of formal lecture hours, to enhance student enthusiasm and to assist learning (Abdulla et al., 1983; Levine et al., 1999; Carroll, 1998; Davis et al., 1997; Dwyer et al., 1997; Richardson, 1997). In fact, computer-assisted education is now considered a useful resource to teach physiology to undergraduate and medical students (Blumberg and Sparks, 1999; Levine et al., 1999; Carroll, 1998; Todd, 1998; Wiemer, 1998; Davis et al., 1997; Dwyer et al., 1997; Richardson, 1997) and to teach health education to physical education students (Béliveau and Martel, 1995). The present study provides support for the use of these teaching strategies in undergraduate exercise physiology.

Currently available research supporting technology education suggests that in general, the incorporation of technology into higher education has not proven detrimental. On the contrary, some studies have reported that the introduction of technology is beneficial to undergraduates' learning (Blumberg and Sparks, 1999; Devitt and Palmer, 1998; Levine et al., 1999; Davis et al., 1997; Richardson, 1997). One might assume that kinesiology students also could benefit from the contact with this technology in the classroom. Moreover, according to a recent report prepared for the American Federation of Teacher and the National Education Association (Phipps and Merisotis, 1999), most studies supporting the use of technology done to date, have been descriptive and few had control groups to compare teaching methods. This study is the first to control for teaching method and suggests that technology and PBL can contribute to learning in an undergraduate exercise physiology course. Also, there is little information available on the long-term impact of technology in teaching of exercise physiology. The students involved in this study will be recruited and tested again to determine the degree to which information was retained in both teaching styles. Furthermore, few studies have addressed undergraduates' perceptions of technology education in the instruction and learning of exercise physiology (Davis et al., 1997; Richardson, 1997). In the present study, student perceptions were sought. Overall, students indicated that this teaching method was interesting, effective and appreciated. Students commented that the use of technology with PBL was more effective because some of the learning could take place without the need to get together as a group.

Bloom's (1956) taxonomy of educational objectives domain identifies six aspects of learning, the first three being knowledge, comprehension and application. Because application requires the use of general principles to solve a problem, technology and problem-based learning exercises can help students to apply their understanding (comprehension) to new situations (Carroll, 1998). The students who participated in the PBL and technology class were, overall, better at answering an exam question which was designed to evaluate their ability to apply their new knowledge to a specific situation. There is evidence that knowledge acquisition and reasoning skills are greater for students taught using PBL than students taught using conventional methods (Finch, 1999; White et al., 1999; Doucet et al., 1998; Kaufman and Mann, 1998). Students commented that PBL problems made the information more pertinent. This may be a reason why students believed this approach to teaching was more relevant to their needs.

Anecdotally, the use of computer technology and problem-based learning exercises was adopted by another faculty member teaching in the same Kinesiology program. In another undergraduate course (growth and motor development), second year students also commented positively on course evaluations about the use of PBL and technology, suggesting that this method could be used more extensively in undergraduate kinesiology curriculum delivery. Also, recent studies have indicated that students find problem-based learning beneficial (Béliveau and Martel, 1995; Kuhnigk and Schauenburg, 1999; White et al., 1999; Birgegard and Lindquist, 1998; Doucet et al., 1998; Lancaster et al., 1997; Stern, 1997; Cliff and Wright, 1996). Specifically, students explain that such an experience enhances reasoning, integration of content and professional behaviours (Stern, 1997). Students did feel however, that problem-based learning was not effective if they did not feel confident that they were learning the content their instructor had intended them to learn (Huang and Carroll, 1997). The use of the web-site discussion provided the instructor/ tutors opportunities to give feedback and minimize the likelihood of this being a major problem in the present study. Feedback could be provided promptly, individually or to the group and ensured that the students were studying the correct material.

One problem that remains to be resolved is the choice of appropriate outcome assessment measures to evaluate the effectiveness of technology and PBL as a mode of learning in undergraduate courses (Lim and Chen, 1999). In the present study, exam questions were developed and grades on selected questions as well as final course grades were used. Long-term retention of course material will also be assessed using the same exam questions. Although present assessment methods may not be the best, in the present situation, they were deemed the most appropriate.

Conclusions and Perspectives

To our knowledge, experimental learning such as problem-based learning has not been performed previously using the computer as a learning tool in exercise physiology. This pilot project verified the viability of these teaching methods and demonstrated their acceptance by undergraduate students in kinesiology. In summary, we suggest that regular use of problem-based learning activities and technology education can be useful assets in teaching undergraduate exercise physiology or other kinesiology courses. The integration of technology education into an alternative approach such as problem-based learning to teach exercise physiology could very well motivate students to learn as well as improve student performance particularly with regard to information application. There is little research on the effectiveness of the use of computer technology to help teach using a problem-based learning approach although there is a vast potential for education using these methods. For example, these methods could be very useful for continuing and distance education. Finally, this first project demonstrates the short-term benefits of using technology in problem-based instruction in exercise physiology.

References

Abdulla, A.M., Watkins, L.O., Henke, J.S., Weitz, F.I., & Frank, M.J. (1983). Classroom use of personal computers in medial education: A practical approach. *Med. Educ.* 17(4), 229-232.

Barrows, H.S. (1998). The essentials of problem-based learning. *J. Dent. Educ.* 62(9), 630-633.

Béliveau, L., & Martel, D. (1995). L'apprentissage par problèmes: une expérience d'implantation en éducation physique. Dans Enseignement supérieur: stratégies d'enseignement appropriées. Actes du colloque de l'Association internationale de pédagogie universitaire, Presses de l'Université du Québec à Hull.

Bloom, B. (Ed.) (1956). *Taxonomy of Educational Objectives*. New York: David McKay.

Blumberg, P., & Sparks, J. (1999). Tracing the evolution of critical evaluation skills in student's use of the Internet. *Bull. Med. Libr. Assoc.* 87(2), 200-205.

Birgegard, G., & Lindquist, U. (1998). Change in student attitudes to medical school after the introduction of problem-based learning in spite of low ratings. *Med. Educ.* 32(1), 46-49.

Carroll, R.G. (1998). Current and future impact of technology on physiology education. *Adv. Physiol. Educ.* 20(1), 8-11.

Cliff, W.H., & Wright, A.W. (1996). Directed case study method for teaching human anatomy and physiology. *Adv. Physiol. Educ.* 15(1), 19-28.

Dalton, S. (1999). Problem-based learning: a method that encourages critical thinking. *Health Care Food Nutr. Focus.* 15(9), 4-6.

Davis, M.J., Wythe, J., .Rozum, J.S., & Gore, R.W. (1997). Use of world wide web server and browser software to support a first-year medical physiology course. *Adv. Physiol. Educ.* 17(1), 1-13.

Delbeck, A.L., Van de Ven, A.H., & Gustafson, H. (1975). *Group Techniques for Program Planning: A Guide to Nominal and Delphy Process.* Glenview, Ill: Scott, Foresman Co.

Des Marchais, J.E. (1999). New pedagogic approaches adapted to the teaching of pharmacology, the activities centered on the student. *Therapie* 54(1), 171-181.

Devitt, P., & Palmer. E. (1998). Computers in medical education 1: evaluation of a problem-orientated learning package. *Aust. N.Z. J. Surg.* 68(4), 284-287.

Doucet, M.D., Purdy, R.A., Kaufman, D. M., & Langille, D.B. (1998). Comparison of problem-based learning and lecture format in continuing medical education on headache diagnosis and management. *Med. Educ.* 32(6), 590-596.

Dwyer, T.M., Fleming, J., Randall, J.E., & Coleman, T.G. (1997). Teaching physiology and the world wide web: Electrochemistry and electrophysiology on the internet. *Adv. Physiol. Educ.* 18(1), 2-13.

Edwards, N., Hugo, K., Gragg, B., & Peterson, J. (1999). The integration of problem-based learning strategies in distance education. *Nurse Educ.* 24(1), 36-41.

Finch, P.M. (1999). The effect of problem-based learning on the academic performance of students studying podiatric medicine in Ontario. *Med Educ.* 33(6), 411-417.

Galey, W.R. (1998). What is the future of problem-based learning in medical education? *Adv. Physiol. Educ.* 20(1), 12-15.

Huang, A.H., & Carroll, R.G. (1997). Incorporating active learning into a traditional curriculum. *Adv. Physiol. Educ.* 18(1), 14-23.

Kaufman, D.M., & Mann, K.V. (1998). Comparing achievement on the Medical Council of Canada. Qualifying Examination Part I of students in conventional and problem-based learning curricula. *Acad. Med.* 73(11), 1211-1213.

Kuhnigk, O., & Schauenburg, H. (1999). Psychological health, locus of control and personality of medical students of a traditional and alternative study program. *Psychother. Psychosom. Med. Psychol.* 49(1), 29-36.

Landcaster, C.J., Bradley, E., Smith, I.K., Chessman, A., Stroup-Benham, C.A.. & Camp, M.G. (1997). The effect of PBL on students' perceptions on learning environment. *Acad. Med.* 72(10 Suppl. 1), S10-12.

Levine, M.G., Stempak, J., Conyers, G., & Walters, J.A. (1999). Implementing and integrating computer-based activities into a problem-based gross anatomy curriculum. *Clin. Anat.* 12(3), 191-198.

Lim, L.P., & Chen, A.Y. (1999). Challenges and relevance of problem-based learning in dental education. *Eur. J. Dent. Educ.* 3(1), 20-26.

McInerney, P.A. (1998). Recurriculating to a problem-based learning curriculum: The Wits Experience. *Curationis.* 21(2), 53-56.

Niederman, R., & Badovinac, R. (1999). Tradition-based dental care and evidence-based dental care. *J. Dent. Res.* 78(7), 1288-1291.

Phipps, R., & Merisotis, J. (1999) What`s the difference? *Institute For Higher Education Policy.*

Purdy, R.A., Benstead, T.J., Holmes, D.B., & Kaufman, D.M. (1999). Using problem-based learning in neurosciences education for medical students. *Can. J. Neurol. Sci.* 26(3), 211-216.

Richardson, D. (1997). Student perceptions and learning outcome of computer-assisted versus traditional instruction in physiology. *Adv. Physiol. Educ.* 18(1), 55-58.

Saarinen-Rahiika, H., & Binkley, J.M. (1998). Problem-based learning in physical therapy: a review of the literature and overview of the McMaster University experience. *Phys. Ther.* 78(2), 207-211.

Stern, P. (1997). Student perceptions of a problem-based learning course. *Am. J. Occup. Ther.* 51(7), 589-596.

Sullivan, M.E., Hitchcock, M.A., & Dunnington, G.L. (1999). Peer and self assessment during problem-based tutorials. *Am. J. Surg.* 177(3), 266-269.

Svinicki, M. D. (1998). A theoretical foundation for discovery learning. *Adv. Physiol. Educ.* 18(1), 4-7.

Talbot, R., & Bordage, G. (1985). Une appréciation préliminaire d'une nouvelle méthode d'évaluation des cours par animation de groupe. Service des ressources pédagogiques, Faculté des sciences de l'éducation, Université Laval.

Todd, N.A. (1998). Using e-mail in an undergraduate nursing course to increase critical thinking skills. *Comput. Nurs.* 16(2), 115-118.

Weimer, W. (1998). It's a long way to multimedia: An account of 18 years of pursuing a new media project in physiology. *Adv. Physiol. Educ.* 20(1), 96-105.

White, M.J., Amos, E., & Kouzekanani, K. (1999). Problem-based learning: An outcomes study. *Nurse Educ.* 24(2), 33-36.

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Adapting Critical Thinking Models to a Technological Approach

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Abstract

Teachers must be prepared to teach higher-level thinking skills and to incorporate technology so that students will have the proficiencies and skills needed to enter this new and creative era. The purpose of this paper is to present several critical thinking models that have been researched and used successfully across the curriculum for all grade levels and are now being adapted to incorporate technology such as: Concept Attainment, Suchman Inquiry, Conflict Resolution, and the Memorymodel.

Introduction

The introduction of critical thinking skills into teaching repertoires is crucial to helping all students reach for excellence in the 21st century. However, if teachers are unprepared to teach those higher-level thinking models that invite active learning (beginning with the early grades and onward) students will not have the proficiencies and skills needed to enter a new and creative era. Furthermore, most assessment procedures for teachers require that higher-level thinking be included in their lessons. Teachers may fail to achieve excellence on their evaluations if critical thinking skills are absent in their classroom observations. In addition, testing for many state certification examinations also require preservice teachers to have a clear understanding of critical thinking and those methods needed to increase critical thought for their students. Teachers who understand and implement teaching models that provide students with the necessary opportunities to improve critical thinking skills will better prepare their students and better prepare themselves professionally as well.

The purpose of this paper is to present critical thinking models that have been researched and successfully used (Eggen *et al*, 2000; Gunter *et a*l, 1998; & Weil *et al*, 1998) and are now being adapted to incorporate technology to encompass a wider variety of resources and presentation tools. Teachers currently integrate technology into their lessons in many ways: student research projects, web page design, online projects, Internet lessons, and reports and presentations via slideshows such as PowerPoint, KidPix, and so forth. For teachers willing to do a bit of online research, multitudes of resources are available for Internet lesson plans and projects. Such lessons undoubtedly enhance thinking skills for the students. It is important, however, that teachers consciously plan and utilize teaching models specifically intended to further develop these skills. We have adapted several critical thinking models by incorporating technology (another often-required and highly desired element in current lesson planning). The results are that many critical thinking activities and ideas in the classroom can be improved and enhanced through the addition of multimedia sources, computer software, and Internet resources.

Concept Attainment

The first model adapted is the Concept Attainment model (Gunter *et al*, 1990). This model is extremely constructivist in nature and requires inductive thinking. Students must formulate their own definitions from positive and negative examples rather than gain the concept through a direct teaching manner. For a simple example, let us say that the concept to be taught is "transportation." Instead of a stated or written definition, students are first given the words "airplane" and "train" as examples, while they are given "book" as a non-example. The game continues, adding words such as "kayak" and "bicycle" in the examples column and "table" and "dress" in the non-examples column. Students and teacher add to the list of examples/non-examples until the students "get it" or the concept is "attained." Continuing, students define the concept and list all other examples they know. This example game is one for young children, but it is easy to see that by increasing the difficulty of the concept and adapting it to any subject area, this process can be used across all grade levels.

Preparing children from an early age to do this type of thinking is a skill that is most desired. Bruner (1977) explains that when students are allowed to "discover" the attributes of a category that is already formed in their minds (as opposed to simply being given a definition), they are engaging in higher level thinking. Eggen and Kauchak (1996) note that this "game" capitalizes on a "sense of the unknown." This triggers motivation through student arousal, defined as a "physical or psychological reaction to the environment" (p. 118).

Our preservice teachers and teachers in post-baccalaureate programs have described their success in teaching this model. Preservice teachers were given the format and rules for the model, and after practicing with each other in small groups, they were required to use the model in several lessons "out in the field." They reported excellent attention and results with their students at every age level and across all subjects.

The traditional use of this model is to list examples and non-examples of a concept orally or by writing them on the board. While this is an effective way to introduce the Concept Attainment model, we took it a step further and introduced pictorial representations of the concept. Most often this would involve cutting images out of magazines or copying them from books. This naturally led us to the addition of images found in various graphic art collections on the computer as well as searches on the Internet for specific pictures to use in the "game." When teaching our students this model at the university level, we then decided to move from the customary presentation of "holding up the pictures and walking around the room" to a more updated technological presentation using PowerPoint. This allowed a more interactive approach in a class of over 50 preservice teachers. As the images appeared on-screen everyone could easily see them and could make decisions as to whether the picture belonged in the example or non-example category. Using the Internet and graphics programs to gather images saved time, and presenting them on the large-screen monitor allowed everyone to see them at once. Finally, a larger range of examples can be quickly accessed on the Internet, allowing learners to see a greater variety. For instance, in social studies, if the concept is "mountains," a number of pictures of various types of mountains can be found, such as those with jagged peaks, those that have been weathered to smoothness, those formed from volcanoes, those covered with snow or jungle, and so forth. This is certainly a more optimal approach than simply writing a definition on the board or referencing a single picture in a book. This model is also very motivating for teachers, as they must also be constantly thinking and engaged with students during the "play." Imagine how much more thinking students do in this model than if they are simply given the definition of the concept followed by one or two examples.

The format we used for designing this was simple. A PowerPoint slide show was created with approximately 20 slides per concept. First a new picture is introduced and the class is told whether it is an example or a nonexample. The next slide shows the first picture placed in the correct category, example or nonexample. The third slide introduces a new picture by itself and students are told to consider in which category it might fit. The fourth slide shows the picture in the appropriate category. From this point on, a new picture is introduced on every other slide, followed by its correct placement among all of the previous pictures. The teacher uses his or her discretion to stop and ask students for other possible examples and when students are ready the teacher directs them to name the concept. The concept is written on the last slide of the show. Education students were then encouraged to select concepts for their own classrooms.

Suchman Inquiry

After successfully adapting the Concept Attainment model to include technology, we then examined several other higher-level thinking models usually presented in education classes. The Suchman

Inquiry model (Gunter *et al*, 1998) seemed to be another easily adaptable model to technology. This model requires that students actively use questioning that can be answered with only "yes" or "no" responses to find the answer to a situation or idea. It is very much like the game of "Twenty Questions." The teacher keeps an answer to him/herself ("an eggplant" for example), and students in a whole class situation ask questions ("Is it green? Is it round?) to narrow their thinking until they reach the correct answer. Of course, in upper level classrooms, the item/situation is more complicated. One difficulty in bringing children into a productive pattern of questioning is that they tend to "pot shot " their questions with no logic or organized system of thought. However, we sought to help students develop logical questioning patterns by utilizing a variation of this model adapted to technology.

While the whole-class version of this Inquiry model has its advantages, we felt that students could also improve their understanding of successful questioning patterns by playing a version of this "game" individually at the computer. We developed a flow-chart approach using HTML documents that provided options for narrowing the inquiry process. Students correctly navigated through a questioning pattern that logically led to the correct answer. In this way, they were forced to develop the questioning patterns we sought to build. For example, instead of young students guessing, "Is it a cabbage? Is it a carrot? Is it a potato?" we directed them to make choices, beginning with "Is it a large vegetable or a small vegetable?" followed by "Do we eat it cooked or not?" and "Is it red or not?" In the first step students make a guess among several broad choices, such as "Animal" "Mineral" "Vegetable." If they choose the wrong one a message flashes saying "Try again!" When they choose the correct picture, the next page offers several more choices such as "Has wings" "Has fur" "Has fins." Some choices are purposely written to distract students, for example after choosing "Has fur" another choice might be "Has gills." Clicking on this choice would reveal a silly picture of an imaginary creature and information about mammals explaining how they breathe. Students continue to navigate through the options until they reach the correct answer. With the use of technology, pictures and clip art can be used with or without text so that even nonreaders can engage in this activity. By navigating through the available pictures and options, students naturally begin to develop a sense of logic for the hierarchical arrangement of information. They are informally utilizing patterns of classification and organization to find the correct answer. It is believed that such learning enhances students' critical thinking processes.

Conflict Resolution

Another teaching model that requires critical thinking is that of Conflict Resolution (Weil *et al*, 1998). In this model students are divided into groups, given a topic to debate, and then guided through the process of gathering information. They list important issues or points to support their position and present their arguments to the other side. Naturally, this process requires students to use higher-level thinking skills (analysis, synthesis, and evaluation). For this model, we assigned a topic and divided students into groups. They gathered information to support their views by searching the Internet. Here they collected up-to-date information; they assessed the importance or popularity of the issue based on how many web pages or URLs were associated with it; and they collected data and made comparative judgements about their side of the debate after reviewing contrasting and supporting information. Current researchers encourage both cooperative groupings for upper level decision-making as well as the use of active technology in the classroom. The combination of the Conflict Resolution model with technology works best to provide these elements.

Memory Model

Another teaching model that is often recommended for higher levels of thinking is the Memory model (Weil *et al*, 1998). Students are asked to create a method to help them remember pieces of information. Quite often ridiculous association pictures are encouraged. For example, one might remember the hard minerals (quartz, beryl corundum, pyrite) by picturing a man in a car (for corundum) pulled up to a stand made of barrels (beryl) where he is purchasing a pie (pyrite) for a quarter (quartz).

Once more, we wished to involve a higher-level thinking activity (creating) through technology by having students use technology tools to design these ridiculous images. After students are given information, they are assigned to a computer as a small group and given the task of developing images that aid in memorization of the materials. For example, in a fourth grade science class studying groups of animals, students constructed a picture of military men marching along in rows ...but they had changed the heads to those of chimpanzees. This funny image illustrated that many chimpanzees are a "troop." Because the students generated the image themselves, the information is more meaningful and the memory association is likely to be much stronger than one shown to them by the teacher or some other source. The resources available to students on the computer offer many options for creating these "silly associations." Various graphics software can be used to create such images, and students who may not consider themselves artists are quite capable of producing unique and creative Memory models using technological resources.

Models of teaching "engage" students in higher-level thinking skills. In combining these various models with technology, both areas reach for excellence in the classroom. The value of these models of teaching is in their versatility. Teachers and students are able to employ these models in their own classrooms across subject areas to gain a much greater depth of understanding. Using technology as a tool, there are few limitations.

References

Bruner, J. S., Goodnow, & Austin, G. A. (1977). *A study of thinking*. New York: Robert E. Krieger Publishing, 1977.

Eggen, P. & Kauchak, D. (2000). *Strategies for teachers: Teaching content and critical thinking (4th Ed.)* Boston: Allyn and Bacon.

Gunter, M. A., Estes, T., & Schwab, J. H. (1998). *Instruction: A models approach* (3rd Ed.) Boston: Allyn and Bacon.

Weil, M., Calhoun, E., & Joyce, B. (1998). *Models of teaching* (6th Ed.) Boston: Allyn and Bacon.

How Can We Share Teaching Experiences in Different Countries through ICT?
- Concepts, Models and Propositions for Instructional Design and Analysis -

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Abstract: Information and Communication Technology (ICT) enables pre-service and in-service teachers to share their experiences with one another while in different places. In other professions such as architecture, medicine, engineering, etc, specific symbols and models are used to express ideas and inventions. In the educational profession, there are no common symbols or models for teachers to express their ideas or to share experiences. This paper proposes a procedure of instructional synthesis and analysis, concepts for teaching, graphic representation of models and logical expression of instructional propositions to enable teachers to share their experiences through ICT.

Introduction

The new Information and Communication Technology (ICT) comes to teachers' desks and into classrooms enabling teachers and children to communicate each other from different places. The Internet, Cyberspace, Computer-Mediated Communication (Ryan 1992) and other concepts emerging from ICT are opening a new era in education on a worldwide scale, connecting people from different culture and countries. Computational communication technologies can play a vital role in the formation and successful operation of work-based learning communities, (Gordin, et al, 1996). Direct communication between children in foreign countries is spreading widely on the Internet despite their insufficient fluency in foreign languages. On the contrary, teachers cannot share their teaching experiences fully with others in a different culture or even within the same county due to the different frameworks used to express ideas and professional experiences. In professional areas such as engineering, medicine, music and other disciplines, members can express ideas, inventions and efforts in common international languages or symbols which are different from daily spoken languages. The teaching profession also needs an internationally understandable language to facilitate communication among teachers from different areas. This paper examines the possibility of sharing experiences among teachers in different workplaces through ICT.

A Framework for Generating Lesson Plans

In the case of conventional lesson plans, we start by describing educational aims and goals, specify instructional objectives and predict teaching and learning events which may occur in the classroom. In this procedure, we start from our educational intention and aims and move to instructional contents, teachers' actions, teaching materials, students' activities and other remarks. However, when we start to develop our ideas from educational norms, educational values differ from teacher to teacher, from school to school and from society to society. It is not difficult to express ideas as expectations and philosophical views in written statements, but it is hard to reach common agreement on educational goals and subsequent teaching, or to describe instructional events which will occur in the teaching process in advance. The same description of teachers' intentions and instructional objectives does not necessarily result in a similar learning or common visible student outcome due to differences in teachers' experiences. Teachers' intentions in written form are easy to read, but it is difficult to reach a common understanding and agreement, to modify the statements or replace them with other statements. On the other hand, when we start from students' activities, learning environment and a visible outcome, it is possible to describe them, to reach same agreement after critical discussion on visible events, to collaborate each other and work together to assess and support students' learning. In this context, we try to describe the physical and psychological environment needed for an effective learning by means of concepts, models and propositions.

There are two directions to follow regarding instructional design. One is to start from our specific intentions and aims for instruction, proceed to images, models and a rational sequence of teaching, develop a concrete lesson plan and conduct it in the actual classroom. Another direction is to start with a flexible instructional strategy, conduct the lesson, observe the teaching-learning process, analyze the behavior of teacher and students in the classroom and predict teaching-learning events for the next lesson. In the real teaching situation, both directions are taken into consideration to generate a lesson plan. The designing procedure proposed here consists of several components; images, codes/categories, synthetic and analytic concepts, empirical models and propositions, which form sequential steps shown in the following figure in English and Japanese.

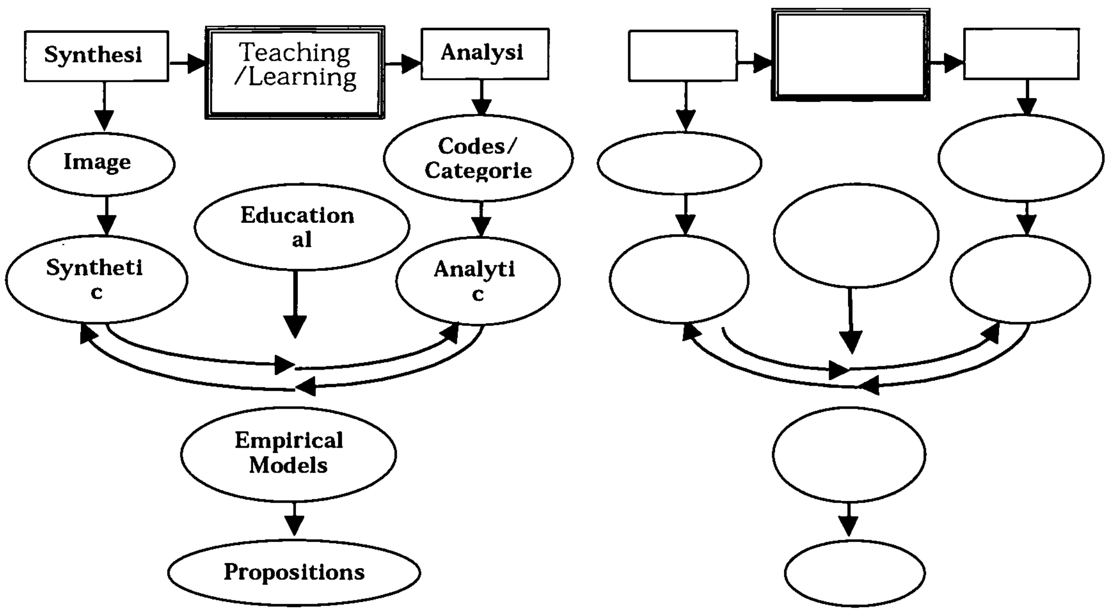


Figure 1. Procedure for instructional synthesis and analysis in English and Japanese

In other professions such as construction, architecture and chemistry, internationally understandable symbols, concepts and models are available to express ideas and facilitate communication. When we start to develop a lesson plan from a prescription of teaching-learning events, it is easy to select common symbols, concepts, models and propositions from a database of instructional materials and to describe the lesson plan with such elemental components. If a theoretical model applicable to the lesson is available, it is suitable to adopt it for effective teaching. Whole configuration of symbols, concepts, models and propositions constitutes a structured lesson plan and represents specific educational aims. Graphic representations of symbols and concepts for instructional design enable teachers to develop their ideas and revise them ceaselessly. These components stored in a database are applicable to other instructional situations to be utilized by other teachers. In this context, the components of symbols, concepts, models and propositions are free from any specific educational values.

The proposal described here aims to give in-service as well as pre-service teachers a new framework for preparing instructional plans in daily teaching. They construct a lesson plan by selecting images/models and propositions stored in computers. They can add and store new images, models and propositions at will. They start writing lesson plans in a very primitive way using pictorial images, proceed to the stage of keywords or concepts, represent ideas in graphic models and describe judgment and explanations in propositions. The revising procedure is vital for improving an initial lesson plan before experiencing the actual situation to be observed in the classroom and reaching a refined plan to enable realizing and assessing the intended instructional goals. New models and propositions will be created endlessly just like new car models emerge one after another. Components for the synthesis and analysis will emerge always and will be far too many to memorize.

In spite of such a multiplying of components, we can store these components and utilize them to express our experiences through ICT.

Appendix I shows a tree structure of variables and Appendix II PowerPoint slides representing a few examples of images and models. Appendix III represents examples of propositions. The method for instructional design is named a MACETO model representing meaning/values, activities/actions, concepts/contents, environment, tools/techniques and outcome. The following table shows pairs of components in both English and Japanese If a teacher describes a lesson plan in English, it will be simultaneously translated into Japanese, and vice versa.

English	Japanese
M: meaning/values	M:
A: activities/actions	A:
C: concepts/contents	C:
E: environment	E:
T: tools/techniques	T:
O: outcomes	O:

Table 1 Pairs of variables in English and Japanese

Each component has a number of items arranged in a tree-structure as shown in the following table. Other variables of MACETO are given in Appendix II.

English	Japanese
1. Meaning/Value	1.
1.1 Contextual/situational	1.1
1.1.1 Interest and inquiry into subject matter	1.1.1
1.1.2 Self-awareness	1.1.2
1.1.2.1 Self-recognition through learning and achievement	1.1.2.1
1.1.2.2 Social recognition through learning and achievement	1.1.2.2
1.1.2.3 Experiences in the past	1.1.2.3

Table 2 Some variables in tree structure

If there is a correspondence between English technical words and the foreign equivalents, teachers in different countries can exchange their experiences through English as an international language.

Implementation of the Procedure in Pre-service Education

The procedure of synthesis and analysis for instructional design was introduced during the course 'Instructional Technology' to confirm its applicability in pre-service education. Students in this course were requested to follow these instructions.

1. Describe an imaginary lesson to be developed in workgroups with images and models and elaborate it further according to their own ideas. Explain the rationale used to design such lesson referring to documents of instructional standards (issued by the Ministry of Education and/or Local Boards of Education in Japan) and literature on education.
2. Develop a lesson plan using images and models referring to the MACETO model to select synthetic and analytic concepts. The plan should be relevant to children's activities, learning situations and the educational environment.
3. Report their learning experiences during the course and evaluate them referring to the learning plan prepared at the beginning of the lessons.

At the beginning of every session, 'Topics for this week' and 'Learning plan of this week' were distributed. The class was conducted by showing the lesson plan of this course through PowerPoint presentation and handouts of 'Learning plan of this week' to be filled and submitted at the end of each session. Students worked hard collaboratively in groups as well as individually to accomplish their tasks.

Pre-service students have a long history of attending classes in elementary and secondary schools. They hold rigid and sustaining images on teaching from these experiences. At the initial stage of instructional designing, they tend to refer to such images and follow the experienced framework to generate lesson plan. It is hard for them to change the framework and accept new types of instruction not written in the form of a conventional lesson plans. New types of software such as PowerPoint enable us to express ideas in a flexible way and to revise them with ease. Repetitive revisions enable us to refine these ideas and making them relevant to instructional events observed in the real teaching situation. In this context, components used to describe a lesson plan should be flexible enough to change its structure at a very early stage of designing.

The following figure shows the image of a whole course representing students' ambiguous states at the beginning, gradual clarification, creative contribution, panel presentations and submission of final report. This image has an entirely similar structure and representation in English as in Japanese without any modification.

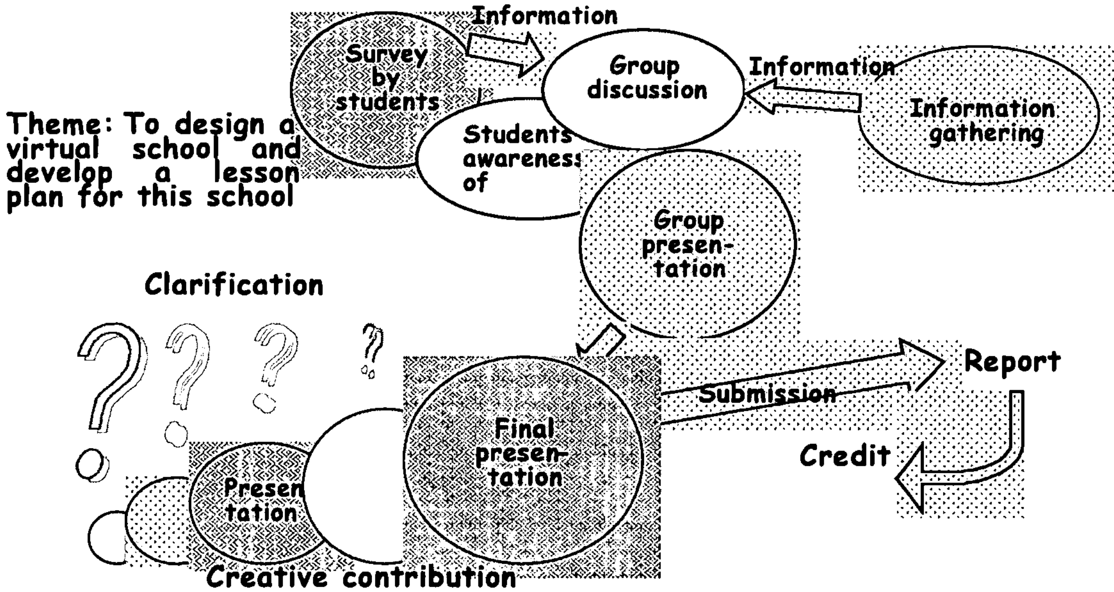


Figure 1. Instructional procedure of 'Instructional Technology' representing graphic images

Conclusion

The course can be described in the form of images, concepts, models and propositions that are exportable to professional teachers through the Internet or other communication technology, enabling them to share professional experiences on teaching. There is no clear cut distinctions between image and model, but the image represents teachers' ideas and expectations, while the model represents teaching and learning events observed in actual classes in the form of conceptual figures and concepts. Synthetic concepts are derived from images and are intention-oriented; analytic concepts come from an analysis of teaching/learning process and are behavior-oriented. There is no continuous or reliable procedure for converting a lesson plan from concept to empirical model. This requires intuitive ideas and back and forth repetition to refine the lesson plan. If we succeed in standardizing symbols and concepts internationally, it is possible to share our teaching experiences in other countries.

Teachers try to predict learners' activities in a class, develop instructional materials, provide an interesting learning environment, select tools for effective learning, support students' learning and then expect to achieve their instructional goals. There may be various procedures to develop instructional plans, teaching in classroom and evaluation after teaching. This developing procedure should be described in internationally understandable symbols and languages to enable teachers to share their experiences with people from different cultural backgrounds.

Researchers propose models to apply scientific knowledge to solve problems in teaching/learning, and teachers adopt them to improve their teaching. Many models have been proposed to make this procedure rational and effective so as to achieve predetermined educational goals and instructional objectives. However, the unilateral application from theory to practice is not always effective in the complicated real situation. Teachers have to develop their own framework to confirm applicability of their knowledge accumulated from previous experiences. In this circumstance, they have to equip themselves with the competency to originate practical knowledge suitable to solve problems tackled in their work place. Teachers share a strong feelings of the ineffectiveness of instructional theory as taught in teacher education schools, especially, regarding pre-service education. Experienced teachers nominated by the Local Board of Education in each school district supervise novice teachers and give them advice on teaching during the first year of their professional careers. Nevertheless, novice teachers heavily rely on their individual experiences but share them with colleagues only occasionally. This procedure reproduces empirical consistency and professional continuity in successive generations among teachers. It is hard to change the framework of writing lesson plans in the conventional style or to introduce a new concept of instruction. However, it is indispensable to develop a new style of lesson plan that enables teachers to express ideas in very primitive state and revise them repeatedly in order to create a refined lesson plan.

References

Nishinosono, Haruo (2000): 'Integration of Working, Learning and Researching in Teacher Education', paper presented at SITE2000 held in San Diego, USA

Ryan, R.(1992): 'International connectivity: A survey of attitudes about cultural and national differences encountered in computer-mediated communication. *The Online Chronicle of Distance Education and Communication.*

Bump, W et al. (1999): 'Virtual Teams in the Classroom' Proceeding of SITE1999,

Gordin, D.N., Gomez, L.M., Pea, R.D., Fishman, B.J. (1996): 'Using the World Wide Web to Build Learning Communities in K-12' Journal of Computer-Mediated Communication. Vol. 2. No. 3

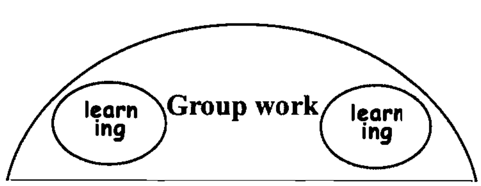
Appendix I : Tentative list of concepts/keywords used to design lessons (about 400 items are stored)

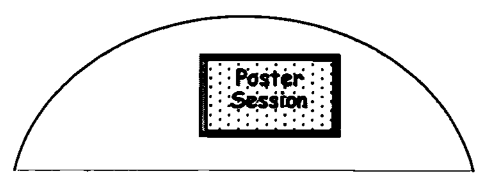
1. Meaning/Value

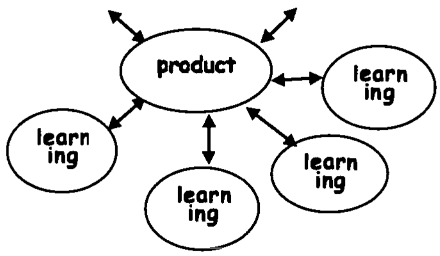
- 1.1 Contextual/situational
  - 1.1.1 Interest and inquiry into subject matter
  - 1.1.2 Self-awareness
    - 1.1.2.1 Self-recognition through learning and achievement
    - 1.1.2.2 Social recognition through learning and achievement
    - 1.1.2.3 Experiences in the past
- 1.2 Awareness of problems
  - 1.2.1 Social problem: economy, environment, social welfare, information, health
  - 1.2.2 International problem: peace, poverty, development, education
  - 1.2.3 Community problems
  - 1.2.4 Personal problems
- 1.3 Preparation for future
  - 1.3.1 Preparation for entrance examination
  - 1.3.2 Acquisition of certificates
  - 1.3.3 Preparation for specific profession
- 1.4 Self cultivation: (details omitted)

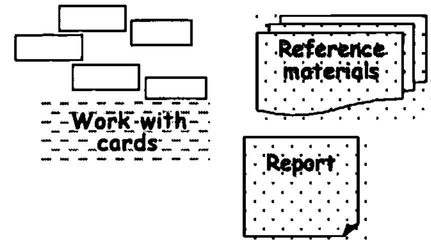
2. **Activities & Actions:** (details omitted)
3. **Contents/Concepts:** (details omitted)
4. **Environment:** (details omitted)
5. **Tools/Techniques:** (details omitted)
6. **Outcome:** (details omitted)

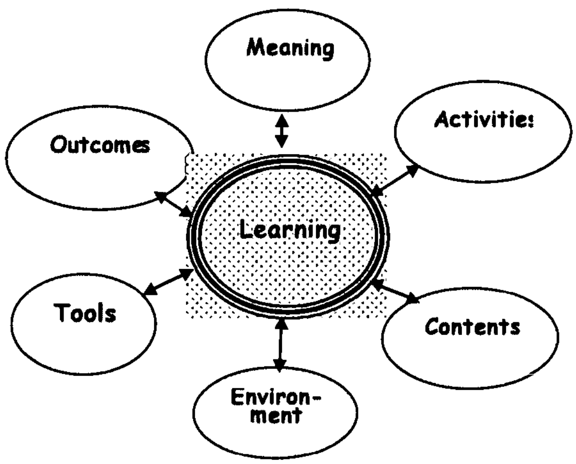
Appendix II : Images and models for instructional designing using PowerPoint

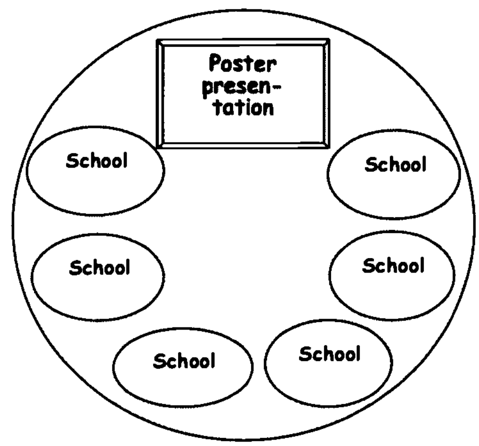












Appendix III : List of instructional propositions (about 60 propositions are stored)

It is possible to develop students' competency for instructional designing through a sequence of training sessions to form pictorial images, key concepts, graphic representations, models and propositions.

Alternative strategies regarding degree of freedom in learning

1. When we increase the degree of freedom in learning and give more initiative to students, learning results in a wide range from excellent to poor outcomes in quality and quantity.
2. When we decrease the degree of freedom in learning and give less initiative to students, learning results in more reliable but a mediocre outcome of less quality.

When we feel confident by a gradual formation of an outcome in ourselves, we realize the meaning of learning.

There are two possible ways to proceed to forming empirical models.

1. Students observe recorded teaching, take notes and analyze them. After this analysis, they try to describe the process in keywords and put them in a graphic representation.
2. Students repeat describing their own experiences in keywords and show activities in a graphic representation, and succeed to express relationship and procedure in a model.

To recover autonomous learning, it is effective to concentrate on developing a lesson plan dominated by activities, rather than one dominated by contents of the subject matter.

To manage a large group of students to learn autonomously, it is effective to form groups or clusters of groups, to encourage active participation and let them recognize their responsibility for autonomous learning.

Continuous Zoom applied to texts

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Abstract: The amount of text that we are required to read in the present days is amazing. One of the reasons for a poor performance of electronic text systems may result from the fact of users to avoid reading the whole text and make decisions mostly based on their headings (Fox, 1992). Aiming to minimize this problem, we have developed a computer-based tool for continuous zoom interfaces (graphic interface that allows a text to be continuously magnified of decreased). Prior to displaying the text, this tool performs a previous analysis of the text, taking into account its grammatical classification. Then, the text is displayed in its most condensed format and lowest zoom level, where only the most important words are shown. For that, the tool uses the artificial intelligence technique (pattern matching). The text is then displayed in its most condensed format and lowest zoom level. As zoom increases, more elements of the text become visible. It should be highlighted that the tool deals with language "traps" and whenever the pattern recognizer fails to classify a certain word, it makes that word visible in its most reduced zoom format.

Introduction

One of the most important aspects of an eletronic document reading is the user interface (Knight 1999). Zoomable User Interfaces are a kind of information visualization (Benderson 2000). *Ken Perlin* of New York University defined the concept of *Zoomable* surface *(Perlin 1993). Ben Benderson* designed and implemented *PAD++* tool, which in Maryland University gave rise to *Jazz (Benderson 2000)*, which in turn provided a *Java API to* develop the *Zoomable User Interfaces (ZUI)*. When working with version 1.0 of *Jazz*, we had to made several extensions to its original format.

The objective of this work is to contribute to reduce the effort to read general electronic documents; to produce and test new ways to analyze texts and identify patterns of sentence constructions, as well as to classify grammatically each of their components. One of the most important questions about electronic documents lies in the research of their usability, which advantages will be provided and how they will be *(Maes 1992)*.

Pattern Recognition

One critical natural language processing task is that of determining the syntatic structure of a sentence, also known as parsing. Correct parsing of unrestricted text is and exceedingly dificult task, due to the ambiguities in part of speech (noun, verb and so on) and structure (Goldstein 1999).Natural languages constitute a number of *traps* for any pattern recognition tool; for instance, a Word may have several meanings under diverse contexts. Such meanings could lead to a different grammatical class. In English, the word *Kiss* analyzed separately can be either a verb or a noun. The final definition will depend on the context it is employed. In other words, almost always it is necessary to analyze a whole sentence to be able to define the grammatical class of each of its components. Sometimes, the definition of a particular element of the text can influence that of another text. This problem may lead the inference algorithm to an endless *loop* condition. In this case, after a certain number of attempts, our program ends by classifying the word as "*indefinite classification*". This special class is given a differentiated treatment. Should a second element, in order to obtain its classification, need the classification of another element in the same sentence and the latter is defined as "*indefinite classification*", the former also assumes this condition. Therefore, as shown below, at constructing our patterns, we should be more economic in generic expressions, that is, we should use to the extent possible rules that should not depend on others. The more *indefinite classification* we have, the poorer the results obtained. There is also the problem of verb conjugations. Here, the existence of a rule to deal with them is indispensable. Otherwise, we would fall into the "*indefinite classification*" condition. Word classifications may be constant, such as adjective, adverb, definite article, verb, etc., or indefinite.

Continuous Zoom Interface

Of all extensions, that dealing with the management of the zoom stands out. Since we are working with text, each element will be assigned its particular zoom control. This is due to the fact that we will control the exact time when the element (text) will be visible to the final user. That time basically depends on both its *classification* defined as above and the text style.
Style, as briefly mentioned in the introduction, may vary greatly according to the purposes for which the text was produced. Documents can differ along several dimensions, such as length, writing style and lexical usage. Thus, specific classifications and expressions assume diverse importance in different *styles*.

To address this issue, the program will be provided with a zoom *dictionary* specific for each *style*. Note that while the *pattern dictionary* defined in the previous section is generic for a given natural language, our Zoom *dictionary* is more specific. This way, the program can work with any combination of both the dictionaries predefined by the final user.

Conclusions

Initial tests have proved promising. It was clearly confirmed that the law for formation of rules for the natural language dictionary are sufficiently consistent to express any set of <Exception1>, <Exception2>, <ExceptionN>, ... <Rule> for word classification in Portuguese language. We have also succeeded in introducing Continuous Zoom resources to the list of computer resources that help online reading.

References:

Perlin, K.M. & Fox, D. (1993). Pad: An Alternative Approach to the Computer Interface. *In proceedings of Computer Graphics* (SIGGRAPH 93) New York, NY: ACM Press , pp. 57-64.

Benderson, B.B., Meyer, J. & Good, Lance (200*). Jazz: An Extensible Zoomable User Interface Graphics Toolkit in Java* : [Web Page] URL : http://www.cs.umd.edu/hcil/jazz/learn/papers

Muter, P. , Latremouille, S.A., Treunet, W.C., and Beam *(1992).* P. *Extended reading of continuous text on television screens. Human Factors 501-508*

Maes, °A., Goutier °S., (1992) *Online Reading and Offline Tradition.* Sigdoc'92.

Knight, Kevin ; *Commun. ACM* 42, 11 (Nov. 1999), Pages 58 – 61

Goldstein ,Jade , Kantrowitz, Mark, Mittal, Vibhu and Carbonell, Jaime; *Proceedings of the 22nd annual international ACM SIGIR conference on Research and development in information retrieval*, 1999, Pages 121 - 128

Cognitive Design of Instructional Databases

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Abstract: One of the fundamental problems in distance delivery of educational content is to determine the amount of learning that is taking place. Merely delivering content is not enough - some form of assessment (at a distance) is necessary. Traditional methods for assessing students' understanding of course content (e.g. multiple choice problems short answer problems) can be enhanced and supplemented through the use of computers and information technology. Timing and tracking information collected in real time, coupled with information from interactive, specially designed Java applets and scripts, can be used to supplement traditional assessment methods by capturing information about students' decision-making processes. This paper describes how to develop databases and assessment methods based on cognitive models of information processing, to better interpret performance data and more effectively deliver instruction at a distance.

Cognitive Foundations

To address issues related to the diversity of educational problems and lack of consistency in instructional approaches, the field of education is moving to models of cognition based on logical-mathematical principles (Anderson et al. 1998). Using models that can be implemented and tested on modern computer systems, performance can be analyzed rigorously and compared to experimental observations. This offers some defense against recent criticisms of poor scientific practice (Labaree, 1998). We feel that theories of information processing (Anderson 1996), cognition (Anderson et al. 1998), knowledge representation (Sowa 2000) and database design have progressed far enough to enable one to design, analyze and test the effectiveness of instructional delivery systems. The particular systems we have in mind are web-based, and designed for use both in-class and at a distance.

Borrowing from classical Philosophy, "ontology" is defined as an explicit formal specification of how to represent objects, concepts and other entities that are assumed to exist in some area of interest and the relationships that hold among them (Gruber 1995, Guarino 1998, Guarino et al. 2000, Stutt 1997). "Knowledge Engineering" is a relatively new discipline that has arisen to transfer human knowledge and expertise into computer systems (Sowa 2000). The goal is to build Knowledge Based Systems (KBS), systems that store and use very large amounts of information about an application (or knowledge domain) and serve as an intelligent assistant rather than an expert system. An example of this has been the work done in the area of Intelligent Tutoring Systems (ITS). There is an enormous body of literature regarding the construction and design of KBS to which we refer the interested reader (Boose et al. 1988, Gauthier et al. 2000, Ringland et al. 1988).

Rather than pursue an abstract theoretical approach, we will focus on a concrete example. Suppose we wish to teach methods of integration to students in Mathematics. The identified knowledge domain within mathematics would be integration methods. From the standpoint of student comprehension, however, integration methods is too broad a topic to teach, thus, the knowledge domain would be broken down into sub-domains or components that restrict both the teaching and learning focus. In this example, our target sub-domain might be integration of functions of a single variable. Subsequently, we may recognize that the sub-domain itself is too broad, so instructional focus may shift to a single objective, for example, integration by parts. Although integration by parts might also be considered a sub-domain, we refer to it as an *objective*, and view the sub-domain of single variable function integration as being covered by multiple objectives as depicted in Figure 1.

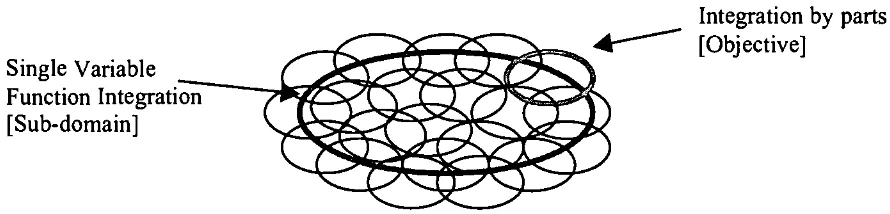

Figure 1: Decomposition of a knowledge sub-domain into overlapping objectives

Once we have identified a specific objective, we must come up with a suitable knowledge representation. We follow the general information processing approach (Anderson et al. 1998) by identifying three types of knowledge: declarative, procedural and strategic. Roughly speaking:

> ***Declarative knowledge*** consists of basic factual knowledge; for example, formulae or rules of a restricted form (such as derivatives of polynomials, trigonometric and exponential functions).
> ***Procedural knowledge*** consists of algorithms; for example, changes of variable or trigonometric substitution.
> ***Strategic knowledge*** consists of information about alternate ways to perform sequences of actions, usually in the course of problem solving; for example, identifying groupings of terms or reducing terms to standard forms.

The knowledge needed to accomplish the objective (in this case, integration by parts methods for functions of a single variable) is then partitioned into declarative, procedural and strategic knowledge. This process is analogous to the Cognitive Task Analysis done when building an ITS (see Figure 2).

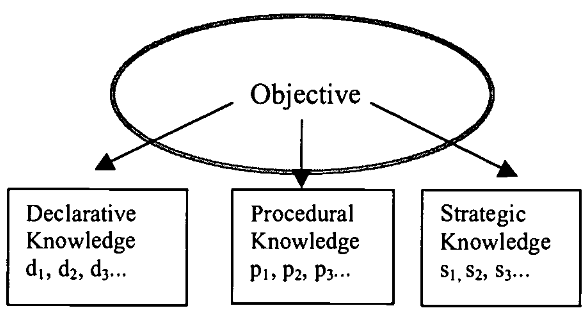

Figure 2: Decomposing an objective into declarative, procedural, and strategic knowledge components.

This decomposition is usually performed by a Subject Matter Expert (SME), someone who is knowledgeable about the sub-domain and the relationships among the knowledge components. The decomposition is not necessarily complete, and should be extensible to allow for improving the model.

One of the problems encountered in knowledge engineering is designing systems that are independent of the knowledge domain ("re-usability"). We need to design a structure that is flexible enough to capture relationships but allows for variable content. We accomplish this through a particular database "schema."

Database Design

The knowledge representation within the database includes both the content and meta-data about the content. The data are all listed within a single table that includes the name and description of the datum, the data type (e.g. declaration or procedure or strategy) a list of dependent data, and a list of questions that test a student's knowledge of the content area. These data **content** and the **relationships** between the data are dependent on the particular knowledge domain (sub-domain or objective), but the **structure** of the database is independent of any specific content area.

Figure 3 illustrates the inter-relationships between the declarative, procedural, and strategic knowledge associated with a specific objective.

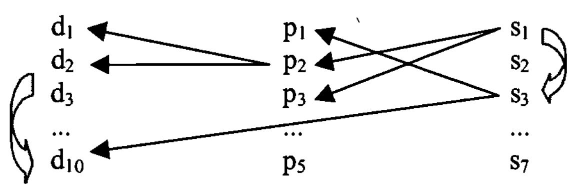

Figure 3: Linkages between declarative, procedural and strategic knowledge.

In this example, strategy 1 depends on strategy 3 and procedures 2 and 3. Strategy 3 depends on declaration 10 and procedure 1. Procedure 2 depends on declaration 1 and declaration 2. Declaration 2 depends on declaration 10, etc. An important constraint to these relationships is that no circular references should occur. A second constraint is that no lower order meta-datum should depend upon a higher order meta-datum. That is, a declaration cannot depend upon a procedure and a procedure cannot depend upon a strategy. All other inter-relationships would be legitimate.

The final piece of the knowledge representation is the questions. The database stores the questions and their properties within a single table. The primary fields are:

question id, question type, question text, variable definitions, stems, solution, explanation, keywords, estimated time for completion, estimated difficulty, comments, evaluation method, hints

It is important to note that because the structure of the database and tables are not dependent on the particular knowledge domain (or sub-domain or objective) under consideration, it is possible to design software tools and interfaces which help build a knowledge representation as part of an iterative process.

Assessment

Up to this point, this type of conceptual modeling or knowledge representation can be done without any instructional goals in mind. In order to test whether learning is taking place, a set of questions is created which address the particular objective. These questions act as "probes" which help build a model of the student's understanding. The simplest questions merely test the basic factual knowledge (declarative knowledge) through true-false or multiple-choice questions. Single-step procedural knowledge can be tested through multiple-choice or short answer questions. More complicated multi-step procedural knowledge can be tested through short-answer, multiple-choice or workout problems. Strategic knowledge can be probed through workout problems that are skill based.

One of the benefits of the question database is that during the process of adding questions to the database (e.g. by an instructor, through an authoring tool) it may become apparent that some type of knowledge has not been included (e.g. a basic differentiation rule has been omitted). This provides an opportunity for the knowledgebases to be updated or edited. The author benefits from greater awareness of the underlying knowledge representation.

Although this seems like a complicated structure, it is invisible to the student. When a question is presented to the student, it is in the form of standard HTML (which may include graphics, multimedia, forms, scripts or applets!) The student's response is then recorded and compared to the solution, using the appropriate evaluation method. This includes the following:

Strict numerical equality or equivalence ("5/2" or "2.5" compared to "2.50")
Numerical equality within a prescribed tolerance (e.g. "3.14" compared to "3.14159")
Strict string equality, ignoring case (e.g. "Parabola" compared to "parabola")
Symbolic equivalence (e.g. "$\sin^2 (ax)+\cos^2 (ax)$" compared to "1")

The evaluation method then returns a measure of student performance (which can then be weighted by difficulty, elapsed time, number of hints received, etc.)

Pre-tests can be given to provide information on the students understanding of declarative and procedural knowledge, prior to instruction. Post-tests can be given to test strategic understanding after instruction. Tests for "retention" are also useful to see how much knowledge has been "proceduralized" and how much is in long-term memory versus short-term memory.

Based on the performance metrics returned for each question, and because of the underlying database structure of the questions, an analysis can be performed for each student. For example, suppose 10 questions on integration by parts were given, of these 5 questions were missed. Suppose further that each question that was missed involved differentiation of trigonometric functions (one element of the declarative knowledgebase). If none of the questions that were answered correctly involved differentiation of trigonometric functions (only polynomials or exponentials), a recommendation would be given to the student to work on a module involving differentiation of trigonometric functions. This recommendation could be in the form of a diagnostic report to the student or possibly by forcing the student to complete (successfully) a module on trigonometric differentiation prior to resuming instruction. In either case, we are following the general paradigm of "assessment inform instruction."

Assessment takes place continually, in conjunction with content delivery. Assessment may be formal (pre-test or post-test), it may be graded or non-graded (for use in tutorials or practice tests). Usually it will occur informally as part of the feedback provided by the student back to the instructional delivery system.

Implementation

The assessment components described in this paper have been used for several semesters in two Educational Psychology Statistics courses and an analysis of the effectiveness of this system can be found in (Hall et al. 1999, Pilant et al. 2000). In the Hall, et al. (1999) study, 41 graduate and undergraduate students enrolled an applied statistics course self-selected into one of three groups. Group 1 took chapter pretests online and printed out results. Subjects in group 2 printed copies of the pretests but did not take tests online. Group 3 did not access the pretests. Pretests for exams 1 and 3 were made available through a class. Groups could not be distinguished, *a priori*, based on demographic data, self-reported motivation, time spent studying, class goals, or math skill scores. There were, however, statistically significant differences among groups on exam performance, favoring students in the online-pretest group.

Currently, the authors have developed and are testing a limited version of the assessment tool outlined in this paper. A series of linked components make up the online testing instrument. The first is an "administration" or "authoring" component that is web-based and password protected. In this environment, an instructor can build or modify questions and exams and create classroom databases. A second component provides students access to the actual interactive testing. Finally, the third part is the database itself, currently *Microsoft ® Access,* which is completely hidden behind a web front-end (for portability).

One of the unusual features programmed into the online testing tool is the ability to capture information related to motivation through use of sliders that measure student's "familiarity" with content objectives prior to testing, and "confidence" about response accuracy as the test proceeds. This provides students and instructors with information regarding depth of preparation, level of skill, and degree of uncertainty. Each question is timed transparently to the student. The format of the questions is unstructured - any valid HTML code can be included. Question types currently supported are true/false, multiple choice, short workout, and detailed workout. Questions can be interactive (through embedded *JAVA* applets), and can contain graphics and multi-media. Responses are recorded and a printable summary of the students' work - including computer-graded questions (true/false and multiple choice), explanations, time spent answering individual questions, reported confidence and help, and reported familiarity with learning objectives - can be returned to students when all questions have been answered. In the pretest mode, students review one question at a time and once questions are submitted, they cannot be revisited. If there is not enough time to complete a pretest, a bookmark feature allows a student to return to the test at the point where he/she stopped.

Using this tool, instructors can maintain question, exam, student, and class databases, and link questions to categories and/or objectives to individual questions. The authoring tool is completely accessible through the Web (although it is password protected for security reasons). In not providing immediate feedback to students regarding the correctness of their responses, students experience exam level questions in a context that mimics in-class exams. When the pretest is completed, students are provided with their test results and with explanations for each of the questions. These reports are intended to be used as study guides and include detailed explanations for each question with embedded links to tutorial material, detailed workouts, and interactive graphics.

A more recent version of the online testing program is being used in actual classroom testing. This version features a random question function so that students sitting next to one another are not working on the same question at the same time and allows students to review their exams (all or targeted questions) at the end of the test before submission, to skip questions that they want to return to later, and to justify responses to multiple-choice or true-false questions. All question types are supported and graphics and applets can be integrated into the questions.

Conclusions

In this paper, we have outlined a methodology that a significant portion of the system is independent of the knowledge domain - specifically, the database structure (schema), authoring tools and HTML delivery system. The main features of this process are:

1) Identify a set of objectives that cover the knowledge (sub) domain
2) For each objective, identify an initial set of:
   a) Declarative Knowledge
   b) Procedural Knowledge
   c) Strategic Knowledge
3) Create a question database

The main driving mechanism is the creation of a question database that dynamically updates the declarative, procedural and strategic knowledgebases. This is accomplished through an interactive HTML based authoring tool. One of the side benefits is the explicit awareness of the underlying knowledge structure (ontology) on the part of the instructor.

Questions may be formulated using any valid HTML code, which allows the inclusion of JavaScript and Java applets. Java Applets allow much more interactivity, and provide the opportunity for skills-based testing. Recording time-on-task, either through the applets or through JavaScript, provides additional insight into the learning patterns of individual users.

Finally, it should be emphasized that this type of knowledge engineering approach works in the field, having been tested in two different Educational Psychology courses during the last two years.

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References

Anderson, J. (1996). *The Architecture of Cognition.* Mahwah, NJ. Lawrence Erlbaum Associates, Inc.

Anderson, J. & Lebiere, C. (1998). *The Atomic Components of Thought.* Mahwah, NJ. Lawrence Erlbaum Associates, Inc.

Boose, J.H. and Gaines, B.R. (1988). *Knowledge Acquisition Tools for Expert Systems.* Vols. 1, 2. Academic Press, 1988

Gauthier, G., Frasson, C. & Vanlehn, K. (2000). *Intelligent Tutoring Systems*, Springer-Verlag, vol. 1839, *Lecture Notes in Computer Science.*

Gruber, T. (1995). Toward Principles for the Design of Ontologies Used for Knowledge Sharing. *International Journal of Human and Computer Studies*, 43 (5/6), 907-928.

Guarino, N. & Welty, C. (2000). A Formal Ontology of Properties. In Benjamins, R., Gomez-Perez, A., Guarino, N. and Uschold, M. (Eds.), *Proceedings of the ECAI-2000 Workshop on Applications of Ontologies and Problem-Solving Methods.*

Guarino, N. (1998). Formal Ontology and Information Systems. In Guarino, N. (Ed.), *Formal Ontology in Information Systems. Proceedings of FOIS'98* (pp. 3-15). Amsterdam, IOS Press.

Hall, R., Pilant, M, Strader, R. (1999), The Impact of Web-Based Instruction on Performance in an Applied Statistics Course, (pp. 261-266), *Proceedings of International Conference on Mathematics/Science Education and Technology*

Pilant, M., Hall, R., Epstein, J., Hester, Y., & Strader, R., (2000), Issues Involved in a Large Scale Implementation of Web-Based Mathematics Instruction, (pp. 334-339), *Proceedings of International Conference on Mathematics/Science Education and Technology*

Labaree, D. F. (1998). Educational researchers: Living with a lesser form of knowledge. *Educational Researcher*, 27(8), 4-14.

Ringland, G.A. and Duce, D.A. *Approaches to Knowledge Representation.* Research Studies Press, 1988.

Sowa, J. (2000), Knowledge Representation: Logical, Philosophical and Computational Foundations, Brooks/Cole

Stutt, A., (1997), Knowledge Engineering Ontologies, Constructivist Epistemology, Computer Rhetoric: A *Trivium* for the Knowledge Age. (pp. 1914-1919) *Proceedings of Ed-Media 97 and Ed-Telecom 97*

URLs

Advanced Computer Tutoring Project, ACT Research Group, Carnegie Mellon University, Pittsburgh PA http://domino.psy.cmu.edu/ACT/awpt/

OnlineTesting Project, TexasA&M University, College Station, TX http://onlinetesting.tamu.edu/

Ontolingua, Knowledge Systems Laboratory, Stanford University, Stanford CA http:// http://www-ksl-svc.stanford.edu:5915/

A "fearless approach" to technology integration in the elementary classroom

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Abstract: Taking on this challenge, a professor and graduate student at a major urban university with over 40,000 students and 600 preservice teachers restructured a traditional instructional technology course and piloted a constructivist model without changing the content. The mission was to train teachers to utilize current technologies in the classroom effectively through a two-credit course. During this project, the researchers tracked the progress of both the course and the success of the students. Multiple variables merged to create a meaningful experience for preservice teachers about to embark on their teaching career. Approximately twenty-one technology skills were assessed using a pre-post self-assessment tool. All 26 teachers in the sample reported a significant increase in their technology skills by the end of a 10-week restructured instructional technology course for elementary teachers (ISTE, 1999).

Introduction

The overriding purpose of the course was not have students become "technology proficient" in every application, but that preservice teachers (students) in the class develop a "fearless approach" to learning new technology. Objectives focused on the development of skills necessary to model lifelong independent learning. To achieve this, the class setting modeled both constructivist and behaviorist perspectives. Demonstration of technology integration into traditional transmission and constructivist-compatible instruction was presented. Students observed the differences in learning with technology within both types of pedagogy.

Approach

Topics covered in the course were flexible and evolving, centering on the needs of the learners (students). Relevant learning theories discussed included a diverse segment of scholars: Piaget, Vygotsky, Skinner, Papert, Gagne, H. Gardner, Bloom, Bruner, and Dale (Cone of Experience.) Students engaged in on-line discussions as well as essay writings in studying the learning experience.

Instructors placed special emphasis on lesson planning analysis, particularly in the areas of objectives and assessment. Students utilized the learning plan model called "ASSURE" to examine effective planning for integration of technology. Class members created rubrics and utilized them to evaluate various assignments to include the final presentation.

Instructional Design

In designing the course content, both students' interest and newly implemented standards became important. The preservice teachers in this course will soon be subject to technology standards being implemented by the state of Ohio and based on the nationally developed standards by ISTE (International Society for Technology in Education). This course attempted to instill the confidence these future teachers will need to meet the new standards.

Participants

The convenience sample for this exploratory analysis of an isolated instructional technology class for elementary preservice teachers included 26 preservice teachers. The teachers were classified as interns or teaching assistants who were in their 4th and 5th year of teaching preparation. Class members completed projects and presented their authentic learning in using technology to enhance the instructional process and student understanding over a 10-week period. Thus, sharing of multiple examples that demonstrated "appropriate use of technology" occurred. Students engaged in software evaluation, multimedia production, and portfolio presentation. A particular assignment involving action research by the students challenged them to observe and interview a classroom teacher on the topic of technology integration. Results of this particular learning experienced varied as much as the use of technology in today's classroom. It became a very telling event for all. Figure 1 provides a description of the course structure, instructional approach, activities, assessments, and outcomes.

Course Description: Instructional Technology for Elementary Teachers:

This is a two-credit course offered on foundation technology skills, pedagogy, and instructional designs, which support learning and teaching with technology in elementary learning communities. The course structure and content are intended to address educational reform and basic technology foundation skills. (National Commission for the Accreditation of Teacher Education and the International Society for Technology Education (NCATE/ISTE; Available: iste.org)

Prerequisites: Recommended for 4th and 5th Year Preservice Teachers and a Basic Computer Literacy

Readings:
Textbook required: Heinich, R., Molenda, M., Russell, J., & Smaldino, S. (1998). *Instructional media and technologies for learning* (6th ed.). Upper Saddle River, NJ:Prentice Hall

All textbook reading should be completed before class. After reading, complete a summary KWL reflection for class discussion and your portfolio. Summaries must be "word processed".

Other required reading and Internet Web-sites

Paper #1: Papert readings are available by querying the Search Engine Lycos using the essential phrase, "The Children's Machine by Seymour Papert". You will find over 100 websites to choose from. Write a report based on the sites that describes Papert's beliefs about technology in education. Compare and contrast his views with your perspective as a future teacher. Due in the portfolio at the end of the term. (E.g. Papert, S. (1982). *Mindstorms: Children, computers, and powerful ideas*. New York: Basic Books. Paper due in portfolios at the end of the term, double-spaced, references, and cover sheet.

Websites to visit:
Software Review Projects, Supportive Online Lessons, and Ohio Technology Standards for Students http://www.ohioschoolnet.k12.oh.us/home/contents.asp
Tutorials: http://microsoft.com/education/tutorial/classroom/default.asp
Kathy Shrock's Guide for Educators (http://www.capecod.net/schrockguide/)

Overview:
The course will incorporate activities connected to the *Ohio SchoolNet Learner Technology Profiles* sites and other Internet resources that were created to guide teachers as they integrate technology into the curriculum. The course is organized around the six categories:

(1) Basic operations and concepts
(2) Social, ethical, and human issues
(3) Technology productivity tools

(4) Technology communication tools
(5) Technology research tools
(6) Technology problem-solving and decision-making tools.

Instructional Design:
The course structure is based on learner-centered theoretical perspectives. This approach is supported by multiple instructional strategies to encourage a constructivist learning environment. Technology skills learn technology skills by engaging in integrated and collaborative activities. The activities are intended to demonstrate ways in which technology tools can be effectively integrated into the instructional environment to encourage collaboration, exploration, and/or the development of problem solving skills.

Coursework:

The modular units incorporate discussion, project-based, and exploratory approaches throughout the learning and instructional process. A few specific technologies include: PowerPoint, HyperStudio*, Netscape Communicator, Excel, Internet/WWW, basic Windows computing skills, and reviews of educational software (See SchoolNet Software Review Project at: http://www.ohioschoolnet.k12.oh.us/home/contents.asp

Weekly Assignments

Grading Criteria

Assessment and Evaluation: Student performance is based on individual and team projects. The final grade will be based on all completed papers, projects, comprehensive portfolio, and an oral presentation. The final grade will be based on a 200 point system (100 points for class assignments and 100 points for a final project/portfolio). See grading scale following assignments.

All assignments will be graded based on an appropriate rubric for each project--- guided by the following principles:

1. Clarity of assignment –covers the relevant details required for the specific project.
2. Integration – ideas for classroom use discussed.
3. Products are clear and useful following all principles of visual presentations.
4. Choice of software is appropriate for the audience and environment.
5. The ease of presentation, quality of the assignment, and the ability to answer questions evidence knowledge of the software and technology.

Summary Class Projects 1/3= 100 points, Portfolio 1/3, and Final Presentation 1/3 = 100 points
Total:200 points.

Figure 1. Sample Syllabus for Instructional Technology Class

Course Objectives:

The course is designed to help students:

Basic Operation and Concepts

1. Demonstrate a sound understanding of the nature and operation of technology systems.
2. Become proficient in the use of technology.

Social, ethical, and human issues

1. Understand the ethical, cultural, and societal issues related to technology.

2. Practice responsible use of technology systems, information, and software.
3. Develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.

Productivity tools

1. Use technology tools to enhance learning, increase productivity, and promote creativity.
2. Use productivity tools to collaborate in constructing technology-enhanced models, preparing publications, and producing other creative works.

Technology communication tools

1. Use telecommunications to collaborate, publish, and interact with peers, experts, and other audiences.
2. Use a variety of media and formats to communicate information and ideas effectively to multiple audiences.

Technology research tools

1. Use technology to locate, evaluate, and collect information from a variety of sources.
2. Use technology tools to process data and report results.
3. Evaluate and select new information resources and technological innovations based on the appropriateness to specific tasks.

Technology problem-solving and decision-making tools

1. Use technology resources for solving problems and making informed decisions when planning and assessing classroom learning activities.
2. Employ technology in the development of strategies to solving problems encountered in real classroom environments.

Attendance Policy

Student presence in class and labs is required to earn credit for assignments. Please arrange with the professor for planned absence. In case of emergency you must call (513) 556-4385 and leave a voicemail message. Sending E-mail is not a substitute, but you may do both.

Collaborative Work: There is only one group assignment. Each member of the group is equally responsible for the work.

Portfolio: Details on your portfolio will be given at a later date. However, all assignments completed in class will become a part of your portfolio. Your are asked to keep a journal of your reflections on all readings and class projects/assignments.

Online Participation and Discussion

Due dates: All assignments will be given a due date during the class time and updated on E-mail each week in case of a change.

Performance-based Assessment

Pre & post assessments administered to students determined their self-perception in the acquisition of technology integration skills. The results of the assessments, along with evaluations of individual assignments, presentations and a cumulative portfolio, combined to determine students' final grades. Course analysis was used for planning and restructuring the class as indicated by student achievement and performance.

Lessons Learned

In recent years, the vision for technology in the Division of Teacher Education at the University of Cincinnati has increasingly been shaped by both state and national standards for the teaching and use of technology in the classroom. SchoolNet, an Ohio technology education agency, has established standards for identifying and strengthening skill levels for preservices' appropriate use of technology in the classroom. Nationally, the National Council for Accreditation of Teacher Education (NCATE) standards, which incorporate International Society for Technology in Education (ISTE) standards, outlines those skills that are necessary for preservices and faculty to hold. This project will result in comprehensive incorporation of these standards into the University of Cincinnati's nationally recognized preservice education program. In 1998 UC College of Education [CITE program] received the *Exemplary Practice Award in Support of Teacher Education Accreditation* by the American Association of Colleges for Teacher Education (AACTE, 1998). *U.S. News & World Report and Modern Maturity* hailed the UC College of Education as "cutting-edge" for teacher reform (*Educator*, 1999).

The Cincinnati Initiative for Teacher Education (CITE) at the University of Cincinnati's College of Education is a five year preparation program that is nationally recognized as a leader in systemic school reform and innovative methods of teacher education. The program is built on the Holmes Group model and has been in place for five (5) years. During the professional preparation year (Year 4), students are considered Teaching Associates. They take methods classes, content area classes, and spend 4 to 6 hours per week each quarter in schools, teaching and observing. During their internship year (Year 5), students complete their advanced methods requirements, participate in coordinated seminars, and teach half time in a school for a complete and full school year.

Interns typically receive pay from the school systems and are teachers of record in their classrooms, bearing the full responsibility of two classes of students in a secondary school and a half-day teaching in an elementary school. Students are placed in schools (Professional Development Schools) that have agreed to work closely with the College of Education to provide supportive and extended induction experiences. Currently five high schools and 11 elementary schools support teaching associates and intern teachers through the Professional Development School concept and in keeping with the College's urban mission. Many of these schools are located in the Cincinnati Public Schools district.

Identification of Specific Gaps and Weaknesses

The mission of the CITE program is to develop high quality teachers experienced in working with the special needs of inner city schools and pupils. A primary focus is the Cincinnati Public Schools (CPS). Currently, pre-service teachers in the CITE program receive inadequate training in technology. A comprehensive program analysis has determined that one critical component missing from this program and from many of the courses taught by the teaching associates and intern teachers, is technology. At the present time the average number of IT hours per CITE student is between two and three credit hours (2.5 cr. hrs.). Students get these hours of technology instruction only in the 4th or 5th year of the program (Figure).

The use of technology has been infused only sparsely into methods and curriculum areas. Of even greater concern are the inconsistent and ineffective methodologies employed during instruction. Access to professional development and technical assistance for faculty is only rudimentary. Although, during 1997-1998, the instructional technology methods for courses were revised to introduce focus on curricular integration; project based learning, inquiry-based and exploratory learning, collaborative learning, standards-based lesson planning, and technology integration, the small insulated change was inadequate to meet the need of preservice teachers with little or no experience in technology environments.

Evaluation data indicates that students participating in the enhanced courses demonstrated increased potential to perform at higher levels of achievement and an ability to use a variety of instructional technologies with their own pupils in the schools. However, a large percentage of students expressed frustration with non-traditional constructivist learning and teaching strategies and most did not include new instructional strategies in their technology integration lesson plans. This was evident across all the teacher education programs. An analysis of the course evaluations revealed that students skills varies widely, over half of the students wanted more direct instruction. Students also expressed that in a constructivist learning setting the traditional textbook and syllabus are highly ineffective tools because of the emerging information and new knowledge from web-sites and practical field experiences. In addition, teachers indicated that most of their mentor teachers preferred the traditional lesson plan format, therefore they were unable to apply much of what they learned in their field experiences in the public schools.

Conclusions

After fully evaluating the data, it became apparent that to bring about a comprehensive change in teaching practices it would be necessary to expand the implementation to include all methods, faculty, and students across programs and subject areas.

References

Heinich, R., Molenda, M., Russell, J., & Smaldino, S. (1998). *Instructional media and technologies for learning (*6th ed.). Upper Saddle River, NJ:Prentice Hall.

International Society for Technology in Teacher Education (ISTE) (1999). National Educational Technology Standards for All Teachers. Available at: iste.org.

Educator (1999).*U.S. News & World Report and Modern Maturity* Article.UC College of Education as "cutting-edge" for teacher reform.

Software Review Projects, Supportive Online Lessons, and Ohio Ohio Technology Standards for Students http://www.ohioschoolnet.k12.oh.us/home/contents.asp

Tutorials: http://microsoft.com/education/tutorial/classroom/default.asp

Kathy Shrock's Guide for Educators (http://www.capecod.net/schrockguide/)

Extending the Learning Environment: Potentials and Possibilities in a Web Mediated Course

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Abstract: Asynchronous learning tools on the World Wide Web have opened up possibilities and potential for a new environment for teaching and learning. One program, employing this learning tool was the Connecting Communities of Learners (CCL) developed by a team of science educators and programmers at Florida State university in the mid 1990's. This paper describes how it was used as one tool in a science education course for pre-service teachers. Facilitating dialogue journal, notice board, grade book and critical review, the CCL extended the physical learning environment beyond the traditional class contact periods. Learners were afforded the opportunities to work with materials and tools while operating at a pace convenient to them and appropriate for learning within the social context of the learning community being developed.

Introduction

Modern computer technology has made possible a new and rich learning environment (Lee, 1999). Today as we perch, poised for the next millennium there is evidence that the computer and the World Wide Web (WWW), have become a more viable option for teaching and learning. The Internet has quickly become a ubiquitous open WWW of interconnected, global computer networks (McIntyre, & Wolff, 1998), allowing for interaction and much collaboration among learning communities.

Developments in technology coupled with research in teaching and learning have led to substantial alterations in the way computer technology is now used in education. Today, asynchronous learning tools on the WWW have opened up possibilities and potential for a new environment for teaching and learning. The central pedagogical idea in an asynchronous learning network is collaborative learning at the time and place of the individual learner's convenience (Nulden & Hardless, 1999). Researchers contend that learners are afforded the opportunities to contribute their understandings on issues from any place and at any time that is personally convenient. At the same time, it allows for multiple discussions to occur simultaneously. Asynchronous learning network utilizes different tools for computer mediated communication. It employs the integration of these tools as a means of slowing down the dynamic face-to-face interactions, characteristic of the traditional classrooms (Nulden & Hardless, 1999). One of the hallmarks of the asynchronous learning network is that it reduces competition for airtime among participants allowing for equal voice in communications. In part, this is accomplished as the time available for reading or rereading materials is increased, allowing for critical reflection and formulation of thoughts.

Connecting Communities of Learners (CCL)

One program employing the asynchronous learning tool was the Internet application known as Connecting Communities of Learning (CCL). This was developed by Kenneth Tobin and a team of educators and programmers at Florida State University (FSU) in the mid 1990's. Embracing social constructivism, giving credence to the social context of learners and their individual needs, emphasis was placed on the active role of learners in knowledge construction and the social construction of this knowledge.

Structure of the CCL

The CCL consisted of a number of sites for posting students' work. Identified by a named button, some of these were critical reviews, dialogue journals, research papers, proposals, portfolios and notice board. A mailroom system also allowed for selective or mass dispatching of e-mails to all members enrolled in the course along with the instructor. Access was facilitated through the use of a log-in name and a private password that allowed entry into the website. In this paper I will discuss how the CCL was used as one tool to facilitate learning in a science education course for pre-service teachers.

Website Teaching and Learning Tools

Dialogue Journal

The dialogue journal, a semi-private site, offered a safe base, learning environment where participants became involved in academic discourse, shared perspectives and had access to the ideas of their peers. It also provided a platform where group members could work collaboratively on projects. One project, The Moon Model, required group members to observe the moon over a period of time and create a model to explain their observations. Group members were able to continue their discussion on their science project without having the constraints of a common meeting time. Within this environment they shared their observations, offered explanations and reflected on their model as it was being constructed.

Critical Review

Critical review was one of the teaching strategies used in the course. As a course requirement, each week the students were required to read one chapter of the assigned text: Teaching with the Brain in Mind, Jensen (1998). For each chapter the students wrote formal critical reviews that were posted in the appropriate sections on the web. To complete the assignment, each student critiqued the review of one of his or her peers who was randomly assigned. This forum provided useful feedback to the individual whose work was being critiqued and at the same time provided an avenue for further learning to the person doing and receiving the critique.

Notice board

The notice board was a site for brainstorming and speculative thinking. At the beginning of the semester the notice board served the purpose for easy accessible instructor's general notices and public communication. However, as the semester unfolded the notice board provided the forum for participants to verbalize their positions on specific ideas generated from reading, or other experiences such as observation and reactions to micro-teaching. Topics such as assessment, the nature of science and the level of science teaching in elementary schools became the focus of discussion on the notice boards. Responses in the form of feedback then provided the opportunities for elaboration or modification of views while interacting with the ideas of their peers. This provided the opportunities for the creation of shared beliefs and enabled much critical thinking.

Grade Book

The grade book provided easy access to feedback and grades. It included distribution of ratings from each peer review as well as all the related feedbacks from peer, instructor and self. These feedbacks occurred at two levels; providing private comments addressed to the individual and public comments that served to inform the work of the general class.

Conclusion

There is no doubt that the computer and the WWW have revolutionized much of our day to day actions and interactions. Harasim, (1990) and Linn, (1998) note that computer technology has introduced unprecedented options for teaching and knowledge building while expanding the opportunities for creating communities of learners. The possibilities now exist for learners outside of traditional classroom settings to become active, reflect on interesting issues raised during the development of a course of studies and then share with their peers in a non-threatening environment. Extending the traditional learning environment and the contact times, the CCL has moved the on-line capabilities offered in university classrooms beyond e-mail only communication. The challenge therefore, is for instructors to strive for more effective teaching strategies and instructional design in this new social context afforded by web technology.

References

Harasim, L. (1990). *On-line education: An environment for collaboration and intellectual amplification in on-line education: Perspectives on a new environment.* New York: Praeger.

Jensen, E. (1998). *Teaching with the brain in mind.* Virginia, Association for Supervision and curriculum Development.

Lee, J. (1999). Effectiveness of computer based instructional simulation: A meta analysis. *International Journal of Instructional Media 26(1)*, 71-85.

Linn, M. (1998). The Impact of technology on science instruction: historical trends and current opportunities. In Barry J. Fraser & Kenneth G. Tobin (Eds.), *International Handbook of Science Education.* Great Britain: Kluwer.

McIntyre, D. & Wolff, F. (1998). An Experiment with WWW interactive learning in University Education. *Computers and Education 31* (1998), 255-264.

Nulden, U. & Hardless, C. (1999). Activity Visualization and Formative Assessment in Virtual Learning Environments. In J. A. Chambers (Ed.). Selected Papers from the 10th International Conference on College Teaching and Learning. Florida Community College, Jacksonville.

Effective Online Learning at Western Governor's University

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Abstract: Internet-based, distance learning solutions may prove effective in facilitating advanced study coursework for remotely located, place-bound students. However, the conditions for promoting online learning success have not been entirely defined. We present as an example the teaching challenges and benefits of an online graduate-level Instructional Design course for in-service teachers taught through Western Governors University and Washington State University. This paper addresses some of the teaching challenges for this online instructional experience, focusing specifically on how teaching styles were used to build online learning community, to effectively promote productive and satisfying learning interactions, and develop student problem-solving and critical thinking abilities. Also discussed are those instructional design strategies that were repeatedly employed in multiple course sections to increase online student engagement, critical thinking, and enhance student learning. This paper should prove of interest to anyone currently developing or delivering online instruction.

Introduction

Online Learning Environments

Computer-mediated instructional environments, or online learning environments (OLEs), are networked learning tools that are finding increased use in institutions of higher education. Online learning environments provide an interaction space that allows students to actively engage in critical dialogue and reflect on information in a way that facilitates knowledge construction and higher order thinking (Jonassen, Carr, & Yueh, 1998). Effectively designed OLEs also provide a communal workspace for group and peer-based teaching and learning (Collis, Andernach, & van Diepen, 1996). By incorporating instructional methodologies that support higher order thinking, OLEs can provide an interaction space for increasing student metacognitive awareness, critical understanding rather than simple knowledge retention, and problem solving abilities (Hannafin, Hill, & Land, 1997). Online learning environments are seeing increased use in institutions of higher education that are feeling pressures for delivering educational materials to a wider student audience. Many colleges and universities are investing considerable time and money in distance delivery methods to meet the diverse needs of learners. In spite of the effort and resources being spent, we do not have a comprehensive understanding of what factors influence successful student learning in online domains (Brahler, N.S., & Johnson, 1999).

Online learning environments are thought to provide a venue for developing higher order thinking skills in college students (Ewing, Dowling, & Coutts, 1999; Jonassen, 1995a), and are widely assumed to have a positive impact on student higher order thinking and learning. However, opinions differ greatly on how to effectively implement online technologies into learning (Ewing et al., 1999). Technology-enhanced OLEs can potentially provide higher order thinking opportunities, but technology does not of itself cause the development of these advanced cognitive abilities (Jonassen, 1995a). Rather, a major determinant of higher order thinking skills development is the quality of discourse that occurs within well designed, properly structured OLEs (Oliver, Omari, & Herrington, 1998). Ideally, OLEs possess several characteristics: a means of accessing, generating, and sharing information; support learner articulation of knowledge and reflection on what they have learned; represent and simulate authentic, real-world problems and contexts; provide structure for student thinking; support critical discourse among learners within a learning community (Jonassen, 1995b); promote student control of learning decisions; and integrate multiple learning perspectives (Jonassen, 1993). In reality, the promise of OLEs is largely unrealized, as many instructors use online learning environments as simple knowledge repositories (Jacobson & Spiro, 1993). When properly structured and utilized to their potential, OLEs are capable of moving education from teacher-centered, lecture-based, passive instruction to learner-centered, self-reflective, active learning (Lan, 1999). Emphasizing this concept, Diaz and Cartnal (2000) state, "Because more online courses will invariably be offered in the future, some assurance must be provided to the college, the faculty, and the students that distance education will meet expectations for a good education. Not only will students expect an education that is equal in quality to that provided by traditional offerings, they will expect a student-centered learning environment, designed to meet their individual needs (Diaz & Cartnal, 2000). While considerable research has touted the purported benefits of OLEs (Collis & Smith, 1997; Goldberg & McKhann, 2000; Hiltz & Turoff, 1994; Jones, 1996; Koschmann, 1994; Scott et al., 1997); little work has been done specifically dealing with how instructional design and styles of teaching influence student higher order thinking in these environments.

Teaching Styles, Instructional Design, and Online Learning

Teaching styles, hypothetical constructs used to characterize the teacher-student interaction (Fischer & Fischer, 1979), are based on several criteria. An instructor's beliefs regarding teaching and learning, how these beliefs are translated into teaching practice within a learning environment (Fereshteh, 1996; Grasha, 1994), how instructors present information, interact with students, manage and supervise learning tasks, and mentor students (Fereshteh, 1996; Grasha, 1994) are all components of teaching style. Instructors' teaching styles vary considerably; unfortunately, not all variations effectively promote student learning. The question remains: which styles of teaching most effectively develop student higher order thinking skills in OLEs? Many instructors are under the impression that the same teaching styles and approaches used in their traditional classes will also work in an online classroom (Diaz & Cartnal, 2000). While it is unclear whether traditional classroom teaching styles can translate to online domains, instructors utilizing facilitative, guidance-based, interactive teaching styles more effectively create critical thinking opportunities for the majority of students (Kember & Gow, 1994). Students report greater learning satisfaction with facilitative styles of teaching as compared to traditional authoritative instruction (Friday, 1990). Concurrently, facilitative teaching approaches that promote problem solving and critical thinking can be uncomfortable for students, and may be in contrast to students' superficial approaches to learning (Andrews, 1996). Collectively, these findings indicate that teachers that use facilitative, problem solving-based instructional approaches provide thinking challenges despite student discomfort with critical thinking.

Instructional design also plays a significant role in online learning success (Winfield, Mealy, & Scheibel, 1998). While technology can enable learning opportunities, it is teachers' careful planning and incorporation of instructional strategies that contribute to student interaction, growth, and learning (Kirby, 1999). In particular, instructional designs that incorporate student-centered learning approaches in online learning environments support student reasoning, problem solving, and higher order thinking (Land & Hannafin, 1997). Furthermore, the instructor's questioning skills significantly affect student critical thinking outcomes in college courses (Bonnstetter, 1988; Elder & Paul, 1997). By using systematic questioning techniques (Hannel & Hannel, 1998) and/or research-based questioning methods (Adams, 1993) in their teaching style and instructional design, teachers can enhance critical thinking skills in student learners (Adams, 1993; Hannel & Hannel, 1998).

Instructional strategies used to enhance student mental engagement and critical thinking include: not asking questions with known answers; waiting an appropriate length of time for students to think; increasing instructors' non-evaluative responses to students; and avoiding questions requiring a "yes" or "no" response (Bonnstetter, 1988). In addition to questioning techniques, the quality of the college student learning experience (i.e. critical thinking) is partially determined through other, less tangible, instructional design components like planned social interactions, alternative, non-lecture teaching formats, student learning choices that exploit personal interests and strengths, teaching approaches that provide real-world contexts for learning, and course material demonstrating the value of diverse cultures and perspectives (Stage, Muller, Kinzie, & Simmons, 1998).

The Study

The present work focused on the quality of student learning as a function of teaching style in an online learning environment hosted by Western Governor's University and Washington State University. Student participants, a collection of technology professionals for their respective K-12 school districts, were enrolled in a graduate level "Instructional Design and Performance Improvement" course as part of the Masters in Technology and Learning degree at Western Governor's University. For this content area, class size was strictly limited to 20 or fewer students, based on recent suggested benchmarks for Internet-based distance education (*Quality on the Line: Benchmarks for Success in Internet-based Distance Education*, 2000).

The Instructional Design and Performance Improvement course was comprised of an informational website (http://education.wsu.edu/TL/522/) and the primary communicative tool for the course, an email listserve. The course website contained an outline of course requirements, student evaluation criteria and grading procedures, required and recommended texts, and instructions for completing the primary assignments for the course, three problem-based Instructional Design projects. In addition, several descriptive hints for project development were included. The three projects comprised the majority of the course grade (90%) with the remaining 10% for student participation in weekly online discussions. Also included on the course website were email hyperlinks for direct student access to the course instructors and coordinator, as well as instructions for subscribing to the email listserve. Students were assigned readings from the required textbooks, and the instructor posed weekly questions to the listserve so that all class members could potentially participate in any aspect of any posted discussion. Questions were structured and goal-oriented but open ended, and were designed to develop student research and evaluation skills that were necessary to successfully complete each of the three projects. An email listserve format was chosen as the discussion tool as it was anticipated that all students had ready access to email technology. Hardware and software requirements for full email functionality were minimal; using more sophisticated communication systems could have limited student access potentially. Students were required to post at least one well-developed, thoughtful answer to each weekly question as a criterion for student course performance.

The course design specifically emphasized problem-based learning by requiring students to develop three in-depth research projects that were distinct but built upon one another. The first project invited each student to evaluate and assess their specific, unique instructional environment by constructing a well-developed instructional technology assessment rubric, and to preliminarily identify a pressing instructional problem particular to their environment. The second project requested that each student describe in further detail his or her specific instructional problem, and provide supporting rationale with relevant literature. The primary goal of the second project was to research and develop a proof-of-concept model for pilot testing a potential solution to the identified instructional need, and to determine the instructional effectiveness of the proposed solution via educational testing. Finally, the third project bid each student to critically reflect how their instructional practice has changed, what aspects or models of the instructional design process were most useful to them, and how they planned to implement their solution in future instruction.

Methods

Research Question and Variables

In an attempt to identify and comprehend some of the important criteria for learning online success, our research question was: Does teaching style and instructional design affect the quality of student learning and satisfaction in online courses? For this study, our first independent variable was the instructor's teaching styles, which represented 1) instructional design content expertise, 2) provided learning structure and guidance, 3) provided a personal example for learning and instructional leadership, 4) guided, questioned, and facilitated student interaction, active learning, and critical thinking, and 5) cultivated student learning abilities so as to empower student learners to become independent, functional Instructional Designers. Our second independent variable was the course instructional design, which reflected the structure and purpose of inherent course activities. Our dependent variable was the overall quality of student learning in the online domain. Indicators of student learning quality included the frequency of interaction, the quality of weekly teacher-student and student-student discourse, the level of student writing confidence and development of content expertise, and the degree of reflection and revision indicated in student responses.

Learning Quality Assessment

The categories of the teaching styles independent variable were determined using a validated Teaching Styles Inventory (Grasha, 1996), whereas the student learning quality dependent variable was evaluated qualitatively (Guba & Lincoln, 1982) via weekly and semester observation. In addition, students evaluated various aspects of the course, the instructor, and their learning experience with a 140-item, validated survey questionnaire (Silhouette Flashlight). Specifically, the Flashlight survey asked students: 1) the degree to which course assignments were stimulating, challenging, and encouraged student creativity; how quickly students received feedback, and how effective the reflection and revision process was; 2) the instructor's teaching effectiveness with regards to the teacher's ability to build students' confidence and promote student learning success; 3) how authentic the context and relevance to working environment was; 4) whether the instructor provided an informative, thorough evaluation of student thinking process and course performance specifically highlighting strong points and points for improvement; 5) the degree to which the instructor provided yes or no answers; 6) how well the instructor bolstered student learning confidence and stimulated excitement about course material and productive student interaction; and 7) whether students would recommend this general type of distance course, this particular course, and the course instructor to others. The survey also assessed student comfort with the course, specifically focusing on 1): student satisfaction with assignments; aspects of community building; 2) the level of thought put into responses; 3) whether students were likely to spend time on issues not related to course; 4) whether students were more likely to try and search for their own answers before approaching the instructor; 5) if they were better able to visualize course concepts; and 6) the effectiveness of the course structure and design.

Results

Below are the results of the Teaching Styles Inventory (Table 1), which was used to characterize the course instructor's instructional approach, and a profile of interaction within the Instructional Design and Performance Improvement course.

	Teaching Styles				
	Expert	Formal Authority	Personal Model	Facilitator	Delegator
Instructor	4.2	4.2	5.3	6.6	5.1
Norming Equivalent	Moderate	Moderate	Moderate	High	High

Table 1: Instructor Teaching Styles profile

Term	Total Responses	Instructor Responses	Instructor / Total Responses
Spring 2000	916	229	25%
Summer 2000	904	345	38%

Table 2: Instructor Interaction with Online Students over the Course Term

A collection of student quotes regarding the effectiveness of online instruction and utility of the online learning experience are as follows:

"Given the fact that the facilitation was on-line and we never talked face to face, I feel it covered all the needed areas and provided the feedback and information needed as well. Answers to questions were prompt and to the point. You gave useful feedback and insight into the instructional design field."

"Overall this course has been a very good experience. I have learned a great deal. Thank-you for letting me make this course relevant to my day job. Being able to do that has been invaluable."

"This was my first experience with a listproc, and it was very helpful to be able to read all the comments and submitted assignments. The weekly assignments did a great job guiding us into the different projects. I now feel I have a very good understanding of the instructional design process. The personal and professional growth attained through participating in this class has made me a better professional educator."

"I did appreciate your comments, and took them to heart whether it was on a weekly question, or as part of evaluating my projects. Your sense of humor kept things in proportion, but still deadlines were deadlines, etc. I always want to know where the line is and with your reminders, there was never a doubt."

"[I] wanted to say that although I didn't think that operating through a listserv was the best way to take this class, I've changed my mind over the last month and a half... this class has been straight forward and I think that the listserv has actually drawn us into the class more effectively than using web boards."

Discussion and Conclusions

Online learning, for better or worse, appears to be an educational trend that will continue for some time as educational institutions look for innovative ways to provide a quality learning experience for their students (Brahler et al., 1999). This qualitative study provides some insight into the distance learning process, and identifies some factors that may partially determine learning success for students in online domains.

The results of this study suggest that specific teaching styles can be used to promote effective student learning in online learning environments. In this distance learning experience, Facilitator and Delegator teaching styles were used most by the instructor, and were characterized by such activities as problem-based project development, guided student exploration, online group discussion, self-discovery exercises, learning debates, case studies and independent, student-designed research, and using the instructor as an independent resource (Grasha, 1994). To a slightly lesser extent, the Personal Model style was used by the instructor to illustrate alternatives, demonstrate ways of thinking, outline the thought processes involved in research-based project development, and to share personal viewpoints (Grasha, 1994). Finally, both Expert and Formal Authority teaching styles were used to provide a modicum of content expertise; however, the primary instructional goal for this online course was to begin with graduate students with little or no research or instructional design experience, and guide them on a path of self-discovery to a point of autonomy and independence within the Instructional Design field. Accomplishing this goal meant that students needed to develop their own content to a large extent. Collectively this meant that the instructor had to nurture student confidence and guide student development of independent research and individual critical thinking skills; thus the high scores for Facilitator and Delegator teaching styles. In this case, Expert and Formal Authority styles were utilized to provide structure within the independent learning environment, and to emphasize the high performance standards set for the students.

For the graduate Instructional Design and Performance Improvement course offered through Western Governor's University and Washington State University, we found that interplay between the teacher's and students' personalities was essential to productive learning. These findings were consistent with previous research that states teachers' personalities must be built into online courses (Winfield et al., 1998). Initially, it was essential that the WGU instructor establish a level of trust, professional credibility, and community with the students. Since the students were unable to 'see' any physical expressions of the instructor, it was vital that the teacher's initial responses were confident and competent, and that students felt part of a larger community of learners. As teacher confidence and competence was conveyed, the students expressed more trust and confidence in learning from a teacher in an online context, and shared more personal information in initial community building exercises as a result. When one has a class of 20 students, small, collaborative subgroups may spontaneously form. This phenomenon was also observed in the online classroom. Much research has shown the benefits of small group collaborative learning in online environments (Collis et al., 1996; Hiltz, 1998; Newman, Johnson, Webb, & Cochrane, 1997); however, in this context, small online groups served the purpose of community cohesion rather than collaborative learning.

Despite the high demand for this course, the course coordinator strictly limited the number of students to 20, a number that ensured a reasonable teacher/student ratio and was consistent with professional recommendations (*Quality on the Line: Benchmarks for Success in Internet-based Distance Education*, 2000). In addition, it was important that student learning become the focus of the course, not the teacher. In this case, the simple technologies used for this course and the design of the instruction allowed the technology to blend into the background and become more transparent; as a result, the students spent more time engaged in rigorous discourse and developing research abilities and critical thinking skills. In this scenario, the technology was a convenient, effective means to an end.

An interesting observation from the WGU teaching experience was how student perception led to increased performance expectations. In traditional face-to-face classrooms, student work is generally not publicly displayed, and the instructor is many times limited to teaching to students with the worst performance to try and increase average class performance. In the online classroom, students were encouraged to submit works in progress to the listserve as project development proceeded. This had the unexpected effect of increasing average class performance, presumably because less motivated students were exposed to high-quality projects and were prompted to increase their efforts by class overachievers. In this case, the instructor was not limited to teaching to the lowest performing students; instead students tried to emulate the project quality of the best students. It is unclear whether this shift in student perception would have occurred in a traditional classroom.

The Instructional Design and Performance Improvement course relied on an email listserve. This asynchronous method of communication allowed students to contemplate their submitted comments prior to submitting them for perusal by their class peers and the course instructor. Face-to-face interactions, such as those that occur in a traditional classroom, tend to be more spontaneous and unstructured. As a result of the asynchronous method, student responses in the online classroom tended to be more structured and well thought out.

In conclusion, we maintain it is the quality of human interaction that determines online learning success. We conclude that online instructors can use teaching styles to achieve instructional goals and provide rich, satisfying learning experiences for online students. The results of this study are intriguing; however, this study is not without limitations, and the conclusions drawn by the authors are speculative and preliminary. Only a small sample was used for this qualitative investigation, and as such there are limitations to how far these findings can be generalized. Additional studies in this area are necessary to more definitively support these conclusions.

References

Adams, D. L. (1993). Instructional Techniques for Critical Thinking and Life-Long Learning in Science Courses. *Journal of College Science Teaching, 23*(2), 100-104.

Andrews, J. (1996). The Teaching and Learning Transaction in Higher Education: A Study of Excellent Professors and Their Students. *Teaching in Higher Education, 1*(1), 81-103.

Bonnstetter, R. J. (1988). Research & Teaching: Active Learning Often Starts with a Question. *Journal of College Science Teaching, 18*(2), 95-97.

Brahler, C. J., N.S., P., & Johnson, E. C. (1999). Developing On-line Learning Materials for Higher Education. *Educational Technology & Society, 2*(2).

Collis, B., Andernach, T., & van Diepen, N. (1996, October 15-19). *The Web as Process Tool and Product Environment for Group- Based Project Work in Higher Education.* Paper presented at the WebNet 96, San Francisco, CA.

Collis, B., & Smith, C. (1997). Desktop Multimedia Environments To Support Collaborative Distance Learning. *Instructional Science, 25*(6), 433-462.

Diaz, D. P., & Cartnal, R. B. (2000). Students' Learning Styles in Two Classes: Online Distance Learning and Equivalent On-Campus. *College Teaching, 47*(4), 130-135.

Elder, L., & Paul, R. (1997). Critical Thinking: Crucial Distinctions for Questioning. *Journal of Developmental Education, 21*(2), 34-35.

Ewing, J. M., Dowling, J. D., & Coutts, N. (1999). Learning Using the World Wide Web: A Collaborative Learning Event. *Journal of Educational Multimedia and Hypermedia, 8*(1), 3-22.

Fereshteh, H. (1996). The Nature of Teaching, Effective Instruction, and Roles to Play: A Social Foundation's Perspective. *Contemporary Education, 68*(1), 73-75.

Fischer, B. B., & Fischer, L. (1979). *Styles in Teaching and Learning.*

Friday, R. A. (1990). Faculty Training: From Group Process to Collaborative Learning. *Journal of the Freshman Year Experience, 2*(1), 49-67.

Goldberg, H. R., & McKhann, G. M. (2000). Student Test Scores Are Improved in a Virtual Learning Environment. *Advances in Physiology Education, 23*(1), 59-66.

Grasha, A. F. (1994). A Matter of Style: The Teacher as Expert, Formal Authority, Personal Model, Facilitator, and Delegator. *College Teaching, 42*(4), 142-149.

Grasha, A. F. (1996). *Teaching with Style.* Pittsburg, PA: Alliance Publishers.

Guba, E. G., & Lincoln, Y. S. (1982). Epistemological and Methodological Bases of Naturalistic Inquiry. *Educational Communication and Technology: A Journal of Theory, Research, and Development, 30*(4), 233-252.

Hannafin, M. J., Hill, J. R., & Land, S. M. (1997). Student-Centered Learning and Interactive Multimedia: Status, Issues, and Implications. *Contemporary Education, 68*(2), 94-97.

Hannel, G. I., & Hannel, L. (1998). The Seven Steps to Critical Thinking: A Practical Application of Critical Thinking Skills. *NASSP Bulletin, 82*(598), 87-93.
Hiltz, S. R. (1998, November 7-12). *Collaborative Learning in Asynchronous Learning Networks: Building Learning Communities.* Paper presented at the WebNet 98 World Conference of the WWW, Internet, and Intranet Proceedings, Orlando, FL.
Hiltz, S. R., & Turoff, M. (1994, June 25-30). *Virtual Classroom Plus Video: Technology for Educational Excellence.* Paper presented at the Proceedings of ED-MEDIA 94--World Conference on Educational Multimedia and Hypermedia, Vancouver, British Columbia, Canada.
Jacobson, M. J., & Spiro, R. J. (1993). *Hypertext Learning Environments, Cognitive Flexibility, and the Transfer of Complex Knowledge: An Empirical Investigation.* Urbana, IL: Center for the Study of Reading - University of Illinois.
Jonassen, D. H. (1993). Thinking Technology: The Trouble with Learning Environments. *Educational Technology, 33*(1), 35-37.
Jonassen, D. H. (1995a). Computers as Cognitive Tools: Learning with Technology, Not from Technology. *Journal of Computing in Higher Education, 6*(2), 40-73.
Jonassen, D. H. (1995b). Supporting Communities of Learners with Technology: A Vision for Integrating Technology with Learning in Schools. *Educational Technology, 35*(4), 60-63.
Jonassen, D. H., Carr, C., & Yueh, H.-P. (1998). Computers as Mindtools for Engaging Learners in Critical Thinking. *TechTrends, 43*(2), 24-32.
Jones, D. (1996). *Solving Some Problems of University Education: A Case Study*, [WWW]. Available: http://cq-pan.cqu.edu.au/david-jones/Publications/Papers_and_Books/96ausweb/.
Kember, D., & Gow, L. (1994). Orientations to Teaching and Their Effect on the Quality of Student Learning. *Journal of Higher Education, 65*(1), 58-74.
Kirby, E. (1999, February 28-March 4). *Building Interaction in Online and Distance Education Courses.* Paper presented at the SITE 99: 10th Society for Information Technology & Teacher Education International Conference, San Antonio, TX.
Koschmann, T. D. (1994). Using Technology to Assist in Realizing Effective Learning and Instruction: A Principled Approach to the Use of Computers in Collaborative Learning. *Journal of the Learning Sciences, 3*(3), 227-264.
Lan, J. J. (1999). *The Impact of Internet-Based Instruction on Teacher Education: The "Paradigm Shift."*
Land, S. M., & Hannafin, M. J. (1997). The Foundations and Assumptions of Technology-Enhanced Student-Centered Learning Environments. *Instructional Science, 25*(3), 167-202.
Newman, D. R., Johnson, C., Webb, B., & Cochrane, C. (1997). Evaluating the Quality of Learning in Computer Supported Co- Operative Learning. *Journal of the American Society for Information Science, 48*(6), 484-495.
Oliver, R., Omari, A., & Herrington, J. (1998). Exploring Student Interactions in Collaborative World Wide Web Computer-Based Learning Environments. *Journal of Educational Multimedia and Hypermedia, 7*(2-3), 263-.
Quality on the Line: Benchmarks for Success in Internet-based Distance Education. (2000). Washington DC: The Institute for Higher Education Policy.
Scott, D., Durnell Crampton, C., Guavin, S., Lobert, B., Steinke, G., & Patterson, K. (1997). *Internet Based Collaborative Learning: An Empirical Evaluation*, [WWW]. Available: http://ausweb.wsu.edu.au/proceedings/donscott/index.html.
Stage, F. K., Muller, P. A., Kinzie, J., & Simmons, A. (1998). *Creating Learning Centered Classrooms. What Does Learning Theory Have To Say? ERIC Digest*: George Washington Univ., Washington, DC. Graduate School of Education and Human Development. ERIC Clearinghouse on Higher Education, Washington, DC.
Winfield, W., Mealy, M., & Scheibel, P. (1998, August 5-7). *Design Considerations for Enhancing Confidence and Participation in Web Based Courses.* Paper presented at the Annual Conference on Distance Teaching & Learning (14th), Madison, WI.

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Interactive Training Video and Software (For Faculty & Staff Development)

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The process of learning has been a source of amazement and fascination for centuries. Investigators have continually attempted to describe both animal and human learning in a wide variety of interactions and contexts. More recently, larger number of actual experiments has been conducted. It is perhaps ironic, given the sheer magnitude of the learning research that has been undertaken that we still do not know precisely how human beings learn.

Learning process has its own science at the level of professionals. New research and development has always been a key issue at all levels and at all geographic regions around the world. Teaching and training staff has been the backbone of the whole learning methodology, as to how disciplined training staff would be, and how effective the training would be. To improve the quality of training and its disciplines, an interesting training video has been developed and pictured. It is been presented in the form of a VCD, which also includes user-friendly software designed and developed for Faculty and Staff Development. This VCD is a helping tool for teachers and trainers involved in professional education and deals with students or trainees of competence-based vocational areas like computing, multimedia, CAD/CAM etc.

This training video is a helping tool to acquire qualifications in Teaching and Training, especially covering the course "International Diploma in Teaching and Training" by City and Guilds International (UK awarding body).

The video-training program has been categorized into five main stages and subsequently sub-stages:

a) Identify individual learning requirements
- Identify individual learning needs
- Identify suitable available learning opportunities

b) Plan and prepare learning sessions and materials
- Prepare learning session plans
- Select and prepare resources for a learning session

c) Deliver teaching and training sessions
- Establish a positive learning environment
- Make presentations to groups
- Instruct learners
- Promote group learning

d) Assessment, evaluation and review

- Assess learner performance
- Review progress with learners

e) Evaluate own performance and identify self development needs

- Evaluate own performance
- Identify self-development needs

As this video covers the Learning Cycle with 5 stages of learning and then 12 sub-stages; for each sub-stage a detailed learning session has been shown. Stages have been captured through role-plays, role-demos, different techniques used by trainers at each level and the moods and styles of trainers and its effect on the trainees. The video also includes trainer's body language and personality improvement techniques.

The other important part of this video CD is software designed by keeping in view the requirements of training staff. At each stage or sub-stage, the software helps to design and prepare slides, material, write-ups, records, data and other training updates.

In the help-line, this software has the provision to get connected via the Internet with the producers to get more assistance, updates or any trouble shooting.

References

Manual (1998), City and Guilds International Diploma (1104) in teaching and training.
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Sequence Independent Structure in Distance Learning

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Abstract: This paper is a preliminary report on a study of the use of a 3D virtual world designed to present a sequence independent distance learning environment. Students taking a class about the integration of computer technology into instruction were presented with a world that presented no prescribed sequence for exploring topics and no time schedule for completing various activities. The world was structured into "areas" that implied common topics and the students were asked to complete products that were identified with these "areas". Students were asked to report on their experience, participate in surveys about the world and their experience, and interviews about their experience. The instructor was interviewed about his intent for each of the readings and activities and his perceptions of student participation and completion of products.

Introduction

Teacher schedules and commitments make it difficult for them to pursue long term learning environments that help them develop the skills and understandings necessary to exploit the use of technology in their own classes. Therefore, there is a need to understand the role various technologies and formats play in distance learning environments for training and supporting teachers in the field.

Many web-based distance learning environments use web pages to transmit information and assignments and use email, chat and threaded discussions to afford students with opportunities to interact with the instructor and with each other. These courses tend to follow traditional schedules for student activity. Students may work at different locations and at different times during the day or week but the overall expectation is that they work on the same content and activities during roughly the same time frame.

The World Wide Web has the potential to provide a completely time independent exploration of content. Courses that have sought to exploit this potential have taken on the characteristic of programmed learning in which the students follows a sequence of content presentations and assessments of understanding. There is usually no opportunity afforded for interaction with other students and, often, little opportunity for interaction with an instructor. The student may move through the course at his or her own pace but must follow the sequence provided and must do so with little or no interaction with another person.

Another feature of the World Wide Web is the freedom with which an individual may explore information. A person may make many choices on what to pursue and in what depth to pursue information in a given area. While this may seem antithetical to the notion of a course, whether delivered via the web or otherwise it does pose an interesting avenue to explore when considering using a web-base environment as the basis for distance learning.

Can a learning environment be developed in which a time independent exploration of content is afforded the student and in which the students have an opportunity to interact with the instructor and other students? Further, can this learning environment provide an opportunity for students to plot their own path through the content rather than following a rigid specified sequence?

The Virtual World

Appedtec, a 3D virtual world, was built in which physical representations of the students (avatars) moved through representations of physical objects. Students in Appedtec could see other students' avatars when they were in the world together and could chat with them. The physical objects represented varied from buildings to walkways to trees and lampposts to chess pieces on a chessboard. There were signs to provide help and to indicate activities that were to be completed. The signs and many of the other objects (chess pieces, lampposts, tables) were linked to web pages that provided directions, links to readings, and links to forms to be completed or to the threaded discussions. Appedtec could be accessed by any Windows computer with access to the Internet

There were four areas in Appedtec that were part of the class in which the students were participating. Students entered into a main plaza. The side of the plaza they faced when entering this area had signs that provided directions and links to the threaded discussion areas. The other three sides of the plaza led to each of the other areas. One of these areas was a garden. In this garden the students were linked to readings and activities designed to help them focus on the role of computer technology in the learning setting. A second area was a chessboard with chess pieces on it. Each of the chess pieces linked to readings and activities designed to help the student explore the factors that influence the ability of teachers to integrate computer technology into instruction. And a third area was a building in which the students were linked to resources and activities designed to help them analyze their skills and knowledge related to the use of computers.

Students were asked to complete three products, in no particular order. One was a plan for integrating computers into an environment of their determination. Another was a statement of their concept of the role of the computer in learning settings. And another was an actual unit plan in which computer technology is an integral part of the learning activities. Students were informed that they could send their products in (as email attachments) at any time and that the instructor would provide feedback as many times as it was desired.

There were two chat times arranged for the whole class in which the nature of the products was discussed. The instructor also met with the class (face-to-face) periodically, to make sure everybody was comfortable with the experience, and was available via email at anytime and in Appedtec at prescribed times.

One assignment asked students to arrange a chat time with another student to discuss readings and to then post a set of conclusions. Other assignments asked students to contribute to threaded discussions. And some assignments asked the students to complete forms such as a self analysis of computer skills or perceptions of factors that influence computer integration. This experiment with Appedtec was conducted during the course of a regular semester rather than as an open entry completion experience.

Initial Results

At this writing not all surveys and interviews have been completed. Initial results indicate that there was early frustration with a class that did not impose a timeline (other than the fact of the end of a semester) or a clear starting place. However, this discomfort appeared to disappear with time spent in the Appedtec as students began establishing their own schedule for participation. Students initially expressing the most satisfaction were those who had the greatest distance to travel to get to a campus-based course. The degree to which students felt comfortable interacting with each other and with the instructor through the threaded discussion, chats, and other forms is still not clear. If such an environment is to be successful in bridging the opportunities to explore information in one's own time and order with the opportunities to interact with fellow explorers who may be working on a different timeline and sequence, then understanding the degree to which these tools functioned is vital.

Learn the principles of creating and administering Web-based tests and assessments using Question Mark™ Perception™ software. Find out how to use Perception's authoring wizard to create questions in a variety of formats: multiple choice, multiple response, hot spot, text, numeric, selection, and matrix questions as well as explanation screens that can include text, graphics, and multimedia. Participants will also learn how to create multiple question banks from which to assemble tests, surveys, and questionnaires. Other topics include how to set up interactive feedback, create adaptive tests, analyze test results, and create reports. . Example questions will be presented from various applications including competency testing, employee recruitment, customer satisfaction questionnaires, study aids, diagnostic tests, skills assessments, product knowledge exams, course evaluations, and certifications. The presentation will cover such issues as test security, linking with learning management systems, and the use of Perception Secure Browser for high-stakes tests.

Edu-Effectiveness and Distance Education: How to Measure Success in the Online Classroom

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Abstract: How we determine the quality of online education in the classroom is of primary concern for all institutions and organizations providing continuing education via new technologies. Recent statistics from the National Center for Educational Statistics reveals that enrollment in distance learning courses roughly doubled in two years from 754,000 to 1.6 million. With heightened enrollments come heightened expectations from adult learners that the quality of their online instruction will be (at minimum) equivalent to that which they can obtain in traditional learning environments. Despite the lack of national standards (at present) for delivering online educational courses, there are effective (and peer-reviewed) strategies that online faculty can use to measure and ensure an effective online classroom experience for the learner. This session will explain those strategies, and provide models for other faculty to use in their online classroom experiences.

Introduction

How we determine the quality of online learning, which translates into success in the online classroom is at the heart of this research report. As more individuals turn to online education as a means of maintaining continuing education requirements for certification, as well as look for convenience without the sacrifice of quality in learning, the standard for online education providers will become a significant goal to achieve and use in online course development.

This project proposes to use previous research which measured the impact of critical incidents in the online classroom as a standard for identifying barriers to excellence and effectiveness in the online classroom, and for use in creating models of online learning excellence for institutions.

The Study

For this research, we are choosing to focus on measuring effectiveness in the facilitated online classroom of adult learners who are taking courses offered by associations and professional membership groups online. The measure of effectiveness was further defined as determined by faculty members facilitating the course and by students taking the courses, as: having completed the course from start to finish; having felt as if new knowledge was gained, which would be advantageous professionally (student perspective); having felt as if the learning was immediately applicable to current professional work or professional growth (student perspective). (Note: The learners, in this instance, do not necessarily receive "grades" as in a traditional academic course. Many individuals, depending on the industry in which they work, are required to take continuing education courses to maintain professional certification, and these courses do not necessarily return "grades," but proof of attendance or a record of completion for the learner having finished the course.)

The actual measure of effectiveness is being determined by: course participant persistence; number of completed assignments by course participants; level and intensity of interactivity between course participants; level and intensity of interactivity between adult learners and faculty members; frequency and amount of feedback among course participants; frequency and amount of feedback between faculty members and course participants; quality and quantity of written conversation among course members and faculty members; and, success in problem solving or resolution of course difficulties (if any) by course participants and faculty members.

Findings

At present, the findings are inconclusive, because the research is ongoing. However, a overview of current data on the associations reveals the main issues at the heart of determining effectiveness in an online course that includes association member-users tends to focus on consistency, quality, and reliability of regular communication, both in the online classroom and in using alternative communication tools when necessary.

Conclusions

While any conclusion is considered early at this stage of the research, it is hoped that the specific findings from this project result in the development of guidelines and an assessment tool for associations to use in creating viable online education opportunities for their members.

References

Brooks, David W. 1997. Web-teaching: A guide to designing interactive teaching for the world wide web. New York: Plenum Press.

Eastmond, Daniel V. Summer 1998. Adult learners and internet-based distance education. New Directions for Adult and Continuing Education: Adult Learning and the Internet 78: 33-41.

Gunawardena, Charlotte N. and Frank J. Zittle. 1997. Social presence as a predictor of satisfaction within a computer-mediated conferencing environment. The American Journal of Distance Education 11, no. 3.

Markowitz Jr., Harold. 1990. Continuing professional development in distance education. Contemporary Issues in American Distance Education, Editor Michael G. Moore, 58-66. Oxford: Pergamon Press.

Assessing Student Statistical Problem-Solving Skills using Interactive Java Applets

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Abstract: Problem-solving instruction is a growing field within education. However, for distance education and other Web-mediated courses the traditional methods of assessment, namely multiple choice and short answer, are not sufficient. Although these formats can record final answers they cannot assess detailed aspects of the problem-solving process without becoming intrusive. A better assessment strategy is to use simulations and other highly interactive systems. Such tools can discreetly track student performance data without interfering with the problem-solving process. This paper will explore the use of interactive environments as an assessment technique of the problem-solving processes within Web-mediated courses and will focus on an example developed by the authors for use in an applied statistics course.

Introduction

An essential component of effective teaching is to constantly assess the level of understanding throughout instruction. Within a classroom the teacher performs this task by observing students' actions while asking questions and assigning tasks. The teacher can then adjust the flow and method of instruction to better meet the needs of students. To obtain an equivalent result, Web-mediated materials must provide similar data to either an instructor or to another computer system for the purpose of guiding the next level of instruction. Traditional multiple choice and short answer questions can assess final solutions but fall short in addressing problem-solving questions such as "At what step did this student get off track?" or "At which steps do large groups of students fail?" One possible solution would be to ask multiple choice and short answers questions throughout the problem-solving process. However, this solution has the potential of affecting a student's actions by requiring him to mold his own solution path to one dictated by the assessment vehicle. This limitation makes this option an inferior choice. A better solution is to use highly interactive "sandbox" tools that allow a student to pursue his own problem-solving path. This solution contains a minimal amount of biasing information that would guide the learner in any particular direction. More importantly, such tools can record additional pieces of data necessary to properly evaluate problem-solving skills and to effectively prescribe remediation. Possible data to collect are the problem-solving steps taken, the order of those steps, the time required for each step, and the dead ends pursued and abandoned. All of this can be collected unobtrusively without affecting the students' actions.

Example

To accomplish these goals, we have developed several mathematical Java™ applets that provide the tools needed by a student to solve a wide range of problems within a "sandbox" environment. This paper considers a problem-solving exercise using a statistical applet to illustrate how how sequences of behavior can be captured through the applet and used to assess student problem-solving skills. Note: This example with the live applet is available at http://www.coe.tamu.edu/publications/strader/site2001/.

Problem. Consider the following scatter plot of data from ninety-two college students who were asked to report height, weight, and gender. When data from males and females are combined, the correlation between height and weight is 0.78. However, when you look at the data for males and females separately, the correlations are 0.60 and 0.49, respectively. Using the scatterplot below combined with your knowledge of how correlation coefficients describe relationships between variables, determine which of the points are "male" and which are "female." **Note**. The average height for males (20 to 29) is 68.8" (S.D. = 3.0") and the average height for females (20 to 29) is 64.6" (S.D. 2.5"). How would the correlation coefficients be interpreted? In general, what cautions must be must be exercised when interpreting correlation coefficients? Why?

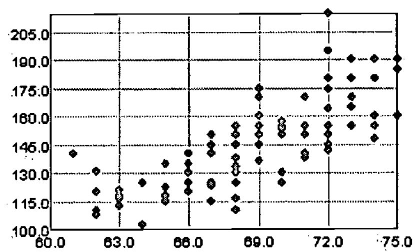

Figure 1: Scatter plot for combined sample

This problem sits on a Web page with the live applet. Each student will attempt to solve this problem by designating each point as either "Male" or "Female" so as to achieve the specified correlations. The objective of this exercise is to assess a student's understanding of correlations and in the process inform the student about potential problems with interpreting correlation coefficients when groups are combined. By having students solve this problem using the applet, we can look for important patterns within student solution processes. Figure 2 shows a subset of the sequence of steps a student might take to solve this problem.

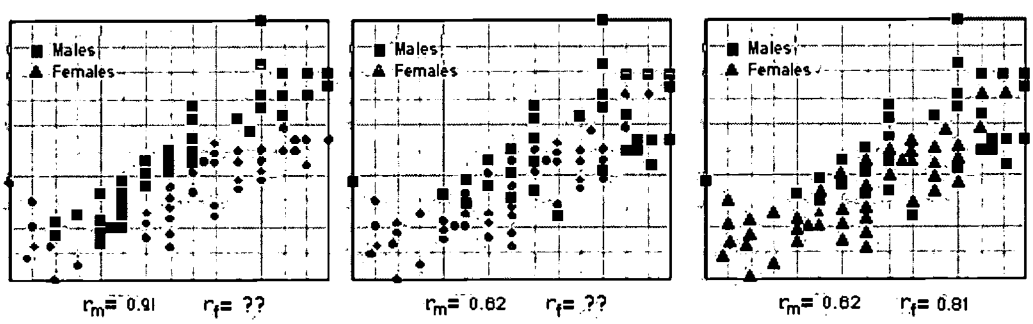

Figure 2. Example student sequence taken to solve example problem

The sequence in Figure 2 shows a student designating points as "Male." In the first screen, the student replaces cirlces in the scatterplot with the box symbol designating male and returns a correlation of 0.91. This is too high so in the second screen you can see that the student has modified the point selection to reduce the correlation coefficient to 0.62. Having achieved the target coefficient for males, the student then designates the rest of the points as "female." Clearly, the problem has not been resolved as the coefficient for females is 0.81. Presumably, the student would continue to revise the point selection to come up with better overall designations. The question is whether the modifications are systematic and informed by his/her knowledge base or more randomly targeted at an end point. Whatever solution path a student follows, a real-time record is preserved. The sequence of modifications can be replayed and form a basis for student/instructor or instructor/class discussion. Interactions between student and instructor can take place either face-to-face or at a distance with no loss of information.

The Formative Evaluation of a Computer-Managed Instruction Module: Metric Instruction for Pre-Service Elementary Teachers

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Abstract: A Computer-Managed Metric Instruction Program (CMIP) providing instructional units on basic metric concepts has been developed. A blending of Gagné, et al. (1992) and the developmental theories of Bruner (1966) provides the pedagogical basis for the instructional design. The instructional design model used to create each lesson utilizes a system of "branches" allowing a student who has difficulty with a specific lesson to be routed to appropriate remedial exercises. Each unit has a companion review module for students who obtain a score that meets the pre-test criterion for that particular unit. The pre-test for the area module consisted of 15 questions, three each on the following square unit segments: kilometer, meter, decimeter, centimeter, and millimeter. Results indicate that the use of concrete materials adds a learning dimension to those students who need a transition between the "hands-on" learning modality and the more abstract learning module presented in the CMIP.

Introduction

One of the new facets of the elementary science methods program at Idaho State University is the increase in the science and mathematics general education requirements. These additional science and mathematics requirements were spawned by a survey that indicated a serious deficiency in the science content knowledge of elementary school teachers (Strickland & Horejsi, 1999).

One alarming feature found in the analysis of the survey data was the apparent lack of knowledge and understanding of the metric system within teacher work samples. A parallel survey was conducted of pre-service elementary students and the results were similar: Lack of science content knowledge and, of particular interest for this research, a serious lack of knowledge of the metric system. Two decades ago, Strickland (1980) reported a similar lack of science and metric system knowledge among pre-service teachers at Indiana University.

The solution at Indiana University was a computer-managed program using the PLATO computer-learning system. After using PLATO for five weeks (i.e., five 3-hour sessions on the system), the metric performance among pre-service elementary teachers increased by 86%, and there was a corresponding change in science content knowledge and science teaching in the elementary school classroom. Apparently, as evidenced by the survey data referred to earlier (Strickland & Horejsi, 1999), the issue of science and metric illiteracy has resurfaced.

Idaho State University has embarked on a much larger research effort focusing on the design and development of a Computer-Managed Metric Instruction Program (CMIP). The CMIP software comprises instructional units providing basic metric concepts for each of the following measures: Length, area, volume, mass, force, and temperature. Uniquely, this instructional package consistently uses a pedagogical model based on the behaviorist views of Gagné (1962, 1968, 1970), and Gagné, Briggs, and Wager (1992). While each of these theorists offers the premise that correct sequencing of conceptual knowledge in conjunction with a mastery approach leads to meaningful learning by the student, the design team for CMIP felt the most effective sequencing model would be a blending of Gagné, et al. (1992) and the developmental theories of Bruner (1967).

Bruner (1967) stresses that the effective use of information is found only when the learner has successfully translated the information into a form the learner normally uses in problem solving. Without this translation, according to Bruner, "Though it is logically usable, it is psychologically useless" (p. 53). To this end Bruner has applied a multi-branching model to learning. This model is incorporated into the metric instructional units discussed in this research.

Additionally, Rodrigues (2000) highlighted several fundamental differences between behaviorist and constructivist views as they impact multimedia development. These views are expressed in the following excerpt:

> Some of the strengths of behaviorist tutorials – for example, repeat practice, reinforcement, and control – are almost the opposite to goals advocated by constructivist philosophies (Heinich, 1984), where the notions of reflection, active construction, personal relevance, and autonomy (Lebow, 1993) are considered crucial constructivist learning facets. (p.1)

The instructional design model used to create each metric lesson utilizes a system of "branches" (as opposed to linear programmed learning). For example, a student who has difficulty with a specific lesson, or who shows deficiencies in command of a subject (identified by pretest results), can be routed to a review section or to remedial exercises, meanwhile all other students progress through increasingly more difficult exercises. Thus, the system is simultaneously a "Tutor, Tool and Tutee" (Taylor, 1980). As a result, this research concentrated on the design and development of the metric area module as the first module of the entire metric system course (and to act as a prototype for the remainder of the modules).

This selection, based on metric pretest data (see Table 1), indicated a serious deficiency among the students' ability to perform calculations in determining area (mean score = 4.620) and volume (mean score = 4.440).

Section		# questions	N	Mean	SD
Length	1	15	56	7.425	1.84
Area	2	15	56	4.620	2.30
Volume	3	15	56	4.440	1.77
Mass	4	9	56	3.717	0.98
Force	5	8	56	2.200	0.83
Temperature	6	8	56	2.680	0.68
Total		70	56	26.65	1.56

Table 1: Metric Unit Pre-Test Data

Metric area was selected instead of metric volume since the skills and concepts needed for the volume module were subsumed by the area module. The wide variation (SD = 2.30) in score on the metric area was an additional rationale for selecting this module to be first.

Computer-Managed Metric Instruction Package (CMIP): Unit Design

The CMIP software package (Fig. 1), has four primary elements; (1) the introduction to metrics module, (2) the pretest and skill assessment module, (3) the metric instructional module, and (4) the posttest and analysis of results module.

The introduction to metrics module is composed of an overview of the CMIP metric instruction. The student is guided through an array of examples which depict the metric system being used to measure length, area, volume, mass, force, and temperature.

The pretest and skill assessment module is designed to access the students preknowledge of the metric system, rudimentary mathematics skills and selected learner aptitudes.

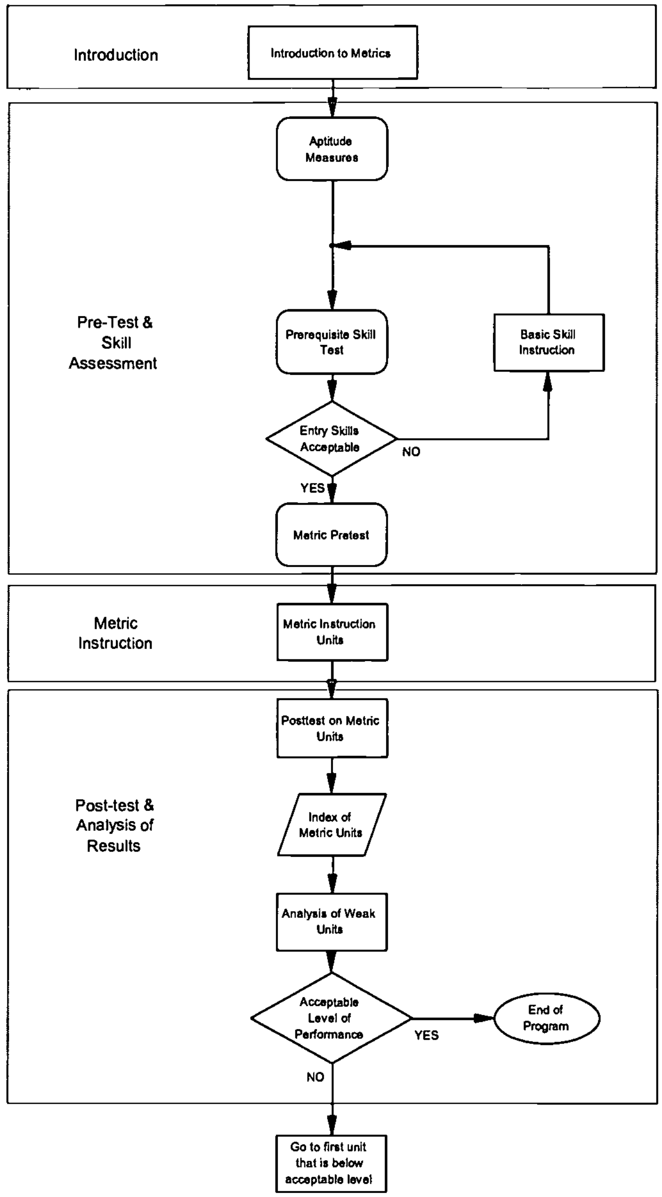

Figure 1: Computer-Managed Metric Instruction Package (CMIP) flow chart outlining the elements of the metric instruction. If the student does not meet acceptable level of performance they are returned to the first unit that was below the acceptable level.

The metric instructional module consists of six metric instructional units (Fig. 2): Length, area, volume, mass, force, and temperature. Each unit describes the basic unit of measurement and explores units, which are smaller and larger than the base units.

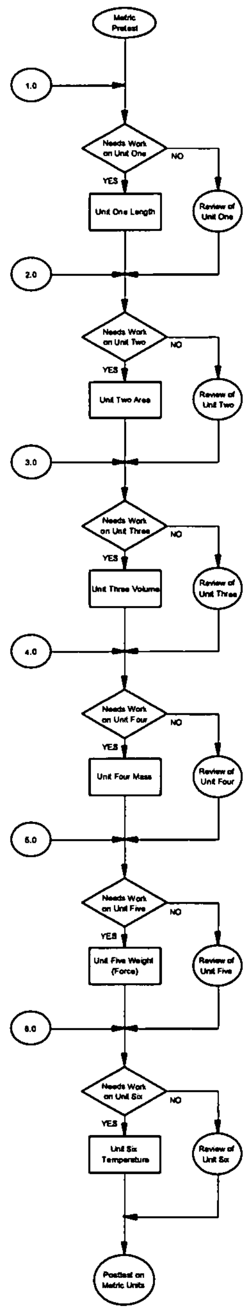

Figure 2: Expanded flow chart of the Metric Instructional Module of CMIP. The Metric Instruction Module uses data from the pre-test module to determine the appropriate lessons for the student.

The posttest and analysis of results module is designed to measure the performance level of each student. If the performance level is acceptable then the student passes the metric course, if weakness (low performance) exists in any unit the student is guided back through that unit until an acceptable performance level is reached.

Formative Evaluation of the Metric Area Module

The metric area unit consisted of four segments (Fig. 3): (1) An introduction to the module, (2) the base unit module (square meters), (3) three modules with measurements smaller than the base unit (square decimeters, square centimeters, and square millimeters), and (4) one module with measurements larger than the base unit (square kilometers).

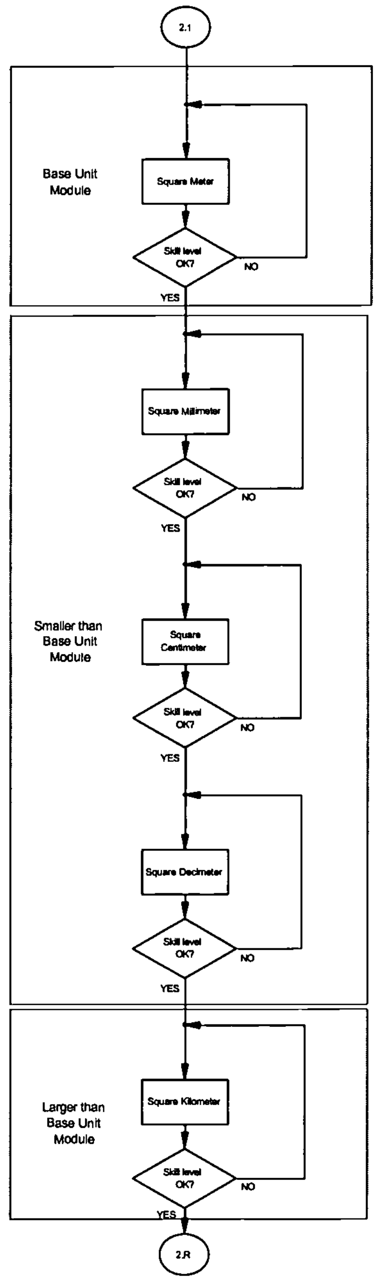

Figure 3: Metric Area Unit flow chart. After a brief introduction (2.1) the unit begins with the base unit of area and ends in a review and post-test (2.R) of the area unit.

The pre-test data for the metric area module consisted of 15 questions, 3 each on the following square unit segments: Kilometer, meter, decimeter, centimeter, and millimeter. The mean of the square kilometer was lowest ($X = .20$, $SD = .09$; out of 3); thus, this module was selected to be the initial module segment to be tested. The square kilometer segment (Fig. 2) consisted of several large regular shaped objects (scaled to fit on a standard monitor), such as New York's Central Park. Central Park is rectangular in shape and made a good first example of the area calculations for large objects. After several similar examples, the instruction moved forward to irregular shaped large objects, such as a large reservoir in the geographical area. A scaled one-square kilometer area was used with the technique of summing whole and partial grid squares. The instruction produced a significant change in the performance on the module segment ($X = 1.35$, $SD = .57$; out of 3).

Summary

The analysis of the data collected during pilot test of the Metric Area module: Square Kilometer segment was critical in determining alterations needed to this module segment and additional components. This data analysis has shaped the instructional process for each of the remaining modules. While observing the students participating in the computer-managed module segment on square kilometers, it became apparent that each module must be constructed with some use of a manipulative, as well as the computer software. Apparently, the use of concrete materials adds a learning dimension to those students who need a transition between the "hands-on" learning modality and the more abstract learning module presented in the computer software.

References

Bruner, J. S. (1967) *Toward a theory of instruction.* Massachusetts: Belknap Press.

Gagné, R. M. (1962) The acquisition of knowledge. *Psychology Review, 69*, 355-365.

Gagné, R. M. (1968) Learning hierarchies. *Educational Psychologist, 6*, 1-9.

Gagné, R. M. (1970) Conditions of learning. New York: Holt, Rinehart, and Winston.

Gagné, R. M., Briggs, L. J., & Wager, W. W. (1992) *Principles of instructional design.* Texas: Harcourt Brace Jovanovich, Publishers

Rodrigues, R. (2000) A Survey of Mathematical skills of Elementary Teachers. *Journal for Research Mathematics Education, 31*(4) 396-428

Strickland, A. W. (1980) Metric instruction in elementary science using computer-managed instruction. *Alberta Science Education Journal, 18*(2), 10-13.

Strickland, A. W., & Horejsi, M. (1999) An Examination of the Knowledge and Skills of pre-service Southeastern Idaho Elementary Teachers. Center for Technology Solutions, Technical Report No. 2

Taylor, R. (1980) *The computer in the school: tutor, tool, tutee.* New Jersey: Teachers College Press

Online Teaching Tools:
Early Results of a Survey of Online Instructors

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Abstract: As online learning becomes increasingly common and an integral part of our educational system, it is important to investigate how instructors and students teach and learn in the online classroom. This paper presents preliminary results from a research in progress which studies the use of instructional tools by online instructors. We are collecting data on the most used tools, the tasks they accomplish, and on the impact of their use as reported by instructors. The research focus is on instructor tasks which are facilitated by online tools, whether the use of these tools increases or decreases instructors' workload, according to their own perceptions, and how online instructors value the use of tools for online teaching.

Introduction

The face-to-face classroom has been the vehicle for imparting instruction to learners for the last four hundred years. Instructors teaching in the classroom have used various traditional tools to support their teaching activities: the blackboard, the chalk, print material, media material for class presentations, classroom attendance list, and many other tools which have become essential components of classroom teaching (Ong, 1982). More recently, with the advent of the World Wide Web (Web) and the online classroom, instructors are also beginning to use tools to support online teaching (Harasim, 1999; Bonk, 1999; Teles, Ashton, & Roberts, 2000). Developers of these tools claim they help instructors in the task of online teaching.

While tools are used in both the face-to-face and the online classroom, the nature and function of these tools vary from a face-to-face to an online mode of teaching. Face-to-face and online teaching have similarities but have also their own specific attributes as learning environments. Berge (1998) developed a framework that captures the specificity of instructor's tasks in online environments. He identified four roles for the online instructor: pedagogical, managerial, social, and technical. Some of these roles may have a direct impact on online teaching, and others may be presented as supportive to teaching, such as the social role (Wegerif, 1998). These four roles and the teaching tasks associated with them can be supported by tools such as the online gradebook, usage statistics on student participation in the online classroom, automatic reminders for due assignments, chat for online office hours, etc.

Some instructors state that online tools help them to teach online and facilitate classroom management while others may argue that these tools are not very useful and also they add more workload to instructors. While the use of Web tools is on the increase with online educational services and portals offering various instructor tools, it is not yet known whether these tools are being used by instructors, which teaching tasks are supported by them, and whether they help online teaching.

This paper discusses the use of tools to support online instructors. We are investigating the use of tools that facilitate the process of online teaching: online grade books and evaluation, online classroom attendance, information-sharing capabilities, creation/management of group work, assessment, interaction with instructor, etc. While there are advanced systems for student record management, to generate statistics about students, and to keep track of payments and related administrative information, these tools are not of direct interest to our research.

For the purposes of this research study an online instructional tool is defined as a software that supports the instructor of the virtual classroom in his or her online teaching tasks and activities. We are mainly interested in tools currently being used by online instructors such as ICQ (for office hours communication), usage statistics generator for class attendance (hours spent in the different areas of the online classroom, number of messages read and written), gradebook, and other related teaching tools.

Related Literature

A review of the literature on the use of tools to support the online instructor was conducted. This was done through library research restricted in most cases to the years 1997-2000 and using the Eric database, (filtered through the Information Technology Clearing House), and Web online research, using primarily the Google.com search engine. The key words used for the search were: Instructional Technology, Online tools, Faculty Development and Online Learning, Evaluation of Instructional Technology, Tools for Interactive Course Delivery; Technology and Instructors, Computer Mediated Learning. The online search yielded the most current and relevant information, and provided links throughout the academic network which pointed to known, reputable sites and scholarly research in this area.

Information technology for teaching and learning is now being widely used in education, including tools by online instructors (Frayer, 1999; Fletcher, 1998; Heinich, Molenda, Russell, Smaldino, 1999; Lee, Groves, Stephens, Armitage 1999). Although there are some studies in evaluating and comparing online software tools, (FutureU, 2000; Marshall University 1999; University of Canberra, 1999; Douglas College, 1999 and University of Manitoba, 1999; University of British Columbia; University of Alberta; University of Toronto, etc.) there appears to be little research available on how the tools have impacted instructor's teaching activities.

Furthermore, there is not much evidence in the research literature of online tools being evaluated for their pedagogical benefits. The need very often expressed by educators, is that the online environment allows for more flexible teaching and access to resources and peers, promote collaborative student-centered learning and generally be more educationally effective (Britan, & Liber, 1999), and online tools support instructors tasks in these online environments.

In one of the few studies on the use of online tools, instructors from the Brigham Young University were surveyed on their reactions to an online course management tool used at the university (DLE, 1999). The findings show that in spite of a widespread acceptance of the potential of online teaching there is a fear by many instructors as to how they will make the transition to online teaching with the limited resources of time and money currently available. Findings also showed that instructors value tools as long as they help them to execute tasks and to save time. Tools have to facilitate the work of teaching and information-sharing, should take little time to learn, are easy to use, and have adequate university support structure in place.

There are many Web tools to support online teaching tasks, for managerial, pedagogical, social, and technical tasks. These tools offer features that supposedly make them valuable to instructors, such as:

- provide asynchronous and synchronous communication between students and instructors, and groups of students;
- allow instructors to gather data, (usage statistics tools) manage assignments, or test students via the Web;
- offer the opportunity for chats in real-time, (Olmstead, & Kontos, 1997) and
- allow instructors to continuously follow students' progress.

Method

The study involved online instructors from different educational institutions. Our approach consisted of: (1) review the literature in the field; (2) questionnaire with selected online instructors; (3)follow-up in-depth interviews with a group of online instructors who had previously responded to the questionnaire, (4) validation of findings by a group of expert online instructors and academics.

Participants

The survey started in November 2000 and it is expected to run to February 2001. The participants include online instructors teaching online or mixed mode from Canada, the United States, Mexico, the Netherlands, Greece, Colombia, and South Africa. Formal consent was obtained from all the instructors who participated in the study.

Procedure

The online instructors were chosen from Canada and other countries. The primary source were the scholars from the TeleLearning Network of Centres of Excellence, in Canada. However, we decided not to limit ourselves to Canada and tried to reach other online instructors through different ways including listservs, newsgroups, and our Web page. The survey began by contacting potential participants by e-mail or letters to find out whether they would like to participate. The next step was to complete our questionnaire. The questions sought some background information but were primary looking for answers for our research questions: (1) Which are the tools most commonly used by online instructors to support their online teaching activities; (2) Does the use of tools increase or decrease instructor's workload, according to his/hers perception; (3) How do online instructors value the use of tools for online teaching. The next step will be a follow-up in-depth interview with selected participants to help us expand findings and areas where more information is needed. The last step will be validation of findings with the help of academics considered experts in the field.

Early Results

Early results of the study provide information about online instructional tools and how they are used by the online instructors. The preliminary results from ten questionnaire responses are reported here. The respondents are from Canada, the USA, Colombia, and Greece. The information we are investigating is: the correlation between the teaching mode and the amount of used tools; the use of online teaching tools and the desire for newly developed tools; the tools that are found to be very and somewhat helpful, and the most beneficial tools. We found that the distribution of courses taught entirely online to mixed mode was half and half. All of the instructors stated that they find the use of online tools helpful. Here are some of the comments they made: "Much functionality is not even used"; "The variety of tools certainly helps with the effective delivery of the course"; "The communication between the students and me has improved a lot"; "The question is what can you do with the tools to provide a better learning for the students."

Asked whether the expectations about the amount of online tools needed to teach online had changed after they used these tools, we found that all of them would like to have more Web-based tools to support their teaching.

The instructors also stated that the following new tools are needed: instructional design tools, role-play tools, debate tools, brainstorming tools, videoconferencing tools, conferencing with wireless application protocol (WAP), streaming video tools, dynamic learning environment tools. The tools found to be the most beneficial are: e-mail, student tracking, sharing information tools, bulletin boards, conferencing tools. The advantages found in the use of online instructional tools include: learning process enhancement, different sets of learning opportunities in the classroom, place independence, providing structure and unity to the course, offering effective course delivery and flexibility, supporting time management. The disadvantages mentioned are relatively less compared to the advantages and they consisted of: difficulty when securing information, rigid structure, and technological glitches. The following table represents the ratings of how the online instructional tools facilitate and support the instructor.

Online Tools	Very helpful	Somewhat helpful	Requires additional support	Not used at all
Course Syllabus	50%	10%	10%	30%
Multiple choice questions	10%	40%	10%	40%
True/false questions	10%	40%	10%	40%
Matching questions	10%	40%	10%	40%
Short answer questions	10%	10%	30%	50%
Fill in the blank questions	10%	20%	10%	60%

Generation of random set of questions	10%	10%	10%	70%
Online gradebook	50%		10%	40%
Number of written messages	40%	40%	10%	10%
Number of read messages	50%	30%	10%	10%
Unread messages	20%	40%		40%
Reminders for due assignments	50%	20%	10%	20%
Glossary	20%		30%	50%
Chat	40%	30%		30%
Whiteboard	20%	10%	10%	60%
Plagiarism checking	30%			70%

Table 1: Ratings of Online Instructional Tools

Discussion and Conclusions

The results of this early survey show that online tools support and impact instructors teaching in different ways. Results also indicate there is a need for the development of new software tools and show as well that existing tools are being incorporated into the process of process of online teaching. While online tools in many cases are found to be supportive to the task of online teaching, technical problems associated with their use often disrupt online teaching.

Further data collection from this study in the next three months may add new information and may also extend and expand early findings of this survey. This preliminary study also points to new research directions needed to be conducted on the use of online tools to support online teaching, particularly in regards to which teaching tasks are supported by these tools, how they support the instructional method and the pedagogy of instructors, and what they offer regarding the assessment and evaluation of online students.

References

Berge, Z. (1997). Characteristics of online teaching in post-secondary, formal education. *Educational Technology*, 37, 35-37.

Bonk, C. J., & King, K. S. (Eds.). (1998). *Electronic Collaborators: Learner-centered technologies for literacy, apprenticeship, and discourse*. Mahwah, NJ: Lawrence Erlbaum Associates.

Britain, S., & Liber, O. (1999). A Framework for Pedagogical Evaluation of Virtual Learning Environments. *Report prepared for JISC Technology Applications Programme*. [Available online: <http://www.jtap.ac.uk/reports/htm/jtap-041.html#_Toc463843840>, retrieved June 21, 2000].

Chen, Z. (1999). *On Tools for Education*. School of Engineering, Kristiantad University, Sweden. [Available online: <http://rimula.hkr.se/~chen/webresources/edtool-report.html>, retrieved Aug. 13, 2000].

Fletcher, K. (1999). Teaching Nonprofit Management Online: Instructors' Experiences and Lessons Learned. *Paper presented at the 1998 ARNOVA Conference*. [Available online: <http://www.futureu.com/fletcherarnova98.html>, retrieved June 1, 2000].

Frayer, D. (1998). Creating a campus culture to support a teaching and learning revolution. *Cause/Effect*, 22(2). (EDUCASE) [Available online: <http://www.educause.edu/ir/library/html/cem9923.html>, retrieved Sept. 15, 2000].

Harasim, L. (1999). A framework for online teaching: The Virtual-U. *IEEE Computer*, 32(9), 44-49.

Heinich, R., Molenda, M., Russell, J., & Smaldino, S. (1999). *Instructional Media and Technologies for Learning*. Columbus, OH: Merrill/Prentice-Hall. [Available online: <http://www.indiana.edu/~mmweb98/imtl.html>, retrieved Nov. 22, 2000].

Landon, B. (1999). *Online educational delivery applications :A webtool for comparative analysis.* [Available online: <http://www.ctt.bc.ca/landonline/>, retrieved Aug. 15, 2000].

Lee, S., Groves, P., Stephens, C., & Armitage, S. (1999). On-Line Teaching: Tools and Projects. *JISC Technology Applications Programme,* report 28. [Available online: <http://www.jtap.ac.uk/reports/htm/jtap-028.html>, retrieved June 21, 2000].

Olmstead, P.M., & Kontos, G. (1997). Utilizing Inter-Relate Chat Auditorium for Graduate Instruction. *Paper presented at the Seventeenth Annual Microcomputers in education conference '97 (MEC '97) on Mastering the Electronic Classroom.* Tempe, AZ: Arizona State University.

Ong, W. (1982) *Orality and Literacy: The Technologizing of the Word.* London ; New York : Methuen.

Teles, L., Ahston, S., & Roberts, T. (2000). *The Role of the Instructor in Online Collaborative Environments.* TeleLearning Report: Project 5.25. [Available online: <http://www.telelearn.ca>, retrieved Oct. 20, 2000].

Wegerif, R. (1998) *The Social Dimension of Asynchronous Learning Networks.* Centre for Language and Communication. School of Education, The Open University, Milton Keynes. [Available online: <http:///www.aln.org/alnweb/ journal/vol2_issue/wererif.htm>, retrieved July 20, 2000].

Web Sites Containing Evaluation Results of Online Teaching Tools

Several comparisons of course management tools have been published on the Web, as a resource for others. They provide a good starting point for selecting software for further consideration.

Douglas College, New Westminister, British Columbia, 1999. Available online: <http://www.ctt.bc.ca/ landonline/>, retrieved June 21, 2000]. This site is a collaborative effort of the British Columbia Standing Committee On Educational Technology, the Centre for Curriculum, Transfer and Technology and the Office of Learning Technologies. The site is managed by Dr. Bruce Landon and helps evaluate software for educators.

FutureU, 2000. [Available online: <http://www.virtualu.com>, retrieved Nov. 22, 2000]. FutureU did a comprehensive evaluation of six leading course management software packages to help academic institutions make informed decisions when they purchase or upgrade CMS products and to help developers make informed decisions when they plan for development or marketing.

Western Washington University, Center for Instructional Innovation. [Available online: <http://pandora. cii.wwu.edu/ showcase>, retrieved Nov. 22, 2000]. Western Washington offers an excellent showcase of two online courses with details of what software they chose, how they implemented and how it contributed to a rich learning experience for students and instructors.

Marshall University, 1999. [Available online: <http://multimedia.marshall.edu/cit/webct/compare/comparison. html#instructor>, retrieved June 14, 2000]. This comparison provides reviews on the existing online course delivery software products categorized by developmental features, instructor features, instructional features, student tools, technical support, administrator tools, administrative features, software and hardware costs.

University of Canberra, 1999. [Available online at: <http://www2.canberra.edu.au/cc/flex/webct_report.html>, retrieved May 31, 2000]. Evaluation of WebCT was conducted with the notion to be used as a standard, supported university-wide online management system.

University of Manitoba, 1999. [Available online: <http://www.umanitoba.ca/ip/tools/courseware/evalmain. html>, retrieved June 14, 2000]. This site provides information on tools for developing interactive academic web courses and online educational delivery applications.

TeleLearning Project 7.8: Research Spotlight on National Networks for Learning. [Available online: <http://www.telelearn.ca/g_access/advances/spotlight.html>, retrieved June 1, 2000]. Wudeman, Owston and Shapson are conducting case studies at York University involved with Writers in Electronic Residence (WIER) and Satellite Networked Schools. Their project investigates how network innovations are implemented in the everyday practices of the teachers and the students.

WestEd. [Available online: <http://www.wested.org>, retrieved June 1, 2000]. One of the current projects of WestEd Technology in Education program is the Distance Learning Resource Network. It provides information for the constantly growing number of educational institutions that use distance learning and for the software developers who service the educational institutions.

Recently Developed Online Instructional Tools to Support Online Teaching

Convene.com is a recently developed e-learning platform with built-in instructors and trainers tools. It offers the possibility of creating a customized Home Page which serves as an interface with links to personal e-mail, course materials and Web resources (school and personal related). The currently available tools for the instructors are not significantly different from already existing ones with the difference for posting multimedia files, recorded presentations and video messages <http://www.convene.com>.

Jenzabar.com is a provider of integrated administrative software, Internet infrastructure, and services devoted exclusively to higher education. Jenzabar.com provides its Web-based Intranet application to educational institutions. The highlights include: communication, learning, organizational, and fun tools. The most valuable tools for the instructors would be: the syllabus posting with the daily remainder for the students, the calendar which automatically includes course schedule and the option to participate in a community with people with similar interests <http://www.jenzabar.com>.

MetaCollege.com provides Web-based tools that allow educators to easily develop, distribute, and archive instructional material online to supplement their classroom teaching methods, deliver distance-education courses, or build collaborative online communities. The tools are divided into two large groups: course and community tools <http://www.metacollege.com>.

Information in Place, Inc. (IIPI) is dedicated to helping organizations, enterprises, and individuals create and deliver Internet-based information and services. IIPI offers infrastructure software for mobile and wireless devices and customizable solutions. The company is currently developing a product called Your Information in Place Intellilink, Yiipi. It will be a browser and service system allowing anyone to create and view location-based information that can be authored and viewed by anyone <http://informationinplace.com>.

Plagiarism.org provides the online instructors and trainers with a document source analysis tools to detect plagiarism. The instructor is responsible for registering the class he/she is teaching and afterwards all the papers are submitted to a web site for plagiarism checking <http://www.plagiarism.org>.

The product developed by ThoughtShare Communications Inc. - PlanBee allows the user to map his/hers web journey and save all the relevant Web addresses. It allows for filtering and extracting of information, adding personal comments, attachments. In the end the compiled information could be shared and e-mailed as a knowledge packet <http://www.thoughtshare.com>.

The product Hot Potatoes is developed at University of Victoria, Canada. It enables the instructor to create interactive multiple-choice, short-answer, jumbled-sentence, crossword, matching/ordering and gap-fill exercises for the World Wide Web <http://castle.uvic.ca/hrd/halfbaked/>.

Creative Technology produces three groups of software: teaching and learning software, and development tools. Markin is an annotation program for online and electronic teaching environments. It replaces the traditional red pen with an on-screen marking environment. TexToys allows the instructors to produce on-screen learning exercises which could be delivered to the students as interactive Web pages. Choices is a multiple-choice quiz program. The tests are completed by the student in a password-protected environment. Word-Processor Annotation Buttons are templates containing customized button sectors for annotating sections of a document <http://www.cict.co.uk/software/>.

Inxight Software, Inc., provider of information access and content analysis software solutions, has developed tools which could be useful for the online facilitator. Summary Server extracts summaries from almost any electronic document. Thing FinderTM Server is a text analysis application that automatically identifies, tags and indexes key content–allowing end users to easily browse large amounts of unstructured text. Murax is designed to analyze relationships between concepts whilst users simultaneously could search and browse <http://www.inxight.com/>.

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A Model to Design Technology Teacher Training Program

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Abstract: Teacher training is one of the most important factors that determines teachers' use of educational computing in classroom. On Average five to seven-years of training is necessary for a teacher to become a confident user of educational technology (Hardy, 98). However, most teachers do not have enough computer skills (Dupagne, 92) and feel they have not taken adequate training to integrate computer in their classroom. The purpose of this paper is to describe a teacher technology-training model for a private high school in Turkey that incorporates the notion of instructional design and systems thinking. The training model is structured around the generic ADDIE model, which is Analyze, Design, Development, Implementation and Evaluation. However, the model provided in this paper is situation-specific and has additional elements to satisfy the need for in-service technology teacher training.

SETTING: ORGANIZATIONAL CHARACTERISTICS

The school for which the technology-training program will be designed is a private non-profit high school in Turkey. The goal of the school is to provide formal high school education and prepare its students for nationwide standardized university entrance exams. The school has 25 successful experienced teachers with approximately 300 students.

Due to the rapid diffusion of instructional technology in education, the high school management has decided to adapt computer technology in the classroom. Even though the school has an in-service teacher-training program with a little emphasis on computer technology there is no well-designed and specific technology training model and program for its teachers. The purpose of this paper is to create a new teacher training design model to replace with the present one. This model will assist the in-service trainers in the school to form a new training to help teachers become familiar with computer technology and integrate it into their classroom instructions. For example, if a teacher teaches mathematics, he/she will be trained on how to teach mathematics with the support of computers.

PROBLEM ANSLYSIS: GAPS IN THE PRESENT TRAINING PROCESS

Because of the nonsystematic procedure the school in-service trainers employ, there are numerous deficits with the current training programs indicated below:

- Needs assessment is not conducted to determine the minor and major gaps in teachers' technology use in the classroom
- There is no job analysis conducted as to how teachers can integrate technology in the instruction successfully

- There are no established performance objectives and performance measurements pertaining to successful technology integration.
- There are no defined rules specifying how to deliver the training efficiently.
- There are no standards for creating training materials.
- There is no quality control of training process and materials.
- There is no formative evaluation process.

THE RECOMMENDED TRAINING DESIGN MODEL

The recommended model is very similar to the general instructional design process, in which planning, design, production, and implementation are the main steps (Flagg, 1990). However, to make it efficient, three categories were added to it and the sub-categories were elaborated.

The New Model
Pre-design → Needs analysis → Job/Task analysis → Design → Development → Pilot test → Evaluation

1.) Pre-Design
Establish a design team (at least one instructional designer and one Subject Matter Experts (SME) from every teaching branch, such as computer-based math instruction, computer-based science instruction etc.)

2.) Needs Analysis/Assessment
2.1. Establish the objectives of needs assessment for technology teacher training
2.2. Determine target teachers to be trained
2.3. Determine data collection techniques for the needs assessment
2.4. Determine data collection procedure
2.5. Determine data analysis methods
2.6. Evaluate previous steps
2.7. Conduct needs analysis
2.8. Determine if there are discrepancies between required performance and actual on the job-performance in teachers' technology integration
2.9. Analyze performance problems
2.10. List evidences of the problems causing low performance in teachers' technology adaptation
2.11. Speculate on what would be the most important problem causing the insufficient integration
2.12. Evaluate the previous steps
2.13. Determine the training solution and non-training solution to help teachers use the technology successfully in the classroom

3.) Job/Tasks Analysis
3.1. Indicate desired results from job analysis
3.2. Decide how results will be used
3.3. Conduct the data collection
3.4. Identify job requirements for teachers to successfully integrate the technology in the curriculum
3.5. Divide the job into functions, duties, and tasks
3.6. Identify entry level behaviors, attitudes and skills to successfully integrate the technology in the curriculum
3.7. Identify the minimum acceptable criteria for each task
3.8. Evaluation

4.) Design
4.1. Write technology-training objectives
4.2. Sequence the objectives
4.3. Identify the content sources
4.4. Write course title
4.5. Make course map
4.6. Sequence learning activities

4.7. Determine level of training
4.8. Chose instructional strategies
4.9. Determine instructional tactics
4.10. Prepare training material specifications
4.11. Recommend delivery method
4.12. Make delivery schedule for training
4.13. Match performance, conditions, and criteria specified in the terminal objectives and each of the learning objectives.
4.14. Develop test
4.15. Evaluate

5.) Development
5.1. Conduct research pertaining to existing materials
5.2. If there are existing materials, evaluate, arrange and modify existing materials
5.3. If there are no existing materials, write new instructional and administrative materials
5.4. Produce necessary media
5.5. Evaluate

6.) Pilot test
6.1. Select a representative sample from the teacher population
6.2. Create a realistic pilot test environment
6.3. Conduct the plot test
6.4. Monitor the plot session
6.5. Get feedback
6.6. Conduct debriefing session
6.7. Document result of plot test
6.8. Make necessary modifications with instructional materials
6.9. Evaluate instructional materials for specific teaching/learning situations
6.10. Have all materials ready to distribute

7.) Evaluation
7.1. Select evaluation team
7.2. Determine purpose, objectives, audience, and subjects
7.3. Assess information needs
7.4. Create evaluation materials
7.5. Consider proper protocol
7.6. Conduct the evaluation plan

PRE-DESIGN

Pre-design is the first step in which the necessary personnel are identified to create the training program. Usually instructional designer(s) and subject matter experts (SMEs) are the key people who create the training. The SMEs should be individuals who have significant experience in teaching with the technology in different subject areas, such as math, science, literature etc. After the personnel are identified a project-planning meeting is held, and an action schedule, cost of the training and other relevant matters are determined.

NEEDS ANALYSIS

The second step, needs analysis, helps the instructional design team compare the current teachers' technology integration level and the expected level in the school in order to identify the teachers' performance gap. The purpose of needs assessment is to uncover(more precisely than performance analysis does) what the performance problems are, who they affect, how they affects them, and what results are to be achieved by training. Needs assessment is very important because all subsequent steps in the ISD model depend on its results. A needs assessment identifies gaps in results, places them in an order of priority, and selects the most important for closure or reduction. To develop a needs assessment plan, instructional designers should first clarify why they are doing the assessment. (Rothwell & Kazans, 1998)

JOB/TASKS ANALYSIS

The job/task analysis is conducted to identify the functions, tasks, and skills necessary to accomplish the job, namely, successful technology integration in the classroom. Job analysis determines what teachers actually do to employ computers and identify the job norms. A task analysis is carried out to determine components of job performance, identify activities that may be simplified or otherwise improved, determine precisely what a teacher must know, do, or feel to learn a specific job activity, clarify conditions, equipment and other resources needed for competent performance, and establish minimum standards for how well job incumbents should perform each task appearing in their job descriptions. Like a blueprint, data collection tools and evaluation of data are planned prior to conducting the analysis. After the data collection, the results are illustrated in a comprehensive manner. The preferred way to exhibit the job/task analysis results is tabular form. The table should show the job title and functions, duties, and tasks associated with the job. In addition to the table, the knowledge, the skills, the attitudes and the entry-level behaviors should also be reported.

The table and the report should be used to identify the training specifications. Our main purpose is to carefully inspect the table and find out the problems associated with the job's functions, duties, tasks, skills, knowledge etc. Then, according to the findings, the training programs are designed or several non-instructional solutions are identified, such as job aids to cover those problems.

DESIGN

The design step includes creating the training plan. Similar to a regular course plan, the design process includes writing and sequencing the objectives, targeting the problems, creating a course content including the information to recover the performance deficits caused by the problems, considering the learning strategies and tactics for the effective learning, creating the instructional materials and delivery platforms to facilitate the delivery while creating the evaluation tool to measure the performance at the end of the training. Some criteria for the good designs would be as include: 1) training units in a harmony with objectives and content areas, 2) objectives associated with the duties and tasks, 3) instructional strategies, tactics, and activities consistent with the learner group, the content, the performance level and so on. The objectives should clarify in measurable terms what trainees should be able to do at the conclusion of the training, how well they should be able to do it and what conditions have to exist or equipment has to be available for them to exhibit the performance.

Performance objectives should contain at least two components of performance, criterion, and condition. The resulting sequence of objectives becomes the basis for an instructional outline. It is a blue print for choosing an instructional strategy and selecting, modifying or preparing instructional materials. Rules for sequencing instruction provide guidance for instructional design.

An instructional strategy is a plan for systematically exposing learners to experience that will help them acquire verbal information, establish cognitive strategy or develop intellectual skills, motor skills, or new attitudes. An instructional tactic is any instructional activity undertaken to facilitate a strategy. No, one instructional strategy works uniformly well under all conditions. To choose the appropriate strategy, consider the learners, the desired learning outcomes, the learning and working environments, and constraints on the instructional design process (Rothwell & Kazans, 1998).

Evaluation is one of the most important items in this step, because according to its results we will justify if the trainees gain the required skills, knowledge and performance levels. The proposed evaluation strategy is pre-test and posttest process. The pretest determines the trainees' knowledge before they engage in planned experiences. By the end of the planned training experience, posttest determines how well learners have achieved the terminal performance objectives (Rothwell & Kazans, 1998).

DEVELOPMENT

In this step the actual teaching and learning materials, such as teacher manuals, study materials, slides, computer presentation, etc., are created as specified in the design documents. The key persons are the subject matter experts and the developers. Before producing the course materials, due to cost effectiveness issue, research is conducted to find out if there are any ready-made materials that are compatible with the required specifications. If some existing materials are found, several modifications are performed to make them more appropriate for training purposes. If no materials are found, new materials and media will be produced. This includes storyboarding, outlining, proceeding through writing and editing, and developing visuals, tapes and other computer related media.

While using appropriate existing instructional materials, it may be necessary to organize or modify the materials in ways appropriate to satisfy the objectives. Based on the instructional strategy and media that were selected earlier, detailed outline will help summarize the content of planned learning experience or series of related learning experience. Storyboard will also be created for a visual representation, which illustrates the text, graphics, and interactivity that will appear in the training program (Rothwell & Kazans, 1998).

PILOT TEST

The pilot test aims to assure the quality of the training materials in terms of teaching and learning. According to the results of the pilot test, several revisions, if necessary, are made to improve the materials. During the pilot test, a representative sample from the target population is selected and like a real-life training environment is created. Then the test is conducted, data is collected on students' performance and attitudes, the results are discussed and evaluated, and the final modifications are made in the materials. The pilot test will capture participants' reactions to instructional materials in a setting similar to that in which the instruction will be delivered. It gives instructional designers valuable information about the effectiveness of the instructional materials by the information collected from the target trainees group (Rothwell & Kazans, 1998).

FORMATIVE EVALUATION

Formative evaluation is concerned with the quality of the instructional design process rather than effectiveness of the training materials. The plot test's scope is the quality assurance of the materials that will be used during the training. Prior to general use, instructional materials and methods should be evaluated and revised to increase their instructional effectiveness. This helps to minimize learner confusion (Rothwell & Kazans, 1998). It is advised that formative evaluation be conducted by a different team including subject matter experts and an evaluation expert or instructional designer. The formative evaluation is conducted and a suggestion report is written. The suggestion report will contain information including any necessary modifications with the segments of the ID process. As specified in the report, necessary changes are performed in the design process.

STAFFING

To conduct the instructional design process, several specialists are needed, such as instructional designer, evaluation specialist, subject matter experts, etc.

Instructional designer: Instructional designer is the manager of the process and responsible for hiring new staff, controlling the work process and writing scheduled reports to the principle of the school. Evaluation specialist is responsible for the formative evaluation conducted in the every step and in the plot test. If an evaluation specialist is not found, ideally another instructional designer can be hired for the evaluation task. Two sets of subject matter experts will be considered. The first group expert is responsible for the designing the training materials under the control of the instructional designer. Also, they are going to be involved in the production process to control the quality of media in terms of the materials' teaching capabilities. The second group of subject matter experts is responsible for conducting and evaluating the plot test with the evaluation specialist. Media developers are responsible for the material production. They work with the instructional designer and the subject matter experts. Moreover, it is possible to make an agreement with a media development company. Therefore, instead of hiring media developers, making an agreement with outside subcontractor is also a possibility.

JUSTIFICATION OF THE NEW MODEL

The main purpose is to create a teacher technology-training model that incorporates the notion of instructional design and systems thinking for the new teacher candidates as well as the experienced teachers who will integrate computer technology into their instructions. Before composing the model, many instructional design processes were reviewed. The appropriate models for training design were selected and reviewed. All steps and sub-steps were rearranged.

CONCLUSION

Our purpose is to create a technology training model and program for the high school teachers in the school in Turkey. The general instructional design model was not appropriate for this purpose because it has limitations with its four steps, which are planning, design, production, and implementation. We elaborated on this process and added three steps. The three steps emphasize team building, training (product) evaluation and process evaluation. Additionally, we elaborated on the sub-steps under the main seven steps to make the new model more systematic, clearer and effective to use.

In the new model, evaluation is divided into two different phases. Pilot training and formative evaluation activities are given more emphasis. Pilot training is concerned with the quality of training. It evaluates how well and accurately the training is created in terms of media and subject area information, how effectively it teaches, what impact it leaves on the trainees. Formative evaluation is concerned with how effectively and accurately the sub-steps are conducted.

We do not expect any obstacles in the implementation of the plan. However, this kind of training design is the first attempt in the high school. We think that the personnel in the school will naturally have specific questions and opinions concerning this project. It is important that we address any comments and/or concerns that arise, if we expect to obtain similar results as outlined in this paper. To prevent and potential negative results, we will arrange several briefing sessions with the personnel, to inform them of the benefits of instructional design. We will include examples of several successful ID applications.

References

Dupagne, M. & Krendl, K. A. (1992). Teachers' attitude toward computers: A review of the literature. *Journal of Research on Computing in Education*, 24(3), 420-429

Flagg, B. N. (1992). *Formative Evaluation for Educational Technologies*. Hillsdale, N.J L. Erlbaum Associates.

Hardy, J. V. (1998). Teacher attitudes toward and knowledge of computer technology. *Computers in the Schools,* 14(3/4), 119-136

Rothwell, W. J, & Kazanas, H. C. (1998). *Mastering the instructional design process: a systematic approach*. San Francisco, Jossey-Bass Inc.

Scheffler (1995). *The identification of computer competencies needed by public school teachers.* Unpublished Dissertation

Designing Web Based Constructivist Learning Environments

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Abstract: A group of 18 university teachers designing and constructing a Constructivist Learning Environment (CLE) was interviewed and monitored in order to find and test optimal design of web based CLEs. The information functions of the CLE were supported by web based technology and the social / collaborative functions were designed using "face to face" interaction. The learning environment was designed for use by a group of 180 first year students with no experience in using CLEs. The results show that supporting the information functions of a CLE with web based technology can be very useful for case oriented education. It also supplied good support for efficient instructional design by a group of teachers. In addition it resulted in a shift of teachers behavior towards facilitating active learning.

Introduction

The last decade of the previous century has brought two developments with important consequences for design of instruction (Tam, 2000). The first development is the changing perception of what learning is about. Learning has long been seen as the result of knowledge transfer from teachers or knowledge transmission from information sources. Now the constructivist conception of learning has gained recognition, stressing the idea that knowledge is individually constructed by learners based on their interpretations of experiences in the world. Instructional design should thus focus on creating constructivist learning environments (CLEs) that engage learners in meaning making and knowledge construction (Jonassen, 1998). The second development is the use of information technology enabling new ways of exploring information, social interaction and constructing information sources. These two developments combine well as virtual experiences and web based sharing of results and viewpoints adds possibilities to individually construct knowledge (Rice & Wilson, 1999).
According to Jonassen (1998) CLEs should supply:

- questions / cases / problems / projects
- related cases
- information resources
- cognitive (knowledge-construction) tools
- conservation and collaboration Tools
- social / contextual support

The first four functions are dealing with information (construction) and they can be supported by web based technology. The last two functions are aimed at social interaction, and the information technology support of them is well described in the literature covering Computer Supported Collaborative Learning (CSCL). CSCL is often the main focus for the introduction of information technology in education. However it is still not very clear what advantage CSCL has compared to "face to face" implementations of collaborative learning if there is no need to bridge time or location differences. In general the first four functions mentioned above might benefit from web based technology regardless of the need to bridge time and location differences.

Purpose

The purpose of the research reported in this paper was to find and test optimal design strategies for CLEs using web technology support for the information (construction) functions.

Methods

In 1999 Wageningen University (in the Netherlands) had planned a major change in its study programmes starting with the courses for the new students arriving in September 2000. As a result of this the educational institute for environmental sciences (EIES) had to design a new introduction course for environmental science students. The institute wanted the introduction course to be case oriented with active participation of students. In addition the course had to be multidisciplinary by using input of university teachers from 14 different department groups. Stoas assisted the EIES in this task by formulating a project aimed at interactive group design using Web technology. The EIES scheduled group design sessions from April till September 2000. The meetings were at irregular intervals about two times each month. The group of 18 designing teachers was formed between March and July with most teachers participating by June. The teachers were all new to ICT supported case oriented learning, and had not been working together in this group before. The course had to be ready for use in September. It would be used by 180 first year students with no experience in ICT supported case oriented learning.

The teachers were interviewed at the beginning of the design process and after the students had finished their tasks at the end of the course. The meetings of the teachers were monitored during the design, construction and utilization phases and student satisfaction was monitored at the end using a web based questionnaire.

Results and discussion

The design phase

At the beginning of the design process the teachers had no clear idea on how to proceed and they had doubts about the available resources for the design, construction and utilization phases. However in general they showed to be prepared to "jump in the dark" and were willing to discus instructional design based on principles they were not familiar with. In the first meetings the teachers agreed on an approach using cases build on problem specifications and information resources. In addition it was decided that the social interaction and collaborative work needed during the course would be done in group gatherings (18 groups of 10 students) of 4 hours during 7 weeks. There was a clear consensus to use a face to face approach for these meetings as that was considered essential for new students. The student groups would have to elaborate on the problems they could specify using the course cases presented on the web. The construction of group work presentations would be facilitated using general presentation software (Microsoft Power Point) and a student software training was included in the course. The students would be introduced to the course on a plenary introduction session on the first day.

By the beginning of June the teachers had thus made major decisions on all the functions of a CLE mentioned in the introduction and gathered some case material as well. Yet most group members had problems creating course content as a clear framework for the case information was missing. At that point Stoas made a design for the web based information functions, incorporating all the work the group had done so far. A simple design using web pages was selected as there was no need for student tracking or a secluded learning environment.

The construction phase

The design for the web based functions was approved and build on the web within one week. In the following weeks group discussions were based on the structure and examples on the web. Most teachers were able to provide substantial input as they had just attended a joined web page construction course (using Microsoft FrontPage). In addition to the case content, the group constructed a joint environmental science glossary. That was an important step as the 14 department involved had not confronted the students with consistency in definitions in the past. Course information functions like a work schedule, teacher contact data and a search function were added as well. Also a library containing pictures with environmental science related explanations was constructed. These pictures were described using an international standard for educational metadata (ARIADNE, 1999). This enables the collection to be part of a University wide or international database.

The course execution and evaluation phase

The course started on the 4th of September, by that time all web based information functions were completed. The design for the group work was almost finished (some parts for the last course weeks were added later) and the 18 group work rooms were made available that day. The course lasted 7 weeks and the students used the web based information functions to formulate and solve their case questions. The students assigned each other tasks and worked alone and in small groups to accomplish them. Each group room was equipped with 1-5 computers. Student couldn't work efficiently in the few rooms with only one or two computers. The students presented their work half way and at the end. The teachers were pleasantly surprised by the quality of these presentations. A web based questionnaire on the quality of the course was introduced in the last week. The response to this questionnaire was 60% (108 out of 180). In general the course scored well with exception of the first part which had suffered from the time stress due to the late start of the design process. The teachers were all pleased with this type of education and they had liked their new role.

Conclusions

Facilitating effective group interaction is essential for designing web based CLEs as usually all the CLE facilities needed can't be constructed by one person. A group design process requires frequent work meetings. In the first meetings the teachers can help each other in understanding new learning approaches. It is important that those discussions results in joint decisions about the instructional design. In addition the group should decide on web design standards to be used. Web based functions can be designed as soon as major decision on instructional design are taken. The construction of these functions is needed as a trigger to enable the entire design to be constructed by the group

Supporting the information (construction) functions with web based technology can result in a shift of teachers behavior towards facilitating active learning. In addition it can create a good basis for intensive group work.

Constructing cases for CLEs is time consuming and web based support doesn't change that much. Web based cases are an excellent use of information technology for education, however complicated case material requires combination with the social functions of CLEs in order to be effectively utilized.

The group work was done in large groups of 10 students. In general the groups reached good results but a design with more variation in group size as described by Heath et al. (1999) might be more efficient.

The CLE made the students cooperate nicely and it made the teachers cooperate in a way they had never done before.

References

Heath, M., Dimock, K.V., Adams, S. & Zuhn, J. (1999). Restructuring Teaching with Technology and Constructivism. In J.D. Price, J. Willis, D.A. Willis, M. Jost & S. Boger-Mehall, *Proceedings of SITE '99*. Association for the Advancement of Computing in Education. Charlottesville, VA. 657-659.

Jonassen, D. (1998). Designing Constructivist Learning Environments. In C.M. Reigeluth (Ed.), *Instructional theories and models,* 2nd Ed. Mahwah, NJ: Lawrence, 1998. Erlbaum

Rice, M.L. & Wilson, E.K. (1999). How technology aids constructivism in the social studies classroom, http://global.umi.com/pqdweb.

Tam, M. (2000). Constructivism, Instructional design, and technology: implications for transforming distance learning. *Educational Technology & Society* 3(2) 2000.

ARIADNE (1999). Educational Metadata Recommendation Version 3.0, December 1999 http://ariadne.unil.ch/Metadata/

URL's of organizations involved:

Wageningen University:	http://www.wau.nl/welcome.html
Stoas:	http://www.stoas.nl/english/

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Using Information and Communication Technologies to Develop a Learner-Centred Approach With Pre-Service Elementary School Teachers : An Exploratory Research.

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Abstract : This paper presents the preliminary results of our exploratory research concerning students' perceptions about their role as future elementary school teachers and the educational practice they integrate in the development of an integrative scenario. We have noticed that when a socio-constructivistic teaching/learning approach is used, many students still have problems assuming more freedom over their own learning experience. Indeed, they tend to fall back on their old ways of learning and they plan their lesson accordingly. We will present instructional strategies that are likely to facilitate the shift from a teacher-centred approach to a more genuine learner approach. We will shortly describe a Web site providing scaffolding tools to help students and teachers through the whole process of scenario production. In order to stimulate metacognitive processes and collective knowledge construction about the new roles of teachers, we use telediscussions in an electronic forum.

1. Introduction

The wide adoption of information and communication technologies (ICT) throughout all of our life domains push our society towards a knowledge society (Levy, 1994). Our working and learning environments are strongly transformed by ICT. Home, work and schools are all called to merge as they all make a more intensive use of these technologies. This emerging knowledge society calls for new and revised competencies for both teachers and learners (NCATE, 1997). Beyond technological competencies and probably more important, there are the pedagogical and knowledge construction competencies. Socio-constructivist teaching/learning approaches such as networked communities of learners (Brown, 1997; Wenger, 1998) are seen by many researchers as the way to rethink teaching and learning in order to meet society's new expectations. The principles that feed this epistemological stance could be synthesised in saying that significant learning is more likely to happen in: a project or problem based activity, anchored in a real life situation that makes it a meaningful and an ecologically rich context for the student; collaborative knowledge construction activities where learners are given more control over the executive decisions about and within the learning activity; activities involving individual and collaborative metacognitive work. But these principles do not fit with neither teachers' nor students' experience of teaching and learning. Most of us have learned in a more traditional and directed way with little initiative and responsibility given to the learners. Teachers and learners need to be prepared and supported to make this important shift. Experience with socio-constructivist learning activities are required to develop the related competencies.

Over the past six years, we have implemented a socio-constructivist approach in the two Information and Communication Technologies (ICT) mandatory courses provided to students registered in the teacher education program at l'Université de Montréal. Although we believe that ICT provide numerous opportunities to render students more autonomy over their learning, and despite the knowledge and experience gained over the past years, we have noticed that many students still have problems assuming more control and freedom over their own learning experience. Indeed, when they are facing a novel situation or when they encounter a difficult problem, students tend to fall back on their old ways of learning (Viens & Amélineau, 1997). They seem to do the same when they plan a lesson for a specific class situation An important challenge is then the scaffolding of both a comprehensive understanding of socio-constructivist principles and the ability to apply these in school practice.

In this paper, we will describe in more details the context and characteristics of our teacher education strategies, *Les Scenaristes* Web site, the research methods, the results of the first analyses and the solutions that emerged from our experiment. Ultimately, this exploratory research project will help us refine the strategies used in teacher education in order to help students benefit from a more efficient learner-centred model of learning.

2. Context

Students registered in our teacher education programme have to take a minimum of two courses about the integration of ICT in the classroom. The first course, *Les TIC en éducation* (ETA1700), is a general overview of the various technologies that could be integrated in a given learning environment. The final assignment consists of producing, as a team, a complete and fully working integrative scenario that will be available on the Web, for the benefit of their colleagues and the teaching community. A scaffolding procedure is proposed for lesson planning. Scenarios should integrate the following five basic elements : motivation and contextualisation activities; teaching/learning activities: metacognitive activities; modes of evaluation; and transfer activities. As the teams develop their integrative scenarios, individual members are invited to participate in telediscussions. For ETA1700, four themes are provided : the impact of ICT on society, the effective use of ICT in educational settings, the changing role of teachers and learners and continuing education of teachers. Since learning to use the technology is a sub-goal of the course, students are requested to make at least one contribution for each theme, as well as offer one reply to one of their colleague.

The second course, *Laboratoire d'intégration des TIC* (PED2000), is a full year course, offered to second or third year students and mostly at a distance. Team members are free to meet as they please. Students have to produce a more comprehensive scenario for a situation of their choice. However, prior to designing their scenario, students have to contact an in-service teacher who will let the students conduct their intervention in his or her classroom. The field experiment allows the teams to conduct a formative evaluation of their project. PED2000 students also have access to electronic forums of discussion, with the difference that no themes have been pre-determined. It is the students who create and launch topics of discussion. An on-line tutor is available to guide the students in their creative process.

Since three years, a multilingual Web site, http://facvirtuelle.scedu.umontreal.ca/scenaristes, *Les scénaristes*, provides additional scaffolding tools to help students through the entire process of scenario production. Scenarios are constructed and stored online so students can keep trace of their evolution. During the development process, pre-service teachers are supported by detailed questions for each of the following steps : 1-needs analysis; 2- in depth elaboration of teaching/learning strategies appropriate to the identified situation; 3- production of all related materials; 4- implementation of the lesson plan *in situ*; 5- formative evaluation and collective critical analyses. In addition, the Web site provides numerous resources such as a model of educational uses of ICT with four axes: Information source, Knowledge organiser and production, Teaching, and Communication; a description of 14 teaching strategies analysed to demonstrate their collaborative and student initiative potential; four scenarios presented as case examples, and so on. In ETA1700, students are asked to complete the first three steps of the model (until production). In PED200, students engage in the full developmental process, in collaboration with a school teacher who provides a real class situation in order to implement the scenario. Final products (scenarios and accompanying resources) are then posted on the Web so they can be shared with the teaching community.

3. Description of the Research

Essentially, we are aiming at discovering the links (or absence of links) between the constructivist discourse held in the forums and the application of those principles in their integrative scenarios. It is those two main sources of data-- the forums and the integrative scenarios--that we are using to conduct our research. Based on the obtained results, we plan to develop instructional strategies that will use both the scenario's scaffolding tools offered by *Les Scénaristes* Web site and the reflective activities provided by the forums to help students harmonise their discourse with their practice.

3.1 Goals

Our goals are :

1- to identify students' perceptions about their *role as future teachers* while using ICT;

2- to verify the extent to which students *apply socio-constructivist principles* in their scenarios;

3- to explore the strength of the relationship between *discourse and practice*.

Ultimately, the research results will be used to improve and to enrich our scaffolding approach, which in turn will help the students not only discuss the socio-constructivist principles but also adopt them in practice. To do so, we explored the links between the discourse held in the telediscussions and the application of the principles in the integrative scenarios.

3.2 Analyses

We have proceeded to an in depth reading of all the forum messages of the two courses in search of descriptions of socio-constructivist teachers/learners' roles (student centred, student control, teacher as a guide, collaborative learning, etc.). Messages presenting such descriptions were identified and the team mates (scenario team) messages were all extracted and grouped to be analysed together. Our initial idea was to get the scenarios of these teams and to proceed to a comparative analysis. But the results of the forum analyses provided surprising data.

We found that while many ETA1700 students are indeed adopting a socio-constructivist discourse, almost no PED2000 students did. Our preliminary analyses showed that PED2000 students used forums to evaluate collaboratively their scenario implementation and to ventilate about emerging problems. Very few messages discussing the teacher/student roles were posted. The students who did, adopted a shallow perspective with very little justification or elaboration on the topic. Hence, in PED200, it would have been difficult to establish a relationship between the students' perceptions in the forums and the applications of those in the scenarios. Consequently, we decided to focus on the analysis of ETA1700 students' work.

3.3 Sampling

We selected four teams from the ETA1700 course, representing 18 students, who contributed a total of 80 messages in the forums. Two discussion themes were relevant for our analysis: They are the "perception about the role of the teacher " and the "effective use of ICT in the classroom". For both themes, students contributed 55 messages.

3.3 Criteria for Analysis

3.3.1 Integrative Scenarios

To assess the students' perceptions about their changing role as teachers, we referred to some of the criteria described in Viens (1993), as well as the general constructivist principles (Brown, Collins & Duguid, 1989; Lave & Wenger, 1991; Brown, 1997; Wenger 1998). Even though we used a Likert scale to evaluate each criterium, our intention was not to cumulate frequencies. We rather used the scales to guide our critical analysis of the constructivist aspects of each scenario. Consequently, the results are more descriptive in nature. The criteria are as follows :

Learning strategies . Notwithstanding the specific learning strategy to be used, we assessed whether during the instructional strategy the learners were « directed », « guided », « rather guided », or «free ».

Team work. We examined whether the students planned to have their learners work individually, in teams but to conduct a fragmented task, or in teams to conduct a collaborative and collective task.

Content. Did the students determine a specific content or did they leave it completely opened for their learners to decide of their specific subject, as it is usually done in project-based learning?

Pedagogical goals. Aside from the usual well-stipulated instructional goals, did the students add other learning objectives such as transversal competencies? Did they consider metacognitive processes?

Interdisciplinarity. Did the students focus on one subject matter or did they use the opportunity to integrate several disciplines?

It is to be noted that all criteria were considered simultaneously in order to assess the global constructivist flavour of each scenario.

3.3.2 Forums

For the forums we proceeded differently. First, we focused on two aspects : the positive/negative attitude toward the ICT. Secondly, we looked at the perception of the teacher's role. In addition, we attempted to assess the student's capacity to reflect critically, that is we observed whether the students were able to develop and support their thoughts rather than merely contributing an unsubstantiated opinion (Quellmaltz, 1987; Ennis, 1987).

4. Preliminary Results

4.1 Forums

4.1.1. Attitude Towards ICT

After conducting the preliminary analysis of the telediscussions for ETA1700, we noticed that the students positions about the integration of ICT in the classroom are not radical as one might expect. The majority seems relatively sensitive and cautious about technologies. In fact, several interventions were concerned about the fact that the computer will never replace the teacher and that the human factor is essential for the development of the pupils. In other words, aspects such as empathy, communication, emotional support are still essential for the learners development.

4.1.2. Perceptions of the Role of the Teacher

After listing all relevant interventions, we noted three recurrent themes that could constitute categories. First, some interventions directly mentioned the role of the teacher, but did not provide further explanations or examples. The second category encompasses interventions that focus on the learner and whereby the role of the teacher is addressed indirectly. In the third group, interventions were about more specific tasks of the teacher. We chose to use these categories to present the results about the perceptions of the role of the teacher. Although not all interventions under the theme « Perception of the role as teacher » referred directly to the subject, it is interesting to discover that the perception of the role is indeed changing. The students did mention that the ICT will help shift from a traditional role of « content deliverer » to one that assumes more guidance, more facilitation. Terms such as « facilitator », « animator », « councillor », « advisor » were used relatively frequently. However, we discovered that the majority of students limited their intervention at the opinion level. For example, they only named or listed the role without providing an explanation or a definition of what they meant by « facilitator ». Furthermore, they did not establish a priori what they mean by « traditional role ». Very few went as far as mentioning « content deliverer » or « lecturer ». In other words, students talk about the changing role without defining their assumptions. No one proceeded to compare and contrast the two positions or provide an illustration to support their thought. Indeed, most participants merely identified keywords and did not attempt to engage in a more critical discussion.

Some interventions were also addressing the issue of the changing role, but indirectly. Some students talked about the fact, for example, that the ICT will provide the opportunity for the pupils to be more active in their learning process. Here, the guiding role of the teacher is implied in the discussion. Participants mention the possibility that ICT will encourage the active construction process and consequently, will contribute to a more significant learning experience. In fact, in those indirect interventions, the learners are considered to be at the centre of their learning, actively engaged in the construction of their own knowledge and experience. Incidentally, the teacher assumes the role of guide in the learning process. In sum, the students in this category seem to think that ICT can be used to favour collaboration between the learners as long as the learners' needs are respected. It seems that participants perceived the ICT as an integrated tool to teaching that favours self-learning.

Interestingly, the same group of students also discussed a specific aspect of teaching that will be affected by the technology : the impact of broader access to information. Some students recognise the fact that a wider access to information will bring new tasks for their learners. One student mentioned that their pupils will have to « clarify their own research goals, define their information seeking strategy, make choices in the information, and sort the information ». This type of anticipation regarding « transversal » competencies was certainly an interesting discovery.

However, the same students who demonstrated their critical thinking abilities, still perceived themselves as the authority figure for their students. In fact, they mentioned that it will be their responsibility to assess the quality of information gathered on the Web as well as to judge the relevance of the source. Instead of making the link between the role of guide or facilitator, as it would be expected in a constructivist fashion, it seems that the higher cognitive skills required, such as analysis and evaluation, will remain in the mind of future teachers, as their own territory.

4.2 Integrative Scenarios

Two interesting trends have been identified in this analysis. First, the students who are more able to support their opinions by providing examples, using the literature, explaining their thoughts, seem to be more capable of producing a scenario that uses a genuine constructivist approach. In fact, if all the constructivist criteria are applied whenever it is reasonable to do so, the tone used to describe the learning activity is more opened, more respectful of both the freedom of the teacher and the learners. Here, we noticed that teams who produced a constructivist integrative scenario, were constituted of at least two members who demonstrated critical thinking abilities.

In the second trend, it seems that the students who claim that the role of the teacher is changing but who do not support their opinion, do not apply their values and perceptions in their integrative scenarios. In the telediscussions, they claim to be constructivist, but they fail to transfer their thoughts in practice. Their interventions tend to be opinions and value judgements rather than supported, critical reflections. As we anticipated, the majority of the scenarios produced were meant to be constructivist. Some teams for example, will have their students work in teams but in a fragmented fashion (individual students will provide parts that will make a whole); the content will be determined and not opened for change; the learner will be rather guided in the learning process.

Two sources or information reveal the lesser constructivist approach : the instructional goal statement and the description of the lesson plan. Statements of the instructional goals in those scenarios tend to be highly fragmented, clearly measurable, well stated. Often, the students will refer to the Ministère de l'éducation du Québec programme to write the goals. There is no reformulation of the goals to suit their situation or needs. Also, there is no interpretation or critical analysis or re-evaluation of the goals. In addition, the students do not go beyond the goals officially prescribed by considering, for instance, the development of transversal competencies. The students just take the goals as they come.

The design of the lesson plan is another indicator that a scenario might not represent a good application of constructivist principles. Lessons plans tend to be very organised and directed as well. The outcomes, ensuing the instructional goals, are well planned. In fact, the pre-service teachers, remain perfectly in control of the predetermined outcomes. Despite their good intentions, the students remain in control of the learning process. The steps are not only too well defined, that are also not flexible. The outcomes of the intervention using ICT are still pre-determined. Finally, the teams did not seize the opportunity to create a lesson plan that encompasses more than one subject matter. Since the students had the freedom of choosing what to cover, one would expect a project that draws on multiple disciplines. Here too the students did not fully exploit the potential of constructivist approaches.

5. Conclusions

In this exploratory research we highlighted two trends. Students who demonstrate critical thinking abilities in telediscussions are more likely to apply successfully their values and beliefs in their productions of integrative scenarios. We also found that teams made up of at least two members who substantiate their reflection tend to create scenarios that are more constructivist. Secondly, students who do not support their opinion in the telediscussions will be less able to apply the constructivist principles to their productions. The teams are constituted of students whose interventions are opiniated rather than being critically reflective. Those teams will remain in control of their pupils' learning.

Our analyses revealed some limitations related to team leadership and the understanding of the group dynamic. In fact, it is difficult to link one's work to a collective production without having a sufficient knowledge about how this individual influenced the group artefact. Hence, data about the evolution of the group's work and individual contributions could permit to run a more specific analysis of the collective knowledge construction processes. Nevertheless, our results suggest that scenarios production and discussions in a forum about teachers/learners roles may be used in a convergent way such as to provide rich scaffolding activities for pre-service teachers.

In conclusion, the next logical step would be to support the development of critical thinking skills in the telediscussions by having students to specifically discuss how they implement their representations of the teachers/learners' roles in their scenario. This would probably bring to front some ruptures in students representations by a process of confrontation to practical considerations. We believe that such a breakdown generative activity may be necessary to build a more coherent mental models of teachers/learners roles in socio-constructivist activities and to encourage a better transfer of the socio-constructivist principles to the development of integrative scenarios.

6. References

Brown, A. (1997). Transforming schools into communities of thinking and learning about serious matters. *American Psychologist*, 52 (4), 339-413.

Brown, J.S., Collins, A. & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher*, Jan.-Feb., 32-42.

Ennis, R.H. (1987). A taxonomy of critical thinking dispositions and abilities. In J.B. Baron & R.J. Sternberg (Eds.). *Teaching thinking skills: Theory and practice*. New York: W.H. Freeman & Company. 9-26.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge: Cambridge University Press.

Lévy, P. (1994). *L'intelligence collective. Pour une anthropologie du cyberespace*. Paris : La Découverte.

National Council for Accreditation of Teacher Education, NCATE (1997). Task Force on Technology and Teacher Education. *Technology and the new professional teacher: Preparing for the 21'st' century.* Washington, DC : NCATE.

Quellmaltz, E. S. (1987). Developing reasoning skills, In *Teaching thinking skills: theory and practice.* J.B.Baron and R.J. Sternberg, Eds. New York: Freeman, 86-105.

Site des Scénaristes : http://facvirtuelle.scedu.umontreal.ca/scenaristes

Viens, J. & Amélineau, C. (1997). Une expérience d'auto-apprentissage collaboratif avec le logiciel Modélisa. *Cahiers de la recherche en éducation*, 4 (3), 339-371.

Viens, J. (1993). Au-delà d'une certaine multidisciplinarité : Un prototype d'environnement informatisé permettant l'expérimentation d'outils pour la construction des connaissances. *Revue Educatechnologiques,* 1(2).83-106.

CRACTIC : towards a model for the implementation of socio-constructivists principles in multiple classrooms collaborative projects using the Web.

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Abstract: CRACTIC stands for "Research Community on Collaborative Learning with Information and Communication Technologies". It is a collaborative research involving university professors, teachers and domain experts in the development and implementation of collaborative learning activities based on socio-constructivist principles. Our pedagogical model builds on having students from different schools along the St-Lawrence River to exchange questions and answers about the impact that the River have on their respective economical, social and geographical environment. Each school answering questions raised by another school and doing so, contributing to the construction of collective knowledge expressed in a community Web site. Six classrooms, matched in pairs, participate to our community. Each classroom developed a Web site presenting itself and the work done locally. We will present the theoretical foundations, the emerging model, the implementation conditions, the process of appropriation of the model by teachers and students and the outcomes of our three cycles of experimentation.

Socio-constructivist principles are raised as the basic guidelines for the use of Information and Communication Technologies (ICT) in almost every recommendation plan delivered by national orientation committees in the United States (NCATE, 1997 ; ASCD, 1998) and in Canada (MEQ, 2000). But there is a huge gap between the ideal vision and the day by day school's perspective. The pathway to a successful implementation of those principles in K-12 classroom activities is complex and requires numerous conditions to be met. In order to study those conditions and to develop a model of implementation that would take teachers' concerns as well as day by day classroom reality into consideration we have initiated, four years ago, a community of research on collaborative learning with

ICT. In fact, CRACTIC stands for the French appellation of "Research Community on Collaborative Learning with Information and Communication Technologies". This community gather some professors and researchers of the Université de Montréal and McGill University; teachers and pedagogical support staff from a Montreal schoolboard; and topic experts from a Montreal Museum, the Biosphere. It is financially supported by a National research fund, FCAR.

The basic idea was to initiate a collaborative research community linking universities, teachers and domain experts from a Museum, and to have them to develop and implement a model of collaborative learning activities based on socio-constructivist principles (Roschelle, 1995; Brown, 1997; Wenger, 1998). The basic model that was developed builds on having students from different schools along the St-Lawrence River to exchange questions and answers about the impact that the River have on their respective economical, social and geographical environment. Each school trying to answer questions raised by the other schools and doing so, contributing to the construction of collective knowledge expressed in a community Web site. Six classrooms from different schools were participating to our community. In order to establish a stronger relation between students, to facilitate the harmonisation of teachers strategies as well as students evolution in the projects, classrooms were matched in pairs. Each classroom developed a Web site presenting itself and the work done locally. Even if a classroom was to get involved more directly with a specific other, they could access the other classrooms Web sites and communicate with every participants of the enlarged community. Exchanges were taking place along a full academic year. The activity implementation procedures contain 9 steps that guide students in the collective knowledge construction process.

The conditions of development of the model and its implementation have been observed and documented. Data sources are numerous: meeting notes and reports; classroom observations; interviews with teachers, students and school administrators; students production such as email messages exchanges and Web site produced. The model have been revised after each annual experimentation based on the gathered data.

The gathered data all points out to numerous factors that impedes the implementation of such a collaborative knowledge construction strategy. In fact, it was very difficult to have teachers as well as students to systematically apply the proposed model which implies to communicate regularly with the matched classroom. Problems came from various sources : technical, pedagogical, research related and social problems. We will shortly describe the majors difficulties that were encountered and present the solutions that we applied. Finally, the model resulting from our 4 years experience of collaborative research will be presented.

References

ASCD (1998). *Yearbook on Learning with technology.* C. Dede, (Ed.). Alexandria, VI: ASCD.

Brown, A. (1997). Transforming schools into communities of thinking and learning about serious matters. *American Psychologist*, 52 (4), 339-413.

Brown, J.S., Collins, A. & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher*, Jan.-Feb., 32-42.

MEQ, (2000). Programme de formation à l'école Québécoise. Internet document (29-11-00). http://www.meq.gouv.qc.ca/dfgj/program/programm.htm

National Council for Accreditation of Teacher Education, NCATE (1997). Task Force on Technology and Teacher Education. *Technology and the new professional teacher: Preparing for the 21'st' century.* Washington, DC : NCATE.

Roschelle, J. (1995). What Should Collaborative Technology Be? A Perspective From Dewey and Situated Learning. Internet document (20-11-2000). http://www.cica.indiana.edu/cscl95/outlook/39_roschelle.html

Wenger, E. (1998). *Communities of practice: learning, meaning and identity.* Cambridge: Cambridge University Press.

Overview of Web-Based Pedagogical Strategies

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Abstract: Preparing teachers to utilize Web-based instruction requires a focus on Web-based pedagogy, not just Web-based technology. Teachers must understand that technology should be utilized as the enabling factor, not the primary factor if Web-based instruction is to be effective in enhancing teaching and learning. The Web provides an array of teaching strategies that can be added to those commonly utilized in traditional instruction; and today's teachers must understand both. Recommended Web-based pedagogical strategies are addressed in this paper as well as how they relate to Gagne's Nine Events of Instruction as well as the American Association of Higher Education's Seven Principles for Good Practices in education.

Major Web-Based Pedagogical Strategies

There are at least four important Web-based instructional elements including: (1) Course administration, (2) Interaction with content, (3) Testing, and (4) Discussions. A review of the major Web-based instructional software products such as Blackboard and WebCT illustrates a focus on functionality to accommodate these four elements. Effective utilization of these components allows course designers to utilize a broad array of features to establish extensive Web-based pedagogical strategies. Each major component is described in more detail below.

Course Administration. Course administration components make it possible to post course information on the Web, including the course syllabus, assignments, course notes, and other course documents. Students can access information easily, and instructors can post and update important course information conveniently. Most Web-based instructional software also allows students the capability of submitting assignments electronically.

Interaction with Content. Interactive components make it possible for students to engage in student-centered learning activities and interact with course content. Direct access to Web resources allows instructors the capability of creating student assignments that require students to perform Web research and apply critical thinking skills to analyze site information and document their findings. Another major advantage of the interactive component of Web-based instruction is enhanced remediation. Course content elements such as audio or video files, simulations, PowerPoint slides, and course notes, can be reviewed by students as often as necessary.

Testing. The self-testing component of Web-based instruction provides very important learning advantages. Students can practice newly acquired knowledge and skills and obtain instant feedback on their progress.

Discussion. One of the most important functions Web-based instructional software provides students and instructors is the ability to electronically communicate. Students who may be too shy to speak out in class often do so comfortably in electronic discussions. Teamwork is fostered through electronic discussions, and the obstacles of organizing team meetings around the schedules of team members are eliminated. Electronic communications also affords instructors many advantages such as engaging in one-on-one discussions with students electronically, as well as establishing electronic office hours.

Web-based Pedagogical Strategies to Engage Learners

There are a number of factors that must be implemented to engage learners in the learning process; when learning is Web-based, special care must be taken to insure learner engagement. Figure 1 lists twelve major factors needed to engage learners in the learning process and example Web-based strategies for each. This form is provided as a planning tool for creating Web-based strategies appropriate for Web-based instructional prototypes.

Figure 1

Web-based Pedagogical Strategies to Engage Learners

Needed for Learner Engagement	**Recommended Web-Based Strategies**
1. Must feel comfortable and not threatened.	Online orientations to Web-based learning. Online tutorials on template functions. Instructions on course technical requirements.
2. Are social by nature.	Instructor profiles posted on course website Include bios and photos Classmate profiles posted on course website Include bios and photos After class electronic discussion board.
3. Must make connections with the instructor.	Electronic Discussions one-on-one with instructor. Phone conversations with instructor.
4. Must make connections with fellow students.	Electronic discussions with fellow students. Team projects and assignments.
5. Must make connections with course content.	Effective instructional design principles. Effective Web-based design principles. Effective use of graphics and multimedia elements. Guest speakers via electronic discussions.
6. Must have an important reason to learn the content.	Learning activities such as frequent Web research that requires critical thinking skills. (For example, if students are asked to research websites, have them analyze information and document findings.) Frequent Web-based activities that count towards grade.
7. Must be actively engaged in the learning process.	Numerous Web-based research activities. Effective multimedia elements. Choices on learning activities. Numerous discussion opportunities. Self-testing activities.
8. Must be allowed to learn in their own styles.	A flexible choice of learning activities to Accommodate learning styles (audio, visual, "try out" exercises, and others)

Figure 1 Web-based Pedagogical Strategies to Engage Learners	
Needed for Learner Engagement	**Recommended Web-Based Strategies**
9. Must build on prerequisite skills and knowledge.	An introductory activity to relate prior knowledge such as an electronic discussion with instructor or students before course gets underway. A before you start self-test.
10. Must obtain feedback in a timely manner.	Instructors must respond to email in a timely fashion. Utilize course facilitators to answer questions, monitor discussions, and respond to email. Utilize student team leaders to answer questions, monitor discussions, and respond to email. Implement a Help Desk concept for the course.
11. Must apply knowledge or skills to real tasks.	Utilize case studies. Utilize team projects. Student portfolios. Practice activities to develop technology skills needed in the workplace.
12. Must be able to monitor their own progress.	Have students maintain journals, logs, or diaries. Self-tests Statistics on # of times Web-site accessed by students.

Figure 1 - Web-based pedagogical strategies to engage learners.

Web-based Pedagogical Strategies Applied to Gagne's Nine Events of Effective Teaching

The list of Gagne's Nine Events of Effective Teaching is one of the most popular tools used by educators to insure that instruction is effective (Gagne 1985). Gagne's Nine Events can also serve as guidelines for designing effective Web-based strategies for online learning. Figure 2 is a tool that lists Gagne's Nine Events and example Web-based strategies that comply with each event. (Harris and Watehrouse 2001). (Details of Gagne's Nine Events can be viewed at <http://ide.ed.psu.edu/idde/9events.htm>.)

Figure 2 Web-based Pedagogical Strategies and Gagne's Nine Events of Instruction	
Event	**Web-based Strategy**
1. Gain Attention	Effective use of graphical and multimedia elements.

Figure 2 Web-based Pedagogical Strategies and Gagne's Nine Events of Instruction	
Event	**Web-based Strategy**
	Effective Web-design including appropriate use of color, fonts, and text. An announcement section. A discussion on current topics. Referral to appropriate Web sites.
2. Inform Learners of Objectives	Course orientation. Course tutorial. Post course syllabus.
3. Stimulate Recall of Prior Learning	A getting started self-test to apply what you know. An electronic discussion about prior topics.
4. Present the Content	Web-enhance lectures, textbook activities, and other content delivery activities through Web-research, simulations, audio/video modules, and others.
5. Provide Learning Guide	Post syllabus, course notes, course assignments, and other course related documents. Facilitate discussions.
6. Elicit Feedback	Electronic student surveys, electronic discussions, electronic quizzes, and electronic office hours. Students submit work electronically.
7. Provide Feedback	Electronic discussions and electronic office hours. Respond to email in timely fashion.
8. Assess Performance	Electronic testing. Graded work is returned electronically. Student portfolios are reviewed electronically.
9. Enhance Retention and Transfer to the Job.	Web-research activities foster critical thinking. Team collaborations. Resolve case studies. Student Web-based portfolios. Utilize technologies common in workplace.

Figure 2 - Web-based pedagogical strategies applied to Gagne's Nine Events of Instruction.

Web-based Pedagogical Strategies Applied to the Seven Principles of Good Teaching

The American Association of Higher Education's Seven Principles of Good Teaching is another tool that is popular among educators and instructional designers. The Seven Principles of Good Teaching has been adapted by many educators, and one of the most renowned adaptations is the Chickering and Gamson (1991) application, The Seven Principles for Good Practices in Undergraduate Education. (A summary of Chickering and Gamson's work can be viewed at <http://www.msu.edu/user/coddejos/seven.htm>.)

Figure 3 is a tool that lists the Seven Principles for Good Practices in Undergraduate Education and provides an area for recording appropriate Web-based pedagogical strategies, depending on the learning activity.

Figure 3 Web-based Pedagogical Strategies and the Seven Principles for Good Practice in Undergraduate Education	
Teaching Principle	**Web-based Strategy**
1. Encourages contact between students and faculty.	Electronic discussions with students. Electronic discussions with instructor.
2. Develops reciprocity and cooperation among students.	Electronic team projects and collaborations.
3. Uses active learning techniques.	Web research activities. Simulations and practice activities. Provide students choices.
4. Provides prompt feedback.	Self testing. Instructors respond to email in a timely fashion. Instructor returns graded work promptly.
5. Emphasizes time on task.	Numerous student-centered learning activities.
6. Communicates high expectations.	Students assume responsibility for learning.
7. Respects diversity in talents and ways of learning.	Learning styles are addressed through flexible learning activities. Students apply technology skills needed in the workplace.

Figure 3: Web-based pedagogical strategies applied to the Seven Principles for Good Practice in Undergraduate Education.

References

Chaffee, E. E. (2000). Finding the will and the way. In *Preparing your campus for a networked future,* edited by M. Luker. San Francisco: Jossey-Bass Publishers.

Chickering, A. W., and Z. F. Gamson. (1991). *Applying the seven principles for good practice in undergraduate education.* No. 47, Fall. San Francisco: Jossey-Bass Publishers.

Gagne, R. (1985). *The conditions of learning.* 4th ed. New York: Holt, Rinehart & Winston.

Harris, R., Waterhouse, S. (2001). *A 10-Step Guide to Establishing Instructional Technology.* Washington, D.C.: Executive Leadership Foundation.

Additional Resources

Appling the Seven Principles for Good Practice in Undergraduate Education
From a book written by Arthur W. Chickering and Zelda F. Gamson

http://www.msu.edu/user/coddejos/seven.htm

Felder, Dr. Richard M.; Hoechst Celanese Professor Emeritus,
Chemical Engineering at North Carolina State University
Online learning styles assessment guide
http://www2.ncsu.edu/unity/lockers/users/f/felder/public/RMF.html

Gagne's Nine Events of Instruction
http://ide.ed.psu.edu/idde/9events.htm

Institute for Higher Education Policy
http://www.ihep.com

The Integrated Curriculum in Engineering Program,
Embry-Riddle Aeronautical University
http://www.db.erau.edu/campus/departments/aeroeng/ice/index.html

Penn State University
Guidelines for Developing Distance Education Web Sites
http://www.cde.psu.edu/de/id&d/DoDont.html

The Pew Grant Program in Course Redesign
http://www.center.rpi.edu/PewGrant.html

Cognitive Learning Theory Meets Technology: Incorporating Research on Attention into E-Design

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Abstract: During the implementation of a two-year faculty development grant, California Lutheran University (CLU) has explored technology's potential for improving teaching and learning. In incorporating various technologies into the design and redesign of 27 undergraduate courses, we have found that certain cognitive and physiological processes are tremendously relevant to learning outcomes. Strategic uses of new technologies that capitalize on the dynamics of these processes can, we believe, optimize a student's ability to focus and sustain attention, improve comprehension, and facilitate the transfer of content into long-term memory. To develop new design strategies that incorporate relevant cognitive theory, we have set up the generic methodology we follow in this paper: 1) examining a specific cognitive phenomenon (Attention, in this case), 2) identifying its relations to learning, and 3) imagining how its principles might be best incorporated into the architecture of an e-designed instructional project.

In 1998, the Charles E. Culpeper Foundation provided California Lutheran University (CLU) with a grant to help faculty develop and deliver curriculum in technology-infused learning environments. Our Teaching, Technology, and Teamwork groups focused on integrating good pedagogical practices into 27 e-designed courses and other instructional multimedia projects.

We now want to integrate the principles of cognitive learning as well as good practices research into other e-designed projects. We are convinced that strategic uses of new technologies can capitalize on the dynamics of cognitive and physiological processes, optimizing a learner's ability to focus and sustain attention, improve comprehension, and facilitate the transfer of content into long-term memory.

We have identified several areas of cognitive learning theory that hold promise for technology-enhanced instructional products. This paper 1) briefly examines one of these areas (Attention), 2) identifies some of its interrelationships with learning, and 3) suggests how we might incorporate relevant Attention principles into multimedia instruction to achieve better learning results.

Teachers want to get information into a student's long term memory, but too often neglect to first ensure that learners are "paying attention" when that information is being delivered. Attention is learning's most crucial step. Educators have long known that better learning outcomes are inevitable when attention is focused, and that formal organization of content and flexible methods of delivery help direct and sustain student attention. Now, educators can use mechanical strategies to reinforce organizational and delivery methods that focus attention—something designers of ATM and other machines have been doing for a long time (e.g., that buzz directing our attention to the card slot!).

Reviewing concepts developed by Attention theorists can help us formulate strategies of incorporating Attention principles into educational multimedia design. Attentional Resource theorists propose that the number and kind of resources needed for processing information depend on the complexity of the incoming stimuli (Sternberg 1999). Simple stimuli require only a small number of resources, while the remaining resources can be used to pay attention to other stimuli simultaneously. Difficult material, requiring more resources, will limit our ability to divide attention as readily among various tasks. Practice reduces the number of resources required to attend to a task, making additional resources available for simultaneous multi-tasking.

Additionally, Attentional Resource theorists point out that the number of processessing resources available is not consistent across populations and situations. A tired person, having fewer resources available, has a reduced ability to pay attention to complex stimuli. According to other Attention theorists, students will also have difficulty paying attention to verbal material when they are trying to read and listen simultaneously because when they read, they are transforming a visual format into an acoustic format (Best 1999). It follows that the acoustic processing in reading could displace the acoustic processing in listening, a physiological dynamic that needs to be considered when designing multimedia instructional projects. Students should not be expected to read blocks of PowerPoint text and listen to an instructor at the same time, anymore than they should be expected to read handouts during a live lecture.

Because changes in attention levels are subject to the above as well as to so many other variables, instructors must continually vary delivery methods. One common way to effect variance is to increase or decrease delivery pace. The bottleneck theories in cognitive research (Broadbent 1958; Moray 1993; Treisman 1964) indicate that a "bottleneck" occurs in the presence of excessive stimuli, and information that gets stuck in the bottleneck doesn't get processed. Complex verbal material requires slow-paced delivery because it needs time to "get through the bottleneck" and (in the Attentional Resource theorist's context), because more cognitive resources are required to understand it.

When the delivery pace is *too* slow, however, students often use their "left over" resources to daydream and to drift away from the course material. Retention usually improves when delivery rate is increased, an expected result of the speech/thought speed differential: 125-175 spoken words per minute to 400-500 words processed through listening per minute. When learners have less opportunity to let attention lapse, comprehension and retention rates improve (Wines 1998). And, as Kevin Harrigan has pointed out, learners can listen to speech compressed at as much as 50% without loss of comprehension or retention (Harrington 1999). Thus, theoretically, arbitrary timing of online verbal material that would force the user to process at faster paces would focus and sustain attention simply by not giving the user an opportunity to drift.

Given the many variables that affect Attention, however, a design which gives pace control to users instead of instructors is a better option for designers who emphasize the importance of user choice and control. Many who e-design educational projects argue that the more actively engaged user learns more and learns better, and that most students have some awareness of their metacognitive processes, their learning potentials, and their limitations. Learners can, therefore, be taught to consider variables such as complexity of material and emotional and physical states, and to adjust their listening pace accordingly. They can then optimize their learning experience by deciding how to control the flow of information.

Software that gives users this control has already been developed. The DUKES computer application is a good example (Harrigan). Created to let e-designers build in variable-speech speed options, this application could be invisibly integrated into an online lecture segment, giving students the option of choosing different listening rates, e.g., remedial, slow, medium, fast paced. Questions on comprehension and tracking mechanisms could be integrated into the design to help the instructor evaluate student-learning styles and to better assess learning outcomes.

In applying Attention (in relation to listening as just discussed, as well as viewing and reading) and other cognitive principles and concepts to the e-design of multimedia instructional projects, we hope to achieve better learning results as well as a more quantitative assessment of learning outcomes.

References

Best, J. B. (1999). *Cognitive Psychology*. Belmont, CA: Wadsworth.

Broadbent, D. E. (1958). *Perception and Communication*. New York: Pergamon.

Harrigan, K. A. (1998). DUKES: Creating Real-Time Variable-Speed Speech for Use in Educational Multimedia, *AACE 1999 Hawaii Conference Proceedings*.

Moray, N. (1993). Designing for Attention. In A. Baddeley and L. Weiskrantz (Eds.) *Attention: Selection, Awareness, and Control* (pp. 111-134). Oxford: Clarendon Press.

Sternberg, R. J. (1999). *Cognitive Psychology*. Fort Worth: Harcourt Brace College Publishers.

Treisman, A., (1964). Monitoring and Storing of Irrelevant Messages and Selective Attention, *Journal of Verbal Learning and Verbal Behavior*, 3, 449-459.

Wines, J. F. (1998). Using Technology to Improve the Quality of Student Research in the Literature Classroom, *A Worldwide Network of Learning: Opportunities, Challenges, and Contrasts*. Proceedings of the Fifteenth International Conference on Technology and Education, Sante Fe, 69-71.

Got Hack? Strategies to Reduce Online Cheating

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The purpose of this paper is to report findings from an empirical study investigating the degree to which three popular WBT development systems—scripting, authoring and enterprise—are susceptible to student "hacking." Three questions were of primary interest to the researchers—(1) are there any differences in the number of technology-centric cheating methods students can discover between the three WBT development environments, (2) which technology-centric cheating methods are most common, and (3) what attitudes do students exhibit regarding technology-centric cheating? As WBT development tools continue to evolve, and as individual faculty take greater responsibility in the development of their own custom assessments for online delivery, answers to these questions are critical to the derivation of specific strategies to reduce online cheating.

Methods

The sample used in this study comprised all students (n=76) enrolled in multiple sections of an undergraduate Education Technology course required of Education majors at a medium-sized public suburban university. Sixty-eight percent of the participants were female; all students were either freshmen or sophomores and new admits to the teacher- education program. Students were randomly assigned to take one of three online vocabulary quizzes, one created with the web-editor and scripting application, *Coursebuilder for Dreamweaver* (Macromedia), another by the icon-based authoring program, *Authorware Pro Attain* (Macromedia), and the last with the enterprise-level integrated learning system, *WebCT*.

The setting for each administration was a technology classroom housing 25 Internet-enabled PCs. Each student accessed his or her individual quiz by entering an appropriate URL in a Netscape web browser. Each of the three quiz versions presented the same multiple choice items in the same order, with only minor interface design differences. Students marked their answers by clicking appropriate graphic buttons with their mouse and then submitted them for automatic grading by clicking a "Score My Quiz" button. For each administration, students were challenged to discover as many different ways possible to use technology to "cheat" on their assigned quiz. Cheating was operationally defined as either 1) quiz file and item theft, or 2) "hacking" the system to extract the correct answers, and students were asked to focus their cheating efforts accordingly. To avoid prompting, no examples were provided.

Students were given thirty minutes to discover various cheating methods and asked to generate a list describing each in specific detail. At the conclusion of the allotted time, students were surveyed for perceived proficiency and attitude. All data were coded, blind-scored, and analyzed in Excel and SPSS.

Results

Descriptive statistics indicate that students in this study (n=76) had a mean of just over 4.5 years of computing experience, with reported values ranging from one to fifteen years, but the majority within one standard deviation. On a five-item scale of computer proficiency, students estimated their own skills with a mean score of 2.8, between "basic" (2) and "intermediate" (3).

One-way ANOVA and subsequent pairwise analyses yielded significant differences between groups assigned to the three WBT development environments. Students assigned to the script-developed quiz discovered significantly more methods to cheat than students assigned to either of the other groups. Differences between the enterprise group and the authoring group were not significant.

Students discovered six different technology-centric cheating methods. The most common method used by 61% of all participants was to retake the quiz over and over until the desired score was achieved. Saving the quiz file to disk (26%) or emailing the file (21%) to a valid address were the next most popular methods. Using instant-messaging (text chat) to relay quiz answers between different student workstations was an effective option discovered by 20% of participating students. Fewer students (11%) realized that the internet address for the quiz file, the URL (uniform resource locator), could be used to steal the file outside of class. Only a handful of students found that the javascript source code could be parsed for correct answers. The authoring quiz file had the least number of total cheating occurrences (22); students were unable to save it, email it, or view its source code.

Almost 40% of all students in this study reported that they would cheat using one of the methods discovered if they thought they could "get away with it." Of those students, most cited the need for a grade as justification for cheating. Others explained that the ease of the technology made the temptation too great to resist. A few students reported that they would cheat simply because they could.

Discussion and Conclusion

More than 80% of students (across groups) discovered at least one cheating method. It is interesting to note that, according to the data, the authoring quiz was the most difficult to extract or hack; students were unable to save the file, email the file, or manipulate its source code. This discrepancy is easily explained by its non-standard, proprietary file format, which can only be displayed in a web browser with the appropriate *Authorware* plug-in. Unlike *WebCT* and *Dreamweaver*, which generate a single file for downloading, *Authorware* segments the quiz file into smaller pieces, each of which is arcanely named and not individually viewable. In addition, the text rendered in the *Authorware* file is not editable, unlike that in *WebCT* and *Dreamweaver*, which allow a student to copy and paste text quiz items into a word processor or emailer. Neither are there menus at the top of the window prompting students to save the file to diskette or email it to an address. Finally, *Authorware* does not make its proprietary source code available for display in the browser; the other programs place a "0,1,1,1" next to each correct response in the javascript code.

Perhaps the real value of this study is that from these methods specific design strategies can be derived to reduce the probability of technology-centric cheating occurrences. WBT developers might consider the following:

1) Open the file in a window without menus and toolbars. Creating the quiz link to open in a new window without navigation buttons, toolbars and menus inhibits students from copying the URL, emailing the file, saving the file, and viewing the source code. *2) Limit time and scoring*. Setting the score quiz value to <1> and retaining unlimited tries per question allows a student to change his or her mind about an answer, yet preserves only one opportunity for submitting the quiz for scoring. Setting a time limit, and including a visual timer on the page, may discourage users from discovery cheating. *3) User authentication*. Preventing users from logging in and retaking web-based assessments can be accomplished through sophisticated user authentication schemes. WebCT has this capability "out of the box," whereas Dreamweaver and Authorware require the use of middleware applications such as Cold Fusion or ASP to port quiz data to a parent database. *4) Disable right-click*. Deactivating the right mouse button is another way to prevent a user from viewing source code or accessing edit commands like <Copy>, <Paste> and <Save>. *5) Use an index file*. Assigning a default index file (for example, index.htm) to the root directory containing the quiz file(s) inhibits a user from accessing all objects in that directory. If a user tries to explore by truncating a URL to a parent directory (for example, www.yourschool.edu/yourname/quiz1/), the index file automatically loads, instead of listing all available files in that directory. *6) Policies and proctoring*. Obvious but essential, stipulating specific policies and active (mobile) proctoring may decrease the propensity for some students to cheat, especially those who would use instant-messaging, email or other internet communications.

As online education initiatives continue to burgeon, the need for secure WBT development tools, and the empirically validated design principles guiding their effective use, will be imperative. The data from this study strongly suggest that the three WBT development environments used are vulnerable to security issues that facilitate cheating. The design strategies derived from these issues warrant future investigation.

Full paper and references available at www.coastal.edu/education/faculty/winslow.htm

Can We Address Learning Styles of Students in Traditional And Web-Based Courses: Perceptions of Faculty Members and Preservice Teachers

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Abstract

The present study explored faculty members' and preservice teachers' perceptions on addressing learning styles in different instructional environments, namely in traditional classroom and web-based instruction. This study used data from faculty members and preservice teachers at a state university in Turkey. This study reports both faculty members' and preservice teachers' perceptions on considering individual differences while designing a course for both traditional setting and web-based instruction.

Introduction

In our daily teaching practices, we observe that some students can learn easier than others and therefore they perform better on tests. This fact underlines the principle that instructional, contextual, and individual characteristics come into play during learning. In their study, Jonassen and Grabowski (1993) point out the importance of a similar principle by advocating, "student learning differs because student learning traits differ, and because the thinking process differs depending on what the student is trying to learn." (p. 3).
If the learning traits, aptitudes for learning, willingness to learn and preferences for processing information differ dramatically, we need to recognize the need for alternative design approaches that address these differences.
Consequently, the instructional design approach is of a great value for providing learners with opportunities to learn better and effectively.

Background of the Problem
Since the advancement of technology in education, World Wide Web (WWW) has become one of the most popular tools for delivering instruction over the Internet. Such capabilities of the Web as handling text and picture as well as audio and video, promoted itself as a powerful tool for delivering instruction.
Although there is a number of instructional design models that propose prescriptive approaches for Web-based instruction, only a few considers individual learning differences at appropriate level. Therefore, there exits a need for an alternative design model that conveys and considers such characteristics as learning differences, learning goals and objectives, content, user interface and so on that have a tremendous effect in web environment.

Purpose of the Study
Web-based instruction has been commonly used in distance education, especially as a supplementary delivery method for instruction for traditional courses. Hence, there is a lack of contemporary instructional design approach that fully addresses learning styles of individuals.
Learning style is not fixed to an individual, a situation or a task; it can vary by time, motivation, and learner's psychology or by other conditions of learners. Being aware of individual differences, it is

important to continuously evaluate all aspects of Web-based teaching and learning if the promise of Web-based instruction is to be fulfilled. Therefore, designing a web-based instruction by considering all variables of the instructional environment would result in more effective instruction.

The purpose of this study is to examine the perceptions of faculty members and 4th year preservice teachers of Computer Education and Instructional Technology department in a state university of Turkey. This study examined participants' perceptions and their preferences of learning styles in both traditional and web-based instruction.

Research Context:

The learning styles theory was championed by Carl Jung, who is usually credited with first defining learning style theory. Myers and Briggs have also applied Jung's work and this work lead to a new field, understanding the differences in learning, for researchers (as cited in Silver and Strong, 1997).

The learning styles theory implies that individuals have different ways of perception, and one style doesn't represents all the individuals. So, instruction must be presented in different ways respecting these differences.

In their study of the effect of end user learning style and method of instruction on end user learning outcomes, Bohlen and Ferratt (1993) concluded, ". . . the method of instruction alone and in combination with learning style makes a difference in some, but not all measures of achievement, efficiency and satisfaction" (p. 280-81).

In the study conducted by Bostrom, Olfman and Sein (1988), the importance of individual differences in end-user training has been criticized from the learning styles point of view. The findings of this study suggested, "...in the design of training, it is essential to match training methods to individual difference variables" (p. 133).

Another study by Chuang (1999) investigated the presentation effects of text, oral narration, and computer animation implemented in an instructional lesson, and individual differences, which affect students' learning in a multimedia computer environment. Chuang (1999) cocluded that "subjects performed significantly better on the posttest in the animation+text+voice version, which was also the favorite interface design chosen by most of the subjects".

Assuming that technology is most effectively used in the classroom when students use technology as a cognitive tool, Cohen (1997) conducted a research about learning style in a technology-rich environment and concluded, "a technology-rich environment impacts the written and unwritten curriculum of a school. Schools should be sensitive to students' learning styles when adopting an instructional methodology that will be used extensively throughout the curriculum".

In their studies Gilbert and Han (1999) stated, "an approach to achieve "A Significant Difference" is to provide several different instruction methods". (p. 433) So, they have developed a Web-based instruction system they called as "Arthur" which provides adaptive instruction. As an opposite view to traditional system, which defines one-to-many presentation of the lecture, this system takes several different styles of instruction from several different instructors and makes them available to each learner, which defines a many-to-one relationship. Here the web-based instruction is presented to the student by using different methods like audio, visual and text, which is expected to result in accommodating individual learning styles.

Contradictory to the findings of previous studies, Shih and Gamon (1999) found that "student learning styles and student characteristics did not have an effect on their Web-based learning achievement". They also concluded that "students with different learning styles and backgrounds learned equally well in Web-based courses and learning styles did not affect student motivation and use of learning strategies" and that "motivation and learning strategies seemed to be the most important factors in Web-based learning".

Snyder (2000) developed an instrument that teachers could easily administer to their classes to learn more about the learning needs of their students and by using this tool she investigated the relationships between academic achievement and the learning styles/multiple intelligences in her study. The results of this study showed that "many relationships emerged as being dependent" and the researcher concluded, "to be successful in our classrooms, we need to be more aware of how our students learn".

Research Questions:

This research particularly focused on the following main research questions:

1. What are the perceptions of faculty members on addressing learning styles in different instructional environments (traditional vs. web-based)?

2. What are the perceptions of 4th year preservice teachers in terms of considering learning styles in different learning environments (traditional vs. web-based)?

Research Methods:

This study used qualitative research methods for two specific reasons. First, qualitative research is an adequate method for disclosing underlying attitudes, thoughts, and perceptions when the literature suffers from lack of research on the phenomenon (learning styles and web-based instruction, which this study investigates). Second, a detailed description about the research content is needed in order to provide a complete and revealing picture to see what is going on. That's why, this study is a 'case study' since the participants were selected from only one department at a state university and it is needed to present a holistic portrayal of the phenomenon (Patton, 1987).

Subjects

The subjects of this study included 3 faculty members and 13 preservice teachers of department of Computer Education and Instructional Technology (CEIT) at a state university. Since main concern of this study is to understand the phenomenon about the consideration of learning styles in traditional and Web-based instruction, we have to explore the phenomenon from multiple perspectives. To attain this goal, the subjects of this study were selected from Computer Education and Instructional Technology (CEIT) Department keeping these two issues in the mind;

1. The department is the one, which uses Web-based instruction most frequently as a supplementary to traditional courses among the departments of faculty of education in one State University,
2. For its accessibility.

Data Sources

This study extracted data from the following main sources:

1. Three faculty members
2. Thirteen preservice teachers
3. Document Analysis

Structured interviews were conducted with Faculty members of CEIT in order to understand their perceptions. These interviews were conducted according to a 'interview guide' which was developed and pilot tested by the researchers. All of the interviews were tape-recorded with the consent of the participants.

Preservice teachers were asked to fill out a 'questionnaire' in order to access a wider population. This questionnaire had parallel questions with the interview guide developed for the faculty members. The questionnaire was prepared and pilot tested by the researchers in order to ensure its validity.

To obtain a more detailed vision of the preservice teachers towards the topic, a structured interview guide is prepared for preservice teachers including parallel questions with the questionnaire. For the recording of interviews, a tape recorder was used.

Finally, as the document analysis part of the study, the researchers did a comprehensive literature review.

Procedures

In this study, data was collected in the following manner:

1. Structured interviews were held with 3 faculty members.
2. Open-ended questionnaire was administered to all preservice teachers (totally 49 students of 4th year) of Computer Education and Instructional Technology Department. Of 20 students volunteered to participate the study.
3. After the analysis of results of previous step, 13 students were selected out of 20, in order to conduct more in-depth interviews. 3 focus group interviews were held with 4 students in two groups and 5 students in one group respectively.

Data Analysis:

The results obtained from interviews and questionnaire were analyzed, in order to explore faculty members' and preservice teachers' perceptions.

The data collected were analyzed inductively after the collection period is completed. The analyses were triangulated in terms of sources of data. According to Maxwell (1996), triangulation "reduces the risk of chance associations and of systematic biases due to a specific method and allows a better assessment of the

generality of the explanations that you develop" (p. 93). Furthermore, other researchers validated each interview transcript and interpretation.
Multiple perspectives will yield people approaching situations from different point of views. Therefore, it is important for the reader to see the case from multiple perspectives and think about or judge the case by his/her own ideas.
The results obtained from interviews were analyzed separately, in order to understand faculty members' and preservice teachers' perceptions. Interview data were transcribed precisely and coded inductively. The similar patterns and/or themes were outlined. After creating coding categories for the analyzed data, coding of the data was repeated according to these coding categories. Finally, the results were reported both from the views of faculty members and preservice teachers, separately.

Findings:
Throughout this section, illustrative opinions of faculty members and preservice teachers from structured interviews highlights the results.

Faculty members:

Theme 1: Faculty Members' Perceptions on learning styles in traditional learning environments:

All faculty members agreed that every student has different characteristics and talent. Every student has individual preferences coincided with their learning process. Two faculty members provided a definition for learning styles that parallels with learning theories. They also advocated that differences in learning styles could especially be tracked down by observing one's study habits or behaviors in the learning environment. When faculty members were asked about how they determine their teaching style, they all stated that such decision mainly relies on the content to be taught.

Theme 2: Perceptions of faculty members on instructional materials and strategies used in the classroom:

All faculty members reported that preferring certain teaching strategies in the classroom requires utilization of variety of teaching materials and learning tasks. Additionally, all faculty members reported that if one intends to accommodate students' learning styles in the classroom, s/he has to utilize a number of appropriate teaching strategies and techniques as possible.

Theme 3: Faculty members' perceptions on learning styles in web-based instruction:

Faculty members stated the lack of "face-to-face interaction" and "presence of immediate feedback" on the web as the most distracting feature for instruction. They also recognized the inefficiency of interactivity among all parties on the web. They also mentioned the value of utilizing all possible cognitive tools while designing a web-based instruction in order to address students' varying learning styles.

Theme 4: Perceptions of faculty members for addressing different learning styles in a web-based instruction:

Faculty members stated that the most important issue in addressing learning strategies in a web-based instruction is to consider such learning theories as cognitivism and constructivism. According to the faculty members, designing an instruction on the web is a dynamic process and this dynamism should be conveyed by the feedback provided by students.

Preservice Teachers:

Theme 1: Preservice teachers' opinions about their learning preferences in traditional learning environments:

The most common learning preferences of students in traditional classrooms could be classified from most used one to least used as; note taking, asking questions and listening to the instructor, discussion, learning in cooperative groups, reading course material and individual study.

Theme 2: Perceptions of preservice teachers about instructional strategies used in the classroom:

The most preferred instructional strategy by preservice teachers was "discussion". Learning by doing, project-based learning, cooperative learning, questioning, discovery learning and problem solving were the other strategies favored by preservice teachers respectively. All preservice teachers also addressed that they have to be an active participants of the learning environment. Unlike other focus groups, one of the groups reported that they prefer a mix of different learning methods, and learning environment must be a representative of real life cases. Surprisingly, 14 students out of 20 ranked books as the most favored medium of instruction.

Theme 3: Preservice teachers' perceptions about web-based instruction and their learning preferences:

All groups agreed that a web-based instruction should offer texts in different formats such as html, word, pdf and so on. They also reported that they should be able get print out of those pages whenever needed. Using different types of media such as audio, visuals, video and so on are also preferred in a web-based instruction by the preservice teachers if those features are available whenever they want.

Theme 4: Preservice teachers' perceptions about how to adopt their learning preferences to a web-based instruction:

Preservice teachers' responses to this question varied. For example, two of the groups addressed that web-based assessment is less valid than traditional assessment in terms of authenticity of student responses on a test and other security issues regarding to access. They also advocated that web-based instruction limits social interaction among the participants. Of 2 focus groups addressed that the sequence of instruction should be in accordance with their performance and learning pace. Navigation structure of the web-based instruction is another important future that preservice teachers emphasized. Finally, they reported that web-based instruction is more suitable for adult learners.

Discussion and Conclusion

The purpose of this study was to examine participants' perceptions and their preferences of learning styles in traditional and Web-based instruction. Sixteen participants (3 faculty members, 13 preservice teachers) were the main focus of this study.

One of the most important findings of this study is that all faculty members recognize the importance of utilization of a number of teaching materials and learning activities in favoring certain teaching strategies for effective instruction. They also underlined the necessity for adopting appropriate and a variety of teaching strategies and techniques as possible to address students' differing learning styles in the class. On the other hand, faculty members considered web-based instruction as a weak format for presenting content in terms of its inadequacy in providing face-to-face interaction and immediate feedback. Therefore, they suggested that all possible cognitive tools should be integrated into web-based instruction to overcome such obstacles. This finding parallels with the related literature as well (Yildirim & Kiraz, 1999). Finally, faculty members reported that web-based instruction should provide adaptive instruction to address students' differing learning styles. Brusilovsky and his associates (1999) also reported similar concerns; "To support the student navigation through the course, the system uses adaptive annotation. . ." (p. 257).

When preservice teacher were asked to identify their preferences of learning strategies in traditional classroom settings, they reported "note-taking, questioning, discussion, and learning in cooperative groups" as the most preferred strategies. Preservice teachers also favored learning by doing, problem solving and problem-based learning for effective learning. Surprisingly, most preservice teachers ranked books as the most preferred medium of instruction, yet they were majoring in computer education and were advanced on using computers. Similar to faculty members, preservice teachers also advocated that different type and format of presentation should be present on the web. They also stated that active participation is a key activity to learn effectively and different formats and medium of presentation on the web should have them actively participate in instruction. In conjunction with the faculty members' perceptions, preservice teachers also stated that web-based instruction should provide instruction in accordance with their learning pace and performance. Additionally, they underlined the importance of navigation structure on a web-based instruction. Finally, in contrast to faculty members' perceptions, preservice teachers viewed web-based instruction as more suitable for adult learners.

References:

Bohlen, G. A. and Ferratt, T. W. (1993). The effect of learning style and method of instruction on the achievement, efficiency and satisfaction of end-users learning computer software. Proceedings of the 1993 conference on Computer personnel research , Pages 273 – 283.

Bostrom, R. P., Olfman, L. and Sein, M. K. (1988). The importance of individual differences in end-user training: The case for learning style. Proceedings of the ACM SIGCPR conference on Management of information systems personnel, Pages 133 – 144.

Brusilovsky, P. & Schwarz, E. & Weber, G. (1999). Electronic textbooks on the world wide web: From static hypertext to interactivity and adaptivity. In B. H. Khan (4th Eds.), *Web-Based Instruction* (pp. 255-61). Englewood Cliffs, NJ: Educational Technology Publications, Inc.

Chuang, Y. (1999). Teaching in a multimedia computer environment: A study of the effects of learning style, gender, and math achievement. Interactive Multimedia Electronic Journal of Computer-Enhanced Learning, 1(1). URL: http://imej.wfu.edu/articles/1999/1/10/index.asp. Last visited 10.10.2000.

Cohen, V. L. (1997). Learning styles in a technology-rich environment. *Journal of Research on Computing in Education*, 29(4), 338-50.

Gilbert, J. E. and Han, C. Y. (1999). Arthur: Adapting instruction to accommodate learning style. In P. Bra and J. Leggett (Eds.), Proceedings of WebNet 99 – World Conference on the WWW and Internet, (pp. 433-438). Charlottesville, VA: Association for the Advancement of Computing in Education.

Jonassen, D. H. and Grabowski, B. L. (1993). *Handbook of individual differences, learning, and instruction.* Hillsdale, NJ: Lawrence Erlbaum Associates, Inc. Publisher.

Maxwell, J. A. (1996). *Qualitative research design: An interactive approach.* Thousand Oak, CA: SAGE Publications, Inc.

Patton, Q. P. (1987). *How to use qualitative methods in evaluation.* Thousand Oak, CA: SAGE Publications, Inc.

Shih, C. and Gamon, J. (1999). Student learning styles, motivation, learning strategies, and achievement in web-based courses. URL:http://iccel.wfu.edu/publications/journals/jcel/jcel990305/ccshih.htm. Last visited 11.29.2000.

Snyder, R. F. (2000). The relationship between learning styles/multiple intelligences and academic achievement of high school students. *High School Journal*, 83(2), 11-20.

Silver, H. and Strong, R. (1997). Integrating learning styles and multiple intelligences. *Educational Leadership*, 55(1), 22-27.

Yildirim, S. and Kiraz, E. (1999). Obstacles in integrating online communication tools into preservice teacher education: A case study. *Journal of Computing in Teacher Education*. 15(3), 23-28.

Putting Assessment in Perspective: Successful Implementation in Educational Technology and Curriculum Integration

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Abstract: This paper focuses on how to use assessment tool to effectively integrate educational technology into curriculum. The authors examine the current practices in educational technology and curriculum integration and point out that successful integration of educational technology and curriculum depends on a sound system of quality assessment. An assessment model is proposed with a focus on the various stages of designing, developing and implementing the model that will enhance the integration of educational technology and curriculum in schools. Examples and case studies are discussed to illustrate how to use this model for K-12 educational technology integration. Limitations and suggestions are included for further study.

Introduction

Concern regarding how to effectively integrate educational technology into curriculum is at a high point in K-16 settings (Jones & Paolucci, 1999). School board members, policy makers, and the media are saying that educators have spent millions of dollars on technology for classrooms without being able to measure its effects on student learning. Some parents, even teachers themselves, become skeptical about the role of technology played in teaching and learning. To avoid the pessimistic forecast that the technology will simply become a passing fad in education, attentions must be paid to defining the goals for the use of technology, developing a strategic plan for technology and curriculum integration, and measuring the progress made. Sun (2000) in a recent article points out that the challenge that educational technology faces today is not what software and hardware we need to invest in our schools, but rather how to "create realistic evaluations of IT's effect on students and their academic achievement" (p. 34).

What to assess and how to assess still remain critical issues in educational technology evaluation. Studies indicate that current practices in educational technology evaluation mainly fall into three categories: (1) assessing the use of educational technology in specific content area, (2) assessing the use of educational technology in assessment itself, and (3) assessing the use of educational technology in specific learning strategies or approaches. The first category focuses on the relationship between the technology and a single subject, that is, on the effectiveness of the use of various technologies including multimedia and hypermedia in specific subject areas such as math, reading, writing, ESL education, special education (Dugdale, et al., 1998; Lindsay, 1999; Zhang, 2000). Such assessment limits itself to a specific learning situation within a single subject and hardly goes beyond its subject domain, failing to address the issue of integrating technology into curriculum as a whole. Therefore, it does not meet the needs for general purpose evaluation. The second category zeros in on the use of technology in assessment. That is, how to use technology to enhance the efficacy of assessment. Assessment under this category examines the role of online testing and computer-assisted assessment in learning (Gretes & Green, 2000; Titus & Martin, 2000). Again, it fails to address the issue of an overall planning for effective integration of technology into curricula. The third category has in recent caught the attention of educators as performance-based learning, authentic learning and other types of constructivist learning approaches become the fad in education (Bonnie, 1994; Carlson, 1998; Russell & Butcher, 1999). The role of technology has been examined to create an authentic, real life situation in which learners can engage in meaningful and constructive learning. Although assessments in the above three categories have contributed to the understanding of the relationship between assessment and technology, they, nonetheless, fail to provide a holistic picture of how technology can be effectively applied to subjects across the curricula. In other words, what is the common denominator with which educators are able to evaluate their practice in educational technology and curriculum integration? Evaluating educational technology should consider variables that are common to all subjects and that are applicable to integration across all curricula.

Current practices in educational technology tell us that what teachers need most is not how to use technology, but rather how to use it *effectively*. Oftentimes, efforts to integrate educational technology into curriculum fail to yield desired results because such efforts are not garnered by a sound system of quality assessment. The term "quality assessment in educational technology" means using appropriate assessment tools and methods to evaluate various stages in educational technology and curriculum integration. This paper will, therefore, address the following issues which are vital to our current practices in integrating educational technology into curriculum: (1) The needs for using assessment as an effective tool to enhance integration of educational technology into curriculum; (2) Ways of using various assessment methods to align educational technology with curriculum standards; and (3) Ways of teacher using assessment to create an effective learning environment with educational technology.

Needs for Assessment in Educational Technology

With the rapid introduction of computers into schools, routine access to multimedia and hypermedia resources by instructors becomes possible. Among many of technology users, three types of users typically represent those who are currently using the technology in today's classrooms. They are: (1) follow-the-national-and-state-mandate users, (2) follow-the-fashion users, and (3) self-initiated users. The first type of users are passive in using the technology, simply follow the national and state mandate and use the technology in teaching as required by the school or the district. The technology therefore plays a very limited role in instruction under these circumstances. The second type of users are characterized by an "overnight" enthusiasm for the use of technology. Urged by their colleagues or peers who have integrated technology into teaching, they become enthusiastic about the technology and begin to use technology in their classrooms. However, their enthusiasm for technology is a short one and wanes quickly as they encounter difficulties in the process of using the technology. The third type of users are adamant about putting technology in their classrooms. This is a type of "I want to do it" users. Yet their technology and curriculum integration lacks a systematic planning and is not garnered by a sound system of assessment. Oftentimes, they found themselves in a situation where the result was only worth half of the efforts made. Obviously, if technology is going to play a positive role in teaching and learning, if learners are going to benefit from technology in their learning, if teachers want to create a creative and constructive learning environment, it is imperative to establish a sound system of quality assessment that evaluates "how teachers are using technology in the classroom and the general academic achievement that results from their instructional technology (IT) practices" (Moersch, 1999, p.41).

The National Educational Technology Standards for Teachers (NETS•T) Standards IV states that teachers "apply multiple methods of evaluation to determine students' appropriate use of technology resources for learning, communication, and productivity" (ISTE, 2000). The challenges that we all face today are: how do we use methods of evaluation to determine students' use of technology? And how do we know that teacher's use of technology in classroom is working? There are various models that address the issue of integrating technology into curriculum. Bowens (2000) introduced a technology-integration model known as The RAC Model which consists of three phases: Research, Analysis, and Communication. The RAC Model starts with engaging students in gathering information by researching through various media including traditional textbooks, film/videos, Internet, then involving them in various higher level thinking activities such as analyzing and categorizing information, and finally using variety of technology to communicate the results. Although the Model discusses the role of technology in higher level cognitive learning, it fails to establish the connection between curriculum objectives and the use of technology. In Bowens's model the functions of technology are not examined to provide a strong rationale for its use in curriculum implementation. What has happened is that the users moves directly from the stage of curriculum objectives to the stage of technology activities, that is, using the technology without understanding exactly why a particular piece of technology is used and what the functions are that will ensure the successful implementation of the curriculum objectives.

Morrison et al. (1999) proposed an Integrating Technology for Inquiry (NTeQ) model which addresses the issue of technology functions in curriculum integration. Morrison et al.'s model provides an excellent tool for teachers to integrate educational technology into curriculum. Yet their model regards assessment as a separate entity. The assessment is placed at the last stage of the NTeQ model. In other words, NteQ Model adapts a summative approach rather than a formative one in assessing technology and curriculum integration. However, the authors believe that the assessment should be an ongoing process which must be built into every stage of technology and curriculum integration.

Model of Assessment

Being aware of the challenges that teachers face in their technology and curriculum integration and realizing that successful technology and curriculum integration depends on a sound system of quality assessment, we start to develop an assessment model which is based on five guiding principles: (1) student-centered, (2) focus on standards and objectives, (3) focus on students' ability to construct knowledge, (4) encourage higher level thinking, and (5) encourage reflective thinking. After an extensive study on national and state standards, we defined two types of knowledge and three types of skills as the basic knowledge framework for evaluating teachers' use of technology and students' performance in a technology-integrated curriculum. The knowledge and skills include: (1) Declarative knowledge, (2) Procedural knowledge, (3) Complex thinking skills, (4) Effective communication skills, and (5) Collaboration/Cooperation skills. We believe the types of knowledge and skills we defined are applicable to subjects across all curricula.

Our assessment model (EEAER Model) contains five stages: (1) Evaluate objectives, (2) Examine technology functions, (3) Assess technology-rich activities, (4) Evaluate learning outcomes, and (5) Reflect on learning experience (Figure 1).

Various Stages in Assessing Educational Technology and Curriculum Integration

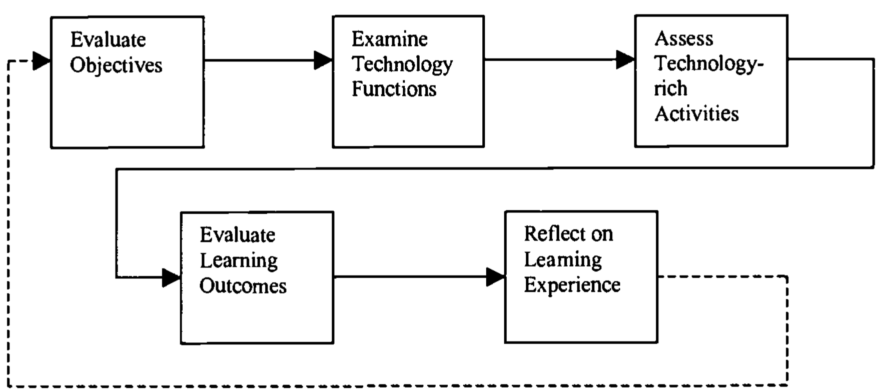

Figure 1: EEAER Model of Assessment

Evaluate Objectives Successful implementation of technology and curriculum integration starts with careful planning which clearly defines the curriculum objectives. Assessment is to ensure that curriculum objectives meet the standards. The evaluation of objectives, therefore, focuses on: (1) alignment with standards, (2) the role of technology in instruction, (3) the role of technology in learning, and (4) knowledge and skills covered. We used assessment tools such as checklist, matrix, questionnaire, Likert's rating scale to assess whether the objectives are aligned with various standards and criteria.

Examine Technology Functions Technologies which apply well in one learning situation may not work well in other learning situations. Some students may benefit from a specific computer software whereas others may not benefit from it at all. The complexity of various functions of technology determines that the process of implementing a technology-integrated curriculum must be a complex one. Therefore, teachers need to identify the functions of technology and understand what software to use and how to use. For example, teachers may look at the functions of educational software by examining the role it plays in learning, whether it belongs to a productivity tool or a mindtool (Jonassen, 2000). If it is a mindtool, what specific function does it have? Is it a concept mapping tool, or a data processing, or a graphic/data processing tool? How well does it meet the curriculum objectives?

Assess Technology-rich Activities The technology-rich activities stage consists of three sub-stages: (1) *Pre tech-rich activities*. Students identify problems, plan how to collect, analyze, and categorize data; (2) *Tech-rich activities*. Students learn to use technologies and engage in higher level thinking activities via technology; (3) *Post tech-rich activities*. This is the enrichment stage where students engage in peer review, exploring other forms of content delivery, and examine how their knowledge becomes transferable to other learning situations.

Evaluate Learning Outcomes Four learning outcomes are essential for evaluating technology and curriculum integration: (1) Core technology skills (Coughlin & Lemke, 2000), (2) Cognitive and metacognitive skills, (3) Social skills, and (4) Attitudes. Coughlin and Lemke (2000) defined core technology skills as hardware, network, information tools, application tools, and multimedia/presentation. Cognitive and metacognitive skills include reasoning, analyzing, synthesizing, creating, constructing, problem solving (Marzano et al., 1994) and self-awareness, goal setting, and strategic planning. Social skills consist of collaboration, communication, contribution to group goals, etc. Finally, attitudes means students' motivation and disposition to learning, interest in using technology, and ability to face challenges in learning. Again, rubrics, portfolio, checklist, questionnaire, interview, observation are viable tools for assessing learners' learning outcomes.

Reflect on Learning Experience Oftentimes, assessment is a teacher-dominate process. Our assessment model tries to include students in the evaluation process. This will create in students a sense of ownership and motivate them to learn. In this stage students reflect on the technology and content learning, the technology and cognitive skills, and the transferability of knowledge to other learning situation via technology.

The EEAER assessment model is a dynamic, self-generating model in that each stage is a on-going, formative assessment process that detects and self-corrects errors in its integration of technology into curriculum. For example, when an assessment tool like checklist is used to assess the software functions and finds that the software selected is not the right tool for carrying out the objectives, other software will be chosen from the checklist to meet the requirements. Thus the assessment tool is not a passive tool that simply inspects, it is, instead, a dynamic tool that helps to form instructional decision based on standards. The five stages in the EEAER Model are an on-going, cyclic process in which the stages are interwoven and interacting with each other. For instance, the technology-rich activity stage may provide some feedback to the objectives stage which will be revised and which will, in turn, further affect the use of technology and the role of technology in learning and teaching.

Case study: the implementation of technology and curriculum integration with EEAER model

We have applied the EEAER model to several undergraduate and graduate courses. The results are positive. The students feel they understand better the functions of the technology, the relationship between technology and curriculum, therefore, are better users of technology in teaching and learning. A typical example is a graduate course we offered in the summer of 2000 in which we applied the EEAER model to integrate technology into curriculum.

The course is a graduate seminar entitled "Bridge building between community and school using educational technology." It was designed to help the students become aware of the issues regarding school and community collaboration, explore ways to bridge school and community via technology, and appreciate the benefits of using technology as an effective tool to collaborate school with community. Fourteen graduates enrolled in the seminar. Among them eleven from elementary schools and three from junior high. Except one graduate student who was at administrative level, the rest were teaching at various grade levels in the subject areas of language arts, reading, math, science, social studies, etc. The course objectives focused on integration of technology into the content area. The students were to use Web technology to create an instructional Web page which served as the link between the school and the community. The functions of Web technology were examined and assessed to determine if it fit the objectives and met the purpose of teaching and learning. Students also engaged in brain storming, discussing pros and cons related to the use of Web technology as a tool for school and community collaboration. They planned how to design and developed their Web pages. The instructors taught the basics in Web construction. But it was the students who decided what information should go into their Web pages and how their Web pages should be designed and developed. The students examined each other's Web pages and engaged in an informal peer evaluation which became part of their valuable learning experience. Finally, students presented their projects before their peers. Comments were made regarding the content, the design and the techniques of their Web pages. In an aftermath course evaluation the students reflected that they learned a lot, understood better the content and issues and were able " to create a nice Web page." Others commented they saw " the possibilities available to teachers for use in the classroom." The EEAER model was integrated into the various stages of course design and development. Various assessment tools were used to align objectives with standards, examine the functions of technology chosen, garner the activities in which technology-integrated curriculum was implemented, and evaluate the learning outcomes by checking students' performance in a technology-rich learning environment. By incorporating EEAER assessment model into the technology-rich curriculum we find that

(1) instructors are able to align the use of the technology with standards; understand better the relationship between technology and curriculum, and use technology more effectively to achieve curriculum objectives;
(2) students who use the technology become more goal oriented and know how to use technology as an effective tool to enhance their learning;
(3) the use of model motivates the instructor to teach and the student to learn as the instructor knows better how to successfully integrate technology into curriculum and the student knows better how to learn more effectively with technology.

The EEAER assessment model is applicable to any subject. The model empowers the teachers by allowing them to easily and appropriately incorporate technology in their classrooms, assessing the students' academic strength and weakness as well as their abilities to collaborate and communicate in a technology-rich learning environment. It also enables the teachers to evaluate how well they use technology in the classrooms.

Conclusion

The EEAER assessment model is a useful tool for K-12 teachers who are eager to but do not know how to infuse technology into curriculum. It is a tool that can be applied to subjects across all curricula. It provides the framework for teachers to go beyond the mere acquisition of technology for their classrooms to addressing the bigger question: How can technology be used to effect change and improve student learning and achievement?

Realizing that the model has a potential for helping teachers to improve their use of technology in classrooms, we also notice that the study is still in its fluid stage. It needs to be implemented in a more diverse population and learning setting so that the model can reach beyond its present study scope to generate findings that are significant at a more general level. We hope that our study will serve as a stepping stone which will attract those who are interested in building a sound system of quality assessment that will garner teachers' use of technology in classrooms and their integration of technology into curricula.

References

Bonnie, K.M. (1994). Technology in authentic assessment. Portfolio: addressing the multiple dimensions of teaching and learning. ERIC#: ED376117.

Bowens, E.M. (2000). Research, analysis, communication: meeting standards with technology. *Learning & Leading with Technology*, 27(8), 6-17.

Carlson, R.D. (1998). Portfolio assessment of instructional technology. *Journal of Educational Technology Systems*, 27(1), 81-92.

Coughlin, E.C., & Lemke, C. (1999). *Professional competency continuum: professional skills for the digital age classroom*. Santa Monica, CA: Milken Family Foundation.

Dugdale, S., LeGare, O., Matthews, J.I., & Ju, Mi-Kyung (1998). Mathematical problem solving and computers: a study of learner-initiated application of technology in a general problem-solving context. *Journal of Research on Computing in Education*, 30(3), 239-253.

Gretes, A.J., & Green, M. (2000). Improving undergraduate learning with computer-assisted assessment. *Journal of Research on Computing in Education*, 33(1), 46-54.

International Society for Technology in Education (2000). National Educational Technology Standards for Teachers. Available at ISTE Website: http://cnets.iste.org/teachstandintro.html.

Jonassen, D. H. (2000). *Computers as mindtools for schools*. Upper Saddle River, NJ: Prentice Hall-Merrill.

Jones, R.H., & Paolucci, R. (1999). Research framework and dimensions for evaluating the effectiveness of educational technology systems on learning outcomes. *Journal of Research on Computing in Education*, 32(1), 17-27.

Moersch, C. (1999). Assessing Current Technology Use in the Classroom. *Learning & Leading with Technology*, 26(8), 40-49.

Morrison, G., Lowther, D.L., & DeMeulle, L. (1999). *Integrating Computer Technology into the Classroom*. Upper Saddle River, NJ: Prentice Hall-Merrill.

Lindsay, M. (1999). Designing assessment tasks to accommodate students' cognitive skills in a technology-based mathematics course. *International Journal of Mathematical Educational in Science and Technology*, 30(5), 169-97.

Sun, J. (2000). How do we know it's working? *Learning & Leading with Technology*, 27(7), 32-49.

Titus, A., & Martin, L. (2000). Education research using Web-based assessment systems. *Journal of Research on Computing in Education*, 33(1), 28-43.

Zhang, Yuehua (2000). Technology and the writing skills of students with learning disabilities. *Journal of Research on Computing in Education*, 32(4), 467-77.

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INTERNATIONAL

Section Editor:
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Each year I look forward to the international proposals and then later to the papers sent, now electronically, from around the world. Initially any paper from outside the United States found its way into this section, but each year as we became more and more an international organization, as STATE became SITE, we looked for papers that told of IT in teacher education across national boundaries. Every year I have enjoyed a 'world tour' of IT and teacher education, marveling at the fascinating differences and the wonderful commonalties that we share. This year's annual sees a change in format due to the large number of accepted proposals and the quick turnaround time. All of the papers within each section are listed alphabetically by lead author; however, section leaders have been encouraged to address them in logical groups, providing a 'mental' arrangement no longer possible in book form.

There are a number of papers this year that exemplify *multinational perspectives* and I have grouped them accordingly. Another packet of papers provide us *with virtual windows* on IT within individual countries. Several articles focus of IT with specific types of teachers. Finally, two papers address, to some extent, a more *people-to-people* view.

Multinational perspectives

Five papers represent the findings of panel members from the Project for the Longitudinal Assessment of New Information Technologies (PLANIT): 2000-2001, and should be read with this in mind. These researchers have gathered data about the impact of information technology on teachers and learners using a common set of instruments. *Magoun and Owens,* University of Louisiana-Monroe, USA, evaluate a project in Louisiana involving girls in research opportunities in computing. *Knesek and Christensen,* University of North Texas, USA, examine teacher and student attitudes toward computers in a suburban Texas school district. *Morales,* Institute of Latin American States for Education, Mexico, reports a similar study among students and teachers in the Mexico City area that marks a three-year Mexican contribution to PLANIT. *Khine,* University of Brunei, Darussalam, looks specifically at preservice teachers' attitudes toward IT in Brunei, noting an interesting variation between home computer owners/users and those without, those without being more positive in the impact on student learning. *Palitawanont,* Burapha University, Thailand, explores attitudes in Thailand of students, teachers, and university faculties.

While the papers mentioned above spanned locations around the globe, the work of *Darkwa,* University of Illinois Chicago, focuses primarily on one very large continent, Africa, and the issues and challenges of creating virtual learning communities in incredibly diverse and difficult situations. Suggestions are given for overcoming the challenges confronting technology-based education in Africa.

Freeman, Holmes & Tangney, Trinity College Dublin, report on the curriculum, assessment and the use of ICT as tools to reshape learning in Finland and Sweden. The authors emphasize how Ireland could benefit from following the examples provided by these Scandinavian countries. The authors also provide a rich list of references, the majority accessible via web sites.

The next paper spans the Atlantic reporting on a collaborative effort by a South African University and an American University. The authors, *Kagima and Zayed,* University, United Arab Emirates, *Thompson and Phye,* Iowa State University, USA; and *Van Wyk,* University of Stellenbosch, South Africa, describe a project designed to enhance faculty capacity to meet a number of growing needs including the challenges of providing higher education to in-service teachers and practitioners.

Virtual windows on IT

The first two papers I recommend in this subsection examine IT inservice programs in the Western Hemisphere. *Valcke,* University of Ghent, Belgium, *and Chiluiza,* Escuela Superior Politecnica del Litoral, Ecuador; report on part of a six-year project to improve Ecuadorian elementary education. A sub-project focused on the analysis of video materials and surveys that research the current dominant teaching - learning strategies adopted and promoted by teachers in the project. The second of these papers is authored by *Jenkins, Gilbón, and Contijoch*, National Autonomous Univ. of Mexico, Mexico. They explore the challenges language teachers now encounter and describe a project designed to address these needs through a model which combines the applied linguistic content with experience in the use of educational technology.

The next paper provides a critical analysis of the integration of technology in pre-service teacher education in New Zealand. *White*, University of Houston, USA notes while the country has made great strides there is a continuing issue of professional development of teachers and actual application of technology in the schools.

Chinese teachers have made an impressive progress in using multimedia in their classrooms, reports *Ouyang*, Kennesaw State University, USA, *and Yao*, Texas A&M University-Commerce, USA. These teachers participate in training to enrich their own technological skills, and utilize multimedia to improve teaching and learning.

Two articles examine IT in Malaysia. The first, by *Luan, Bakar, Tarmizi, and Hamzah,* Universiti Putra, Malaysia, describe the development of a group of assessment tools to evaluate teachers' IT preparedness in three domains: the teachers' actual IT skills, their knowledge about IT and their attitudes toward IT. They also describe what the instrument attempts to measure, how it is administered and present results of phases one and two of the study. The second paper, by *Bakar and Mohamed,* University Putra Malaysia, report a descriptive correlational study of vocational trainee teachers attitudes towards the integration of computers in teaching.

Lee and Wu, National Taiwan Normal University, Taiwan, provide us with an overview of IT in education in Taiwan, noting the dramatic increase in IT and the tremendous support given by the Ministry of Education of Taiwan.

People-to- People

In many ways the final two papers explore personal connections, one in a 'virtual exchange program' and the other in a real exchange, between international IT students and their hosts. A description of a "Virtual Exchange Program" is given by *Junghans*, Montana State University, suggesting this as a way to introduce an intercultural experience into the foreign language classroom that would directly stimulate and provide for an interest in contemporary German culture.

In the article, "Views from an Asian Bridge: How International Students See Us and Still Survive" *Cornell, Lee, Chang, Tsai, and Tao,* University of Central Florida, USA, *and Ku,* Arizona State University, describe the problems international students encountered and efforts being made to resolve them. While the setting of this last article is the US there are lessons are universal. Several in my family have studied in other countries, the UK and France, to be specific, and they had concerns and experiences not unlike those mentioned in this paper. Any student in a foreign land encounters similar problems and, one hopes, similar pleasures.

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Attitudes of Malaysian Vocational Trainee Teachers Towards the Integration of Computer in Teaching

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Abstract : This paper is a report of a study conducted to assess the attitudes of Malaysian vocational trainee teachers towards the integration of computer in teaching. One hundred and thirty trainee teachers participated in the study of whom 12.2% was male trainees and 87.8% was female trainees. They majored in agricultural science (13.7%), home science (17.3%), economics and accounting (22.3%), others (46.7%). Their minors areas were living skills (25.5%), business studies (70.5%), and economics (4.3%). In general, vocational trainee teachers had a positive attitudes towards the integration of computers in teaching. However, the attitudes towards the integration of computers in teaching did not differ among students with different majors and minors. Majority of them planned to integrate computers in teaching. A significant correlation was observed between their attitudes towards the integration of computers and their plan to integrate computers in teaching. They believed that all trainee teachers should be required to enroll in a computer class while in teacher training.

Introduction

Microcomputers has started to revolutionize the delivery of education in Malaysia when the Ministry of Education Malaysia initiated a computer in education project for Malaysian secondary in 1983. At that time twenty secondary schools were selected to participate in a pilot project called 'An Introduction to Computer' (Abdul Rahman Abdullah, 1986). The purpose was to equip students with basic knowledge of computers and it's applications. However during the 80's the integration of computer in the school curriculum was not as intensive as it was in the late 90's. During the late 90's the Government of Malaysia emphasized the importance and the role of information technology for national development. In fact, information technology has become a dominant feature of the National Policy. As emphasized in the Seventh Malaysian Plan, there will greater demand for workers with computer and information technology skills as a result of a greater use of information technology the operation of both government and non-government organizations. Preparation of workers with knowledge and skills in computerization begins in schools. Then only, computers became an important component of the school curriculum.

The Government is committed towards the use of computers in the delivery of education and as such a hefty sum of RM 12.5 billion was allocated to the educational sector in 1998. The large budget allocation was intended for the initiation of the infrastructures development and training needed to prepare students for the information age. Currently, many schools (both primary and secondary) has at least one computer with an access to the internet. To emphasize the seriousness of the Malaysian Government in preparing knowledge workers, the government through the Ministry of Education has embarked on the project called SMART SCHOOL project whereby technology will be extensively used to support and enhance teaching-learning. The SMART SCHOOL project is aimed at re-inventing the teaching-learning process and promote creative and critical thinking among students through the extensive use of technology, the Internet and multimedia courseware. Currently, 90 schools have been transformed into SMART SCHOOL. The Ministry of Education Malaysia intends to have all it's 10,000 school in Malaysia to be renowned as SMART SCHOOL by the year 2010.

The excitement to integrate computers in education is not without basis. According to Roblyer, Castine, and King (1988), research findings have made it clear that computer applications have undeniable value and have an important instructional role to play in classrooms. Others (Bruner, Buchsbaum, Hill, & Orlando, 1992; O'Brien, 1991; Papert, 1993) have affirmed that computer technology provides abundant opportunities for students to build or modify their personal knowledge through the rich experiences that technology can afford. Computer technology has the capacity to affect the efficiency and productivity of education (Yang, H. H, Mohamed, D. & Beyerbach, B., 2000). In fact, Pelgrum and Plomp (1991) observed that there was a phenomenal infusion of information technology in school worldwide and Malaysia is no exception.

The success of the integration of computers in teaching depends partly on teachers' knowledge about computers, their skills in using computers and their attitudes towards the integration of the computers in their teaching. As Fouri and Gioia (1991) indicated, teacher's attitude towards computers influences teacher's willingness to use computers a s a professional tool or the introduction of computer applications into the classroom. Woodrow (1992) also stated that positive teacher attitudes toward computers are widely recognized as a necessary condition for effective use of information technology in the classroom. The question is 'What is the attitude of Malaysian vocational trainee teachers towards the integration of computers in teaching?' The answer to this question is needed if the integration of computer in Malaysian school is to be successful.

Objectives of the study

The objectives of the study was to assess the UPM vocational trainee teachers attitudes towards the integration of computer in teaching. The study also attempted to examine the relationships between trainee teachers attitudes towards the integration of computers in teaching with several selected variables such as: (a) level of confidence, (b) level of knowledge about computers, (c) interest towards computers, (d) whether or not they have their own computers, and (e) do they plan to integrate computers in their teaching.

Methods

The present research employed a descriptive correlation research methodology. Two hundred vocational trainee teachers who underwent a 12 weeks teacher training program were mailed the research instrument. They were requested to return the completed instrument within two weeks period. One hundred and thirty-nine completed questionnaires were returned giving a response rate of 69.5%.

The research instrument used to solicit the needed information consisted of attitudes items, one question each on gender, major and minor areas of study, academic achievement, interest towards the integration of computers in teaching, level of confidence and knowledge about computers. Trainee teachers attitudes towards the integration of computers in teaching was assessed using a 5-point Likert Scale (5=strongly agree; 4 = agree; 3=moderately agree; disagree; 1=strongly disagree) Originally, the measure consisted of 36 items. However, based on the pilot test results 5 items were eliminated. The final questionnaire consisted of 31 attitudes statements. The 5 items were eliminated because of either the statements have near zero correlations or negative correlations. According to Mueller (1986), items that have near zero correlations negative correlations should be eliminated form the scale. These items did not contribute to the variance in the attitudes towards the integration of computers in teaching. An analysis of the responses from 30 trainee teachers who did not participate in the study yielded a reliability coefficient of 0.90 for the attitudes scale.

Results

A total of 139 trainee teachers responded to the survey. The respondents consisted of 12.2 % male and 87.8 % female trainee teachers. Their major areas of study were agricultural science (13.7%), home science (17.3%), guidance and counseling (23.0%), Malay language (15.1%), economics and accounting (22.3%), science and mathematics (8.6%). Their choice of minors were living skills (25.5%), business studies (70.5%), economics (4.3%). Their academic achievement as measured by grade-point average ranged between 2.00 and 3.74 with a mean of 2.91 (sd.=.41). Some of the respondents have used computers for more than 10 years while some have just started to use computers about two years ago. On the average trainee teachers have been using computers for about 5.2 years with a standard deviation of 2.73 years. About one-half of the trainees (53.2%) own a computer.

The study showed that trainee teachers were not very confident in using computers (mean=3.71 on a scale of 1-5, sd.=.55). They had quite a low level of knowledge about computers (mean=3.47 on a scale of 1-5, sd.=.57). They had quite a high level of interest in using computers (mean=4.12 on a scale of 1-5, sd.=1.01). majority of the respondents planned to integrate computers in their teachings (93.5%). All of them believed that a trainee teacher should be exposed to a computer course while in training. The study also found that 61.20 % the respondents had taken computer classes beside the computer classes offered by the Faculty of Education, UPM. The study showed that 59% of the respondents did not enroll in a computer course offered by the Faculty of Education, UPM.

Vocational trainee teachers attitudes' towards the integration of computers in teaching was assessed using a questionnaire consisting of 31 attitudinal statements. The total score obtained by the respondents ranged between 89 and 145. The total scale mean was 103.8 (sd.=8.36). The median was 104 and the mode was 105. The items mean was 3.95 on a scale of 1-5 (sd.=.33). In general, trainee teachers tended to agree with most of the statements. Fourteen statements (45.0%) had a score of 4.0 and above, 12 statements (38.7%) had a score between 3.5 and 3.9 and eight statements (16.3%) had a score between 3.0 and 3.49 (Table 1).

Table 1: Means and sd. of vocational trainee teachers attitudes towards the integration of computer technology in teaching (n=139)
(Scale: 1=strongly disagree, 2=disagree, 3=moderately disagree, 4=agree, 5=strongly agree)

Statement of attitudes towards the integration of computer in teaching	Mean	Sd.
I have confidence when talking about computers with my friends	3.38	.82
I am interested to enroll in computer in education courses	4.51	.77
The use of computer in education does not make me nervous	3.75	1.1
Using computer in teaching does not complicate a teacher's job	3.91	1.0
I have the ability to use computer in teaching	3.87	.73
I am knowledgeable about computerization in education	3.23	.75
I have the confidence when using computers for teaching	3.78	.66
I have the skills to use computers in teaching	3.44	.79
It is not difficult for me to use computer in teaching	3.72	1.0
I am knowledgeable about computer some programs	3.81	.75
I like to discuss with friends about computer in education	3.87	.71
I like to use computer in teaching	4.02	.71
Integrating computer technology in teaching is interesting	4.22	.71
It is difficult for me to stop once I start using computer	4.64	.86
If I have problem in using computers, I will seek helps from others	4.48	.66
Using computers in teaching will increase students' motivation	4.34	.68
Using computers in teaching improves teaching effectiveness	4.22	.61
Using computers in teaching will make learning more effective	4.26	.67
Using computers in teaching will enable teachers to teach a difficult to understand concepts more easily	3.87	.77
There is not much a problem in using computers in teaching	3.58	.92
Using computers in teaching will give time for teachers to help academically poor	3.44	.86

students		
Using computer in teaching encourages students' creativity	4.23	.67
Using computers in teaching gives opportunity for good students to excel in their studies	4.34	.56
Using computers in teaching makes students enjoy learning	3.86	.94
Using computers in teaching increase students' self-confident	4.03	.64
Using computers in teaching improve students' academic performance	3.93	.69
Using computers in teaching increases students' knowledge	4.25	.59
Using computers in teaching enable students to get information faster	4.24	.64
Using computers in teaching increases students' interests in subject-matter	4.21	.66
Using computers in teaching makes learning mechanical	3.81	.79
Using computers in teaching does not bore me	4.09	.94

Item means=3.95, sd.=.33
Scale mean=103.8, sd.=8.36

A correlation analysis was conducted to determine if any relationship between trainee teachers attitudes towards the integration of computers in teaching and selected independent variables existed. Low significant correlations were found between trainee teachers attitudes and their level of knowledge about computers ($r=.21$, $p<.05$); level of confidence ($r=.20$, $p<.05$); and their intention to integrate computers in teaching ($r_{pb}=.20$, $p<.05$). No significant correlations were found between the attitudes towards the integration of computers and whether or not the trainees own a computer, the number of years they have been using computers, and their interests towards computers. A One-way ANOVA test was performed to determine if there was any difference of attitude among students of different majors. It was found that attitude towards the integration of computer in teaching did not differ among trainees of different majors ($F_{(6,138)} = 1.902$, $p > .05$) and among trainees with different minors ($F_{(2,134)} = .174$, $p>.05$). The study also showed that attitudes towards the integration of computer technology in teaching did not differ ($t_{(136)} = -.31$, $p>.05$) among students who have or have not taken a computer course offered by the Faculty of Education, UPM (mean=118.9, sd.=10.22; 118.3, sd.=11.79, respectively).

Conclusion

The following conclusion can be drawn from the study:

1. The study has shown that in general vocational trainee teachers had a positive attitudes towards the integration of computers in teaching. Thirty-three percents of the respondents obtained a score of 125 and above. They can be classified as having positive attitudes towards the integration of computers in teaching. About 60% of the respondents obtained a score between 96 and 124. They can be classified as having a moderately positive attitudes towards the integration of computers in teaching.

2. The vocational trainee teachers do not have a high level of knowledge about computers. Their level of knowledge about computers is about average (mean=3.47). A significant correlation was found between their attitudes towards the integration of computers in teaching and their level of knowledge about computers.

3. The vocational trainee teachers were not very confident in using computer (mean=3.71). A significant correlation was found between their attitudes towards the integration of computers in teaching and their level of confidence in using computers.

4. The vocational trainee teachers had a high level of interest towards computer technology (mean=4.12). However, no significant correlation was found between their attitudes towards the integration of computers in teaching and their level of interest towards computers.

5. The trainee teachers believed that all trainee teachers should have been exposed to a computer course.

6. The attitudes towards the integration of computers in teaching did not differ among students of different majors and also among students of different minors.

7. The majority of the trainees planned to integrate computer technology in their teaching.

References

Abdul Rahman Abdullah (1986). Issues in using and teaching computer in schools. Paper presented at the national Seminar on Computer in Education organized by the Department of Mathematics, University of Agriculture Malaysia, Serdang, Selangor.

Bruner, I., Buchsbaum, H., Hill, M., & Orlando, M. (May/June, 1992). School reform: Why you need technology to get there?. *Electronic Learning*, 11, 22-28.

Fouri, W. M. & Gioia, L. M. (1991). *Computers and information processing*. New York: Prentice-Hall.

Mueller, D. J. (1986). *Measuring social attitudes : A handbook for researchers and practitioners*. New York: Teachers College Press.

O'Brien, T. (April, 1991). Computers in education: A Piagetion perspective. *Communicator*, 66, 32-34.

Papert, S. (1993). *The children's machine: Rethinking school in the age of computer*. New York: Basic Books.

Pelgrum, W. J., & Plomp, T. (1991). *The use of computers in education worldwide*. Oxford: Pergamon Press

Robyler, M. D., Castine, W. H. & King, F. J. (1988). *Assessing the impact of computer based instruction: A review of recent research*. Binghamton, NY: Haworth.

Yang, H. H, Mohamed, D., & Beyerbach, B. (Fall, 1999). An investigation of computer anxiety among vocational-technical teachers. *Journal of Industrial Teacher Education*, 37,1. (electronic journal).

Woodrow, J. E. (1992). The influence of programming training on the computer literacy and attitudes of preservice teachers. *Journal of Research on Computing in Education*, 25(2), 200-218.

Views from an Asian Bridge
How International Students See Us and Still Survive

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Abstract: Increasing numbers of international students are entering the graduate programs in the area of Instructional Technology at the University of Central Florida. With this influx comes a series of communications and miscommunications between American faculty, staff, and students with their Asian and other international peers. This article and presentation describe the problems encountered and efforts being made to resolve them. It is our hope that other faculty, staff and students from North America will benefit from our experiences.

The Problem

Faculty and staff at our universities require a substantial amount of information to adequately advise international students who wish to enter instructional technology graduate programs. We choose instructional technology because this is the area in which we work. We feel that, within our field, members share a common bond that is unique, and this sharing needs to be passed on to any and all who might be able to assist our future and current students from abroad.

Like many of our academic peers, we encounter a range of experience among our faculty in advisement of new international students when they are studying with us. While some of this deficit rests with routine logistics involved with assisting international students, i.e., knowing details related to immigration, course load requirements, and related visa status, other elements present themselves in more unique ways.

A survey of faculty and staff in many programs reveals a lack the background and knowledge required to properly assist our international students.

A telephone and face-to-face series of interviews was conducted during May 2000, among fifty faculty members at the University of Central Florida (UCF) across all five colleges, to determine the extent to which they had previous international experience (Cornell, 2000).

In addition, during an International Studies Summer Workshop, also at the University of Central Florida, a 14-point questionnaire was given to over 100 faculty members related to faculty perceptions of international issues.

The findings obtained during both surveys revealed a wide and disparate diversity of attitudes, initiatives, and previous international experience, as might be expected from most academic institutions. Given that our institution has a strong international focus reflected in its strategic plan, these concerns were of interest to those of us who emphasize international outreach in the recruitment and retention of such students.

The telephone and face-to-face interviews asked respondents:

Do you have a valid passport?
When and where was your last trip abroad?
Have you had international students in your classes in the past?
Do you currently have international students in class?
Do you know the current status of your international students' I-20?
Do you know the visa designation of your current international students?
Are international students enrolled in your academic program major?
If so, how did they find out about your program?
If so, what information and services did you provide or arrange on behalf of your international student, before, during, and after completion of their program?

Questions in the second questionnaire (2000, Office of International Studies) asked faculty:

To what extent are you conscious of cultural differences among your students?
To what degree do you encourage diverse values?
What initiatives do you take in dispelling prejudices, stereotypes and misconceptions among students?
Do you recognize your own cultural biases?

What measures do you take to insure that your own prejudices or stereotyped thinking influences expectations from your students?
To what degree do you encourage students' mutual respect and open communications?
Do you search for ways to overcome student reluctance to recognize and discuss cultural/ethnic questions?
To what degree do you adjust your own teaching methodologies with students from differing cultures?
Do you demonstrate that academic expectations are equal for all students, regardless of cultural background?
Do you encourage the formation of cooperative learning groups that reflect diverse cultural and academic performance levels?
Do you include specific world areas and topics within your curricula?
To what extent do you keep up to date on issues and content related to world areas?
Do you feel that institutional resources related to international issues are adequate to meet your teaching needs?

Rather than dwell on the findings of these surveys, the aim of this paper and presentation is to accept the root cause of specific issues identified and to devise means through which they might be addressed. In this regard, we turned directly to our students and had them describe their own survival strategies while studying with us.

Using Maslow as our metaphor, we sought the advice of Dr. William G. "Bill" Huitt, Professor of Psychology and Counseling at Valdosta State University (Huitt, 2000). He generously provided us with a number of citations of his work and complete presentations related to Abraham Maslow and this provided us schemata or rubric upon which we placed our approach.

We took Maslow's Hierarchy as a framework and asked our students to move through it, step-by-step, while they considered their own presence with us. It is the impact of commentaries by our students that constitutes the majority of this paper, for their voices, when heard by concerned faculty, staff, and fellow students, sing. Through these students, all of whom are Asian, we experienced their fear, anxiety, loneliness, isolation, and more. We also learned of their passions, their excitement, and joy of discovery. Together we present a quilt of numerous colors and textures.

It is our contention through this discussion, that the comments made, with some adaptation, may also be extrapolated to students from non-Asian nations, for such problems appears to us to be universal.

Physiological needs form the base of our model for it constitutes the first step along their path toward accommodation into our university culture. Neither this fundamental needs set nor those that follow necessarily lead to assimilation.

– **Food**

What to eat? That posed a real challenge for our students. The immediate problem is to satisfy hunger pangs, and then to seek out sources of food that are as close as possible, to food consumed at home. Fortunately for students coming to Central Florida, there exists a wide variety of international cuisine from which to select, two of which are literally across the street from our campus. Such may not, however, exist among many of the smaller academic communities where international students might settle.

For many of our newly arrived international students, their first trip to an American supermarket posed a mixture of confusion, awe, and disbelief that such a preponderance of selections was available to them. What to purchase and to what extent it resembled their customary dietary needs posed a dilemma for many. Of course, there was always the option of indulging in a hurried trip to one or more American fast food establishments, as many did, only to find several hours later that their digestive system went into open rebellion.

Some of our new arrivals, accustomed to Asian cuisine, found limited availability of chop sticks, and had to conduct a rapid self-tutoring as to how to adapt to knives, forks, spoons, glassware, and only a single entrée.

Fortunately, most students adopted conventional American ways of eating with minimal problems, often within twenty-four hours of their arrival. They also, and with equal speed, located a variety of ethnically compatible sources of nourishment and continue to patronize such establishments with joy.

– **Shelter**

Where will I live? That posed an immediate problem for our students. Our institution, like most in North America, has a well-established student residence office. There are a wide variety of choices for graduate students, most of which are adjacent to our main campus. This, however, is of little comfort when one walks off the plane after having flown twenty-four hours or more and the ravages of jet lag render them nearly immobile.

Typically, our arriving students have established contact with others from their country, and we hope one or more such contacts are there to meet them as they walk off the plane. In some instances, individual faculty members provide their new students with a few days of respite in their homes before the hunt for a new home has to begin.

Personally, I must admit that my own home has been functioning as a kind of international halfway house for some years now, and is likely to continue for some years to come. Not all faculty are as welcoming and, should no one be at the airport to meet a new students, problems can and do arise.

The immediate question raised by most is how far from the University will I be? The second question relates to how to get from their new home or apartment to campus, thus opening yet another series of questions as to available transportation, costs of same, and the wisdom of buying one's own vehicle, be it a bicycle, moped, motorcycle, car or to simply take the bus or walk back and forth. All possibilities exist in and around most campuses but the questions posed are sure to arise soon after the student has recovered from their trip.

Clothing

What to bring? Often questions arise as to what type of clothing one will need, especially if one has come from a culture where specific dress conventions are followed. Islamic customs may pose unique problems for female students, as one example. Most students coming from one of the "Five Dragons" nations (Japan, Hong Kong, Singapore, South Korea, and Taiwan) increasingly wear Western clothing, much of it designer-label, so compatibility with North American standards is less and less problematic.

It was noted by the lead author, during a trip to China in December of 1999, that clothing styles among the younger citizens likewise reflects a Western motif.
Where to buy new or replacement clothing sooner or later poses a problem for some, depending on what the international student brings with him or her. In this regard it is important to communicate with the prospective arrival as to appropriate clothing to conform to existing weather patterns. What we would recommend to one of our students will differ considerably from that of a student about to arrive in Minneapolis or Boston.

Safety needs form the second tier of our hierarchy, once the more primal needs have been addressed. Typically, either before a student arrives or once they are at the university, questions arise, i.e., "Just how safe will I be in this new environment?" Given the plethora of American mass-media content delivered abroad, small wonder that so many unanswered questions are posed, questions that North Americans take for granted, having lived through many prior experiences.

CNN aside, and in deference to the influence of innumerable media epochs laden with blood and gore, our international students need reassurance that in most of America, life is reasonably tranquil. Our citizens do not sport six guns in holsters strapped to their legs, (some Western States being an exception), and that in reality, American life can be quite peaceful, routine, and to some, boring.

As with any new environment, common sense dictates that caution be taken when walking alone at night, when in some "less-chance" neighborhoods, and that yes, the police will be your friend unless you break our laws.

"Is my new home or apartment safe?" A common question with no simple reply. Even in the best of neighborhoods, theft and mayhem occur, and few can predict when such events will happen. Once more, common sense must prevail, and admonitions made regarding security of one's premises and person.

Once our students get into a familiar routine, and gain acquaintances, of both fellow nationals and of Americans, major concerns related to safety evaporate. This feeling may change should some untoward event take place so it is advisable to alert the students to avoid complacency lest they become vulnerable.

Belongingness and Love Needs

How can I belong? This question, while not always vocalized, remains foremost as this step of the hierarchy is encountered. Often a decision is made by the international student to either stay with my own kind or integrate. Because cultures other than ours differ greatly, there may appear to be reluctance for our international student to mix much with their American counterparts. This behavior may often be the result of natural shyness, homesickness, lack of English language skills, fear of being around those different from themselves, or a myriad of other scenarios.

Dating or Miss-dating?

It is not uncommon for our international students to experiment with dating American students, once they have overcome their initial discomfort with being in the new environment. On more than one occasion, hearts will be broken and alliances severed. At other times, true and lasting relationships are formed, the bonds of which will last a lifetime. Marriage is often a goal for some of these students, and frequently the student will share such confidences, once a mutual trust has been established. It is here that the role of surrogate parent comes into play as well as the ability to discern if the intended relationship is mutual between the two parties and if the ultimate intent is one of love and affection or, as does happen, an expedient means through which to obtain a Green Card. Tact and empathy become valued attributes during such times and the question then becomes, "How much looking before I leap?"

Esteem needs entails more than being liked by others. It also address questions of self-worth, of feeling one is valued by others, and certainly, of beginning with valuing of self.
To we rather brash Americans, such reflections of ourselves seem second nature but to those from other cultures, indulgence in one's self is considered in poor taste. In these times of self-assertiveness, our emphasis on introspection, self-development, and need for esteem may appear strange to those from abroad.

The need to know and understand follows in our model and presents its own set of questions. These issues are not solely the purview of international students as their American counterparts voice similar concerns. Among them are:

How do I know I know something?

What should I know and how to learn it?

"Knowing" not = to "Understanding"

Acting on what I both know and understand.

Aesthetic needs begins the climb from more fundamental needs to those wherein the quality of life begins to emerge as being of importance. Some of our international students bring with them a finely tuned sense of aesthetics while others may ask, "Who needs them?"

Once the international student feels comfortable in immersing himself or herself into the mainstream of American academic life, both social and professional interests rise and decisions are made as to concerts vs. football, plays vs. parties, and inter-cultural collaboration. The question then becomes one of achieving a balance.

Self-actualization moves our model components up closer to the pinnacle and the major issue here is have I reached this level? How do I know? How do I know the "real" me? Do others know the "real" you? What are my next steps?

Transcendence is the true shining beacon of both Bill Huitt and Abraham Maslow, to say nothing of Mother Teresa. It is Nirvana for some, unachievable for many, and beyond the imaginations of most. It is the spiritual counterpart of being a mental giant yet, if applied with reason and care, maintains the qualities of caring, empathy, and more.
Our international students may have already reached such a deified state and we would be unaware of it, because we are often unaware of them where they really are.

Faculty and Staff Role

There are many things faculty and staff can do to enhance the experience for our international students. Consider these experiences opportunities for mutual growth as you consider their impact.

Expectations of both faculty and their international students will vary but it is worth noting that:

> My expectations of the man may say more about me than about him.
> What I expect depends upon where I come from and the meanings I give to
> what I experience. Expectations occur on many different levels, from concrete,
> explicit levels to implicit and subconscious ones. When the expectations of who we are communicating with meet our own, there is mutuality of meaning (1998,
> Trompenaars and Hampden-Turner, p. 21).

In searching for the author's meaning as quoted above, we need remain aware that:

International students may be scholars but may not be too adept at "life" skills.

Clarification is critical - what international students "know" may be inaccurate.

Referral to other agencies and sources is invaluable.

Mentoring becomes memorable.

To facilitate transitions from homeland to North America a number of logistics items are worth noting.

Before a student arrives there remain innumerable questions unanswered and often it is the faculty member who can and does supply the answers. The questions may relate to programmatic and/or personal issues that need resolution.

Legal stuff involves providing assistance in applying, advising how to properly complete an I-20 application, clarification of various visa types such as F-1, J-1, H-1, how to obtain assistantships, tuition waivers, etc.

Conventional wisdom says that the American Embassies and/or Consulates, and the University's International Student Office should provide the most accurate help in navigating these legal waters but in truth, small yet critical items frequently are omitted.

Personal stuff may be supposedly simple as advising the international student about what to bring, what to leave behind, and what items might be sent later. Keep in mind that the international student has very little understanding of what they will need in North America and what items might best be left at home.

Arranging housing should be done in concert with the University's Office of Student Housing, as most such offices will have the latest information as to availability, price range, and suitability. This is important information to have but equally important is that the housing located be in harmony with the international student's needs, and this is difficult for a busy housing office to determine.

When a student arrives involves assuring the student that someone will be there to meet, greet, and assist them in settling in. As was previously mentioned, if there is sufficient room in a faculty member's home for a day or two, such a welcoming is never forgotten.

While they are entrusted in your care relates to what happens when they have settled in and are ready to come to the faculty member for advisement in the program. Care must be taken not to overwhelm the new international student, as their previous academic system may be totally different from the one in North America. Everything is new and everything is confusing.

Insuring that legal and financial affairs are addressed is most likely the task of the admissions office and the International Student Services Office but faculty should be alert to the many nuances involved in seeing that all papers are legally in order. Doing so protects both the institution and the student.

Making international students part of the technology studies "family" can be extremely rewarding for the international student. Consider that they have left their own families and friends behind, know very few people upon arrival, and this leaves only the students with whom they will be taking classes.

It is advisable to assign a peer mentor for the newcomer who can assist the student in transitioning from past to present. It is our feeling that, where possible, the peer mentor should be someone from the same geographic area from which the student comes. If not, then the peer mentor should be someone who has traveled abroad, and can thus empathize as to how being alone in another country feels.

Helping overcome difficulties that arise can be an issue, especially if the faculty member has no prior experience in dealing with international issues and concerns. The more the faculty member knows about the culture and customs of the new student's country the better.

✦ **Upon their departure** and the student has completed their academic program with you, the story has not ended. In fact, it is most likely just beginning for, if your student has met with success, it is the beginning of a lifelong relationship. Often such relationships lead to visits abroad to the student's home country or exchanges of faculty between his or her institution and yours or the infusion of many more students from that nation. Our field of instructional technology is close-knit and long lasting.

Summary

Maslow's Hierarchy served us well as a suitable rubric upon which to place our discussion and, in doing so; it has allowed us to see our students as they see us. Beyond all doubt, faculty, students and staff benefit equally. While the context of this article relates to those who come to us from overseas, what is true for our international students is true for ALL our students.

References

Cornell, R.A. (2000). UC F faculty survey of international experiences. Orlando, FL: University of Central Florida, Unpublished document.

Huitt, W.G. (2000). Valdosta, GA: Valdosta State University http://chiron.valdosta.edu/whuitt/col.regsys/maslow.html

Office of International Studies. (2000). The Institute for Domestic Diversity and International Issues participant perceptions and expectations. Questionnaire given to faculty participants at the beginning of International Studies Summer Institute. Orlando, FL: University of Central Florida.

Trompenaar, F., & Hampden-Turner, C. (1998). Riding the waves of culture: understanding diversity in global business (p. 21). New York: McGraw-Hill.

Creating Virtual Learning Communities in Africa: Issues and Challenges

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This paper discusses the growing application of information communications technologies in Africa and other parts of the world. It examines the growing global information technology revolution and how it is transforming educational institutions. It then discusses the state of distance education in Africa, identifying the institutions offering distance education and the nature of the delivery platform used. The prospects and challenges in introducing distance education to tertiary institutions in Africa is discussed. Finally, it offers suggestions to overcome the challenges confronting technology-based education in Africa.

Introduction and background

The new information revolution has enabled academic institutions to provide a flexible and more open learning environment for students. The convergence of new information technologies such as telecommunications, computers, satellites and fiber optic technologies is making it easier for institutions to implement distance education (Harasim, 1993). Indications are that distance education in higher education will continue to grow (Hanna, 1998; National Center for Education Statistics, 1998; Rahm & Reed, 1998; Roberts, 1996). Over the past few years, the World Wide Web (WWW) or Information Superhighway has emerged as a locus of innovative instructional modalities in higher education (Patterson & Yaffe, 1994).

Higher education in Africa is facing a critical challenge to meet new demands for the 21st century. Africa has a population growth rate of 2.3%. This means that those seeking access to education at all levels-primary, secondary, and tertiary will increase. In spite of this fact, educational institutions in Africa are not expanding enough to accommodate the increasing number of students seeking access to higher education. Africa needs a kind of education that would make it more responsive to challenges confronting the continent. Until such time as tertiary institutions in Africa have the resources for their own expanded traditional tertiary institutions, it would be in the interest of the continent if alternative ways of providing access to higher education via distance education is explored. Distance education makes it possible for students anywhere who have Internet and Web connection to enroll in on-line courses.

Even though the application and use of information technology in education in Sub-Saharan African has been severely underutilized, over the past few years, Africa has seen a tremendous growth in the use of technology on the continent. The past few years have seen pioneering efforts in a number of African countries to apply information technology to higher education. Among the countries are Botswana, Madagascar, Namibia, South Africa, Tanzania, and Zimbabwe. Countries such as Cote d'Ivoire, Togo, and Congo are joining the distance education bandwagon by establishing pilot virtual programs.

Distance education could be used to make it possible for African secondary school graduates, only a fraction of whom can be accommodated in African tertiary institutions, to enroll directly, and without leaving their homes, in on-line colleges and universities on the continent and around the world. Such form of education offers several advantages over the traditional educational system. Among them a) virtual access to faculty in higher institutions around the world, b) introduction of new interactive pedagogical techniques (e.g., more hands-on learning opportunities, etc); and c) the linking of institutions in cyberspace where resources could be shared by people and institutions in physically unconnected places.

But what are the prospects and challenges confronting African educators as they explore the power and applicability of new information systems to education. This paper addresses those challenges. First, it begins by discussing the growing global information technology revolution and how it is transforming educational institutions worldwide. It then discusses the state of distance education in Africa, identifying the institutions offering distance education and the nature of the delivery platform used.

The Promise of Distance Education

African educational institutions are confronted with several challenges; the challenge in training a cadre of highly qualified professionals to fuel development and address the challenges confronting the continent; the challenge of inadequate educational resources; brain drain and the loss of the best talented faculty to the outside world; the challenge of providing a more flexible educational system for students; and a host of other factors. Given the above challenges, it is highly unlikely that current educational institutions on the continent will be able to provide access and affordable education to all those seeking access. Even though tertiary institutions have a responsibility to produce scholars to fuel national development, higher institutions in Africa are constrained by space, time, and money. Against the backdrop of these factors, there is the need for the adoption of innovative learning methods that will permit the delivery of education to the majority of people who are looking for access to higher education.

Distance education appears to offer an option for African students in search of higher education but are not in a position to afford it. Distance learning can provide instructionally effective, highly interactive learning experience that are flexible, equitable and responsive to individual needs. (Rogers, 1996). Studies show that distance education is more cost-effective than traditional programs, especially with large student enrollments and a good support system for students (Daniel, 1996). Unit costs per student is below that of conventional programs (Daniel, 1996).

The promise of ICTs on the continent is enormous. Emerging Information Communication Technology (ICT) holds much promise for breaking down the traditional barriers that have limited access to higher education. If this approach to educational development is used judiciously, it will open up new frontiers to learning; enrich collaborative research among African universities and between universities in Africa and other parts of the world; promote cross-national, multi-disciplinary perspectives in educational practice, and thereby equip students, faculty, and administrators with tools and resources that would enable them to successfully engage the academic world of the 21st century. Today, through distance learning strategies and computer applications, we can expand the content, extend the reach, and increase the effectiveness of existing academic programs. Through emerging communication technology, effective computer delivered coursework could be developed; and improve access to scientific and technical information.

Institutions With Distance Education Projects in Africa

Distance learning techniques are increasingly being employed by a growing number of higher institutions in Africa. While most of the on-going distance education initiatives on the continent have been used to upgrade the quality of basic education (ADEA, 1999), some countries are taking bold initiatives in piloting Internet-based, video-conferencing, and other forms of multimedia (ADEA, 1999). The University of Abidjan and the African Virtual University are good examples. Also, the Telesun program in Cameroon uses Internet-based courses in its science program. The FORST program links Benin and three other countries with McGill University in Canada. And the RESAFAD program in Djibouti provides teacher training from French universities (ADEA, 1999). For the majority of the institutions, the delivery platform to date has been text and correspondence based. This is supported by print material. Four institutions in South Africa provide distance education courses- Technikon SA, the Technical College of South Africa, Vista University, and the University of South Africa (UNISA), the oldest mega-university. Its distance education program to off-campus students was started in 1946 (ICDL, 1995; Wiechers, 1995), with an enrolment of over 130,000 in 1995 (Wiechers, 1995). This represents over one-third of all university enrolments in South Africa. These schools enroll over 225,000 students annually (Butcher, 1998). UNISA uses print material, audio cassettes, and community radio

The most ambitious distance education initiative on the continent to date is the African Virtual University (AVU) Project. This is the first satellite based attempt to harness the power of information technologies to deliver university education in the disciplines of science and engineering, non-credit/continuing education programs and remedial instruction to students in Sub-Saharan Africa. In the words of Baranshamaje (1996), it represents the quintessential instruments for sharing resources at affordable prices to large numbers of people (p. 3). The AVU project will deliver instructional programs, strengthen the capacity in African partner institutions, implement a network infrastructure, and implement a digital library program (Baranshamaje, 1996).

About five Anglophone and five Francophone African countries are participating in the initial pilot phase. The project will be extended to other African countries during the third and final phase (AVU Executive Summary, 1997). Another virtual university program supported by the World Bank and the Agence de la Francophonie is the Universit francophone project.

Challenges In Implementing Distance Education in Africa

While distance education holds promises, a number of obstacles will have to be addressed before it can be fully utilized on the continent. The following section addresses the challenges.

One of the major challenges in promoting distance education on the continent is technological constraints. Telephone and other communication infrastructure beyond the cities remain inadequate. Connectivity beyond the major capital cities poses a potential problem in creating a national distance education strategy. Even though Africa has about 12% of the world's population, it has only 2% of the global telephone network and over half of the lines are in the cities (Marcelle, 1998). Telephone density is less than 2 lines per 1,000 inhabitants, compared with 48 per 1,000 in Asia, 280 per 1,000 in America, 314 per 1,000 in Europe, and 520 per 1,000 in high income countries (International Telecommunication Union, 1996).

Another challenge is the lack of a trained cadre of professionals to support the implementation of distance education. The effective use of distance learning technologies demands that faculty be properly trained in using distance education as a delivery mode. To date, few African scholars are familiar with teaching in an on-line (virtual) environment. And this poses a major challenge in introducing distance education on the continent.

The absence of clearly defined national distance education policies in most African countries poses another challenge. Policies are needed to provide a framework for the development of distance education in the various African countries. With the exception of South Africa, few African countries have a clearly defined national information or communication policy to guide the development of distance education and technological development in their respective countries. The absence of such a policy is a clear obstacle to the development of distance education on the continent.

Access to connectivity remains one of the major challenges in Africa. Students would need access to a computer that can send and receive messages using a "browser" such as Explorer 3.0 or higher, or Netscape. They would need an email program, which might be "hotmail" or a similar program. They might need a word processing program. They would need connection to an Internet Service Provider (ISP). They might need, depending on the course, access to a VCR to play videotaped instruction, and perhaps tape recorded lectures. They would need in some cases commercial textbooks. And all these cost money.

The Association for the Development of Education in Africa (1999) lists additional limitations. Among them are a) the lack of high level political support for distance education by political authorities in Africa, b) the lack of recognition of distance learning by the public service in its assessment of employee qualifications, c) the availability of professionally trained distance learning personnel, d) the lack of follow-up and support programs, e) limited budgets, and f) poor domestic infrastructure.

Closely related to connectivity problems is financial. ISP services are expensive in Africa. The connecting colleges charge tuition, in some cases by law very high tuition to students taking those courses. A source of financial support would be needed from some source. For example, multilateral agencies such as World Bank; the United States Agency for International Development (USAID), and national institutional donors such as churches and employers have a role to play in exploring funding sources.

Another challenge to overcome is cultural bias. Current research into distance education has focused on the process as a western social/cultural/educational constructs, and is being viewed by some as a way to export this worldview to other nations more efficiently and quickly than by other media currently available. (Moore and Thompson, 1990; Barker et al.,1996; Bork, 1993). Distance learning, by its very nature, involves more than just the transmission of information, but also the transmission of cultural/social paradigms between and among the participants. This transmission is a very important facet of any design of a distance learning curriculum that is sensitive to the cross-national cultural experiences (Cummings and Sayers, 1990, 1996; Sayers, 1991; Spirou, 1995). To date, most of the distance learning models have been developed and tested outside of Africa- in American, Canadian, or European educational environments. Without diligent research focusing on localizing content, this might pose a problem (Cummings and Sayers, 1990; Owston, 1997; Sayers, 1991;). To date, few scholars or technocrats supporting the push for information technology access for schools have examined questions regarding the possible effects information gained, via the technology, may have on the culture and traditions of a people (Asante,1992; Ani,1994). Clearly, there is the need to address cultural issues so that distance education effort on the African continent would not be seen as an attempt by foreign institutions to extend their influence to the continent (some may view it as cultural imperialism).

Clearly these needs would at the present time make taking on-line courses difficult or impossible technically for those who a) do not have or can not get access to the computer, modem, ISP, and this would mean, the majority of Africans. Potential students in the larger cities that have ISP access, and which have or might have "community or church learning centers" or other ways of providing the needed technology, might be served quickly if the other issues can be attacked.
Closely related to connectivity problems is financial. ISP services are expensive in Africa. The connecting colleges charge tuition, in some cases by law very high tuition to students taking those courses. A source of financial support would be needed from some source. For example, multilateral agencies such as World Bank; the United States Agency for International Development (USAID), and national institutional donors such as churches and employers have a role to play in exploring funding sources.

Fortunately, Africa is awakening to the potential of information technology to take advantage of the opportunities offered by distance education. The efforts of national governments and international donor agencies have contributed to this situation. For example, the United Nations Economic Commission for Africa Pan African Development Information Systems (PADIS) Initiative aims to establish low-cost and self-sustained nodes to provide access to electronic mail in 24 African countries. Another is the African Information Society Initiative with its primary goal of building information and communication infrastructure in Africa. Similarly, the United States Agency for International Development (USAID) Leland Initiative aims to provide 20 African countries with connections up to 128 kilobits. In addition, the program will provide assistance with materials, expertise, training and free internet access for a limited period.

In addition to the above initiatives, professional organizations have emerged to champion and promote distance education on the continent.

Addressing the Challenges

Established institutions have a role to play in addressing the challenges in creating distance education on the continent. For example, religious organizations have a commitment to outreach, to service, to mission. They often have a room or two that is not occupied on days other than worship days. One of these rooms in the church can become a telecentre, a community learning center, and its services offered to the community surrounding the church as well as its own congregation.

Such centers could provide a simple, single point access to information and educational resources to church members and students seeking access to higher education.

Effective measures to sustain distance learning initiatives needs to be considered. While donor funds could be used as the basis of establishing distance learning programs on the continent, sound financial planning by African educators to ensure that funds will be available to continue offering distance education programs when donor funding becomes scarce. Tuition costs have traditionally been the source of revenue to sustain distance learning initiatives. In addition, African stakeholders interested in launching distance learning initiatives should consider gathering resources from various agencies, sharing facilities and offering joint programs. This will go a long way to reduce the start up investment costs for the information infrastructure needed to launch distance learning initiatives on the continent.

Since the concept of distance learning and educational technology is still emerging on the continent, a learner support system needs to be put in place to assist students to comprehend all the technical details needed to make effective use of the technology. Research shows that distance learning requires a lot of self-discipline on the part of the student; student isolation tend to be high, compared to conventional learning (Potashnik & Capper, 1998). Strategies for reducing drop out should be put in place to ensure successful completion of programs.

There is the need for higher institutions on the continent to form partnerships with business, industry, and government to help promote distance education on the continent (Darkwa, 1999). These bodies will be very crucial in helping to advance the development of distance education. The private sector will help develop the technology for the delivery of distance education; the government will help formulate national policies to promote distance education, while academicians will help develop locally-based content (Darkwa, 1999).

Institutional linkage programs between African institutions and foreign partners who are pioneers in applying distance education is needed. Such programs will offer African students the opportunity to take courses on-line, without leaving the shores of their countries.

Creating awareness about the potential of distance education is needed to expose its potential. African Ministries of Education have a responsibility to assist in facilitating this process. Additional efforts could be made to explore the establishment of the necessary infrastructure to support the delivery of distance education courses outside the boundaries of the universities.

One of the major obstacles to expanding the incorporation of distance education into the educational system in Africa is the lack of a well-developed telecommunication infrastructure on the continent, The telecommunication industry is not very active in the provision of telematics services. Besides, telecommunication services are limited to urban areas in Africa. Rural telecommunication infrastructure is highly underdeveloped. This implies that rural institutions are less likely to benefit from the advantages offered by information technology. This calls for an extension of the telecommunication infrastructure to be extended to the rural areas of Africa.

The need for faculty training is essential if Africa is to make any significant headway in applying DE technologies for social work education. Faculty training could be done in conjunction with private information technology institutions and relevant academic departments who have expertise in these areas. The training could be offered by renowned experts in both the public and private sector who have distinguished themselves in the use of emerging communications technologies.

Steps should be taken to advance and support the use of information technology and move rapidly and aggressively to develop programs of the highest quality to advance the promotion of technology-based development on the continent. This should be seen as an act of strategic that touches on the future of higher education on the continent. We hope African educational policy makers will explore, encourage, and promote the development and use of emerging communication technologies at all levels of our educational spectrum.

Invariably, the decision to develop the infrastructure needed to launch distance education initiatives on the continent is primarily a political one. This need to build the continent's distance learning capacity has been echoed by interest groups on numerous occasions. It is time to translate words into action by putting structures to help promote distance education. If the authorities in key decision making positions fail to act, there is little hope for seeing progress in this area. Without this, it will be over-optimistic to expect far-reaching changes in the telecommunication infrastructure of Africa. This calls for a commitment on the part of African political leaders to address the telecommunication imbalance in the country. Without that, very little progress will be made in this area. This requires a whole-hearted political commitment to this cause.

Future Prospects

In spite of the challenges confronting the advancement of distance education on the African continent, there is a growing interest in the concept. Several African leaders are increasingly becoming aware of the potential of distance education in addressing educational challenges. The political leadership in countries such as Burkina Faso, Ghana, Kenya, Tanzania, and Zimbabwe have made recent statements pledging their support to distance education. Awareness about the potential of distance education is spreading among African students and educators. The activities of community-based groups and academic organizations such as the Ghana Computer Literacy and Distance Education, Incorporated (GhaCLAD), the African Distance Learning Association, the Association for the Development of Education in Africa (ADEA), the Commonwealth of Learning, and the Working Group on Higher Education (WGHE), African Association of Universities (AAU), the West African Distance Learning Association, the Acacia Initiative, the African Information Society Initiative (AISI), and WorldLinks have contributed to this awareness. Multi-country cooperation in launching distance education initiatives (e.g., the cooperation between Mauritius and Madagascar, and between Cote d'Ivoire and Burkina Faso), and the creation of non-university-based distance learning programs are likely to be the norm. National organizations have emerged in some African countries to promote distance education. An example is the National Association of Distance Education Organizations of South Africa (NADEOSA). The activities of such organizations are having a tremendous impact in shaping the future of distance education in Africa. The future looks bright for the evolution and development of distance education in Africa.

Conclusion

Effective measures to sustain distance learning initiatives needs to be considered. While donor funds could be used as the basis of establishing distance learning programs on the continent, sound financial planning by African educators to ensure that funds will be available to continue offering distance education programs when donor funding dries up. Tuition has traditionally been where most of the revenue to sustain distance learning initiatives have come from. In addition to this source of funding African stakeholders interested in launching distance learning initiatives could pool resources together to share facilities and offer joint programs. This will go a long way to reduce the start up cost investment in information infrastructure needed to launch distance learning initiatives on the continent.

Universities without walls have a lot of appeal to Africa, given the multiple economic constraints confronting the continent. On-line universities without walls will enable Africans to increase enrollment levels, gain access to up-to-date educational materials through on-line libraries, provide virtual access to the best faculty around the world, share resources, and become part of the global learning community.

Since the concept is still emerging on the continent a leaner support system needs to be put in place to assist students confronted with challenges. Strategies for reducing drop out should be put in place to ensure successful completion of programs.

Africans need to examine the pedagogical effectiveness as well as the cost of each of the available delivery platforms to ensure that it has the capability of meeting the educational needs of institutions that make use of it.

The complexities for introducing distance education to the continent is enormous. But, this initiative appears to represent hope for the millions of Africans who are looking for access to higher education. It is our hope that through distance learning opportunities, fewer Africans will leave the continent for better opportunities elsewhere. The hope is that we can become a team of friends and devoted collaborators, pooling our experiences, resources, and connections to serve the African continent.

References

African Virtual University Pilot Phase (1997). Executive Summary. Http://ww.avu.org

Ani, M. (1994). Yurugu: An African-Centered Critique of European Cultural Thought and Behavior. Trenton, NJ: The African World Press.

Asantem M. K. (1998). The Afrocentric Idea. Philadelphia, PA: Temple University Press.

Association for the Development of Education in Africa (1999). Tertiary distance learning in Sub-Saharan Africa. Newsletter 11 (1), (January-March) 1-4.

Baranshamaje, E. (1996). The African Virtual University. http://www.avu.org

Barker, B. O, Dickson, M.W. (Nov./Dec. 1996). Distance Learning Technologies in K-12 schools: Past, Present, Future Practice. TechTrends. 41(3), 19-22.

Bork, A. (1993). Technology in Education: An Historical Perspective. In R. Muffoletto and N. Knupfer (eds.). Computers in Education: Social Political and Historical Perspectives. Creskill, NJ: Hampton Press. pp.71-90.

Butcher, N. (1998). The possibilities and pitfalls of harnessing ICT to accelerate social development: A South African perspective. http://www.saide.org.za/conference/unrisd.htm

Cummins, J., Sayers, D. (1990). Education 2001: Learning Networks and Educational Reform. In C. Faltis & R. DeVillar (eds.), Language Minority Students and Computers. Binghamton, NY: The Haworth Press. pp. 1-30.

Cummins, J., Sayers, D. (Spring, 1996). Multicultural Education and Technology: Promise and Pitfalls. Multicultural Education. 3 (3), 4-10.

Daniel, J.S. (1996). Mega Universities and knowledge media: Technology strategies for higher education. London: Kogan page.

Darkwa, O.K. (1999). Continuing social work education in an electronic age: The opportunities and challenges facing social work education in Ghana. The International Journal of Continuing Social Work Education, 2 (1), (Spring), 38-43.

Hanna, D.E. (1998). Higher education in an era of digital competition: Emerging organizational methods. Journal of Asynchronous Learning Networks, 2 (1). Available at http://www.alnorg/alnweb/journal/vol2 issue1/hanna.htm

Harasim, LM. (1993). Networked: Networks as social space. In L.M. Harasim (ed.) Global networks: Computers and international communication. Cambridge, Mass. :MIT Press, pp. 15-34.

International Centre for Distance Learning (ICDL) (1995). The mega universities of the world: The top ten, Open University, Milton Keyes.

Marcelle, G.M. (1998). Strategies for including a gender perspective in African Information and Communications Technologies (ICTs) Policy.

National Center for Education Statistics (1998). Issue brief: Distance education in higher education institutions: Incidence, audiences, and plans to expand. [On-line]. Available: http://nces.ed.gov/pubs98/98132.html

Owston, R. D. (March, 1997). The World Wide Web: A Technology to Enhance Teaching and Learning? Educational Researcher. 26 (2), 27-33.

Rahm, D., Reed, B.J. (1998). Tangled webs in public administration: Organizational issues in distance learning. Public Administration and Management: An Interactive Journal, 3 (1)

Roberts, J.M. (1996). The story of distance education: A practitioner's perspective. Journal of the American Society for Information Science: Special Issue: Perspective on Distance Independent Education, 47 (11), 811-816.

Rogers, S. (1996). Distance education: The options follow mission. In T. J. Marchese (ed.). AAHE Bulletin 1995-1996, 48 (1-10), 62-66.

Sayers, D. (1991). Cross-cultural exchanges between students from the same culture: A portrait of an emerging relationship mediated by technology. Canadian Modern Language Review, 47(4), 678-696.

Spirou, C. S. (1995). Generating a positive student experience in distance learning education. In Jack A. Chambers, (ed.) Selected Papers from the National Conference on College Teaching and Learning (6th, Jacksonville, Florida, April 5-8, 1995). (Report No. HE029794). B.J. Schukis Center for the Advancement of Teaching and Learning, Florida Community College. (ERIC Document NO. ED 401866).

Wiechers, M. (1995). Managing the transformation of the University of South Africa. In D. Stewart (ed.), One world many voices: Quality in open and distance learning, 1 ICDE & The Open University, Milton Keynes, 190-192.

ICTs for Learning
An International Perspective on the Irish Initiative

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Abstract

"Where the appropriate systems of support are in place, then ICT can be experienced as a 'transformative technology' both for staff and for students [Comber & Lawson 1999, p 51].

Around the world governments are investing heavily in promoting the use of ICTs within the school system. Our research explores the Irish Policy Framework (IT 2000) and the National Action Strategies of two European countries, Finland and Sweden. The focus is on curriculum and assessment, and evaluation of the use of ICTs in the classroom, as these are key factors in forming policies to influence the use of ICTs as tools to reshape learning. An underlying aspect of the research is that, due to the use of ICTs by governments for the dissemination of their national strategies, concerned individuals can be empowered to compare and contrast policies, identify best practice and make a contribution to the formation of the policies of their own nation by publishing in turn their research.

The Irish Initiative - An Overview

In 1997, the International Data Corporation (IDC), ranked Ireland in the third division (position 23) with respect to the country's preparedness for the Information Age [IDC 2000]. Recognising that Ireland was lagging significantly behind, the Irish Government's Schools IT 2000 initiative was launched in November 1997 to redress the balance in the area of education [DES 1997]. IT 2000 has yet to be fully evaluated but the implementation of the programme allows for its comparison to similar initiatives in other countries so as to assess and expand the programme.

IT 2000 is a policy framework for the integration of ICTs in first and second-level schools. The core objective of the policy was to put in place an infrastructure to ensure that: *'pupils in every school should have opportunities to achieve computer literacy and to equip themselves for participation in the information society; support is given to teachers to develop and renew professional skills, which will enable them to utilise ICTs as part of the learning environment of the school'* [DES 1997, p. 2-3].

In order to achieve these aims, IT 2000 sought to target action on: classroom resources and infrastructure, teacher skills development and support, policy and research. A key objective was to *'bring about a national partnership involving schools, parents, local communities, and third-level institutions together with public and private sector organisations to meet the project's ambitious aims'* [DES 1997, p.2]. In order to manage the implementation of IT 2000, the National Centre for Technology in Education (NCTE) was set up in March 1998. A key aspect of the plan was that a policy formulation unit was to be set up within the educational ministry to act as the focal point for the formulation of policy in all educational ICT related matters[1].

Since the launch of IT 2000 in 1997, the profile of ICTs within the country at large and the education system in particular has been raised significantly. Most schools are connected, by at least a dial-up line, to the Internet and over 40,000 teachers have participated in at least one course in computer literacy training. A national educational portal (Scoilnet[2]) has been set up and funding has been provided for selected schools that are engaged in ambitious ICT related projects[3].

How effective IT 2000 has been in improving the quality of learning, or to what extent ICT has been integrated into the teaching process, are important questions to ask at this stage but the lack of a large scale integrated approach to assessment should not preclude valid individual assessment of government

[1] The Educational ICTs Co-ordination Unit within the Department of Education and Science (DES).
[2] www.scoilnet.ie
[3] The Schools Integration Project (Support Infrastructure strand) of IT 2000 has produced the best examples of learning with technology. See www.sip.ie for details.

policy. The increasing use of ICTs to disseminate information provides a platform for a widening of the idea of action research so that teachers can learn from reflecting on and assessing their own practice, this should be further expanded to include the role that individuals within a system can have in reflecting on and evaluating their own environments.

We believed initially that ICTs within the classroom is still largely confined to the 'early adopter' category and that severe challenges are in store in any attempt to spread the use of ICTs into the 'late majority'. We decided to check our initial impressions and benchmark Ireland's progress on the treatment of the key issues of evaluation, and curriculum and assessment, compared with that of 'leading countries' in the area of ICTs and learning.

Scandinavian Initiatives

Finland and Sweden are, among two of the Scandinavian countries, regarded as having a progressive approach to Information Society issues in general and education in particular. They are also comparable to Ireland in terms of population and economic climate. Unlike Ireland these countries have had substantial investment in educational action strategies for ICT going back to the early 90's, moreover, they have had the time to learn from evaluations of their previous strategies. Their current strategies for Education are action strategies, which clearly articulate a vision for the reshaping of the curriculum and the organization of learning.

Finland

Finland's most recent National Plan (2000-2004) is a concerted effort to implement a comprehensive action strategy aimed at reshaping the role of learning within, and outside, the school system. The focus of the strategy, "*Education, Training and Research in the Information Society. A National Strategy for 2000 – 2004*" is on education, training and research [Finnish Ministry of Education 1999]. While a strategy, of itself, does not create educational change, the commitment on the ground may be furthered with strong signals from the top that in turn support bottom up initiatives. In terms of equality of opportunity, the plan safeguards corresponding standards for both students and teachers. The Finnish strategy provides students and teachers with a detailed framework for the organisation of learning, in contrast with the Irish framework, which appears to lack this dimension in its planning. Furthermore the strategy is a learning and motivation campaign for the population as a whole. It focuses not just upon formal education, but also on all sectors and includes all citizens, from the very young to the elderly. One of the key aims of the Information Age is empowerment of the individual in terms of life-long learning. This is emphasised in the Irish Government's action plan for implementing the Information Society, where it is stated that, '...developing the concept of lifelong learning, of extending access to the formal educational infrastructure to those outside the formal education process and of identifying further options to introduce new learning possibilities for the population in general' [Government of Ireland 1999]. 'Learning to learn' is one of key indicators in a recent EU report on the quality of school education [EU 2000] and the Finnish strategy recognizes this importance and that students and teachers need to improve their skills in the area of communication and in the acquisition of, and management of, information.

Sweden

Support from the top has been recognized as one of the key factors in achieving innovation in the Information Age and the Swedish IT Commission has played a highly influential role in supporting governmental developments in this area. The present commission, appointed in May 1998, is chaired by the Minister of Industry and Commerce. An interesting aspect of the Swedish Information Age initiative has been the setting up of a Youth Council to encourage discussion on the future society from young people's perspectives and, in addition, to propose political actions to respond to the progression towards a future society based on the use of ICT.

In 1998, the Swedish Government submitted to Parliament the report "Tools for Learning -A National Programme for ICT in Schools. [ITiS 1997]. The Delegation for ICT in Schools was given the task of planning and implementing the programme, which became know as the National Action Programme 1999-2001 [ITiS 1998]. The emphasis of the plan is on teaching with technology, rather than teaching about technology, emphasised by Wärnersson stating that: '*The new technology will not replace teachers, textbooks or the classroom. It will supplement them by creating new combinations of* *opportunities and help to put pupils' learning in the very centre.'* [The Minister for Schools and Adult education 2000][4]. It is based upon a revised curriculum and subsequent changes in the learning environment. In scope it covers pre-school, compulsory school and the upper secondary school. The implementation plan was initially expected to involve 60,000 teachers (40% of teaching workforce) but has recently been increased to reach 73,000 teachers.

From Policy Framework to Action Strategy - Issues

As previously stated IT 2000 has had a significant impact on the Irish education system. From the strategic point of view, however, a number of aspects of IT 2000 bare reflecting upon and these are now discussed with reference to the Scandinavian initiatives.

Overall Scope and Aims

The original IT 2000 framework document stated that, *'among the most important outcomes of the framework will be a comprehensive national policy on the role of ICTs in Irish schools together with a strategic action plan specifying the activities and resources necessary to fully implement the policy'* [DES 1997 p.22]. A policy unit, however, was not formally set up until October 2000, which meant that an air of uncertainty surrounded much of the implementation work of the program.

One of the key aims of the Information Age is empowerment of the individual in terms of life-long learning. This view is echoed in much of the Information Society literature, for example [ISC 1999, 2000]. The focus of IT 2000 has however been upon first- and second-level schools within the formal education system with other areas receiving attention only from parallel initiatives – if at all. This contrasts sharply with the Finnish strategy, which embraces all learners from the very young to elder citizens.

At the outset of planning in Ireland it was acknowledged that integrating ICTs in learning is a complex process. It was also accepted that revolutionary approaches and 'quick-fix' solutions involving extensive expenditure on hardware and software can carry the very high risk of large-scale waste and furthermore of outright failure [DES 1996]. With this awareness incorporated into the overall policy, IT 2000, nonetheless, allocated 60% of its total budget on equipment and infrastructure. One justification for this was the relatively low base from which schools were starting.

The most recent data available from the NCTE states that the total number of computers in schools has increased by 65% since 1998, with the current student to computer ratio at Primary level being 18:1 and Post Primary 13:1. All schools are now connected to the Internet by at least a dial-up line. 69% of Post Primary schools have an ISDN line and 62% of all schools have Internet access on more than one machine.

According to an international survey carried out by Angus Reid, 78% of Swedish students, between 12-24 years, are using the Internet from school (nearly three-in-four students in Sweden say they use the Internet from school, a proportion roughly equivalent to the level of home Internet access). More than nine-in-ten students who have Internet access report using the World Wide Web to complete their school assignments. [Angus Reid 2000].

Evaluation

Evaluation of the effectiveness of the use of ICTs for learning is a fundamental concern at present, particularly as there is a remarkable absence of reliable data on the use and effects of ICTs in European countries. One of the key recommendations of a European report, focussed on how learning with ICTs is changing (13 countries), was that EU 'central ministries and regional authorities should co-operate in gathering, analysing and disseminating data, not only on inputs into the system such as pupil/computer ratios, but also on process variables such as deployment and pupil/teacher access time and actual

[4] ***Ms Wärnersson, Minister for Schools and Adult education***, in a foreword on ITiS website: http://www.itis.gov.se/english/back.html#A National Action programme for ICT - why?/

outcomes' [Becta 1998, p17]. Government supported initiatives in Finland and Sweden are to the forefront in this regard, while to date most of the studies of IT 2000 have been quantitative rather than qualitative in nature.

Prior to and during the period of the Finnish National Strategy 1995-1999, significant funding was made available to schools, universities and vocational institutions in order to purchase ICT equipment to network schools and to fund teacher training. The Finnish Parliament's 'Committee for the Future' adopted 'ICTs in Teaching and Learning' as one of its evaluation projects and asked the Finnish National Fund for Research and Development (Sitra) to administer it. Hundreds of pupils, teachers, decision-makers, researchers and officials participated in the project. Various reports focused upon: universities, kindergartens and institutions of general and vocational education, lifelong learning and digital learning materials. In addition to eight reports published in Finnish, a final report was published in English entitled 'The Challenges of ICT' [Sitra 1999]. The important value of these reports is the extent to which they were able to inform subsequent policy formation.

'.... the investigation is not limited to schools, for studying is breaking down school walls more forcefully than ever before, extending itself to be a lifelong learning and open activity of many forms without being limited to place or time. We follow it to homes, old people's homes, libraries and businesses.'. [Sitra 1999]

The Swedish National Agency of Education (Skolverket) plays a strong role in ensuring the collection and analysis of data from ongoing learning projects in the schools. Follow up research activities are undertaken by a special research unit within the agency. Skolverket also sponsors the research programme ELOIS (Students, Teachers and Organisations around Information Technology in School), which is an extremely important participant in the evaluation of ongoing activities [ELOIS 2000]. The work it produces includes annual reports on the influence of ICTs on the role of student, teacher and organization of work. The agency is supported in this work by eleven centres across Sweden. In addition to four quantitative studies (supply and resources of computers), extensive qualitative reports with information on international experiences are also available, [Skolverket 2000]. Further information is available from the Foundation for Knowledge and Competence Development (KK-Foundation), established in 1994, which has put in place a web-based database of projects. The projects are used to evaluate and test innovative activities using ICT as a pedagogical tool. The wide and varied experience of involvement in over 250 projects, ranging from Teaching Materials to Disability and ICT, are disseminated to aid in influencing future developments [KK 2000].

Thus it can be seen that substantial qualitative studies are central to the two Scandinavian initiatives. Ireland could benefit from following such examples.

Curriculum, Assessment and Learning Environment

Curriculum and assessment are at the heart of any educational system and to a large extent shape the nature of the learning environment. A key objective of IT 2000 was the introduction of curriculum innovations to enhance learning through the use of ICTs in the classroom [DES 1997 p. 26]. This development was to be achieved through co-operation with the National Council for Curriculum and Assessment[5] (NCCA). While one of the principles of NCCA policy is that all learners should use ICTs in relevant curriculum contexts, [NCCA 1998], there is only limited mention of ICTs in many of the revised curricula. This holds particularly true for the new Primary Curriculum[6], Junior Certificate and Leaving Certificate[7] curricula. This has very serious implications for the organisation and reshaping of learning in Irish classrooms. The syllabi afford great freedom to innovate, the process, however, is not credited in national assessments. While there is much talk about the benefits of life long learning, Little (1991) referring to the Irish educational system notes that 'For many learners at second and third levels the most important thing is not that they should learn, but that that they should get good qualifications' [Little 1991, p. 47].

Teachers understandably see the curriculum, and particularly assessment requirements, at second level, as not yet strong enough to make the integration of ICTs an imperative for schools. Evidence of this is

[5]The National Council for Curriculum and Assessment (NCCA) is the body responsible for advising the Minister for Education on matters related to the curriculum and assessment procedures for primary and second level education.

[6] A new Primary School Curriculum was introduced in 2000.

[7] The Leaving Certificate is the nation-wide state examination taken at the end of second-level education. For most students the results of this exam is the sole criteria taken into account for entry to 3rd level education.

found in a recent survey of Irish post-primary teachers, where it is reported that just 29% of the teachers surveyed had used ICTs in teaching [Mulkeen 2000]. Conway argues that 'IT 2000 underestimates the curricular scope of computer literacy and although it is not a curriculum document, the inattention to the curricular scope of ICT integration is problematic' [Conway 2000]. Austin et al [NCTE 2000, p. 88] argue that if the intention is that ICTs will have a catalytic effect on classroom practice, policy must play a critical role in ensuring that curriculum and assessment systems accommodate this change.

In Sweden, since 1992, there has been a major shift in focus from teachers teaching to pupils learning. The new curricula and syllabi state that all subjects should integrate the use of computers as a tool where appropriate [ITiS 1998]. In line with this, assessment structures and the organisation of learning and the leaning environment have also been modified. ICTs are seen as powerful tools to promote the transition from one teacher in one classroom to teams of teachers working together with larger groups of students.

> *"Evaluations of ICT projects in schools provide strong evidence that only when the organization of work has been changed can the introduction of ICT fully support the learning of children."* [ITiS 1997]

An outstanding example of a collaborative and integrated learning environment is the Swedish Färila[8] Project, where classrooms have been replaced with open areas and the traditional teaching style replaced by a more collaborative learning focus. All students have access to a personal portable computer. Just 16% percent of time is spent studying with a teacher, reduced from 42% in 1995 [Knut 2000]. This radical overhaul has contributed to the raising of grades in one particular school from one of the lowest in the country in 1993, to being a school with one of the highest grades in 2000.

Across Sweden inter-disciplinary, problem-based and pupil-oriented development projects are planned and carried out together by pupils and teachers working in teams. The aim is to promote and develop the learning approaches of students and teachers. A pedagogic facilitator appointed by the municipality supports the teams, but using each other's knowledge is prioritised. Furthermore, each one of the teachers was supplied with a multimedia computer for the home. The idea behind this is that teachers who use computers at home will use it as a professional and pedagogical tool. Local conditions and the individual desires and needs of participants are taken into consideration in the planning of training for students and teachers. Active involvement of Head Teachers is strongly encouraged and supported. The work of schools involved must be organised in such a way for the team to be able to work effectively on a joint development project. The school must ensure that it has in place technology of appropriate capacity and of sufficient quality to support the work of the team. Organized technical assistance for the participants is at hand to ensure that ICT functions as a working tool in the classroom, [ITiS 1998].

Similar characteristics can be found in the Finnish strategy, which places strong emphasis on the participation of students. The plan acknowledges students' information technology skills and encourages their participation in the practical operation of educational establishments. Even more importantly the involvement of students in the preparation of teaching materials is encouraged. Students, especially female ones, are encouraged to participate through the awards of scholarships, fees and involvement in competitions arranged with appropriate business sectors. In keeping with the emphasis of the role of the learner, the curriculum has been changed. The Finnish policy, moreover, emphasises a move from the classroom to the development of an open learning environment. There is a specific action in the plan devoted to the planning of education and educational establishments and their influence on the teaching and the learning environment.

Conclusion

Bearing in mind, *'that among the most important outcomes of Schools IT 2000 will be a comprehensive national policy on the role of ICTs in Irish schools together with a strategic action specifying the resources necessary to fully implement the policy'*, Ireland has much to learn from developments in Finland and Sweden [DES 1997, p4]. IT 2000 noted the high ranking of small countries and, in particular, the fact that all these countries had national strategies for integrating ICTs [DES 1997, p.14].

[8] The Färila school website is at: http://www.farila.ljusdal.se/farila_skola/default.html
(Information available in Swedish only).

In Finland and Sweden, the National Strategies have played their role, but even more importantly comprehensive action plans have been developed arising from in-depth evaluation of learning with ICTs in both countries. Finally, evidence of the recommendations of the evaluation of ICTs for learning is evident in the incorporation of an adjusted rethinking of curriculum, assessment and learning environment in the action plans of both countries. In summary, both action strategies have evidently prioritised the pedagogic and catalytic goals for integrating ICTs alongside, but not above the social, vocational and economic benefits of their use.

> *"...many countries are just at the start of a very long and challenging road ahead, but it is intended to make that path somewhat easier by distilling the wisdom from what others have learned and sharing the results."* [Becta 1998]

References

- Angus Reid [2000] *Internet invaluable to Students Worldwide.* Face of the Web. Media Release Centre. New York: Angus Reid. *http://www.angusreid.com/services/p_face.cfm*
- Becta [1998] *How learning is changing: information and communications technology across Europe - ICT in education policy.* Coventry: British Educational Communications and Technology Agency.
- Comber, C. & Lawson, T. (1999) *Superhighways Technology: personnel factors leading to successful integration of information and communications technology in schools and colleges.* Journal of Information Technology for Teacher Education, Vol. 8, No. 1. Accessed at: Triangle Journals. Oxford: Roger Osborn-King. http://www.triangle.co.uk/jit/08-01/08-1.htm
- Conway, P. [2000] *Schools Information Technology (IT) 2000: Technological Innovation and Educational Change.* Dublin: Irish Educational Studies.
- DES [1996] *Submission by the Department of Education to the Information Society Steering Committee.* Dublin: Department of Education and Science. http://www.irlgov.ie/educ/publications/243e33a.htm
- DES [1997] *Schools IT 2000. A Policy Framework for the New Millennium.* Dublin: Department of Education and Science.
- Elois [2000] *Students, Teachers and Organisations of Information Technology in Schools.* Uppsala University.
- EU [2000] *European Report on Quality of School Education: Sixteen quality indicators.* Luxembourg: Office for Official Publications of the European Communities. http://wwwhotel.uu.se/ped/forskning/foprojekt/ELOIS/
- FME [1999] *Education Training and Research in the Information Society. A National Strategy for 2000 – 2000.* Helsinki: Finnish Ministry of Education. http://www.minedu.fi/julkaisut/information/englishU/welcome.html
- Government of Ireland [1999] *Implementing the Information Society in Ireland: An Action Plan.* Dublin: Department of The Taoiseach. http://www.irlgov.ie/taoiseach/publication/infosocactionplan/infosoc.htm
- IDC [2000] *Measuring the Global Impact of Information Technology and Internet Adoption.* New York: International Data Corporation. http://www.worldpaper.com/ISI/country.html
- ISC [1999] *Building a Capacity for Change - Lifelong Learning in the Information Society.* Dublin: Information Society Commission.
- ISC [2000] *IT Access for All.* Dublin: Information Society Commission. http://www.irlgov.ie/taoiseach/publication/default.htm
- ITiS [1997] '*Tools for Learning: A National Programme for ICT in schools.*' Delegation for ICT in Schools. Stockholm: Ministry of Education and Science. http://www.itis.gov.se/english/IT_iskolan.pdf
- ITiS [1998] *Swedish National Action programme for ICT in Schools. 1999-2001.* Delegation for ICT in Schools. Stockholm: Ministry of Education and Science. http://www.itis.gov.se/english/ITiSEng.pdf
- KK Foundation [2000] *Examples of Projects.* Stockholm: The Foundation for Knowledge and Competence Development. http://knut.kks.se/english/projekt/
- Knut [2000] *A School with no classrooms.* Stockholm: The Foundation for Knowledge and Competence Development. http://knut.kks.se/projekt/english/reportage/980324.asp
- Little, D. [1991] *Learner Autonomy 1. Definitions, Issues and Problems.* Dublin: Authentik.
- Mulkeen [2000] *The Place Of ICT In Irish Schools: Early Indicators of the Changes since IT 2000.* Dublin: Conference 2000. The Educational Studies Association of Ireland (ESAI).
- NCCA [1998] *Information and Communication Technologies in the Primary and Post-Primary Curriculum.* Briefing Prepared for the Learning Advisory Group of the Information Society Commission. Dublin: NCCA.
- NCTE [2000] *Dissolving Boundaries. ICT and Learning in the Information Age.* Dublin: National Centre for Technology in Education.
- Sinko, M. and Lehtinen, E. (1999) *The Challenges of ICT in Finnish Education. Report 227.* Helsinki: Finnish National Fund for Research and Development. (Sitra). http://www.sitra.fi/julkaisut/pdf/Challenges_of_ICT.pdf
- Skolverket [2000] *Schools and Computers 1999, a quantitative picture. Report 176.* Stockholm: National Agency for Education. http://www.skolverket.se/studier/it/dator99/english.shtml

An In-Service Program in Applied Linguistics for Language Teachers

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Abstract: Given the recent rapid changes in the educational field in Mexico many language teachers face new challenges for which even recent graduates of training programs may be ill-equipped to deal with effectively. Among other new challenges, teachers are being expected to take an ever more active role in syllabus, program and materials design. They are also increasingly expected to be able to manage new technologies. In order to participate they need to transform themselves from technicians to professionals and to do this they need updating in the theoretical and practical bases of their field. This project, sponsored by the National University's Support Program for Institutional Projects for the Improvement of Teaching, hopes to address these needs through a model which combines the applied linguistic content with experience in the use of educational technology.

Objective

The project's objective is to design a distance-learning teacher-education model, including courses, that might serve as the basis for in-service development of language teachers at the high school and university levels, in the area of applied linguistics. The goal of the project is to create a learning community among course participants. They will experience (in many cases for the first time) the use of educational technology to support their learning and will become both independent and collaborative learners. Proposed activities will encourage interactivity within the learning community; participants will inevitably discuss, argue and share their beliefs and ideas about their own teaching. In the long run we hope to create colleagues not only former students.

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Background

Since 1980, the Foreign Language Center at the National Autonomous University of Mexico has trained more than 800 foreign language teachers. These teachers work at both public and private high schools and universities. In conjunction with the Graduate Program in Linguistics, the center offers both a Masters in Applied Linguistics and a Doctorate in Linguistics.

This project is part of a university-wide program to benefit researchers and teachers. In an effort to respond to teachers' needs for better professional development, a group of researchers at the Foreign Language Teaching Center proposed designing a Distance Learning Diploma in Applied Linguistics that, to date, would be unique of kind. Preliminary work on the project began two years ago and other centers have become involved, particularly in such areas as distance learning, web page design, and the use of educational technology. The research team is now complete and the development of the teacher-education model and course design are fully under way.

The project was inspired by the previous work done on distance education and most particularly on the work of Dulce Gilbón Acevedo who with Karen Lusnia designed the first course in distance education for professors at our center (Lusnia & Gilbón 1998) and most especially on the work done by Dulce Gilbón for her master's thesis on the need and possibilities for graduate education in applied linguistics. (Gilbón 1998) On these foundations the project was designed and approved, and with the new year we began to work in earnest.

The program

The program consists of a series of courses related to the most salient areas in the field of Applied Linguistics, i.e. Introduction to Applied Linguistics, Psycholinguistics, Sociolinguistics, Evaluation, Reading Comprehension and Linguistic Aspects in Communicative Approaches. At the very beginning, a course called "How Do I Learn Applied Linguistics through Distance Learning?" is required. This is a 30-hour course to give an orientation to the use of educational technology and to teach some basic information on Applied Linguistics. This course has been piloted once and although it has been well received is being revised.

The program is in a sense open ended. These courses, or modules, are basic to teaching situations of the participants but as more modules are created it is hoped that the teachers can design a program that fits their own needs.

The model

The development of the teacher-education model has taken the following issues into account:

a) Teacher development. Continuous teacher education is absolutely necessary for high school and university teachers. Both the model and course content have to meet their needs.

b) The design of the program. A constructivist/collaborative perspective seems to be the most promising.

c) Materials development. Both printed and on-line materials will be used. If necessary, CD-ROMS, cassettes and videocassettes will also be developed. The criteria for the use of media must be based on the goals and needs of the participants on the practicalities of their situations-

d) The role of educational technology in all of the above

In the research team's view, a teacher-education model is a symbolic representation of the teaching-learning process. However, a model can be interpreted in different ways, as it is only a way of looking at interrelated issues. The same model can be interpreted at different levels: epistemological, theoretical or methodological. In the development of this model we refer to those theoretical issues that have been considered up to now and that have been fully discussed by the project team.

Although the final model is still a rather vague and heuristic one, the discovery process of the interaction in the development team has lead to a reconstruction of views even among those of us who have taught instructional design. Some of the models we have discussed have been algorithmic, some impressionistic but the above elements have appeared in all.

Teacher development

Teacher development is a continuous process. It can be an independent process in the sense that it is the teachers themselves who want to take part in a development program. Teachers will come to the program with their own experiences, with background knowledge about each of the courses, and with expectations and ideas about what teaching is, and about the use and usefulness of educational technology. In the learning process itself, they will be confronted with new knowledge that will help them to think about their teaching practice and their attitude towards the program. Course activities will lead teachers toward learning by doing and experiencing, and reflecting on what has been learned. (Scrivener 1994, Díaz Barriga & Hernández 1998)

It is also important to consider at this point the fact that teachers are adult learners who, by definition, grew up without the most recent technological innovations; inevitably, some will resist the change from print to "on-line". They can be expected to take time adjusting to the virtual classroom. Thus, the project cannot rely exclusively on multimedia technology. The goal is to introduce or seduce the participants into seeing the advantages that they can achieve by the use of the technologies. In our pilot of the first course these issues emerged as might be expected but the trend was definitely positive and the web based activities were a "hit".

Applied Linguistics

The field of Applied Linguistics has not yet been well defined. Some authors still see it as part of Linguistics. (Barriga y Parodi 1998) Nonetheless, in general, it can be considered an interdisciplinary area that tries to solve problems related to language. A look at the topics of international academic events shows its breadth: bilingualism, language therapy, curriculum design, intercultural communication, and so on; however, it is not the number nor the kinds of topics that Applied Linguistics deals with, but rather the interest in identifying uses that leads to the development of theroetical models that can help in the explanation of problems related to language. The theoretical aspects of the field are precisely those that participants need to justify their projects and to participate fully in the roles they are acquiring. All teachers who participate are credentialed teachers and many have years of experience.

Distance Learning

Distance Learning makes learning possible through the virtual classroom which, according to Porter (1997), should ideally recreate an effective learning environment creating the conditions and providing students with the tools in order to respond to their expectations and needs. Distance learning is, according to Harrison (1999), often applied to the materials and media that allow people to learn away from a source of expertise or training. Therefore, we also have to consider that technology is a support, a tool that will be used by teachers and learners to have access to knowledge but at the same time we can learn with technology and from technology. Therefore we must review carefully what we want from it.

There is a direct link between distance learning and self-directed learning. Self-directed learning describes a particular attitude to the learning task, where the learner accepts the responsibility for all the decisions concerned with his learning but not necessarily undertake the implementation of those tasks (Dickinson, 1987). Here, we can realise that the learner is an autonomous and independent one, but the process he/she has to go through is neither easy nor fast.

The role of educational technology

In recent years, there has been a consciousness raising wave towards the way technology should be treated in schools. Jonnassen, Peck and Wilson (1999), under a constructivist perspective, amongst other issues, assume that:

- Technology is more than hardware. It consists of the designs and environments that engage learners.
- Learning technologies can be any set of activities that engage learners in active, constructive, intentional, authentic and co-operative learning.
- Technologies support learning when they fulfill a learning need.

From these ideas we can see that working under a constructivist perspective serves as a guide to develop appropriate methodology (clear objectives, activities, assessment and self-assessment techniques) and appropriate materials to implement the mentioned courses. In order to make to right link with all these aspects it is necessary a clear understanding of the whole constructivist paradigm.

References

Dickinson, L. (1987). *Self-instruction in Language Learning.* Cambridge: Cambridge University Press.

Gilbón A., Dulce M. (1998). *Bases teóricas y empíricas para la creación de posgrados en lingüística aplicada a distancia.* Unpublished Masters thesis. National Autonomous University of Mexico.

Harrison, N. (1999). *How to Design Self-directed and Distance Learning Programs.* McGraw Hill.

Jonassen, D., Peck, K., Wilson, B. (1999). *Learning with Technology.* Merrill. New Jersey.

Lusnia, Karen & Dulce M. Gilbón A. (1998) "Una experiencia del uso de Internet para la actualización de los profesores sobre educación a distancia en el CELE-UNAM." *Memorias del Congreso General de Cómputo.* Mexico:

Scrivener, J. (1994). *Learning Teaching.* Heinemann.

Diaz Barriga, F., Hernàndez, G. (1998). *Estrategias Docentes para un Aprendizaje Significativo.* McGraw Hill.

Porter, L. (1997). *Creating the Virtual Classroom. Distance learning with the Internet.* Wiley Computing Publishing. USA.

Virtual Exchange Program:
Coming to a Computer Near You?

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Abstract: In the spring of 2000, a"Virtual Exchange Program" was piloted by the Koerber Foundation's Transatlantic Classroom project. The intent of the program, initiated by the author, was to allow American high school students of German to electronically correspond with Americans of the same age who were in Germany on a one-year, U.S. Congress-Bundestag Exchange Program.

Introduction

Since the medium for the American-to-American correspondence about Germany transpired primarily in English, the rationale for this pilot program was not based upon teaching Americans German. The program sought to introduce an intercultural experience into the foreign language classroom that would directly stimulate and provide for an interest in contemporary German culture.

Findings

American exchange students in Germany corresponded with high school students of German in America (in Bozeman, Montana). Highlights of their correspondence, conducted via an electronic bulletin board, have been archived at:

http://www.tak.schule.de/amvoices.htm

Based upon the author's five years of experience in American-German K-12 email exchanges, the American exchange students in this pilot program appeared to notice things while in Germany that native students would not notice or would not recognize as worth sharing. This was the general finding of the pilot Virtual Exchange Program, which sought to multiply the positive intercultural learning that takes place when students are able to study and live abroad.

Plans

This spring (2001), the Virtual Exchange Program pilot sponsors would like to expand the program to include more Americans, both at home and abroad. They would also like to begin to build a program for German students of (American) English to electronically correspond with German students on exchange programs in America.

The Virtual Exchange Program, as piloted, may eventually become a comprehensive website that allows students in America and Germany to find "virtual connections" to students on exchange in the target culture. The website would offer both links to information about U.S. states and German Bundeslaender, as well electronic bulletin boards creating electronic access to exchange students in those regions.

An Overview of Information Technology on K-12 Education in Taiwan

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Abstract: Under the support of the government's National Information Infrastructure project, ease of Internet access has increased dramatically at all levels of schools in Taiwan in recent years. In an effort to speed up preparation of tomorrow's teachers to use technology (PT3), the Ministry of Education of Taiwan has launched several multi-million U.S. dollar projects to facilitate and to promote the use of information technologies in the classrooms and in teaching across all subject areas. Those national efforts are directed at improving networking infrastructure, the computing environments, the digital educational resources, and on teacher training. In this paper, we will report the endeavors undertaken, the accomplishments, the current and on-going PT3 related projects in Taiwan and discuss the issues that have emerged.

Introduction

Under the support of the government's National Information Infrastructure project, ease of Internet access has increased dramatically at all levels of schools in Taiwan in recent years. In an effort to speed up preparation of tomorrow's teachers to use technology (PT3), the Ministry of Education (MOE) of Taiwan has launched several multi-million U.S. dollar projects to facilitate and to promote the use of information technologies (IT) in the classrooms and in teaching across all subject areas. In 1999 alone, over $200 U.S. million dollars were subsidized to expedite the process of modernizing all K-9 schools with IT equipments and to broaden the scope of teacher IT trainings. On the infrastructure side, all K-12 schools (3555 in all) now have at least one multimedia PC lab. Furthermore, all are connected to the Internet. Funding is also being appropriated to install IT equipments in all the classrooms. On the teacher training side, several venues are being explored to increase teachers' IT awareness and proficiencies. Lastly, collaborative effort among 80+ selected K-12 schools has been under way since early 1998 to amass educational resources in various subject areas, making Chinese instructional resources readily available on the Web. It is hoped that with the aid of computer technology, the educational resource gap between urban and rural schools may be bridged. In this paper, we will report some of those projects and the issues that were encountered.

Current State of NII for K-12 Schools

Information Infrastructure

1. All K-12 schools are connected to the Taiwan Academic Network (TANet).
2. K-12 schools to TANet Bandwidth: using ADSL technology, upload at 384Kbps, download at 1.5Mbps.
3. TANet Backbone Bandwidth: OC-3 (155Mbps) around the Taiwan Island.
4. TANet to Internet Bandwidth: One T3 (45Mbps) and two T1 (1.544Mbps) trunks to the U.S.

Instructional Computing Equipment at K-12 Schools

1. PC Lab: For each K-12 school, there is one PC lab per 35-40 classes. The PC lab is equipped with enough multimedia PCs, typically 25 to 40, so that every student in the class can have access to one PC. Each PC lab is also equipped with at least one scanner, one digital camera, one laser printer and an instructional broadcasting system. (Project completed in June 1999)

2. IT enabled classrooms: For each regular classroom, installation of one PC/Notebook and one LCD projector/digital TV is being planned. In addition, those PCs/Notebooks will be connected to the campus network so that access to the Internet is possible.

Digital Content Resources for K-12 Teachers and Students

1. CAI software: The MOE sponsored projects have develop over 650 CAI/CAL titles across all subject areas to supplement classroom instructions. The project is on-going and was first initiated in February 1993.
2. NERC: The National Educational Resource Center (NERC) was set up in February 1998 to provide instructional resources for all teachers of all subject areas. Eighty K-12 and vocational schools were selected to develop Chinese instructional Web contents. Besides the instructional materials, the test banks, the other resource links, and contents on local cultures and places of interests, each school maintains a discussion forum to provide timely assistant to all users (teachers and students alike). NERC has an annual budget of U.S. $4,000,000 dollars and currently houses over 30 GB of data.
3. EduCity: EduCity provides an environment for social learning on the net. Virtual elections, distance learning courses, and electronic journals can all being offered in this virtual environment. This is an on-going project that was first initiated in July 1999.

Preparing Tomorrow's Teachers to use Technology (PT3)

1. In an effort to prepare teachers to use technology, the MOE annually sponsored on-the-job IT training courses to teachers through colleges and universities in Taiwan. These courses range from introductory hands-on courses to theoretical advanced network management courses. In 1999 alone, over 8000 teachers have taken advantage of 173 courses.
2. In the 1999-2000 school year, special funding was appropriated to all K-9 schools to provide basic IT training to all teachers and administrative staff within the school. Recent spot checks on school personnel have shown an increase of IT awareness by the teachers. However, the level of IT competency differs greatly from school to school.
3. The MOE is initiating a new project to set national norm on IT proficiency for all K-12 teachers. Upon completion of this project, all incoming teachers will need to be IT-proficient with respect to the standard set forth in this indicator. Furthermore, this indicator will also serve as a measuring stick for evaluating the effectiveness of within-school IT training. Final indicator is scheduled to be completed by June 2001.

Issues and Discussions

Being the principle investigators or project leaders of several of the above mentioned projects, we have observed several interesting issues relating to preparations of teachers to use technology in the classrooms.

1. With the MOE pressing ahead with installing IT equipments into each classroom, we need to think whether having IT equipments in regular classroom is the proper physical setting for doing IT-integrated subject teaching. Or perhaps setting up specialized IT equipped classrooms is a better way to accomplish the same goal.
2. Is regular classroom + IT equipment the proper physical setting for doing IT-integrated subject teaching?
3. What are the K-12 school administrators' views on IT integration? Do they support IT integration? What roles are they willing to play in this IT revolution?
4. What are the teachers' attitudes toward using IT in the classroom? Do they all embrace the idea? Or are they being forced upon by the administrators?
5. The second information technology in education study (SITES) by International Association for the Evaluation of Educational Achievement (IEA) has concluded that adequacy of teacher training is still the major problem faced by most nations. With the multi-million dollars projects at the national level, it is hoped that the teachers in Taiwan are more acquainted with the use of IT in their classrooms.

Evaluation of the Girls Research Opportunities in Computing (Girls R.O.C.)

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Introduction

The Department of Computer Science at the University of Louisiana conducted the NSF/Girls R.O.C. program that was a three-week summer residential project during the month of July 2000. Twenty-four middle school girls were recruited within a 90 miles radius of the campus and experienced a variety of hands-on activities that exposed them to software applications that are used in research, business, and the home. The participants lived on campus with six female undergraduate science majors that served as their mentors/counselors. Activities for the girls included the following: an orientation to campus and dormitory life, defining and developing ways in which the computer is used as problem-solving tool, and becoming familiar with ways the computer and the Internet can be used for research purposes.

Activities

During the first week students were introduced to software packages such as Windows 98, MicroWorlds, Netscape, and Office 2000. MicroWorlds served as a useful tool for introducing programming concepts to the young scholars, and facilitating hands-on experience with artificial intelligence and graphics applications. The Office 2000 Suite introduced business software packages to the participants that included a word processor, a database manager, presentation software, and spreadsheets. A camp newspaper was created using Word 2000 while PowerPoint was utilized by the four research groups to present their research findings at the closing day symposium. In addition to the classroom and lab activities, several field trips and evening seminars with outstanding scientists were conducted.

Research Groups

The twenty-four girls were divided into three research teams and assigned to a research project adviser. The research groups were: Software Engineering (SE), Data Mining (DM), and Expert Systems (ES). Software Engineering investigated the software development models and implemented a small system to familiarize the participants with proper SE techniques. The Data Mining group used Excel's data analysis tools to test hypotheses and to make inferences about their experiments. The Expert Systems group studied the area of artificial intelligence and expert systems that familiarized them with problems that are non-numeric. The solutions to these problems used the stepwise refinement method for system development. During the three follow-up visits to the ULM campus during the Fall 2000 semester, the participants have developed science fair projects and updated their web pages. The URL for the Girls R.O.C. site is http://cs.ulm.edu/~girlsroc.

Evaluation Procedures

The Computer Attitude Questionnaire (CAQ) was administered to the participants at the outset of the 3-week program (pre-survey), at the end of the 3-week program (post-survey), and 10 weeks after the completion of the program (follow-up survey). Prospective studies, such as this, are studies in which the same characteristics are measured on subjects that are followed forward through time and are referred to as repeated measures experiments.

To assess attitudinal changes over time, a multivariate analysis of variance was performed using a one factor repeated measures design. The Wilk's Lambda test statistic ($F = 2.1872$, p-value $= 0.0115$) indicates that differences in attitudes are present among the three survey times. Table 1 below shows the average responses, the individual F-test statistic and its associated p-value for each of the subscales.

Table 1
CAQ Subscale Summary and Test Statistics

Area	Subscale	Means			F-value	p-value
		Pre-	Post-	Follow-up		
YCCI	Computer Importance	4.0455	4.0485	4.0208	0.01	0.9889
	Computer Enjoyment	3.8131	3.7904	3.7927	0.92	0.4072
	Study Habits	3.9182	3.8932	4.1125	4.21	0.0236
	Motivation/Persistence	3.6534	3.7102	3.8438	0.94	0.4017
	Empathy	4.1500	4.1818	4.2188	2.29	0.1170
	Creative Tendencies	3.6504	3.7392	3.9319	4.44	0.0196
	Attitudes Toward School	3.1424	3.3894	3.4271	0.59	0.5612
	Computer Anxiety	3.3003	3.2630	3.3404	0.71	0.4971
	Self Concept	4.2470	4.3000	4.3375	0.50	0.6084
	General Skill Level	3.4426	3.7110	3.5893	1.03	0.3681
TPSA	E-Mail	4.1591	4.6212	4.5833	6.26	0.0050
	The WWW	3.8523	4.6136	4.4844	11.90	0.0001
	Integrated Applications	3.3333	4.3333	4.1771	14.64	0.0001
	Graphics	3.4545	4.1364	4.2500	4.67	0.0163

Significant Subscales

The subscales where significant effects over time were observed are in both the Young Children's Computer Inventory (YCCI) and the Technology Proficiency Self Assessment (TPSA) areas. Significant effects were observed in the YCCI subscales of Study Habits ($F = 4.21$, p-value = 0.0236) and Creative Tendencies ($F=4.44$, p-value = 0.0196). According to Duncan's Multiple Range procedure, the attitudes of these students did not show any evidence of change over the 3-week program; however, when measured at the 10-week follow-up portion of this study, a significant increase in their attitudes was observed.

When considering the subscales of the TPSA, changes in student attitudes were observed in all characteristics. In each of these, the end of the 3-week program significantly improved their attitudes in the TPSA subscales and these positive changes are still present at the 10-week follow-up period. The attitudes of the participants were significantly improved in the areas of E-Mail ($F = 6.26$, p-value = 0.0050), the WWW ($F = 11.90$, p-value = 0.0001), Integrated Applications ($F = 14.64$, p-value = 0.0001) and Graphics ($F = 4.67$, p-value = 0.0163).

Summary and Conclusions

A major facet of the Girls R.O.C. program was to increase female awareness and to foster better attitudes toward the latest technologies in computer science. The CAQ subscales measure the attitudes of students as it relates to various topics. While some are closely tied to their local school environments, others relate to the confidence level with which they have gained through the exposure to technology during the three-week Girls R.O.C. program. The ratings from the surveys provided evidence that changes in the participants' confidence in using E-Mail, the WWW, Integrated Applications and Graphics were greatly improved as a result of the three-week interactive program. Furthermore, the ratings also indicated that the participants' attitudes toward technology as taught in their local environments did not change over the thirteen-week period of this study. This latter finding supports the findings of other studies about the importance of introducing female students to technology at an earlier age. As such, to affect change would mean that one would have to change the attitude of the teacher in conjunction with the attitude of the student.

Teacher and Student Attitudes Toward Computers, 1999 - 2000: Findings from a Suburban Texas School District

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Abstract: More than 500 teachers and 3,000 students were assessed regarding proficiency and attitudes toward technology in a large suburban school district in Texas. In addition, 5000 parents in the district were surveyed regarding the use of technology at home and the support for technology access in the schools. Key findings from this study are provided in this paper. Additional detail is available in a 132-page publication compiled by the authors (Knezek & Christensen, 2000).

Introduction

More than five hundred teachers in a northern Texas suburban school district completed a Needs Assessment (NeedSnap) survey, the Teachers' Attitudes Toward Computers (TAC) questionnaire, the Teachers' Attitudes Toward Information Technology (TAT) questionnaire, the Technology Proficiency Self Assessment (TPSA), and the Stages of Adoption form in the fall of 1999 and spring of 2000. The TAC and TAT measure attitudes toward computers and new information technologies. The TPSA measures skill levels within the major areas specified by the International Society for Technology in Education (ISTE) standards, while the Stages instrument records an aggregate assessment of the overall level of technology integration of the respondent. The NeedSnap measures teachers' beliefs and needs regarding technology, as well as level of classroom use. Students in grades 1–6 completed the Young Children's Computer Inventory (YCCI) while students in grades 7-12 completed the Computer Attitude Questionnaire (CAQ).

Teachers' Proficiency, Needs, and Beliefs about Technology

Analysis of the technology proficiency data indicated that professional development activities carried out during the 1999-2000 school year were highly effective in advancing the skills of teachers. The impact was strong ($p < .001$) in all four areas assessed: E-mail skills (pretest mean = 3.81, post = 4.23), WWW skills (pretest mean = 4.09, post = 4.43), classroom use of Integrated Applications (pretest mean = 3.46, post = 3.80), and incorporating methods of Teaching with Technology (pretest mean = 3.74, post = 4.02). Teachers advanced as a group approximately one stage of adoption on a six-stage scale, moving from: *Stage 4: Familiarity and confidence* (I am gaining a sense of confidence in using the computer for specific tasks. I am starting to feel comfortable using the computer; mean = 4.44) and moving toward: *Stage 5: Adaptation to other contexts* (I think about the computer as a tool to help me and am no longer concerned about it as technology. I can use it in many applications and as an instructional aid; mean = 4.86).

Teachers' general beliefs remained reasonably stable from the beginning to the end of the school year. Specific needs that changed to a great extent from the fall to the spring were: 1) a lesser need for training in how to use the computer and 2) a greater need to be trained in teaching techniques and strategies to integrate technology into the curriculum.

Student Preferences, Attitudes and Technology-Related Skills

Data gathered from approximately 1600 grades 1-6 students in eight district elementary schools indicates that high technology-integrating teachers at the first grade level rapidly influence the preference of their students toward using computers over the more passive medium of watching television. Across grades 1-3, looking at the classroom environment from a pre-post perspective, we found that among teachers who were low integrators of technology, student Attitudes Toward Computers ($p<.001$), Attitudes Toward School ($p<.05$), Computer Importance ($p<.01$) and Computer Enjoyment ($p<.02$) declined significantly from the first to the last six-weeks of school. However, the students of the teachers who had been previously identified by their principals as high integrators of technology also had a significant decline in Attitudes Toward School ($p<.02$), yet increased significantly for Computer Enjoyment (p<.02). The general impact of technology integrating teachers over several months, across grades 1-6, appears to have been the greatest in the area of Attitudes Toward Computers on students without computers at home.

Student dispositions as a whole tended to decline from the younger grade levels to older grades (grade 1 to grade 6). This is similar to trends found in past studies (Knezek, Miyashita, & Sakamoto, 1995; Christensen, 1997). Although all measured attitudes declined, the three indices related to computers declined less across grade levels than other learning-related dispositions.

With respect to student dispositions by gender, girls were significantly higher than boys in Empathy (p<.001), Computer Enjoyment (p<.05), Attitudes Toward School (p<.001), Motivation to Study (p<.05), and Study Habits (p<.001) as of fall 1999. During spring 2000, the girls remained significantly higher than boys in Attitudes Toward School and Empathy, while boys became significantly higher in Motivation.

Based on information gathered from approximately 1400 students in grades 7-12 during 1999-2000, secondary school students appear to have positive attitudes toward information technology and most learning-related dispositions. Their information technology skills showed healthy growth during the 1999-2000 school year, to a point where they approached the level of their teachers. Their relatively-low (and declining with increasing age) ratings on attitudes toward school are consistent with studies conducted at the elementary school level and findings from earlier studies using the same scales (Christensen, 1997; Knezek, Miyashita, & Sakamoto, 1995).

Parent Access to Information Technology

Five thousand ninety-three (5,093) surveys were completed by parents of elementary, middle, and high school students from the district's 12 schools during the fall of 1999. Most parents reported having access to a computer (93%) and the Internet (82%) at home and making the same facilities available to their children. Parents indicated broad-based support for the idea of accessing school-based information electronically, and the idea of students enrolling in web-based courses was well received. The majority of these parents appeared to be immersed in the technology of the information age.

References

Christensen, R. (1997). *Effect of technology integration education on the attitudes of teachers and their students.* Doctoral dissertation, University of North Texas. [Online]. Available: http://courseweb.tac.unt.edu/rhondac.

Knezek, G., & Christensen, R. (2000). Refining best teaching practices for technology integration: KIDS Project findings for 1999-2000. Denton, TX: Univ. of North Texas.

Knezek, G. A., Miyashita, K. T., & Sakamoto, T. (1995). Findings from the Young Children's Computer Inventory Project. In J. D. Tinsley & T. J. van Weert (Eds.), *World Conference on Computers in Education VI* (pp. 909-920). London: Chapman & Hall.

Teachers and Students' Attitudes Toward Computers in México
Results of Phase 2000

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Introduction

The year 2000 marks a three-year Mexican contribution to the International PLANIT study, and is now focused on the attitudes toward the computer and related topics of Mexico City Secondary School Teachers and Students. In previous years our samples included the countryside and various cities from around the Country, but researchers realized that the condition and the context of teachers and students of such a big metropolitan area as México City were special and so those individuals were being under-represented in our study. The administration of instruments was conducted during the Spring of 2000 (May-June) by the same researchers who have been participating in these series of studies since 1998. The results showed a few surprises but most of them supported the previous data.

Sample

There were 762 teachers (Male=324, Female=438) and 753 students (Male=385, Female=368) from three different School Systems: Public Regular, Public Technical and Private Schools of the México City's 16 political districts.

Instruments

In order to measure the attitudes, two instruments were administered: The *Teacher's Attitude Toward Computer Questionnaire* (TAC, Knezek & Christensen, 1996) and the *Computer Attitude Questionnaire* (CAQ, Knezek & Miyashita, 1994), validated for the Mexican population (Morales, Turcott, Campos & Lignan, 1998; Morales, 1999).

TAC's six factors were: a) Enjoyment / Utility; b) E-mail; c) Frustration / Anxiety; d) Learning / Productivity; e) Positivity / Negativity, and f) Negative Impact of Computers. CAQ's six factors were: a) Enjoyment; b) E-mail; c) Frustration / Anxiety; d) Preferences; e) Self-Learning, and f) Empathy.

Variables

The most important variables selected for the analysis of Teachers' TAC were: Age, Gender, Computer at Home, Internet at Home, Years of Service, Computer Experience, Frequency of Use, School System and Stage of Adoption. On the other hand, the selected variables for the CAQ analysis were: Age, Gender, Computer at Home, Internet at Home and School System.

Results

In terms of the general results, we found a favorable attitude toward computers among teachers and students of México City, as previously found in 1998 and 1999. On the other hand, the access to technology was much higher than last year's teachers and students of the rest of the Country:

	Teachers 1999	Students 1999	Teachers 2000	Students 2000
Computer at H.	33%	21%	64%	64%
Internet at H.	8%	6%	30%	40%

In terms of frequency of computer use by teachers, the daily and weekly use were higher than last year's, although the occasional use remained the same:

	Daily	Weekly	Occasionally
1999	12%	16%	40%
2000	22%	26%	40%

ANOVA Results

Teachers

Across factors, the most significant variables responsible for the differences were:

- *Gender*: Male teachers seem to be more positively oriented toward the computer;
- *Stage of Adoption*: Teachers in the Application and / or Integration stages seem to perceive more positively the computer than those in the Conciousness stage;
- *Computer Experience*: Teachers with experience of five years or more using computers seem to have a better attitude than those with no experience;
- *Frequency of Use*: Teachers in daily use seem to be more positively oriented toward the computer than those who use it occasionally.

The big surprise in these data was the Gender variable, which marked differences in all factors, and yet in 1999 no differences were found. On the other hand, *Adoption of Technology* seemed to be related to computer experience, frequency of use and level of technology training.

Students

In contrast with the teachers' results, students showed only a few differences, and not very consistent across the factors. Only two variables had more than one difference:

- *Age*: 18 year old students rated higher than those 17 years old in Self-Learning, while 13 year old students rated lower in Frustration / Anxiety than those 18 years old.
- *School System*: Students from General Secondary Schools rated higher in E-mail and Computer Enjoyment than those from Private Schools.

References

Knezek, G. & Christensen, R. (1996) *Teacher's Attitude Toward Computers Questionnaire. Validating the computer Attitude Questionnaire (CAQ).* ERIC Document Reproduction Service No. ED260696.

Knezek, G. & Miyashita, K. (1994) "A Preliminary Study of the Computer Attitude Questionnaire", in: Gerald A. Knezek (Ed.) *Studies on Children and Computers: The 1993-94 Fulbright Series.* Denton, Tx. TCET-University of North Texas.

Morales, C. (1999) "Actitudes de los docentes de Educacion Basica hacia la computadora y las nuevas tecnologias", *Tecnologia y Comunicacion Educativas,* 13 (30), 38-55.

Morales, C.; Turcott, V.; Campos, A. & Lignan, L. (1998) "Actitudes de los escolares hacia la computadora y los medios para el aprendizaje", *Tecnologia y Comunicacion Educativas*, 12(28), 51-65. http://investigacion.ilce.edu.mx

Preservice Teachers' Attitudes Toward Information Technology in Brunei

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Introduction

Brunei is one of the 35 countries in the world that has a population of less than half a million and is categorized as a micro-state. The country is situated on the northwest coast of Borneo with an area of approximately 5700 sq.km. According to the 1999 census the population of Brunei stands at 331,000. The University of Brunei was established in 1985 and the number of students enrolled in the university reflects the small population of the country. Teacher training is a major thrust of the Institute of Education within the university and each year 100-150 students are taken in for the three year certificate training program. Female students tend to choose teaching as their profession.

The formal school system in Brunei has adopted a 6-3-2 pattern. 6 years of primary education (Grade 1 - 6), 3 years of lower secondary education (Form 1, 2 & 3), 2 years of upper secondary education (Form 4 & 5).

The language of instruction at the secondary level is English. At the end of Form 5, General Certificate of Education (GCE) 'O' level examination is conducted. Subjects covered in this examination include English, Malay, Mathematics and pure science subjects such as Physics, Chemistry, Biology, Combined Science, History, Economics and Geography.

Not all students use computers at school and the students who participated in the survey are average students. Elite students go abroad to study Medicine, Law and Engineering subjects.

Brunei has good communication infrastructure and BRUNET, the only Internet service provider has 14,000 users. In a country with only 70,000 household, this figure translated into 20% of the population who are using Internet.

Findings Regarding Teachers' Attitudes Toward Computers

One hundred forty-eight first year teacher education students completed the Teachers' Attitudes Toward Information Technology (TAT ver. 2.0) semantic differential scales of Electronic Mail (EmailT), World-Wide Web (WWWT), Multimedia (MMT), Teacher Productivity (ProdT) and Productivity for Classroom Learning (ProdCL) during 1999. Internal consistency reliabilities for the scales compared very favorably with those reported for USA data by the authors of the instrument (Knezek & Christensen, 1998). For the Brunei data, Cronbach's Alpha ranged from .90 to .92 for the individual scales. Mean ratings for most new information technologies were quite positive. No significant differences were found among the university students on any of the five measurement indices based on gender or arts versus sciences as a major field of study. Few differences among the students were found with respect to various background variables. One interesting exception to this trend was the students' perceptions of how useful the computer would be for student learning in the classroom. If the Brunei students had a computer at home they were fairly positive in their beliefs that the computer would be useful for student learning in the classroom (5.88 on a scale of 1 = least positive to 7 = most positive), but if the university students had no computer at home they were even more positive (6.20 on a 1 to 7 scale). The difference between the two groups reaches statistical significance ($f = 4.36$, $p = .038$). Perhaps the most significant finding from the Brunei pre-service educators, overall, is their overwhelmingly positive attitudes about teaching and learning with technology, which appears to vary little based on gender, field of study, or even access to technology at home.

Reference

Knezek, G., & Christensen, R. (1998). Internal consistency reliability for the teachers' attitudes toward information technology (TAT) questionnaire. In McNeil, Price, Boger-Mehall, Robin & Willis (Eds.) *Technology and Teacher Education Annual 1998 - Vol. 2.* Charlottesville: Association for the Advancement of Computing in Education.

Findings from Thailand for the Longitudinal Assessment of New Information Technologies

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I. Student Attitudes' toward computer CAQv5.22 (Thai Analysis)

- Targeted population: Students in grade 8th from 3 schools.
- Data collected on July-August 2000 1768 cases (721 boys, 1047 girls)
- School 1 Chonchai Secondary School –519 cases (364 boys, 155 girls)
- School 2 Chonkanya Secondary School – 672 cases (6 boys, 666 girls)
- School 3 Rayong Wltayakom Secondary School–738 cases (357 boys, 381 girls) Doing analysis on 9 areas

Table 1
Summary of Findings

Attitude	Mean (total)	School 1	School 2	School 3	
CI – computer important	3.88	3.8138	3.9530	3.84	Male 3.8223
					Female 3.8567
CJ – computer enjoyment	3.91	3.9269	3.9454	3.86	Male 3.8595
					Female 3.8691
CM- motivation/persistance	3.61	3.5958	3.6672	3.56	Male 3.5563
					Female 3.5725
SH – study habits	3.75	3.7574	3.8218	3.70	Male 3.6582
					Female 3.7447
CE – Empathy	3.87	3.6422	4.0601	3.81	Male 3.6442
					Female 3.9677
CT- Creative Tendency	3.60	3.6021	3.6415	3.55	Male 3.5973
					Female 3.5210
SC – school	3.52	3.4766	3.5433	3.51	Male 3.4383
					Female 3.5968
ANX –Anxiety	3.69	3.7066	3.6929	3.68	Male 3.6121
					Female 3.7388
E-mail	3.56	3.5711	3.5811	3.53	Male 3.5155
					Female 3.5445

Analysis: t-test and ANOVA

- Comparison of gender in co-educational school: significant differences in these areas of Computer Enjoyment, Empathy, School, and Anxiety . Girls tend to have better attitudes in these areas
- Comparison of gender in all three schools: significant differentces in: Computer Importance, Computer Enjoyment and Empathy also girls tend to higher attitudes in these areas.
- Comparison school types: significant differences in these areas: Computer Importance, Computer Enjoyment, Motivation\persistance, Study Habits, Empathy and creative tendency. Non-coeducational schools for girls have more positive attitude than either the non-coeducation schools for boys or the co-education school.

II. Teachers 'Attitudes using TAC (ver 4.0)

- Targeted population: teachers representing every subject taught in the above three schools.
- School 1 Chonchai Secondary School 101 teachers (33 males, 58 females)
- School 2 Chonkanya Secondary School 72 teachers (12 males, 58 females)
- School 3 Rayong Witayakom Secondary School (37 males,55 females)

- Analysis (using the Scoring TAC v3.0) into 7 areas: Computer Importance, Computer Enjoyment, Anxiety, Enthusiasm, Productivity in the classroom and E-mail.

Table II
Comparison of Teacher Attitudes

Attitudes	Means N=270 M=82,f=171		School 1 – ChonChai n=101 M=33,F=58		School 2 - ChonKanya n=72 M=12,F=58		School 3 - Rayong n=97 M=37,F=55	
CIMP importance f16.13 =caq	3.82	M 3.75 F 3.87	3.87	M 3.81 F 3.96	3.85	M 3.74 F 3.88	3.75	M 3.70 F 3.78
CENJ enjoyment=caq	3.44	M 3.40 F 3.47	3.42	M 3.30 F 3.50	3.44	M 3.45 F 3.45	3.47	M 3.46 F 3.47
CANX anxiety=caq	3.45	M 3.41 F 3.47	3.40	M 3.34 F 3.43	3.41	M 3.40 F 3.44	3.52	M 3.48 F 3.55
CENT enthusiasm f16.1	3.70	M 3.70 F 3.70	3.73	M 3.69 F 3.75	3.66	M 3.61 F 3.69	3.71	M 3.76 F 3.68
PINC productivity in the classroom f16.6	3.97	M 3.93 F 4.00	4.07	M 4.04 F 4.10	3.91	M 3.75 F 3.94	3.93	M 3.88 F 3.95
PROD productivity	3.66	M 3.64 F 3.67	3.73	M 3.69 F 3.75	3.63	M 3.47 F 3.66	3.61	M 3.64 F 3.59
EMAIL e-mail	3.42	M 3.49 F 3.39	3.47	M 3.46 F 3.50	3.47	M 3.55 F 3.44	3.34	M 3.49 F 3.23

Results

- Gender: There found no different attitudes in these areas between males and females teachers.
- Frequency of Use: Teachers who daily use have better attitude.
- With the results of this serveys found that 56 % have computer at home and 17% use internet at home.
- Only 7% use computer Daily, 9% use weekly , use occasionally 25% and do not use 59%.

III. Faculties Attitudes' toward IT (FAIT v1.1)

- Targeted population: Faculty representing Colleges of Education from universities:
- Chulalongkorn University , Bangkok received 64 cases from 173 faculties
- Kasertsat University, Bangkok received 32 cases from 110 faculties
- Prasarnmith University, Bangkok received 41 cases from 129 faculties
- Burapha University, Chonburi received 38 cases from 63 faculties
- Data were analysis into 5 factors acording to the scoring of FAIT1.1

Table 3
Comparison of Faculties

Factors	Mean N=175	Mean-U1 n=64	Mean-U2 n=32	Mean-U3 n=41	Mean-U4 n=38
F1 enthusiasm/enjoyment	3.90	3.90	4.02	3.81	3.90
F2 anxiety	3.77	3.75	3.88	3.69	3.80
F3 avoidance	3.39	3.38	3.46	3.36	3.37
F4 e-mail Classroom	3.51	3.58	3.48	3.39	3.57
F6 productivity	3.71	3.77	3.63	3.66	3.74

- Education Ph.D. (94 people, 53.7%) Masters (79 people, 45.1%) Bachelors (2 people, 1.1%)
- Age are vary the most frequency are more than 55 years old -thirty percent.
- Anova Results

1. Education: Faculties who earn higher degrees have better attitudes and have less anxiety about computers.
2. Middle-aged faculties (35-49) have a better attitude, less anxiety toward, and better enjoyment of computers and information technology; and a better appreciation of using e-mail in the classroom than older faculties.
2. Faculties who use computers more often have a better attitude than those who use computer less.

Multimedia in Chinese Elementary Schools

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Abstract: Multimedia describes any system that unites two or more media into a single product or presentation. Along with the increasingly developed computer technology, it is believed that multimedia is the best single set of technologies to promote among teachers to improve the way they educate students. Facing the challenge of large-sized classes and lack of multimedia resources, Chinese teachers have made an impressive progress in using multimedia in their classrooms. They are taking the advantages of national centralized curriculum, design and develop multimedia courseware to accompany with the textbooks. Collaborating with media specialists, they have been directly involved in multimedia courseware development. Supported by administrative bodies, they participate in training, enrich their own technological skills, and utilize multimedia to improve teaching and learning. The schools, like Danyang Experimental Elementary School, Yangzhou International Elementary School and Nanjing's Beijing East Road Elementary School are setting up a good start, although there still exists a great unbalance in utilizing advanced computer technology among Chinese schools and teachers.

Multimedia describes any system that unites two or more media into a single product or presentation (Lockard, Abrams and Many, 1997). In the field of education, multimedia has been used to describe audio-visual teaching aids sincc the early 1960s, almost twenty years before microcomputers entered the classrooms. Today, multimedia has become closely associated with the computer-based, instructional delivery systems for improving teaching and learning (Poole, 1997). Multimedia encapsulates works, pictures and numbers in many ways such as full motion video, still images, text and sound to make the delivery more meaningful. Along with the increasingly developed computer technology, it is believed that multimedia is the best single set of technologies to promote among teachers to improve the way they educate students. However, multimedia is one of the instructional vehicles, it is only an instructional tool. Its effectiveness does not solely depend on the multimedia itself, but its users, teachers and students. Of course, there is a certain excitement in promising new ideas and powerful innovations that allow teachers and students to explore the multimedia instruction and learning, but little research has been done on the effectiveness of teaching and learning with multimedia environments (Grabe and Grabe, 1998). From a global perspective, this paper is to examine the implementation of multimedia in Chinese elementary schools to see how multimedia assists teaching and learning in the large-sized classes that are usually as three times large as those in the United States.

> Fifty-four third graders have entered the classroom sitting at the desks in rows. The teacher is standing in front of the class getting ready to deliver the instruction. Multimedia station including a Pentium III multimedia computer, a VCR, a data projector, and speakers is in function for the class to use. This is a third-grade Chinese language class to be delivered with multimedia implementation in an elementary school in Southern China. Following the respect greetings "Good morning, teacher!" and "Good morning, class!" the teacher states the purpose of the instruction that they would have the lesson of "The Lotus" on that day. The teacher brings up a few questions about the

knowledge of lotus and asks students to describe their experience in the park and what they have seen on the lake, but only few students can give satisfactory answers. The teacher then turns on her multimedia station and the projector. Beautiful animated lotuses are projected on the screen and lovely soft music is played. The texts in Chinese are highlighted and read with excellent standard Chinese tone. Obviously, the fifty-four children have been highly motivated to learn about "The Lotus." With three key words, "smell," "look" and "think," the teacher facilitates the discussion about the characters of the lotus and its symbolic meanings towards human being. Honesty, collaboration, and the value of life are integrated in instruction and learning. The animated images are paused while the discussion is in progress. Students read aloud after the narrator along with the textures displayed on the screen. The teacher guides individual silent reading and integrates listening, speaking, reading, and writing activities in the classroom with the aide of multimedia presentation. Within this multimedia-learning environment, students have had group discussion, participated in a dramatic play, and actively involved in various learning activities. Corresponding to the learning outcomes, students have mastered the reading of the text and completed creative paragraph writing with the phrases and sentence structures learned in the class within a fifty-minute lesson.

Clearly, it is a very successful lesson. Technology is no longer an individual showcase, but a common tool to improve teaching and learning in Chinese elementary schools. Based on the recent visits to Danyang Experimental Elementary School, Yangzhou International Elementary School and Nanjing's Beijing East Road Elementary School of the People's Republic of China, it has been found that multimedia has been successfully implemented in the classroom teaching. The success is evidently attributed to the matching of the contents of multimedia courseware and the contents exactly being taught in the class, instructor's involvement in designing and developing multimedia courseware, and the emphasis of teacher's technology training and implementation in the classroom.

The contents of multimedia courseware packages

The Chinese schools have a national centralized curriculum, unified textbooks, and an emphasized mastery of learning. Although multimedia resources in Chinese elementary schools are comparatively fewer than that in the United States, it is found that the contents of limited numbers of multimedia courseware packages utilized in the classrooms are directly matching with the contents of school textbooks. The courseware "The Lotus" that the third grade teacher has implemented in her class is one of the good examples. It is designed and developed specially for the text version of "The Lotus" in third-graders' textbook. Its images, textures, and audio features serve the needs of teaching and learning in the classroom. With the implementation of that multimedia courseware in the classroom, students can be highly motivated to learn how to read, talk and think. The multimedia has integrated "listening, speaking, reading and writing" activities for a successful language arts class. To name a few more, "Bei de Ren Shi " (The Understanding of the Times of) and "Yuan de Mian Ji " (The Area of the Circle) are also excellent examples of matching the contents between courseware packages and textbooks. "Bei de Ren Shi " is a multimedia courseware to help younger children understand the concept of "times" and to learn how to solve problems of the "times". The contents of this courseware match exactly the contents of the section one, unit six in the second graders' mathematics textbook. When given the information that a squirrel is three years old and is three times younger than an elephant, the second graders can figure out effectively how old the elephant is with the assistance of that multimedia courseware. "Yuan de Mian Ji " is designed to illustrate the concept of circles and to facilitate six-grade students to learn how to measure and calculate the area of a given circle and to learn how to solve related math problems. Again a good match of the content areas between the courseware and the textbook is found. The contents of the courseware, "Yuan de Mian Ji " are closely connected to the contents of the section two, unit four in the sixth graders' mathematics textbook. This type of matching nature promotes teachers to consider the implementation of multimedia courseware in their teaching, assists teachers to achieve their instructional objectives, and facilitates the process of improving students' learning achievements.

Teachers' involvement in multimedia courseware development

In China today, government education commissions at all levels, county, city and province, encourage teachers' involvement in multimedia courseware development and support such development by rewarding and honoring excellent courseware packages and their developers. This administrative action has greatly motivated teachers to be involved in multimedia courseware design and development. Chinese teachers have been involved in the design of most multimedia courseware at different academic levels, though with limited multimedia resources. In some Chinese elementary schools, teachers have learned to use such multimedia-authoring tool as Authorware to design and develop multimedia courseware collaborated with media specialists. The courseware "The Lotus," "Bei de Ren Shi " (The Understanding of the Times of) and "Yuan de Mian Ji " (The Area of the Circle) are all the products of the collaboration between the teachers and the media specialists. Danyang Experimental Elementary School organizes a multimedia teaching demonstration and discussion every month, conducts a multimedia courseware development-competition every semester, and compiles a faculty's essay collection every academic year. Yangzhou International School and Nanjing's Beijing East Road Elementary School encourage and support teachers to participate in the courseware exhibitions on campus, submit their products to city, provincial and national competitions. All these three schools today own multimedia courseware developing labs where teachers can contribute their expertise of teaching and practice on courseware design and development. Each campus has networked cable TV, language labs, and multimedia classrooms. Teachers share with each other their multimedia resources and implement the courseware developed by themselves into their classroom teaching and learning. Campus radio on the other hand helps reinforce the multimedia implementation at each school. As a result of teacher involvement in multimedia courseware design and development, multimedia courseware implementation in elementary schools in China has turned out to be quite a success. Because of the direct involvement, teachers know what they need in the classroom and know how to teach with the integrated multimedia.

The emphasis of teacher training and the implementation strategies

Computer technology, no matter how advance it is, it is an instructional tool; using multimedia, no matter how exciting we feel, we should know how to use it effectively. Like many middle schools and universities in China, Chinese elementary schools have put teachers training on the agenda and emphasized the effective implementation. The school knows that it would become a formality of using technology in the classroom if there had not a team of teachers who were education technology literate. In the past two years, all teachers in Jiangsu province have been required by provincial educational commission to receive training in technology and to pass the technology competency tests. The competency tests include primary level, intermediate level and advanced level. A majority of teachers attend the training classes at weekend, during holidays or summer vocations; a few of them go with self-study track. Out of the training, teachers devote their after-school time, entertainment time and even their valuable dating time to practice at computers. It is told that all teachers in Danyang Experimental Elementary School, Yangzhou International Elementary School and Nanjing's Beijing East Road Elementary School have passed their primary competency tests, quite a number of them are at the medium level and a few have reached advanced level. The purpose of receiving training is to use technology in the classroom. Teachers in the schools mentioned above are encouraged and supported to implement their new technological skills in classroom teaching. This type of implementation has put the emphasis on the clear instructional objective(s), integrated learning activities, and students' academic learning achievements. In schools, implementation strategies are discussed, models of teaching with multimedia aides are demonstrated, and teaching experience is shared among teachers in a timely manner. It is clear that the teacher training and the emphasis of student learning achievement have made the multimedia implementation become more meaningful and effective.

In summary, facing the challenge of large-sized classes and lack of multimedia resources, teachers in China have made an impressive progress in using multimedia in their classrooms. They are taking the advantages of nationally centralized curriculum to design and develop multimedia courseware to accompany with the textbooks. Collaborating with media specialists, teachers have directly involved in multimedia courseware development. Supported by administrative bodies, teachers are encouraged to participate in training and enrich their own technological skills and utilize multimedia to improve teaching and learning. Schools like Danyang Experimental Elementary School, Yangzhou International Elementary School and Nanjing's Beijing East Road Elementary School are having a good start; however, there is one thing needs to be pointed out that these three elementary schools are all key elementary schools in China. They have more funding resources and can afford the cost of hardware, software, training and follow-up support. They also have more advantages to recruit excellent faculty and staff members as well as students. For the majority of elementary schools in China today, there is still a long way to go to implement multimedia in classrooms. There exists a great unbalance in utilizing advanced computer technology between schools, as well as among the teachers. The reality is that quite a number of Chinese elementary schools do not have multimedia classrooms and labs. Some schools do not even have a computer yet. In those schools, teachers have not had an equal access to the advanced technology and students still rely on the textbooks and pencils. But what is happening at Danyang Experimental Elementary School, Yangzhou International Elementary School and Nanjing's Beijing East Road Elementary School today will be seen in other Chinese elementary schools soon along with the advances of computer technology and political-economic reform in China.

References

Grabe, M. & Grabe, C. (1998). Integrating technology for meaningful learning (2nd Ed.). Boston, Houghton Mifflin.

Lockard, J., Abrams, P. & Many, W. (1997). Microcomputers for twenty-first century educators (4th ed.). New York, NY: Longman.

Poole, B. (1997). Education for an information age: Teaching in the computerized classroom (2nd Ed.). Boston, MA: McGraw-Hill.

An introductory internet skills program for teacher education: or from practice to theory: a case study

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Abstract: This case study presentation will report on how the presenters successfully responded to the 'just-in-time' challenge of putting together an inservicing 'introductory technological skills' course for a 'difficult' group of teachers. The particular course which will be the focus of the presentation provided the specific opportunity for the two presenters to bring together their convergent but differing international experiences in teacher education to try and distil the key principles and practical requirements for developing an effective introductory internet skills program. Although many of the students undertaking this course began with little knowledge of computers let alone the internet, they all achieved in a short time (2 hours X 14 weeks) a basic and convergent competency in a range of generic internet skills: internet communications, online information literacy using browsers and search engines, developing animated powerpoint presentations and webpage learnaing resources, and other associated skills like FTPing and scanning graphics. Indeed, some of the initially less confident and even reluctant teacher-learners quickly became adept at using what for them was a completely new medium.

In other words, the presentation will cover some of the approaches, methods and activities used to transform reluctant or intimidated learners into keen users of the internet. This session will identify and discuss the kinds of simple practical skills and activities that can be linked together in progressive contexts of applied, relevant, and even 'real-life' learning to achieve a 'spiral curriculum' of effective reflective practice using the internet. The organization of the presentation will be as follows:

(i) an initial outline of the *context* of the challenge faced by the presenters;

(ii) an overview of how the presenters *responded* by developing this particular program in terms of 'show-and-telling' teacher-learner artifacts, anecdotes and other action research data;

(iii) a *reflection* on the course as case study, and about the key principles or strategies and kind of activities required to conduct an effective introductory internet skills course.

Note that this is an abstract for a Presentation which will complement two other papers by the presenters – 772 and 1033

An Instrument to Measure Malaysian Teachers' IT Preparedness

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Abstract: The Malaysian Ministry of Education plans to turn approximately 10, 000 primary and secondary schools into Smart Schools by the year 2010. This means that in the next decade, all teachers must be fully prepared to teach in all the Smart Schools nation-wide. The pressure on teachers has, therefore, become urgent. For this reason, there is a growing educational interest in the assessment of teachers' IT preparedness. In this paper, we examine the need to develop an instrument that is able to assess teachers' IT preparedness. IT preparedness in this study is measured in three domains: the teachers' actual IT skills, their knowledge about IT and their attitudes toward IT. We also describe what the instrument attempts to measure, how it is administered and present results of phases one and two of the study.

Introduction

Malaysia is considered to be one of the fastest developing nations in South East Asia. Indeed, it has a national ambition called Vision 2020, the purpose of which is to attain developed-nation status by the year 2020 (Mahathir, 1998). To achieve the substance of Vision 2020, the government has set up a blue print for the Multimedia Super Corridor (MSC). The MSC is a massive 750-square-kilometer high-tech information zone encompassing the Kuala Lumpur City Center (KLCC), Putrajaya (administrative center) and the Kuala Lumpur International Airport (KLIA). The infrastructure of the MSC area emphasises what the Prime Minister has described as providing high-powered networking, efficient transportation, satellite telecommunications and intercity connections. To spearhead the development of the MSC and give shape to its environment, seven initiatives for multimedia applications have been identified. These initiatives are borderless marketing, smart schools, electronic government, multi-purpose card, telemedicine, research and development as well as worldwide manufacturing webs. Of these, the smart school initiative is regarded by the Prime Minister as a specific response to Malaysia's need to make the critical transition from an industrial economy to a knowledge-based society (Mahathir, 1998). This initiative will enable Malaysia to produce skilled people who will be able to harness the benefits and the potential of IT needed to attain the "smart" Malaysian society in 2020.

The Need to Measure Teachers' IT Preparedness

The pilot Smart Schools that started operation in 1999 will act as a nucleus for the future Smart School teaching concepts and materials, skills and technology. By the year 2010, if the 1997 planning is followed, all 10,000 of Malaysia's primary and secondary schools will be Smart Schools (Smart School Project Team, 1997). This means that in the next decade, the entire population of approximately 450,000 teachers in Malaysia must be fully prepared to teach in all the Smart Schools nation-wide. The pressure on teachers to become IT literate as well as to understand the education implications of the new technology has, therefore, become urgent. It is now envisaged that all teachers will become skilled in the use of IT and the integration of IT in the teaching-learning process (Smart School Project Team, 1997). This is important because all teachers will have to use IT in the classroom. However, before they can integrate this new technology, these teachers must be trained to be skilled and be knowledgeable about IT with the right attitudes.

The Smart School Project Team (1997) stressed that a comprehensive teacher education programme incorporating best practices in technology supported learning will be critical to the success of the Smart School concept. The training will enable teachers to carry out their responsibilities as facilitators in the classroom, as they will be equipped with specific IT skills and knowledge as well as with the right kind of attitudes. For this reason, teachers must be assessed thoroughly by the educational authorities before they teach in schools to determine if they are IT prepared. With the implementation of Smart Schools nationwide, there is a growing educational interest in the assessment of teachers' IT skills, knowledge and attitudes. An instrument, therefore, is needed to assess Malaysian teachers' IT preparedness.

Theoretical Framework

Evidence supported by the Technology Acceptance Model (TAM) (Davis, 1989; Davis et al., 1989), Adaptive Control of Thought (ACT) theory (Anderson, 1983), and Wilson's (1990) framework has substantiated the claim of this research that these three domains (skills, knowledge and attitudes) should be measured to represent IT preparedness.

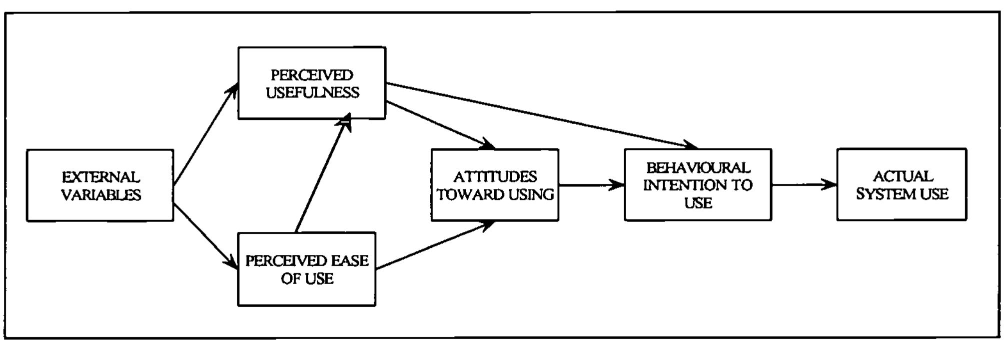

Figure 1: The Technology Acceptance Model

Davis et al. (1989) strongly suggested that the TAM can explain the usage of IT (Fig. 1). This model has strong influences of Fishbein and Ajzen's (1975) theory of reasoned action. It shows that beliefs influence attitudes, which in turn lead to behavioural intentions and ultimately the actual system use. Suffice to say, this model posits that actual system use is determined by the user's attitudes toward it. The actual use can be measured in terms of the user's performance or more specifically the knowledge and skills of the system (Speier et al., 1997).

The ACT theory by Anderson (Anderson, 1983) explains how cognitions can produce action. The ACT theory is one of the most influential explanations of skills acquisition in cognitive psychology. Essentially, Anderson distinguished the learning skill in relation to two different types of knowledge that are:

- Declarative knowledge which consists of facts about the world which can be put into words;
- Procedural knowledge which refers to how we do things.

Anderson (1983) suggested that the first cognitive stage of learning involves acquiring declarative knowledge that is relevant to the skill. Preece et al. (1997) likened this stage to learning a computer. Examples of this stage include activities such as memorising things to select an option from a menu, moving the cursor to the required option using the mouse and then clicking twice rapidly in succession on the mouse button.

From the acquisition of declarative knowledge, an associative stage occurs which connects the different elements needed for performance. The elements are strengthened at this stage (Anderson, 1983). This would include things like learning how to move and 'double click' the mouse.

Lastly the autonomous stage comes into play where the skill becomes more automated and rapid (Preece et al., 1997). The declarative knowledge becomes second nature to the performance of the task and ceases. According to Preece et al. (1997), learning to use a computer system, therefore, can be viewed in terms of thc acquisition of a skill where declarative knowledge changes into a skill.

Wilson (1990) somehow made the connection between the three variables when he stressed that teachers' IT preparedness should be measured in terms of skills, knowledge and attitudes.

The Instrument

The instrument is constructed in our national language, Bahasa Malaysia. Three domains are measured in this instrument. They are skills, knowledge and attitudes. The instrument comprises Parts A, B and C. Part A is paper based while Parts B and C are web based. Part A of the instrument measures the teachers' actual IT skills. The skills are measured in terms of the teachers' ability to execute a series of 74 tasks. Most of the tasks are based on the North Carolina State Board of Education's Educator Technology Competencies (North Carolina Public Schools Info Web, 1999). The North Carolina Board's Educator Technology Competencies are used because Malaysian authorities have recommended no detailed or clear competencies.

The tasks are measured in two dimensions. The first dimension comprises content categories pertaining to productivity tools (word processing, spreadsheet, database and presentation), World Wide Web (WWW) and electronic mail while the second dimension comprises task categories (basic operation, management and design).

Part B measures the actual knowledge about IT. It is measured in terms of 25 multiple-choice questions. Of these, two items are adopted from Deakin (1998). The questions are constructed in two dimensions. The first dimension comprises system hardware, system software, WWW and electronic mail while the second dimension comprises the three lower levels of Bloom's Taxonomy.

Lastly, Part C measures the teachers' attitudes toward IT and consists of two dimensions as well. The first dimension consists of specific software applications, software applications in general, computer and IT in general. The second dimension consists of confidence, usefulness, anxiety and aversion. This part comprises 36 five-point Likert's scale statements. Twelve statements are adopted, translated and adapted from Loyd and Gressard's (1984) Computer Attitude Scale and Christensen and Knezek's (1998) Teachers' Attitudes Toward Computers Questionnaire (TAC).

Administration of the Instrument

Two phases of instrument testing were carried out. The participants for this study were student teachers from Universiti Putra Malaysia who had taken the "Information Technology in Education" course (EDU 3033).

Two sub-samples were involved in phase one. There were two assessments in phase one. The first sub-sample comprised 22 student teachers while the second sub-sample comprised 15 student teachers. At the beginning of the test, the participants were briefed about the assessment that was being carried out. We had the full cooperation of the course instructor who encouraged the student teachers to participate in the assessment. The participants were required to attempt Part A of the instrument, followed by Parts B and C respectively. Each student was given a desktop to work on, access to the Internet and a piece of diskette to save their work into. The participants were required to save their work only for Part A in a floppy diskette. The answers and responses of the participants in Parts B and C were collected via electronic mail. Both assessments took place in our faculty's computer laboratory. The assessments lasted for three hours. Participants in the first session detected several errors in the instrument. For that reason, we were able to correct the errors before the second session took place.

The revised version of the instrument after item analysis was sent for phase two. Forty-nine student teachers participated in the study. Nine and 10 out of 49 students did not attempt Parts B and C respectively as they encountered problems with the Internet connection. So they were not able to access the WWW after completing Part A. Results from phases one and two were used to calculate the internal consistency coefficients. Item revisions and elimination were also carried out based on the results of item analysis from both phases. Item difficulty was calculated for Part B while item discriminant was calculated for Parts B and C. Items accepted ranged between 0.3 and 0.9 for item difficulty and had values greater than 0.3 for item discriminant.

Results of Phases One and Two

Table 1 shows that the reliability coefficients for the subscales are high except for knowledge. The low values are expected because this subscale is measured by a small number of items. For this reason, the reliability estimates are corrected by the Spearman Brown's prophecy formula. The corrected reliability coefficients are comparatively high. The reliability coefficients clearly suggest that the instrument has high internal consistency.

Subscales of IT preparedness	Reliability coefficients		
	Phase One		Phase Two
	1^{st}	2^{nd}	
Skills	0.95*	0.95*	0.94*
Knowledge	0.61*	0.72*	0.74*
	0.75^{+}	0.83^{+}	0.85^{+}
Attitudes	$0.90^{\#}$	$0.95^{\#}$	$0.93^{\#}$

*= KR 20 #= Cronbach's coefficient alpha += Spearman Brown coefficient (corrected to 50 items)

Table 1: Internal Consistency Coefficients

To ensure that the instrument will be valid and reliable, classical procedures for test construction will be closely followed in the third and fourth phases of the study.

Conclusion

IT offers great potential and benefits in the teaching-learning process. However, before the students can benefit from IT, teachers must be trained to use IT. There is great urgency to bridge the digital gap among Malaysian teachers now. Teachers, therefore, must have the right IT skills, knowledge and attitudes to reap the potential of IT. The instrument that is currently being validated can provide valuable information about the teachers' IT skills, knowledge and attitudes as well as to teacher education programmes that are working toward these competencies.

References

Anderson, J.R. (1983). *The architecture of cognition*. Cambridge, MA: Harvard University Press.

Christensen, R. and Knezek, G. (1998). Teachers' attitudes toward computers questionnaire. Retrieved September 29, 1999 from the World Wide Web: http://www.tcet.unt.edu/pubs/studies/index.htm

Davis, F.D. (1989). Perceived usefulness, perceived ease of use and user acceptance of information technology. *MIS Quarterly*, 13(3), 319-339.

Davis, F. D., Bagozzi, R. P. and Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science,* 35(8), 982-1003.

Deakin, R. (1998, September 3). Internet quiz. *Computimes, The New Straits Times*. p. 10.

Fishbein, M. and Ajzen, I. (1975). *Belief, attitude, intention and behaviour: An introduction to theory and research*. Reading, MA: Addison-Wesley.

Loyd, B. H. and Gressard, C. (1984). Reliability and factorial validity of computer attitude scales. *Educational and Psychology Measurement*, 44, 501-505.

Mahathir Mohammad (1998). *Multimedia super corridor*. Subang Jaya: Pelanduk Publications (M) Sdn.Bhd.

North Carolina Public School Info Web (1999a). NC technology competencies for educators-basic. Retrieved August 21, 1999 from the World Wide Wcb: http://www.dpi.state.nc.us/tap/basic.htm

Preece, J., Rogers, Y., Sharp, H., Benyon, D., Holland, S. and Carey, T. (1997). *Human- computer interaction*. Essex: Addison Wesley Longman Limited.

Smart School Project Team (1997). *The Malaysian smart school: A conceptual blueprint*. Kuala Lumpur: Government of Malaysia.

Speier, C., Morris, G. M. and. Briggs, C. M. (1995). Attitudes toward computers: The impact on performance. In Association for Information Systems Americas Conference held in Indianapolis, Indiana, 10-15 August 1995: Online conference paper. Retrieved August 15, 1999 from the World Wide Web: http://hsb.baylor.edu/ramsower/acis/papers/speier.htm

Wilson, B. (1990). The preparedness of teacher trainees for computer utilisation: The Australian and British experiences. *Review of Educational Research,* 16(2), 161- 171.

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An In-Service Program for Ecuadorian Teachers. The Innovation of Elementary Education in the Santa Elena Peninsula Project

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Abstract: The Ecuadorian educational setting promotes teaching strategies that are still built upon traditional educational models. The potential of new learning models and information technologies is neglected and little interest is shown in including ICT as a catalyst to foster innovation of education in general. This paper is about an Innovation Educational Program for elementary education in the Santa Elena Peninsula in Ecuador. The project seeks to develop creativity, critical-thinking and problem solving in primary school children with the support of ICT. A major part of the project is focused on teacher training. The study monitors and follows teachers and pupils during a 6-year period. In this paper part preliminary results of the teacher-focused studies are presented. This sub-project focused on the analysis of video materials and surveys that research the current dominant teaching - learning strategies adopted and promoted by teachers in the Peninsula Project.

Introduction

Today's society is qualified as the information society (Mojica 1999) and the people living in this society are the ones that are in the midst of a third major revolution in human civilisation (Negroponte, 1995). According to Oblinger and Rush (1997) we are living the Information Revolution. Nowadays, the volume of new information is increasing at such a rapid pace that the class of 2000 is exposed to more new data in a year than their grandparents encountered in a lifetime. Knowledge doubles every seven years and ten thousand scientific articles are published every day (Forman, 1995). Yet, are we prepared to dominate all the information surrounding us?

The exponential growing of information urge the individuals of the 21st century to move from a materialistic and physical reality to more of a mental and informational reality –the source of survival will become knowledge rather than physical capital (Lombardo, 1998.) Therefore, the man of the future is challenged to handle three abilities: a) to access information; b) the capacity of prioritise and c) to think critically and analyse the information he reaches (Mojica, 1999.) This challenge is not possible only by exposing the children to the Information and Communication Technologies (ICT), since technology by itself would not create these skills in the pupils. If we are going in the wrong direction, technology will not help us to find the right direction (Ehmann, 1995). Dede (1996) says that technology can help transform schools but only if it is used to support new models of teaching and learning. Therefore, technology will work best if it is seen as a tool, the means, and not the goal of the educational process. As Land and Coe (1998) stated: " Technology works best when learning includes the process of finding data, information or artefacts; making decisions based upon data; and communicating those findings to others. Information Technology as a tool works best when teaching includes the management of a learning environment that sets up environments in which students can work individually an in groups in data collection, decision-making, and communicating within the context of real-world tasks."

The academia throughout Universities, High Schools and Elementary Schools in general has to be committed to participate in the process of preparing the 21st century people to dominate the information age (Chiluiza & Peláez, 2000). The ones called to be the means of this challenge are educators. Teachers have to learn good practices of teaching in order to help in the transformation of new schools in places where the learner learn how to work collaboratively, inside and outside the classroom, with his/her teacher and partners, through active learning techniques and reflective learning (Chickering and Ehmann, 2000). All these characteristics go in line with the new learning models (such as constructivistic model) which promote an active learner and a teaching – learning process centred in the pupil and not anymore in the teacher.

This paper is about the Innovation of Primary Education in the Santa Elena Peninsula (IESEP), an educational project, in rural Ecuador. The project is set up by the Escuela Superior Politécnica del Litoral (ESPOL), an Ecuadorian University and forerunner in (educational) technology. The project seeks to develop creativity, critical-thinking, problem-based learning and collaborative work in primary school children with the support of ICT. Next, the project looks for increasing the number of children that continue higher education after secondary school level. A major part of the project is focused on teacher training. A core group of teachers that receive special training - 40 from a network of 20 schools - will be in charge of the further training of all academic staff in their own and other schools. A cascade-effect will be provoked in the school system in the Peninsula region as a sustainable professional developmental model.

The software tools that are being used - by teachers and pupils - are LOGO-Microworlds and LEGO-Mindstorms. The project will gradually include Internet and databases access to the participants in the IESEP Project. In order to reach the objectives of the project the teachers of the participating children were enrolled in an educational program to train them in the use of ICT and the integration of these technologies in their classroom practices. Previously, the IESEP team needed to assess the educational and technological needs of the teachers to design an appropriate training program for the context of the Peninsula region.

Purpose

This study seeks to identify the common educational characteristics of the rural teachers of the Ecuadorian coastal region and the context surrounding these teachers. Besides, the purpose of the study is to research the current dominant teaching – learning strategies adopted and promoted by teachers in the IESEP project. Considering the educational reform that is promoted in Ecuador since 1992 is based on the social constructivistic pedagogical paradigm, the main questions to be answered are: Do the Peninsula teachers are upholders of this pedagogical paradigm? And do these teachers have a sounded understanding of what they mean by being constructivistic educators?

Additionally, the researchers wanted to identify the educational needs of these teachers; to design a targeted training based on the actual needs of the group. Thus, as suggested by Knezeck and Christensen (2000) the developed plan would move the group from a lower stage of technology integration to a higher one.

Theoretical Framework

The learning theories that frame the present study are behaviorism, cognitivism and social - constructivism. To behaviorist learning is essentially a matter of storing information for later recall. Under this paradigm the teacher plays the central role in the classroom, transmitting knowledge to learner who only have to absorb information. The student's role is reception and compliance. In this model the teacher's performance in front of students is critical, the effectiveness of teachers is evaluated for the ability to establish "effective" eye contact, use different kinds of questions, pause in explanations to allow pupil reflection, use of a variety of concepts, and redirect student questions (Marsh, 2000). These characteristics are the ones that were considered to identify a teacher as promotor or adopter of the behaviorism learning theory.

The cognitivistic school made mental processes the primary object of study and tried to discover and model the mental processes on the part of the learner during the learning-process. Knowledge under the cognitive theories is viewed as symbolic, mental constructions in the minds of individual, and learning becomes the process of committing these symbolic representations to memory where they may be processed. Eggen and Kauchack (1992) propose the following as active teaching-learning strategies that the cognitivist teacher promote in the classroom; however, the cognitivist paradigm knowledge is still viewed as given and absolute just like the behavioristic school:

- Make questions to the students, especially those questions that the students ask when they are learning.
- Make the students paraphrase the information instead of reciting it by memory.
- Construct lessons from the analysis of examples and practical applications, instead of departing from definitions.
- Solve problems

- Develop practical classes and send homework
- Write articles, essays, etc.
- Develop practical activities.
- Elaborate tests and questionnaires that require more than a simple memorisation or recall

In regard to the constructivistic theory besides Piaget, constructivists have embraced other theorist, especially the Russian psychologist L. S. Vygotsky, who considered and individual's cognitive system to be a direct result of and inseparable from social life. The individual's psychological processes are always bound to the culture in some way because the individual uses a particular "set" of cultural tools, thus mental constructs are delimited by one's culture. Is in this social level where sign mediated memory, voluntary attention, and concepts are developed on the basis of internalisation of external activities (Marsh 2000). Then, the question is how this thcory influences educators and education? Educators may have greater influence in his/her students, as they concentrate most of the social pupil's time at schools. The social setting of the school and the classroom is of much greater importance than it has been generally considered in educational research and practice. Teachers can incorporate ICT to transform learning through a social context that reflects a change from knowledge transmission to student-centred learning, which promotes individual and shared construction of meaning. Computers can lever the classroom environment through co-operative learning, collaborative project-based schoolwork; thus, the resulting effect is a class where students are active, self-regulated, reflexive, involved and facilitating rather than passive spectators while the teacher plays the role of a coach, a facilitator of the teaching – learning process (Seels 1989).

Methods and data sources

In order to attain the purpose of the study surveys, interviews, class observations and video analysis were used in the research. The subjects of our investigation were 40 teachers from 20 schools of the IESEP school network.

Surveys and Interviews

Firstly a survey was distributed among 40 teachers during a meeting session and was collected the same day. This anonymous survey intended to describe the following educators' characteristics: average age, sex, years of experience, educational level, self-qualification of the learning model adopted by the teacher, attendance to continued education, previous experience with computers or technology. Additionally, the survey collected the following school context characteristics: number of students per classroom, technology infrastructure available at school or home and the way teachers select support or reference materials.

Secondly, in a later meeting a non- anonymous survey was filled-out by all the educators participating in the IESEP project. The survey contained 18 close-ended and 3 open-ended questions related to 3 close-ended questions. Each close-ended question was graded over 5; thus, a figure near 5 indicated a tendency to promote a specific type of activity. The questions were classified in 6 activities-group, each group represented a learning model or strategy promoted by the teacher.

The surveys were collected again the same day they were distributed. In this opportunity the answers found in the survey were discussed with each teacher during a later programmed interview. The purpose was to identify explicitly and deeply the type of activity promoted by the teacher in the classroom and whether the educator was able to explain the adoption of such performances. Thus, the researchers could assess the level of reflection and understanding the teacher has upon the educational practice he/she adopts.

Class Observations and Video Analysis

Through these methods the researchers went to the field to gather live-data. Ten teachers were asked to let the research team to observe and videotape their performance in the class. An observation list was accordingly designed with respect to the questions of the second survey. The list was used in order to tick activities that were or were not adopted by the teachers during the class. The video analysis was accomplished with the participation of an external researcher to do a more objective analysis.

Results

Descriptive data about the teachers and schools participating in the IESEP school network was collected through surveys; learning models promoted and adopted by teachers and level of reflection upon their teaching practice was gathered from the three methods applied in the study. These data is briefly discussed bellow.

Surveys and Interviews

The descriptive data gathered from the surveys about the teachers indicate that the majority of the IESEP teachers are men, the average age is 42, and the average teaching experiencc is around 19 years. Whereas the educational level 58% obtained their educational/pedagogical degree at the university and 20% followed a pedagogical training in post – high school institutes, the rest has a non-formal training in the educational area.

In reference to the learning model 43% auto-qualified themselves as constructivistic, 44% behaviorist and constructivist, 6% considered themselves as behaviorist, and 7% mentioned other paradigms. 80% of the latter said they adopt the paradigm promoted by the Ecuadorian educational reform; paradoxically, they couldn't remember the name of the driving theory. Even though, 55% of the participant teachers has been linked to programs for continued education (no training the rest) the majority of them (89%) did not have any previous experience with ICT or computers, 11% stated they have medium to high experience in the use of office-support software.

In the school context, an average of 50 students per classroom was found. One out of the twenty schools (2.5%) had computers; but, very outdated ones (no hard disks). Computers are used in administrative tasks and/or for academic usage. The latter includes technology as another subject in the curriculum and does not integrate it as part of the whole curriculum. Only two teachers have computers at home and the reference material is the one chosen by principals or the designated by the Educational Ministry.

According to the chosen answers in the second survey very high indexes over 5 were reached for each of the set of activities. On the behaviorist, cognitivist, and constructivist sets the averages were 3.56, 3.76 and 4.16, respectively see [Figure 1].

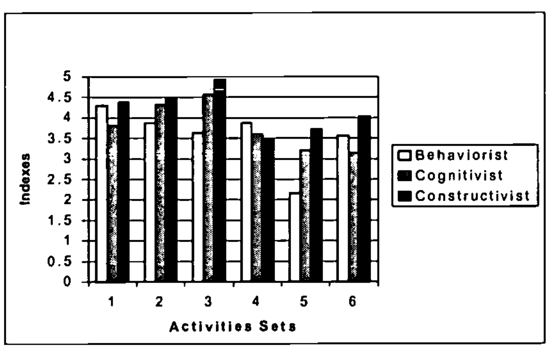

Figure 1: Activities indexes, categorised by Learning Strategy

Next the researchers interviewed the educators in order to find reflexive and coherent answers according to the survey results. Unfortunately, only one of the interviewed teachers where more coherent with the results obtained in the surveys and the paradigm he promoted in classroom. Teachers could not explain why they chose some activities completely opposed to other ones, or from complete different approaches.

Class Observations and Video Analysis

This data source provided the researchers with important evidence referred to the learning paradigm the Ecuadorian teachers adopt. The videos were analysed focused in the following type of activities: (1) behaviorist-related activities, (2) cognitivist-related activities, and (3) social – constructivistic related activities.

Teachers adopted most of the times the central role in the classroom, promote individual activities, rely their activities in concept definitions, drill and repetition. They neither foster the use of other sources of information nor bring past experience to the classroom. Group-based learning is almost avoided due to the high number of students in the classroom, and when used the group community does not exist, all you can see is agglomeration of children trying to solve a problem in a very unguided way. Since, the teacher remains in front of the class instead of supporting kids in their tasks. This latter is aggravated with the lack of enough material to make all the students engaged in specific activities. The developing of project based-activities is neglected, since in their words "there is no time or resources to promote that kind of ideas." Finally, teachers still consider children as repositories of information and not as possible self-regulated or reflexive subjects able to construct their own knowledge.

Analysis and discussion

This analysis will be unfolded in two topics: the educational model adopted by Ecuadorian teachers and the educational and technological needs of these educators.

The Ecuadorian educational model

The results obtained with surveys greatly contrasted with the ones obtained from interviews and much more with the video analysis of classroom's activities. According to the surveys more than the 50% of the teachers have participated in continuing education proposed by the Ministry of Education it would be reasonably to find well-prepared teachers executing a practice in-line with the model the educational reform promotes. But, what researchers found supported by the use of qualitative and quantitative data analysis was a very contrasting reality. Teachers performed a more behavioristic class than a constructivistic one and self-categorised themselves as a mix of behaviorist and constructivist educators (44%).

Educational and technological needs

Teachers from the Peninsula region suffer from a clear weakness -they do not have a deep understanding of the pedagogical paradigm the educational system urges them to adopt. They keep considering students as receivers of information whilst the cognitive and social construction of knowledge is almost neglected; since, the memorisation of content tends to be the primary source for evaluation and educational success. They do not reflect on their educational practices. Ecuadorian educators follow the textbooks the system suggests, they remain as the basic unit of instruction, and few of them refer their students to other information sources. Teachers make efforts to work in a group-based learning approach; nevertheless, their practices do not reflect planned and organised tasks with specific goals to achieve in the classroom setting. They adopt in this a pragmatic and empirical attitude. Therefore, they need a program where they learn the following:
To centre their teaching practice on the learner
To redefine their teaching role as facilitators or coaches in the classroom
To promote the construction of knowledge in view of the social context of pupils and teachers in the Santa Elena Peninsula area.
To develop abilities to work with computers and the programs the project adopted.
To promote self-reflection and critical thinking

Conclusions

The focus of this study was to identify the common educational characteristics of the Ecuadorian coastal rural teachers, specifically the teaching - learning strategies adopted and promoted by these teachers. Besides, the description of the characteristics of the educational context where the educators develop their activities was other of the goals of this study and the identification of the educational and technological teachers' needs. All the goals were achieved successfully. Evidence that the teachers of the Ecuadorian coastal region are not upholders of the social – constructivistic paradigm is the fact that they obtained high rates in all three categories of teaching-learning strategies studied. Teachers do not have a deep and thorough understanding of what they mean by being constructivistic, since they could not explain their performance over what they answered during the surveys and interview sessions. They do not reflect on their educational practice and/or use a specific frame of reference. Qualitative data analysis in this study was the key in these latter findings.

In regards with the educational and technological needs of these teachers, the researchers found the educators needed a program in which they learn to be social-constructivistic teachers; since, they are not able to promote strategies they do not understand. The researchers find the teachers have to have opportunities to share with others their successes and failures in order to learn with and from others; thus, workshops, conferences and reflective practice have to be encouraged for the quality of teaching – learning in the project. Finally, the IESEP team has a major challenge, teachers have to learn while getting involved in what is significant learning for them, they will learn more efficiently by doing or experiencing (Davis, 1998). Unless what is learned can be applied to actual work or life situations the learning will not be effective or long lasting.

References

Chickering, A.W. & Ehmann, S. C. (2000, March). *Seven Principles for Good Practice in Undergraduate Education.* [Online] Available: http://www.facsen.iastatc.edu/conf2000/principles.html

Chiluiza, K. M. & Peláez, E. (2000, September). Training Faculty to Use Technology in the Classroom –An Ecuadorian Experience. *Integrating Learning Technology Practice, Policy and Partnership, 2000,* Association of Learning Technology, Manchester, UK. 109. [Online] Available: http://www.cti.espol.edu.ec/ttr/trabajo-E0.htm

Davis, N. (1998). Developing Telecommunications within European Teacher Education: Progress, Plans and Policy. *Technology and Teacher Education Annual, 1998,* Association for the Advancement of Computing in Education, Charlottesville, VA. 1268-1270.

Dede, C. (1996). The transformation of distance education to distributed learning. *Learning and Leading in Educational Technology,* 23(7), 25-30.

Eggen, P. D. & Kauchak D. P. (1992). *Educational Psychology: Classroom Connections*, Maxwell Macmillan International, New York.

Ehmann, S. (1995). Asking the Right Questions. What Does Research Tell Us About Technology and Higher Learning? *Change*, March/April 1995, 20-27. [Online] Available: http://www.learner.org/edtech/rscheval/rightquestion.html

Forman, D. C. (1995). The use of multimedia technology for training in business and industry. *Multimedia Monitor*, 13(7), 22-27.

Knezek, G., & Christensen, R. (2000, February). A Structural Model of Technology Integration. *Hawaii Educational Research Association.* Honolulu, Hawaii.

Land, M. & Coe, M. A. (1998). Teaching About vs. Learning with Technology. *Technology and Teacher Education Annual, 1998*, Association for the Advancement of Computing in Education, Charlottesville, VA. 1268- 1270.

Lombardo, T. (1998). The Impact of Information Technology: Learning, Living, and Loving in the Future. *The Labyrinth - Sharing Information on Learning Technologies*, 5(2). [Online] Available: http://www.mcli.dist.maricopa.edu/labyforum/Spr97/spr97L8.html

Marsh, G. E. (2000). *Constructivism.* [Online] Available: http://www.bamaed.ua.edu/ail601/const.htm

Mojica, F.J. (1999). La sociedad de la información. *Educación Superior Latinoamericana Frente a las Reglas de Juego del Siglo XXI, 1999,* Asamblea del Consejo en Pleno de Asociación de Universidades de América Latina y del Caribe para la Integración, Quito, Ecuador. 42-46.

Negroponte, N. (1995). *Being Digital.* Vintage Books.

Oblinger, D. G. & Rush, S. C. (1997). The Learning Revolution . In Oblinger, D. G. & Rush, S. C. (Eds.), *The Learning Revolution. The Challenge of Information Technology in the Academy.* Anker Publishing Company, Inc. Bolton, MA.

Seels, B., (1989). The instructional design movement in educational technology. *Educational technology*, 29(5), 11-15.

Critical Kiwi Chronicles:Technology and Teacher Education in New Zealand

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Abstract: This paper provides a critical analysis of the integration of technology in pre-service teacher education in New Zealand. New Zealand has made great strides in reforming curriculum both at the pre-college and teacher education levels. As a result, the country has decided that technology has a vital role to play in the teaching and learning process. As a result teacher education institutions have made great strides in course development, online offerings, and internet resources for prospective teachers. The issue is the continued professional development of teachers and actual application of technology in the schools.

Introduction

Technology and teacher education in New Zealand are undergoing considerable transformation. Unlike the United States, which remains in the grips of societal debate regarding even the very basic goals of education, teacher education, and the role of technology within each, New Zealand has a established a decided direction for technology in education and teacher education. The history of teacher education in New Zealand is not without controversy and domination by traditional praxis. Specific issues unique to New Zealand teacher education include the role of New Zealand in the world, relations with other nations, Maori and bicultural issues, the recent debate over the curriculum documents, the overarching goals of teacher education for transmission or transformation, and the role of technology in education and teacher education.

The history of teacher education has traditionally been conducted by teacher's colleges which have been separate from the university system. As a result, one finds most of the faculty with only bachelors or masters degrees; and many who are still teachers in local schools. Students enter colleges of education immediately after finishing secondary schooling. The three year program includes both content specific courses that are directly tied to content the prospective teachers will be teaching. Students are also required to take the pedagogy courses at the same time. School placements occur during each of the three year program. The focus is to provide placement early on and build on length of placement throughout the experience. There is no semester-long student teaching although students have lengthy placements during the last year in the program. Issues with placements seem to be a lack of organization, lack of relevance (context and connections), and saturation of the schools.

Issues

Technology in schools and teacher education in New Zealand is definitely supported by the ministry of education and the universities themselves. Schools receive funding for technology integration and every school in has at least one internet connection. One also finds at least one fairly new computer in every classroom. There are web sites and online support for teachers interested in technology integration in their classrooms. The issues of standards for technology within education and teacher education are again debated here.

Very similar issues exist in New Zealand as in the U. S. regarding integration of technology in education. These issues include access, support, funding, and "training." Teacher education institutions offer undergraduates one course on computers in education and students can take others as electives. Very little technology integration is included in other face to face teacher education courses. It is generally left to the individual faculty member to decide for themselves. Recent literature reinforce the issue that in general future teachers are not receiving the experience needed to effectively integrate technology in teaching and learning both in the U. S. and in New Zealand (Moursund and Bielefeldt, 1999; Hunt, 2000).

New Zealand is grappling with the issues of technology and standards and many provide a critical response to the technology "by in" by schools, education, and teacher education. A critical understanding of ideology and the social practice of technology leading to an equitable distribution of resources and power should be discussed (Hilty and Gitlin, 1996; Snook, 2000). Brown (2000) suggests that without critical knowledge of pedagogy and a philosophical framework for application in one's own teaching and learning, critical reflection in teacher education, educational technology, and schools is highly problematic.

Perhaps because of the rural nature of the country, New Zealand has made great strides in online course development for teacher education. New Zealand rivals the U. S. in per capita internet usage, thus meeting the needs of students via distance education is a particular directive from the Ministry of Education and colleges of education. As a result, many courses are offered as online alternatives with Webct as the chosen software. In fact, only this year the first totally online cohort in teacher education graduated from Massey University (they did engage in traditional school placements however).

It does seem that recent efforts in technology and teacher education have gone toward online course development rather than integrating technology in teaching and learning in the schools. Massey University has excellent support for online courses. Faculty receive extensive opportunities for professional development and technology support. The university has also established Webct templates to make it easier to get up and running with online courses. The online course office establishes accounts for faculty and students, manages the sites, coordinates all mailing, and even has established general discussion forums and online help sites for addressing issues and concerns. The university web site has all kinds of links to assist faculty, staff, and students with online courses and technology integration.

There is a concerted effort throughout the country to improve information and communication technology (ICT) for prospective teachers. Massey University for example, has established a "knowledge net" metaphor outlining principles of preservice teacher education and technology knowledge and skills for classroom application. The idea is that teaching learning and technology include linking to innovative teaching, be understood as social practice, be located in meaningful contexts, be infused throughout the curriculum, and be integral to lifelong teacher professional development (Brown, 2000).

Perhaps New Zealand is at a crossroads and what really is accomplished regarding schooling, education, and technology integration depends on teacher education, professional development, and eventual application of ideas in the classroom. There is no doubt that there have been efforts made by the ministry in improving education, teacher education, and technology integration within each, but it remains to be seen whether the curriculum documents and teacher education changes will make a difference for the future in New Zealand.

Conclusions

In summary, many similarities exist regarding schooling, education, and teacher education in New Zealand and the U. S. In both nations schooling, education, and teacher education have suffered from inconsistencies dealing with definition, purpose and rationale, and approaches. Curriculum, instruction, and assessment issues are also prevalent in both societies. Perhaps the most important issue has been the continued focus on traditional rather than transformation praxis in teacher education. These issues make for problems as New Zealand attempts to improve teacher education in the new millennium.

Skelton (1997) suggests that there is a desperate need to transform education and teacher education so that the goal is to encourage respect for different perspectives, uncertainty, and provisionality as preparation for living in a increasingly pluralistic, fragmented, and rapidly changing world. Powerful approaches including meaningful, integrative, value-based, challenging, and active teaching and learning are needed to transform both schools and teacher education (Hope, 1996). Likewise, the potential for technology as a tool for transforming schools, education, and teacher education can not be denied (White, 2000).

The real future of schooling, education, teacher education, and technology integration in New Zealand has yet to really be determined. Despite the mandated curriculum documents, there remain entrenched educators, administrators, teacher educators, and others in society bent on ensuring the maintenance of the status quo and traditional teaching and learning, even with the use of technology. As is its history, schooling, education, and teacher education internationally will always be the center of educational debate. New Zealand is no different on this account. But the potential for a transformative schooling, education, teacher education, and technology integration has at least experienced positive hope in New Zealand.

References

Brown, M. (2000). *Preparing teachers for the 21st century: The challenge of new educational technologies.* Paper presented at the TEFANZ conference, Christchurch, NZ.

Hilty, E. and Gitlin, A. (1996). Teacher education: what is good teaching and how do we teach people to be good teachers? In. J. Kincheloe and S. Steinberg (Eds.) *Thirteen questions: Reframing education's conversation.* New York: Peter Lang.

Hope, W. "It's Time to Transform Social Studies Teaching." *The Social Studies.* 87 (4). (1996).

Hunt, A. (2000). *Information technology in pre-service teacher education within a New Zealand college of education.* Unpublished thesis, Massey University.

Moursund, D. and T. Bielefeldt, (1999). *Will new teachers be prepared to teach in a digital age? A national survey of informational technology in teacher education.* Los Angeles: Milken Exchange on Educational technology

Skelton, A. "Studying Hidden Curricula: Developing a Perspective in the Light of Postmodern Insights. *Curriculum Studies.* 5 (2). (1997).

Snook, I. (2000). Teacher education: Preparation for a learned profession. In A. Scott and J. Freeman-Moir (Eds.). *Tomorrow's teachers: International and critical perspectives on teacher education.* Christchurch: Canterbury University Press.

White, C. (2000). *Issues in social studies: Voices from the classroom.* Springfield, IL: Charles C. Thomas, Publisher.

MATHEMATICS

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It is always exciting to examine each year's mathematics section papers as they come in for the SITE Annual and this year proved to be no exception. Not only do we see a broader representation of mathematical themes and teaching approaches, but we also see an increasing number of international papers. This points to the growing influence of SITE within the national and international community and bodes well for the future of our organization. When we add to this picture the large number of PT3 presentations it is clear to see that SITE is rapidly becoming ***the place to be*** for technology in teacher education and has made great strides in fulfilling some of the vision of the original founders.

We are also beginning to see some fruits resulting from the maturation of technologies used within the field as a whole. This growing maturity, together with the stabilizing influence of Web based applications, has gone far to providing a more consistent platform within which to explore mathematics in the classroom and teacher education. To a very real extent it is at last possible to seriously examine the impact of technology upon teaching and learning within mathematics without spending two-thirds of the paper dealing with machine specific idiosyncrasies. It's quite exciting to think about what the years ahead might bring when we are able to focus upon substantive issues without having to spend huge efforts in maintaining a stable workplace within which to perform our research.

We thoroughly anticipate that such papers from the future will look markedly different from those of the last 12 years. As we try to imagine what these future papers might look like, it's possible to anticipate changes in at least three areas. The first area would concern itself with the nature of the content to be taught. Mathematics in a technology-enhanced world looks substantially different than it does when the sole tools to think lived are calculator, paper and pencil. Clearly, content issues will need to be addressed in a markedly different fashion in teacher preparation. Secondly, the role of teacher and the interaction between teacher, technology and student will need to be carefully addressed. One might expect to see a growing number of papers dealing with these interactions. The third area of potential change lies in that of the student as they use this new technology enhanced environment to explore mathematics.

The Papers

Putting the crystal ball away for another year, we decided to use these three frameworks -***Content***, ***Teacher***, and ***Student*** - to organize and discuss this year's papers. So let us begin by taking a closer look at this sorting rubric. As we organized the papers around these three major themes, we recognized the false distinctions that occasionally arose. For example, one cannot teach without having content or students. However, in nearly every case we are able to reach a consensus regarding which category might serve to best represent the intent of each paper.

Papers that were classified in the ***Content*** area tended to provide meaningful insight into what the actual mathematics in a technology enhanced environment might look like. And what a fascinating view this set of papers provided! Running the gamut from pre-numeracy through calculus and beyond they provide a fascinating series of insights into the future status of mathematics, as well as the tools with which we will enable our teacher candidates to come to understand and teach it.

Papers that were placed in the second major organization area, ***Teacher***, tended to deal more with issues of pedagogy, teacher preparation, and professional development. We also included in this section does papers dealing with the inner life of the teacher and descriptions of general technology tools which might be used across a broad variety of contents and with a broad range of students.

The final theme, students, in many ways is the most important of all. After all, the student is the final consumer in the educational enterprise and should be the center of much of our thinking and planning. As we examine the role of student as it emerges from the papers presented this year we see a near requirement for more active, critical, and interactive participation on the part of the student. It is interesting to note that the type of student involvement pointed to in these papers nearly mirrors those outlined by the National Council of Teacher's of Mathematics (NCTM). Relying on the data provided in these papers one can easily build a case that technology can not only be aligned with the NCTM goals, but can easily become a central tool to enable their achievement.

Content. Perhaps appropriately, we begin our discussion of the papers in the content section with Autrey and Myers' paper describing their experiences with designing and using competency exams in college mathematics. With today's national trends placing an increasing burden upon teachers to possess high levels of content mastery, such exams are likely to play an increasingly important role in the future. In this paper we see a report on their progress thus far and suggestions for competency exams across the mathematics curriculum. This paper serves to remind us that pedagogical content knowledge, as important as it is, must be thoroughly supplemented with content knowledge of the teacher is to teach with power and authority.

Of course, assessment is of limited value unless we use the results of that assessment to improve student understanding. In Grandgenett, Zygielbaum, Ostler, Hamersky, and Pawloski's paper we see some preliminary findings regarding an online learning program developed in cooperation with the National Science Foundation. Designed to address the specific content requirements of elementary education majors, this program utilizes a unique database structure and should be examined carefully by those planning to implement a similar approach. We look forward to seeing in future presentations the end result of this work.

In examining those papers dealing with a more traditional view of mathematics content, we find numerous technology-enhanced approaches ranging from beginning mathematical concepts to highly advanced mathematics. Beginning with basic numeracy we have Zelenski's discussion of a new program dealing with whole number concepts as well as fractions. It would be well worth examining the *.pdf* versions of the annual to see the colorful illustrations that were presented with this paper. This program places mathematics learning within a jungle exploration context and should provide both incentive and interest for the young child.

Continuing in the tradition of placing learning within the context of personally interesting and motivating experiences, Beal, Woolf, Beck and Arroyo's paper describing to *AnimalWatch: An intelligent computer tutor for elementary school mathematics* promises to provide a wonderful existence proof of this effective instructional approach. It should be noted that thanks to the support of the National Science Foundation *AnimalWatch* will be available at SITE 2001 on a CD-ROM for teacher educators and teachers. We plan on picking up a copy and would recommend that you do also.

Reporting on a project, which includes both CD-ROM and Web based resources; Thomson and van der Kuyl describe the development of their multimedia combined with the Web and CD package geared specifically for the needs of students in the early years of elementary school. This paper truly blended our three categories, as care was taken not only to ensure that the developmental needs of the students were adequately addressed, but also that the materials themselves enabled effective pedagogy on the part of the teachers. The decision to place this paper within the content area was made based upon the perceived focus upon the actual curriculum that was created.

Continuing in this transition from stand-alone CD-ROM to more Web based activities, Lenze's paper provides a fascinating description of some of the design decisions made by museums to meet the interactive learning needs of their Web based patrons. In addition to his careful and insightful commentary on the design process, we found the resources listed within this paper to be extremely worthwhile as they provided many high quality sites in an easy to locate fashion. Although this paper is not listed in the abstracts, we feel that it is definitely worth the time it takes to find it and would hope that his session will be well attended.

The next presentation suffers from the exact opposite problem. Although it is listed in the abstracts it is not present as a paper. This is to be expected given the nature of the interactive session that Miller proposed. Within this session attendees will have the opportunity to examine two inexpensive software products and use them to script out a series of materials designed to teach linear equations. This certainly set sounds like an interesting session and we likewise would hope that it to be well attended.

An absolutely fascinating vision of how transformational geometry and matrix algebra might be taught in a technology enhanced setting is offered by Norton and Abramovich. This paper is highly significant on a number of points. First, the software utilized is off-the-shelf - by this we mean a spreadsheet, in this case Microsoft Excel - was used to generate the workspace within which the mathematics is generated. Secondly, the mathematics itself is quite interesting and would certainly catch student interest. And not least among these considerations the nature of the workspace itself lends itself toward student exploration. The authors have kindly included the Web address for the Excel file comprising the tool kit. We feel that this is a *must* download for teacher educators regardless of the level of their students. A careful exploration of the approach taken by Norton and Abramovich would be beneficial for anyone interested in using Microsoft Excel, or indeed any spreadsheet, to create such an advanced learning environment.

Finally, Bouniaev provides an insightful discussion regarding the potential for use of databases in teaching calculus and other advanced courses. There is much in this paper of interest not only to the mathematics educator, but the educational theorist as well. It has been fascinating to observe over the past several years the careful theoretical grounding and progress he has made in expanding SSDMA Theory and its applications - not only in terms of information technology, but also within mathematics education.

Teacher. At the risk of contributing to the proliferation of yet another buzzword we have chosen to begin our discussion of this section on teaching with Drier's excellent paper on factors affecting the development of Techno-Mathematical Knowledge. Few would argue that the teacher candidate comes into the methods courses equipped with many believes and misconceptions regarding content, their role in teaching the content, and the role which technology might play in this effort. In this paper we see a careful examination of shifts in belief occurring during a technology intensive mathematics methods course (additional details concerning this course are available via the Web). The included vignettes illustrate how technology can enable subtle shifts in thinking and attitude regarding not only the use of technology, but also the teaching of mathematics.

Continuing this investigation into teacher beliefs, we have Beaudrie's discussion of perspective K-6 educators attitudes towards technology. Although not listed in the abstracts, this presentation promises to say much about the K-6 teacher attitudes toward technology. As the author correctly notes, the use of technology should not began high school classroom. Yet, in examining the beliefs and attitudes of many elementary classroom teachers we find that many of them come to the technology front sadly lacking in desire to use technology. Referring to the author once more, he presents a poignant observation that although students agree the technology is important to say that they like computers would be an overstatement.

Also on the pre-service front, Amarasinghe's paper describes a technology infusion effort that made use of a set of highly structured technology units in the secondary mathematics course. It is worth reading this paper to see the nature of the design that went behind their creation. We would encourage interested readers to make a point to attend this session.

Moving from pre-service to in-service teachers, in Barber-Freeman, Snead-Greene and McFrazier's paper on computer-aided personality assessment we are shown some of the personality attributes of secondary and middle school mathematics teachers. Furthermore, we are provided tantalizing evidence which indicates that teacher self awareness of their own teaching and learning styles can prove to be an effective tool for their use in improving instruction.

Making a slight shift in focus, we now examine a series of papers examining various aspects of the teacher preparation process. The first paper in this series from Cavey and Barnes describes a program, *Girls On Track*, requiring active participate part of the student. This summer-based program provided not only opportunities for student growth but also a tremendous experiential base for use by in-service and pre-service teachers. By simultaneously providing a built-in support system as well as immediately relevant and meaningful tasks, this program truly utilizes a variety of approaches towards training teachers. It is an ambitious program, and one well worth watching in the years ahead.

Of course, it is difficult for pre-service teachers to gain appreciation for the role of technology in instruction when the methods professor themselves are unsure of technology's role. In Jensen's paper we are promised some insight into the mind of the methods professor's reflections upon how technology should integrated into the curriculum. Those people who are still on the fence regarding technology use in the mathematics methods course might wish to attend this session at SITE where this paper is discussed for further information.

Some potential technology roles mathematics teacher education are offered in Hovermill and Meloth's careful analysis of how information technology has been integrated into the teacher education program at the University of Colorado-Boulder. In this paper we see a careful reflections upon the NCTM's goals, together with a very practical series of recommendations into reforming the teacher education program. Their student findings are likewise of interest. First, the students agree the technology offers unique opportunities and enables connections within mathematics and other disciplines. They also came to realize the technology-enhanced investigations lend themselves to authentic collaboration. These are clearly laudable goals in the authors should be well pleased with their attainment.

We would now like to direct your attention away from the development and support of teachers per se and toward some rather unique tools and resources for teacher use. As we began its helpful to remember that not everything works the first time it's plugged in. Quite often in generating new technologies there is substantial time spent thrashing about while we wait for either a stable platform or the correct authoring tools to bring our projects forward. The first paper in this section, by Shibata, offers a case in point. Here we see the beginnings of a description of the creation of not only a dynamic curriculum control module but also a full-blown algebraic editor and authoring system. As is often the case in program development there are significant startup costs and unforeseen problem are common. Those of you planning entering a substantial phase of program creation might do well to attend this session to listen and learn from their experience.

One solution to the dilemma of developing a stand-alone series of applications lies in utilizing the interactive potential of web-based resources. Although not appropriate for every task, it is amazing how often we can accomplish with Java and HTML what is next to impossible to accomplish with C++. We see this approach utilize to great benefit by Zhang who outlines a set of web-based resources designed to teach fractions. Based upon a very careful semantic analysis of the word actions forming the underlying basis for fraction operations over 100 problems were developed and divided into four basic operations and 11 categories. Although not listed in the paper we would love to see the URL for this particular program as it appears to offer great potential forced widespread teacher reference.

Another interesting paper not indexed in the abstracts is Campos, Gomes, and Neto's work using Tele-ambiente in Brazil. TELE itself is a learning environment composed of the TELE interface and a group of activities utilized by this tool. Based in part upon Microsoft's NetMeeting product this interface has been modified to support mathematics. Although still in its beginning stages, this program offers great potential in providing a meaningful and worthwhile environment for student construction of knowledge as well as enabling teachers to have some unique resources available to them.

Another "not in the abstracts" paper by Diez and Moriyón describes another tool designed for teaching mathematics, that of MathTrainer. Drying heavily upon the programming by example methods math trainer appears to be a powerful visualization tool. Of particular interest lies in the importance of the step-by-step actions being delineated by the teacher. This fits in well the SSDMA notions presented by Bouniaev in this section together with other action on objects models (See Connell, 2000). We look forward to seeing the second-generation of this potentially powerful teaching tool and resource.

In the last in this series of interesting papers that are "not in the abstracts" Varvel and Harnisch describe how wireless computer networks are revamping not only what we think of as a network, but also what we think of as a classroom environment. In addition to describing the logistics is setting up such a wireless network, we also see a well thought out and articulated model describing how such a resource might be utilized. Based upon the student responses to the survey conducted for this paper this technology appears to have arrived just in time to meet some very definite student needs.

Finally from the teacher's perspective we have the opportunity of attending a roundtable session by Williams, where we will be able to gain insight into one teacher' efforts on integrating technology into math education. This looks to be a very lively session and I would encourage those of you with an elementary interest to attend.

Student. Given the increasing reliance upon Web based resources in mathematics teaching, it is clearly of utmost importance to consider our students perceptions about such methods of instruction. In the paper presented by Chao and Davis we are offered a careful look at the impact of putting a large number of mathematics courses online at Golden Gate University. The convenience and flexibility of such online delivery appear to have more then offset the disadvantages of not having face-to-face interaction. It should be noted, however, that these students are predominantly composed of part-time students working full-time. At least for this population the online delivery of mathematics courses make sense.

As has often been suggested, spreadsheets can provide a wonderful environment for the exploration and generation of mathematical concepts. In Brzycki and Hechtman's paper we see how a fifth-grade class was able to successfully use both Excel and PowerPoint to create a very dynamic classroom environment. The authors report that these students not only learned basic financial and mathematical concepts but gained confidence in both creating in sharing their own discoveries.

Recognizing that research, in order to be valuable, must have impact for the population at hand Wang, Swanson and Lam have proposed a replication of some foundational CAI research for the island of Guam. This study as outlined has great potential and we look forward to seeing it's successful conclusion and report. Perhaps a day to the preliminary nature of this proposal, it is not currently listed in the abstracts. Hopefully some preliminary data will be made available during the session itself.

In Zhang and Patzer's research on technology and basic math skills over 104 students in 6th 7th and 8th grades participated in a remedial math lab held over a fourteen-week period. An interesting note to this research was that although it was difficult in the eyes of the authors to see differences between the two groups in terms of math improvement, there were obvious attitudinal changes among the students who had access to the computers. The students reported that they enjoyed working on the computers with their problem solving strategies. An equally important lesson was that simply putting a student in front of a computer does not necessarily mean integration of technology into math curriculum. This is a message which needs to be sent quite often even to those of us who should know better.

On occasion at SITE we often lose track of the fact that for the case of mathematics education the appropriate technology is often the handheld graphing calculator. In Ostler and Grandgenett's study we see how a short brainstorming session was able to encourage pre-service math teachers to adopt graphing calculator usage. The session for this paper promises to have insight both in terms of calculator adoption as well as field based aspects of teacher education. We encourage those of you with interest in these areas to attend this session.

Concluding Remarks

Mathematics and Mathematics Education have each had long and distinguished histories, which like many other aspects of our world are becoming deeply and profoundly impacted by technology. The papers in this year's section serve to remind us that whatever the organizing screen we use - *Content*, *Teacher*, or *Student* - or that of our own devising, it is impossible to use old labels to predict the new and emerging trends. As a group, these papers serve to remind us not only of the changes which technology has brought about in foundational issues of mathematical content, but also that our interactions with one another, with our students, and with this changed content will forever be enhanced by these new tools of technology.

We hope that the stability of the modern technology platform will enable us to concentrate more on researching questions of substance rather then on maintaining a meta-stable platform in the midst of logistical and hardware difficulties. Research of this type will prove invaluable in advancing our field of understanding so we might take better advantage not only of the new tools we have to think with, but also the new understandings which they might enable.

References

Connell, M. L. (2000). Actions on Objects: A theoretical framework for mathematics education. In Willis, D., Price, J. D., & Willis J. (eds.) Technology and Teacher Education Annual 2000. (pp. 1034-1039). Charlottesville, VA:Association for the Advancement of Computing in Education.

Secondary Mathematics Methods Course With Technology Units: Encouraging Pre-service Teachers to Use Technology

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ABSTRACT: Although technological tools that can be used in the mathematics classroom were introduced to prospective teachers at various stages in their undergraduate curriculum, novice teachers seldom use them in their actual teaching. This paper describes the efforts taken to encourage secondary mathematics teachers to use technology in their teaching by introducing five highly structured technology units into the secondary methods class. The five units are designed to use Internet, Graphing Calculators, Geometer's Sketchpad, Computer Based Laboratories (CBL), and Spreadsheets. The intent of these units is to make students aware of the existing resources, provide hands on experience, look at the resources critically, and collectively develop effective ways to integrate these resources to mathematics teaching.

Background

Methods and Materials in Secondary Teaching is a required upper division course for prospective secondary school mathematics teachers at California State University, Fresno. Students are expected to learn various teaching methods and materials/resources that help them to become effective mathematics teachers in this class. Although technological tools that can be used in the mathematics classroom were introduced to them at various stages in their undergraduate curriculum, students seldom use them in their actual teaching. Various researchers have tried to identify the reasons for their reluctance to use available technological tools in their classrooms (Flake, 1990; Fine & Fleener, 1994; Brooks, D., & Kopp, T.W., 1990). The research findings promote the change of students' beliefs, hands-on experience, group/collaborative work, reflective thinking, and oral communication in mathematics education classrooms. Studies revealed that just learning about technology is not enough to unlock the minds of the preservice teachers to the possibility of those resources as instructional tools. For example, Fine & Fleener, (1994) concluded their study saying "the mention of pros and cons of calculator use and the brief demonstration lesson plan given in the math methods courses left these preservice teachers with at best a superficial understanding of this form of technology. However they appear inadequately prepared to employ calculators in classrooms of their own."

In order to encourage secondary mathematics teachers to use technology in their teaching by infusing technology units into the secondary mathematics methods course, five technology units were introduced to the secondary methods class. The five units are 1) Internet; 2) Graphing calculators; 3) Geometer's Sketchpad; 4) Computer Based Laboratories (CBL); and 5) spreadsheets.

Nature of the Efforts Taken

The intent of these units is to make students aware of the existing resources, provide hands on experience, look at the resources critically, and collectively develop ways to integrate these resources to mathematics teaching effectively. To accomplish these goals, each unit was designed with six components: 1) demonstration; 2) classroom discussion of the resource; 3) students' group projects; 4) student-designed mathematics lessons; 5) sample teaching of the lesson; and 6) peer evaluation and critique of the lessons.

The demonstration is designed to introduce the components of the resource to students. In this part students were given a brief introduction followed by a sample use of the resource in teaching a lesson in mathematics. The classroom discussion is designed to discuss the pros and cons of using the resource in a mathematics classroom by reviewing various research studies and position papers. The goal was to challenge students' existing beliefs about the use of the resource. Researchers suggested that unless students' beliefs about the usefulness of the technology is changed they are not going to use these in their own teaching (Flake, 1990). The projects are designed to familiarize students with the resources via group projects where students inquire about these resources in collaborative groups. The student-developed lesson plans and sample teaching units are the major portion of this effort. In these two parts students are supposed to incorporate the resource they are learning to enhance a mathematical topic they are interested in teaching. For example, students used Geometer's Sketchpad to enhance a lesson on graphing linear equations or used graphing calculators to enhance a lesson on teaching quadratic equations. The last part, the evaluation and critique, is a classroom discussion designed to promote reflection on students' own teaching experiences, oral communication and discussion of teaching methodologies. During these discussions students are expected to receive a constructive feedback from the classmates and explain the reasons behind selecting the mathematical topic, and the activities incorporated into their lesson.

The ongoing study will include details of the student experience in the class, and the results of the survey at the end of the semester will be used to measure the effectiveness of the units. Students' feedback related to the usefulness of the units in their actual student teaching experiences will be also collected along with student-developed sample lesson plans.

References

Fine, A.E., & Fleener, M.L. (1994). Calculators as a instructional tools: Perceptions of three preservice teachers. *Journal of Computers in Mathematics and Science Teaching. 13*(1), 83-100.

Flake, J.L. (1990). Preparing teachers to integrate computers into mathematics Instruction. *Journal of Computers in Mathematics and Science Teaching, 9*(4), 9-16.

Brooks, D., & Kopp, T.W. (1990). Technology and teacher education. The subject matter preparation of teachers. In W.R. Houston (Ed.), *Handbook of Research on Teacher Education.* (pp. 498-513). New York: MacMillan Publishing.

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Competency Exams in College Mathematics

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Abstract: The idea of competency exams as an integral part of a college mathematics course started at Northwestern State University because of the move to reform based calculus. Further changes in our curriculum have led to a more widespread use of competency exams. While implementation of these exams has been successful in our calculus courses and a course for elementary education majors, we wish to expand our competency exams into developmental mathematics and College Algebra. These exams will ensure that our students have basic analytical skills, while allowing us to maintain reform based courses. We hope to use computer and internet based exams in order to manage a competency exam program throughout the department. We are currently testing a computer based, self-paced program in one developmental math class. We will report on the process we use for these exams and the results we have seen from competency exams across the mathematics curriculum

Our History

The idea of competency exams as an integral part of a college mathematics course started at Northwestern State University because of the move to reform based calculus. Further changes in our curriculum have led to a more widespread use of competency exams. As a part of the reform based calculus, we place a greater emphasis on numerical and graphical ideas, with less emphasis on the analytical skills that previously dominated the courses. While we believe that a reform based approach leads to a greater understanding of the concepts studied in mathematics, our students were naturally less experienced (and less competent) with algebraic manipulations and other analytical skills. In order to ensure that our students have the ability to perform basic analytical operations and the ability to teach the analytical processes, we have implemented competency exams that students must pass as a requirement of the courses.

In recent years, we have developed two new mathematics courses specifically for elementary education majors. The first of these courses, designed to be taken after a student completes College Algebra and Finite Mathematics, focuses on the concepts and applications of mathematics needed in elementary and middle school grades. We were surprised to notice a deficiency in the basic mathematical competence of students in this course (soon to be elementary school teachers). In order to address this problem, we developed a competency exam as a requirement for this course as well. The exam focuses on problems involving computations with fractions, percents, and basic equations. Students are not allowed to pass this course and become teachers without passing the competency exam.

Having noticed this deficiency within the elementary education majors, we believed that the same would be true for other students. Furthermore, we felt that the deficiencies needed to be addressed at an early stage in the students' preparation. At that point, the decision was made to consider the introduction of competency testing in our college algebra course as well as the developmental math courses. Development of fluency in mathematics requires students to be proficient with computations as well as concepts. As stressed in NCTM standards, understanding without the necessary computational proficiency inhibits the ability to become efficient problem solvers; the competency tests we are currently using and those we plan to use emphasize that computational ability.

Over half of the students entering the university are in need of some form of remediation; generally, the majority require remediation in mathematics. At Northwestern, students are placed into college algebra on the basis of either their ACT math scores or their scores on the math placement exam. About 900 students enroll in developmental math courses offered on the main campus in the fall semester and about 600 enroll in the spring semester. Many of these students lack basic arithmetic skills as well as elementary algebra concepts. They not only lack computational skills but also the conceptual understanding required for efficient problem solving

In an effort to better utilize existing resources, the decision was made to offer the beginning developmental course as a self-paced course rather than the traditional lecture course. A pilot section was offered in the fall of 2000 using the existing technology for our online college algebra course to create a hybrid type course. Students still attend class but work in an online classroom setting. This allowed faculty to incorporate competency testing as a component of the course requirements.

Implementation

The competency exams given in calculus courses have been a successful addition to the requirements of the courses. The exams are composed of about 15 problems involving basic differentiation and integration techniques. Students may retake the exams as needed to achieve a minimum competency standard (currently 85%). Since we are a small department, offering only one section of each calculus course per year, the instructor easily manages these tests and re-tests. There are typically 15-25 students in each course. On average, each student requires two attempts to pass the test. Students can schedule times to take the tests, and instructors can find time to grade them within normal office hours.

The competency exam in the course for elementary education majors is a valuable tool to ensure that our students do not graduate without the mathematical abilities they will need in the classroom. Many of the students have been successful in college mathematics, even without a solid background in some of the mathematical concepts that are typically overlooked at this level. There are two sections of the course each semester, with a total of about 60 students. These students require about five attempts to pass the test, making the exams time consuming for the students as well as the instructor, since the tests are scheduled outside the normal class time. Students are not allowed to pass this course and become teachers without passing the competency exam.

Topics covered in the developmental mathematics course include: arithmetic operations with whole numbers, fractions, and decimals; problems involving ratios, proportions, and percents; fundamental operations with sign numbers. To ensure students have obtained at least minimum competency in these areas before moving to the next level of developmental math, four competency tests were created. Students must pass each of these with a minimum score of 80%; failure to do so means that the student will fail the course. Using the technology available through Blackboard (the platform we are currently using for our online course offerings), students may take the tests as many times as necessary in order to achieve the minimum competency. Each test is randomly generated from a test pool and is password protected. Test proctors enter the appropriate password for each test that the student wishes to take. Preliminary results indicate students require, on average, 3 attempts per test to achieve at least the minimum level of competency and those who have passed the competency exams are performing at higher levels on regular exams given during the semester than those who have not passed the tests.

The Future

The college algebra course (Math 1020) taught at Northwestern is also a reform-based course. Since nearly every student takes this course, competency testing is an important element. In talking with faculty members across campus (College of Education, College of Business, Industrial Technology, Biology, etc.), the most common complaint was the lack of basic algebraic skills by many of the students who have completed their math sequence. What we have seen repeatedly is some understanding of basic concepts involved in solving a problem but a lack of fundamental algebraic and other analytical skills necessary for reaching a solution. In an effort to address this deficiency, faculty at Northwestern have proposed the addition of basic competency testing as an additional course requirement. By doing so, we believe that those students entering the teaching profession will be better prepared to teach mathematics at all levels.

The main issue currently under consideration is the implementation of such testing. Our college algebra classes generally have enrollments of 50 to 60 students per section (about 20 sections are offered each semester). Paper and pencil testing with unlimited retakes would make the task almost totally unmanageable. Use of technology, such as that currently being used in the developmental class, would provide not only a more manageable means of test administration but also a method for generating multiple versions of the test. Use of passwords for the test would address security concerns; however, there are still issues to be resolved in this area.

Conclusions

Overall, faculty believe that the use of competency testing as an additional course requirement will provide some measure of assurance that students have the basic mathematical skills needed for success in the future. For many of the students, their level of motivation and self-efficacy has improved with the addition of these competency tests. They are now able to see the link between conceptual material and computational proficiency. In the developmental math class in particular, students have commented that the tests forced them to study the material and finally master it. We believe that the addition of these tests to the college algebra course will have a similar effect.

COMPUTER AIDED PERSONALITY ASSESSMENT OF MATHEMATICS TEACHERS

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ABSTRACT

Mathematics teachers from the state of Mississippi were invited to participate in a training seminar, Technology, Reading, Riting, Rithmetic (TR^3), during the month of July 2000. The overall purpose of TR^3 was to provide mathematics teachers with effective teaching strategies for improving achievement of Mississippi students. In addition, teachers were provided intensive training with a "hands-on" curriculum, based on the belief that the learner must be an active participant in the learning process and must construct his/her own ideas through reflective thought. This objective was met through the utilization of personality assessments. Research suggests teachers realize that optimal learning is impacted by understanding personality preference (Alcock, 1998). Thus, the purpose of this research was to examine personality test that assessed personality, teaching and learning styles of middle school and secondary mathematics teachers.

Background

Mathematics has been identified as the critical filter for careers in science, technology, engineering and mathematics; thus, it is crucial that all students gain proficiency in mathematics so they can successfully participate in these careers. According to a National Science Foundation (NSF, 1993) report, "Shaping the Future," too many students do not enroll in mathematics courses because they find them "dull and unwelcoming." This report also found teachers lacking the excitement of discovery and the confidence and ability to help students engage in mathematical knowledge. Thus, as part of the overall educational reform initiative, there must be a concerted effort to improve mathematics education in the United States by emphasizing various mathematical concepts that have been educationally, financially and politically neglected. Also, teachers of mathematics must find innovative and effective ways for encouraging students to have an appreciation for and to achieve at higher levels in mathematics. With these overarching themes in mind, TR^3 will be a tool for improving professional skills and providing secondary mathematics teachers the opportunity to acquire knowledge needed to empower all students in the areas of mathematics and technology education.

TR^3 was designed to improve the skills of mathematics teachers of grades 7-12 through intensive professional development in methods empirically proven to promote and sustain high student achievement in mathematics. The project objectives are to 1) strengthen teachers instruction in seventh and eighth grade math, pre-algebra, algebra I & II, geometry, probability and statistics, 2) provide technology training for teaching mathematics in grades 7-12; 3) provide strategies for integrating language arts (reading and writing) instruction into the teaching of mathematics, 4) address the equity/ diversity/multicultural perspectives necessary for teaching math in a diverse classroom and 5) demonstrate how to assess the impact of teachers' instruction on students.

Research has shown that a large number of teachers need further training in content areas that have been identified by the NCTM Standards. Thus, *TR*^{3} focused on increasing teachers' awareness, and also provided training and application of mathematics in specific content areas. In many cases, content areas were not included in particular courses taken by the in-service teachers. Therefore, it is necessary to bridge the gap between the prior training of in-service teachers and the expectations of the NCTM Standards (NCTM 1999).

Teachers were provided intensive training with a hands-on curriculum, based on the belief that the learner must take an active role in the learning process and must construct his/her own ideas through reflective thought. The curriculum for the mathematical institute was guided by the National Council of Teachers of Mathematics Curriculum and Evaluation Standards and the Mississippi Curriculum Structure for Mathcmatics. In addition, in service teachers were introduced to new mathematical concepts and content, current strategies in teaching the diverse learner, as well as methods of teaching and assessment. All topics were built on the *Questioning Approach* to teaching. Throughout the project, activities performed were hands-on (manipulatives), based on inquiry, stressing critical thinking skills, and utilizing cooperative learning strategies. The project goals were chosen because of their direct impact on the learning of students.

Technology

Just as students should be provided a problem-solving environment (NCTM, 1989), it is essential to provide in-service teachers with a problem-solving training environment for learning how to identify, explore, and solve problems using manipulatives and technology. It is equally important to be aware of how the integration of technology can affect students' opportunities to learn important mathematics concepts.

Technology can effectively transform teaching and learning by:

a) Moving the focus of instruction from whole class to small groups; changing the primary mode of instruction from lecture and recitation to coaching;

b) Requiring students to be explorers, investigators, thinkers and workers rather than passive recipients of pre-digested information;

c) Allowing individual learners to pursue areas of interest in depth rather than requiring all of them to learn the same material on the same day in the same way; providing teachers with more time to work with students who are most in need while those who are most capable advance at a pace appropriate for them;

d) Creating opportunities for assessment based upon products and real tasks rather than solely upon traditional tests;

e) Promoting cooperation and collaboration rather than competition; and

f) Making it possible for teachers to address diversity more effectively rather than teaching primarily to the mean. (United States Department of Education, 1996, p. 2)

In addition to electronic technology, participants had opportunities to use other math manipulatives. Sufficient repetition of events through the use of hands-on materials should occur in order for ethnically diverse students and females to obtain an internal locus of control with regard to mathematics (Freeman, 1995). Further support for use of hands-on manipulatives involved cognitive theory. Piaget believed that cognitive growth occurs best when there is repetitive use of concrete materials in the learning process (Piaget and Inhelder, 1975). Consequently, teachers participated in the computer aides personality test rather than the traditional method of assessment.

Equity/Diversity/Gender

Culturally and ethnically diverse populations within public schools are increasing to the point that minorities now comprise the majority population in 25 of the largest city school systems in America. This growing phenomenon suggests that educational strategies must adequately address how to prepare all United States students so they can successfully compete in an ever-growing technologically dependent world. Our science, engineering, technology and mathematics work force will be in jeopardy of not meeting the needs of the nation, unless there is an increase in higher order thinking proficiencies in both mathematics and technology for the culturally and ethnically diverse students at the middle and high school levels. Instruction must be taught to promote participation in and understanding of mathematics for diverse students.

Eighth and tenth grades have been identified as the pivotal points for encouraging females and ethnically diverse students to pursue higher mathematics courses (Freeman, 1995). An additional aspect of the *TR*^{3} training ensured that teachers were aware of the varying learning styles and personality preferences which should help lead to an increase in the number of females and ethnically diverse students enrolling in higher mathematics courses.

In order for in-service teachers, students, and administrators to reach their educational, professional and personal potential, they must be actively involved in developing and implementing instructional models. The primary outcome sought through this research was to promote what Franke, Carpenter, Fennema, Ansell, and Behrend (1998) call "self-sustaining, generative change." Self-sustaining, generative change is when teachers make changes to improve their methods of instruction to ensure continued growth and problem solving. To ensure that self-sustaining, generative change is on-going, a teacher personality assessment was conducted. One's personality is without question the most important driver influencing career choice, relationships, health and sense of well-being (Shaughnessy, 1998). To understand the full potential of one's personality, it is critical to first measure and then gain insight into your strengths and developmental needs through examining the results of personality assessment.

What is Personality Assessment?

Personality assessment, as a scientific endeavor, seeks to determine those characteristics that constitute important individual differences in personality, to develop accurate measures of such attributes, and to explore fully the consequential meanings of these identified and measured characteristics (Ozer & Reise, 1994). Simply stated, personality assessment measures such traits as motives, intentions, beliefs, and styles (Wiggins & Pincus, 1992). This measurement can be used to gain supplementary insight into an individual's temperament or character (Keirsey, 1998).

There are a multitude of personality type inventories available for use in the educational setting. These days, taking the Myers-Briggs Type Indicator (MBTI) or the Keirsey Character Sorter and using the results to determine the teaching styles of educators, the leadership styles of administrators, or the learning styles of students is not unusual. For all intent and purposes, we chose to utilize the Keirsey Character Sorter to measure specific personality styles of mathematics teachers.

The Keirsey Character Sorter attempts to help individual's understand both their temperament and character through an investigation of personality differences. In his recent book, Please Understand Me II, Keirsey (1998) introduces the definition of temperament by asking the following insightful question, "What, we might ask, is this thing called "*temperament*," and what relation does it have to *character* and *personality*?" This is an important question to consider when attempting to measure and define one's personality. Keirsey observes that there are two sides to personality: One is temperament and the other is character. Temperament is a set of inclinations we are born with, while character is a set of habits we acquire as we grow and mature. Character is disposition, developed over a lifetime; temperament is predisposition, hardwired in from birth. And, as temperament plays an important mediating role in efforts to assess and understand differences and to facilitate human development (Tice, 1994), an understanding of how a combination of the two creates one's unique personal style is very important when we seek to examine or assess learning styles and teaching styles as related to personality.

Personality Assessment: A Measurement of Learning Styles and of Teaching Styles

Self-assessment is an in-depth look at who you are. It is the process of discovering and learning your personality type; becoming aware of what's important to you; and understanding yourself (i.e., your values, interests, aptitudes, abilities, strengths and weaknesses). It is also a way to gain knowledge of what is a good fit or match for your personality (Ellis, 1999). As one begins to explore his or her learning style or teaching style, they will first need to understand themselves.

Learning styles have been defined as physiological, cognitive, and affective behaviors that serve as relatively stable indicators of how learners perceive, interact with, and respond to learning environments (Keefe, 1987). It is the way a person concentrates on, processes, internalizes, and remembers new and difficult academic information or skills. Styles often vary with age, achievement level, culture, global versus analytic processing preference, and gender (Shaughnessy, 1998). Likewise, teaching styles have been defined as either progressive or traditional. The *progressive* style is characteristic of the following: (1) integrated subject matter; (2) teacher as guide to educational experiences; (3) active pupil role; (4) pupils participate in curriculum planning; (5) learning predominantly by discovery techniques; (6) intrinsic motivation, where external rewards and punishments are not necessary; (7) not too concerned with conventional academic standards; (8) little testing; (9) accent on co-operative group work; (10) teaching not confined to classroom base; (11) accent on creative expression; while the *traditional* style is characteristic of the following: (1) separate subject matter; (2)

teacher as distributor of knowledge; (3) passive pupil role; (4) pupils have no say in curriculum planning; (5) accent on memory, practice and rote; (6) extrinsic motivation, where external rewards are used; (7) concerned with academic standards; (8) regular testing; (9) accent on competition; (10) teaching confined to classroom base; (11) little emphasis on creative expression (Francis & Grindle, 1998). Although the above information indicates that unlike learning styles, teaching styles may be characterized more so by preference then aptitude, both learning styles and teaching styles are thought to be stable and enduring personal qualities and not easily acquired (Derry & Murphy, 1986; Apple, 1999).

Methodology

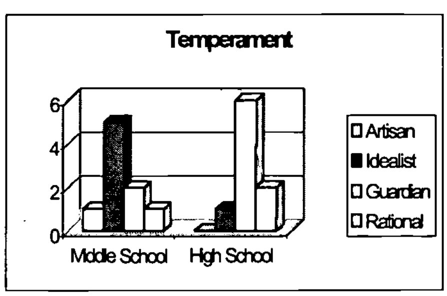
Schools are a wonderful and vast mix of unique teachers and students with individual educational styles and perspectives. Hence, it is imperative that teachers be knowledgeable of the impact that personality style has upon optimal learning. In order for teachers participating in Technology, Reading, Riting, Rithmetic (TR^3) Seminar, to develop a better understanding of the importance of personality, teaching and learning styles, they were required to complete a personality assessment via Internet. According to Wenzlaff (1998), teachers of today and tomorrow must first know themselves and how those intangibles will guide them in their classroom before that can effectively empower their students.

Research has shown that a large number of teachers need further training in content areas that have been identified by the NCTM Standards. Thus, *TR^3* not only increased teachers' awareness, but also provided training and application of mathematics in specific content areas through the integration of technology. Teachers were provided intensive training with a "hands-on" curriculum, based on the belief that the student must take an active role in the learning process and must construct his/her own ideas through reflective thought. In meeting this objective, personality assessment was vital in enlightening teachers as to how their own teaching and learning styles, beliefs and values will impact learning within their classroom. Because teachers should be aware of the impetus of personality style/preference on optimal learning (Alcock, 1998), participants were given the opportunity to complete on-line personality assessments. Following the completion of the survey, counselors assisted with the explanation and interpretation of survey results.

Twenty middle school and high school teachers from the state of Mississippi participated in a Mathematics Summer Institute sponsored by the Institutions of Higher Learning in the state of Mississippi during the summer of 2000. Eighteen of the 20 teachers completed the on-line personality assessment. Nine of the participants were middle school teachers and nine were high school mathematics teachers. *Figure 1* identifies the breakdown of the mathematics teachers' temperament according to grade levels. According to Keirsey (1998), those individuals with an Artisan portrait are concrete in communicating while utilitarian in instituting goals. Where as, the Idealist is an abstract communicator and cooperative in goal implementation while the Guardian is concrete in communicating and cooperating in the implementation of goals. The individual with the Rational portrait is abstract in communication and utilitarian in the implementation of goals, however, they are highly skilled with strategic analysis.

Figure 1 suggests that of the nine middle school teachers the majority of their portraits were Idealist. According to Keirsey (1998), the Idealist is usually found teaching, counseling, mentoring or tutoring. In addition, Idealist comprises approximately eight to ten percent of the population. The greatest temperament found among the high school teachers was Guardian. The teachers portraits that reflected Guardian are identified as supervisors, inspectors or protectors. Individuals that projected the Rational portrait are planners, inventors or engineers. In *Figure 2*, the character style of the majority of middle school teachers were "Teachers," while the majority of the high school teachers character style was the Protector.

Figure 1



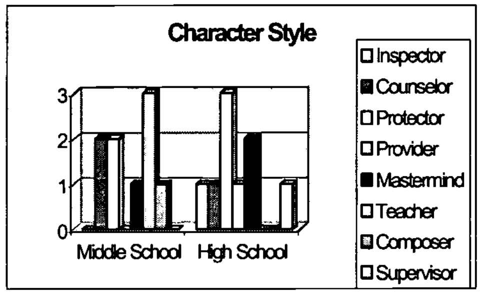


Figure 2

Conclusion

The Keirsey Character Sorter as a Personality Assessment Tool

Temperament, which helps us to understand why we process and respond to situations as we do and why others may process and respond differently in terms of the same phenomena, can operationally be defined through four dichotomous traits: 1) extraversion -E and introversion – I, 2) sensing -S, and intuition-N, 3) thinking -T, and feeling -F, and 4) judging -J and perceiving (Myers & Kirby, 1994). Keirsey and Bates (1984) describe four basic temperaments that can be derived from the interaction of these types of traits, each temperament having its own primary or core value. Keirsey (1998) utilizes the previously stated traits to explain temperament, character and personality as either Artisan, Idealist, Guardian or Rational.

Personality factors, teaching philosophy, and preferred learning styles can play an important role in effective teaching and effective learning in the classroom. According to recent research, the blending of personalities and teaching styles is likely to have a great impact on course success, course continuance, and teacher and student satisfaction. A satisfying (or not so satisfying) teaching situation will affect how the teacher relates to the student; that in turn, affects how the student views the success of the academic course their interest in continuing in such a curriculum (Bruneau-Balderrama, 1997). Fairhurst and Fairhurst in their 1996 studies on how temperament and personality type theories can affect teaching and learning call this type of classroom satisfaction the "personality connection."

In conclusion, personality assessment as used during the TR^3 Mathematics Summer Institute received favorable responses from the participants. Some responses from the completion included: "Now, I understand why I teach like I do..." "....I feel this will really help me within the classroom.." and several teachers were anxious to have their students to complete personality assessment via e-mail. Finally, this research concurs with Wenzlaff (1998) findings that teachers of today and tomorrow must first know themselves and how those intangibles will guide them in their classroom before that can effectively empower their students.

References Cited

Alcock, M.W. (1998). Repecharge, reflection, and brain processing: Personality influences in the classroom. *Nassp Bulletin,* 82(598), 56-62.

Apple, M.W. (1999). Experiencing School Mathematics: Teaching Styles, Sex and Setting. *Educational Policy,* 13(2), 333-336.

Bruneau-Balderman, O. (1997). Inclusion: Making it work for teachers too. *Clearing House*, 70(6), 328-330.

Derry, S.J. & Murphy, D.A. (1986). Designing systems that train learning ability: From theory to practice. *Review of Educational Research,* (1), 1-39.

Ellis, M. (1999). Self-assessment: Discovering yourself and making the best choices for you! *Black Collegian,* 30(1), 30-34.

Fairhurst, A.M. & Fairhurst, L.L. (1996). Effective Teaching, Effective Learning: Making the Personality Connection in Your Classroom. Palo Alto, California: Davies-Black.

Franke, M. L., Carpenter, T., Fennema, E., Ansell, E., and Behrend, J. (1998). Understanding teachers' self-sustaining, generative change in the context of professional development. *Teaching and Teacher Education*, (14)1, 67-80.
Francis, L.J. & Grindle, Z. (1998). Whatever happened to progressive education? A Companion of primary school teachers' attitudes in 1982 and 1996. *Educational Studies,* 24(3), 269-279.
Freeman, P. (1995). Ethnic and gender equity in mathematics via computer technology. *The Mid-South Educational Research Association.*
Keefe, J.W. (1987). Learning style theory and practice. Reston, Virginia: NASSP.
Keirsey, D. (1998). *Please Understand Me II: Temperament, Character, Intelligence*, Del Mar, California: Prometheus.
Keirsey, D. & Bates, M. (1984). *Please Understand Me: Character and Temperament Types*. Del Mar, California: Prometheus.
Myers, K. & Kirby, L. (1994). Introduction to Type Dynamics and Development: Exploring the next level of Type. Palo Alto: California: Consulting Psychologists Press.
Myers, I.B. & McCauley, M.H. (1985). *Manual: A guide to the development and use of the Myers-Briggs Type Indicator*. Palo Alto, California: Consulting Psychologists.
National Council of Teachers of Mathematics (1999). *Overview of Standards for Grades Pre-K-12.* Reston, Virginia.
National Council of Teachers of Mathematics (1989). *Curriculum and Evaluation Standards for School* Mathematics. Reston, Virginia.
National Council of Teachers of Mathematics (1989b). *Professional Standards for Teaching Mathematics*. Reston, Virginia.
National Council of Teachers of Mathematics (1995). *Assessment Standards for School Mathematics*. Reston, Virginia.
Piaget, J. and Inhelder, B. (1975). *The Origin of the Idea of Chance in Children*. New York: Norten.
Ozer, D. J. & Reise, S.P. (1994). Personality Assessment. *Annual Review of Psychology,* 45, 357-388.
Shaughnessy, M.F. (1998). "An interview with Rita Dunn about learning styles." *Clearing House* 71(3), 141-145.
Tice, T.N. (1994). Temperament. *Education Digest,* 59(5), 50-51.
United States Department of Education (1996). Goal 5: First in the world in math and science technology resources. *Achieving the Goals*.
Wenzlaff, T.L. (1998). Dispositions and portfolio development: Is there a connection? *Education*, 118(4), 564-572.
Wiggins, J.S. & Pincus, A.L. (1992). Personality: structure and assessment. *Annual Review of Psychology*, 43, 473-504.

AnimalWatch: An intelligent computer tutor for Elementary School Mathematics

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Abstract. AnimalWatch is a computer based tutor for mathematics instruction, designed for use by 10-12 year olds. AnimalWatch integrates mathematics problem solving with adventure narratives about endangered species (Atlantic Right Whale; Giant Panda; Przewalksi Wild Horse). Whole number operations, and like and unlike fractions are included. AnimalWatch uses artificial intelligence algorthims to model individual student performance and continually adjusts its problem selection, instruction, and hints so that each student is challenged without becoming overly discouraged. AnimalWatch is available on CD-ROM (both Macintosh & Windows platforms) for teachers and teacher educators and will be distributed at SITE 2001. A web site provides a forum for comments, updates, support, and authoring tools for teachers to create their own mathematics problems and endangered species adventures.

Project Goals

There are many concerns about the poor level of mathematics achievement by students in the United States, as well as the lack of interest in studying mathematics that can be apparent at the transition from elementary to junior high school. This dislike and avoidance of mathematics has been particularly noted among female students, and among members of traditionally underrepresented groups. Much research has sought to identify the factors that contribute to math avoidance, including gender role stereotypes, peer pressure, gender-biased instruction and expections on the part of parents and teachers, poor preparation for mathematics teaching on the part of classroom teachers, among others. Although the role of teachers may well have been somewhat overemphasized in the popular press in recent years, it is still the case that many new teachers at the elementary level report feeling ill-prepared to teach mathematics and that they prefer to focus on reading. To address these concerns, teacher educators need well designed, easy to use resource materials that can support effective and engaging classroom instruction in math.

One way to address concerns about the quality and effectiveness of math instruction is to use well designed, multimedia materials to enhance learning. The goal of the AnimalWatch project is to use the power of an artificially intelligent, multimedia computer tutor to provide high quality mathematics instruction that will engage both male and female students, increase their math self confidence, and encourage them to continue to study math. With the support of the National Science Foundation, AnimalWatch will be available at SITE 2001 on CD-ROM for teacher educators and teachers to use in their programs and classrooms.

Program Description

AnimalWatch is a computer program that is easily installed via CD-ROM. It will support roughly 10-14 hours of use by students in the 4th, 5th or 6th grades. AnimalWatch runs under both Windows and Macintosh operating systems. The program is self contained, meaning that it can be launched by the student and used without full time, direct teacher supervision or input.

Mathematics in Context. When the student starts the AnimalWatch program, he or she first selects an endangered species: Atlantic Right Whale, Giant Panda, or Przewalski Wild Horse (Figure 1). Then, the student begins a narrative in which math problem solving is integrated with information about the chosen species. For each animal, the narrative includes four distinct contexts. For example, in the case of the

Prezwalski Wild Horse (also known as the Takhi Horse), the first context includes problems about the unique characteristics of the Takhi along with background on how it became extinct in the wild. The second context provides information about how the Takhi species was preserved in zoos around the world and on efforts to save the animals. The third context focuses on the history, geography and culture of Mongolia, the original home of the wild Takhi. In the final context, the student plans and raises funds for a trip back to Mongolia with zoo-raised horses that are being released back into the wild at the Hustain Nuruu Nature Preserve.

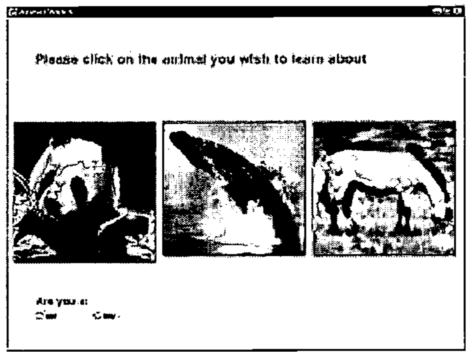

Figure 1: Endangered species selection in AnimalWatch

Math Problem Template Bank. Each of the four contexts provide dozens of problem templates that are based on factual information about the endangered species and their habitats (see example in Figure 2). For example, in the case of the Giant Panda, math problems involve research at the library about the Panda and its habitat, reading about the birth of a new Panda in captivity at the San Diego Zoo, the reviewing of maps of the Panda's habitat, estimates of the expenses associated with a trip to China, and analyses of the rate of decline of the Panda population over time, etc. Each math problem includes an image or graphic that is tailored to the problem, e.g., a map of Cape Cod bay showing the migration route of the Right Whale for a problem in which students must calculate the fractional progress of a whale pod over the course of a week's travel.

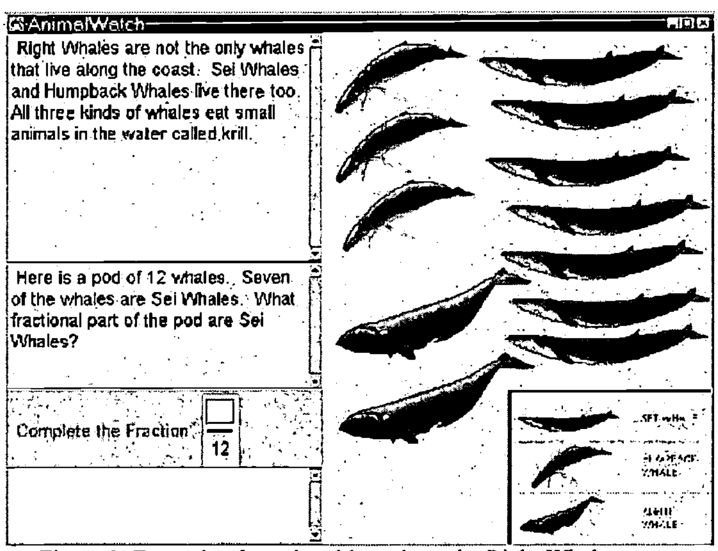

Figure 2: Example of word problem about the Right Whale

To date, the problems in AnimalWatch include whole number operations (addition, subtraction, multiplication, and division of numbers up to 3 digits), introduction to fractions, and addition and subtraction of like and unlike fractions (up to 2 digit denominators). In most cases, the specific math problems are custom created "on the fly" by AnimalWatch. The system uses about 1200 uniqueproblem templates that are instantiated with specific numbers and operations that are tailored for individual users. For each animal and each context, problem templates are available for all mathematical operations included in AnimalWatch. This allows students to work at different levels of math problem solving while also making progress through the narrative at roughly the same pace. (This avoids the potentially demoralizing situation in which one student has finished the story whereas the student at the adjacent computer is still on the first context.) After reaching the end of one narrative, students can also change to a different endangered species and continue working at the same level of mathematics; for example, if a student was working on addition of single digit like fractions at the end of the Panda narrative, he or she would start with like fractions when moving on to the Right Whale narrative. AnimalWatch continually generates new problems from templates, rather than drawing on a fixed, stored set of pre-prepared problems, students who are strong in math can work for longer periods on the most difficult problems, while their less skilled classmates can progress at the easier levels.

Help, Hints and Instruction. AnimalWatch has been designed as a supplement to classroom instruction in math, and was developed with master teachers to incorporate the vocabulary and materials (e.g., Cuisenaire rods) that students would encounter in the classroom. Although it is not designed to offer primary instruction, it does include many hints and instructions screens that will guide the student through the problem to the solution (see example in Figure 3). The particular hint or help screen provided is selected by the system based on its estimate of what the student understands and where there might be a misconception. For example, AnimalWatch might reason that a student who has made several errors in adding unlike fractions might need a hint about how to find the least common multiple, whereas a classmate who has solved such problems successfully in the past might simply need a reminder to check the denominators.

The Student Model. The heart of the AnimalWatch system is its "student model" function: a feature that allows the system to estimate what an individual student user understands about the mathematics domain, compare the student knowledge to its expert knowledge of the curriculum, identify appropriate areas of

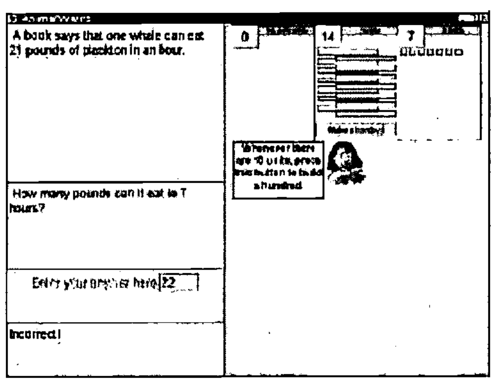

Figure 3: Example of a hint screen

challenge, and construct a specific math problem that is tailored to the student user. The estimate, or "student model", is continually updated based on the student's performance, which is assessed by number and type of errors, response to instruction and hints presented by the system, and latency to reach the correct solution. As the student progresses, hints typically become less concrete and procedural, which encourages the student to generalize past solution strategies and move to a more abstract level of reasoning. The combination of intelligent problem selection and instruction, along with the ability of the system to redirect its teaching focus very quickly in response to student performance, is analogous to having an expert teacher provide individualized tutoring for each student in the class at the same time.

Evaluation Studies

AnimalWatch has been field tested in three school districts in Western Massachusetts, including both affluent and resource-limited schools in rural and urban settings. The primary dependent measure has been students' math self concept, which includes measures of confidence in one's ability to do math; liking of math; and interest in learning math and the belief that math is valuable to learn (Eccles, Wigfield, Harold, & Blumenfeld, 1993). In pre-post test designs, we have found that 3-6 sessions with AnimalWatch leads to significant increases in math self concept, particularly for girls (Beal, Woolf, & Beck, 1998; Beck, Arroyo, Woolf, & Beal, 1999). The provision of math problems that are appropriately challenging along with the availability of help when errors are made is particularly effective with female students, who are less confident and less interested in math to begin with. In onc study, we compared a version of AnimalWatch with the full student model to a drill-and-practice version that simply presented problems in order through the narrative and did not provide the range of hints and help available in the full version (Beck et al., 1999). The results indicated that the "intelligent" version of AnimalWatch fostered more rapid student progress through the curriculum, and that this effect was greater for girls than boys. Consistent with the findings of others, it appears that girls' interest in studying math is more fragile than that of their male classmates; however, responsive and supportive instruction can significantly enhance girls' math self concept.

Student perceptions of AnimalWatch. Student responses to post-test surveys indicate that they generally rated the experience of using AnimalWatch highly: Means range from 3.78 to 4.85 (on a 5 point scale) for questions such as "Would you like to use AnimalWatch again?", "When you made errors, did AnimalWatch give you enough help?", "Do you think the computer is a good way to learn math?". On the question, "Did you like working with AnimalWatch?", girls gave significantly higher ratings than boys (mean 4.50 for girls, 4.05 for boys).

Although both boys and girls give high marks to AnimalWatch, they prefer different types of instruction provided by the system, and they respond to different types of instruction. In an experimental study, the system was "tuned" to provide either detailed procedual hints that walked the student through to the correct solution, or more conceptual hints. Girls reported that they liked the procedural hints better, and procedural hints were also more effective for girls (i.e., procedural hints were followed by fewer errors in subsequent problems), whereas there was no relation for boys. The distribution version of AnimalWatch is designed to select procedural or conceptual hints on the basis of the student model's estimate of the student's current comprehension; hints that are highly effective will increase the probability that similar types of hints will be used with subsequent problems.

Teacher perceptions of AnimalWatch. During the development of the program, teachers were invited to the UMass campus to try out AnimalWatch and provide feedback. During the workshops, we made an initial presentation about gender equity in SEM education, and outlined the goals of the AnimalWatch project. The participating teachers then worked with AnimalWatch, made notes and suggestions, completed a survey about the system, and participated in a group discussion about its strengths and weaknesses. AnimalWatch received high marks from the teachers, who rated it very highly on such issues as appropriateness of math topics, sufficiency of help, ease of use, fit to their curriculum. They also felt that working with AnimalWatch would help prepare weaker students for high stakes achievement tests such as the PSAT or the MCAS (a new state assessment in Massachusetts). Teachers responded very positively to AnimalWatch's ease of use and resilience (i.e., there is little that a student can do to "mess up" the computer and thus require teacher intervention). They were also very pleased that it will run on any platform. About 75% use Macintosh machines at their schools, but many have PC machines in their homes, and a number reported that the computer labs at their schools included both platforms.

Educator Support

AnimalWatch has been designed in collaboration with a team of master teachers of 5^{th} and 6^{th} grade students, and includes several features that facilitate its use in the classroom. First, a student progress report function is provided so that instructors can see at a glance the various curriculum areas that are being worked on by individual students. Second, a companion web site provides background information about the project, support information, updates, and a discussion board. There is also a facility for downloading the AnimalWatch program "shell", along with the three adventures. (Due to the large number of images, the entire system is at this point best distributed via CD-ROM unless the user has an extremely fast connection.) Third, the web site offers numerous authoring tools so that teachers can create their own word problems and submit them for inclusion on the AnimalWatch adventures (see Figure 4). Teachers can also create new adventures with their own endangered species.

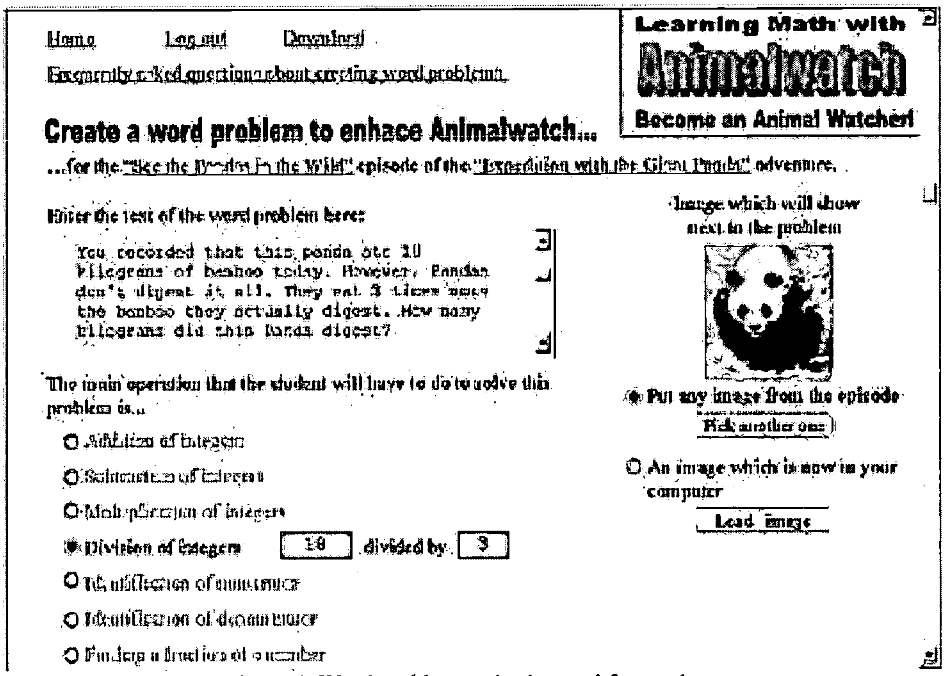

Figure 4: Word problem authoring tool for teachers

Conclusions

Declines in math interest, as well as gender differences in math self concept, are already apparent by thc end of elementary school. Unfortunately, many new teachers at the elementary level, most of whom are female, report that their own mathematics education was weak, that they feel better prepared to teach reading than math, and that they prefer to focus on reading instruction. Thus, there is an urgent need for high quality resources to support mathematics instruction, to encourage all students to feel confident in their ability to learn math, and to maintain student interest in pursuing mathematics training. Many commercial mathematics CD-ROMs for students are simply "drill and practice" packages that do not provide individualized instruction and tutoring; many are also inappropriate for classroom use due to commercial content (e.g., TV cartoon characters), or are targeted primarily to male users (e.g., successful problem solving earns the opportunity to "blast" a target; heavy emphasis on competition).

In contrast, AnimalWatch has been designed to mesh with the classroom curriculum. It uses the same vocabulary and materials that students will see their teachers use during lessons. It links mathematics with an area of the curriculum that both male and female students like: environmental biology. It employs sophisticated artificial intelligence algorithms to provide individualized tutoring to students that is both challenging and supportive. AnimalWatch has been shown to engage student interest and to boost students' math self concept. It is easy to use and is self contained; teachers can allow the system to pace student work. At the same time, it offers teachers the chance to review student progress, and to create new materials when they are ready to do so. Our goal is to reach teacher educators who will be in a position to introduce AnimalWatch to prospective teacher users, and to help us integrate effective technology-based math instruction into as many elementary classrooms as possible.

References

Beal, C. R., Woolf, B. P., & Beck, J. (1998, April). Impact of intelligent computer instruction on girls' math self concept and beliefs in the value of learning math. Poster presented at the annual meeting of the American Educational Research Association, San Diego CA.

Beck, J., Arroyo, I., Woolf, B. P., & Beal, C. R. (1999, July). Affecting self-confidence with an ITS. Proceedings of the Ninth International Conference on Artificial Intelligence in Education, 611-613, Paris.

Eccles, J.S., Wigfield, A., Harold, R.D., & Blumenfeld, P. (1993). Age and gender differences in children's self and task perceptions during elementary school. Child Development, 64, 830-847.

Acknowledgements

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Prospective K-6 Educators Attitudes about Technology

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Since the late 1970's, the use of technology in the classroom has been increasing at an almost exponential rate. The use of computers and calculators is so prevalent in the modern classroom that it is rarely challenged today, whereas twenty years ago the very idea was practically unthinkable. In that short time frame, most educators and parents have gone from asking themselves whether calculators and computers should be in the classrooms at all to how they may be best used to maximize the learning potential of students.

In the publication "Curriculum and Evaluation Standards for School Mathematics," the National Council of Teachers of Mathematics (1989) stressed the increased use of technology in the classroom at all grade levels. The NCTM also emphasized that students should have access to a computer at all times in their classroom, and that each school should have some type of computer laboratory facility to allow whole groups or classes to work on computers at the same time. In the publication of "Principles and Standards for School Mathematics", the NCTM (2000) asserts that technology has become an essential part of teaching, learning and doing mathematics.

However, the NCTM (2000) also states that technology in and of itself is not a panacea. Calculators and computer are tools, much like pencil, paper and manipulatives. As with any tool, calculators and computers can effectively enhance the student's mathematical learning experience or detract from it. Those experiences depend largely upon how the mathematics teacher uses technology in the classroom. Thus the preparation of mathematics teachers in the proper use of technology is of utmost importance.

The use of technology should not begin in the high school mathematics classroom. Rather, computers and calculators should be used throughout the K-12 learning experience. Many colleges and universities have incorporated courses and programs that include the use of technology as part of the pre-service secondary mathematics teacher's preparation. In many situations, elementary teachers are not given the same preparation or background, which may lead to future elementary teachers concluding that using computers or calculators will not be an important part of their teaching experience.

This paper will present the findings of a work-in-progress study concerning the experiences with technology and attitudes towards technology of pre-service elementary school teachers. In addition, it will focus on what this unique group believes should be the role of technology in the classroom, and how they personally will use technology in the classroom. This information was gathered through the use of surveys during the Fall Semester of 2000. The surveys were given to students at Northern Arizona University, a mid-sized university in the southwest United States. Note: Since the data is still being analyzed, many of the results are still pending; they should be ready by the time this paper is presented during the conference. However, there are some preliminary descriptive results of data analysis of one survey, which will be described and presented below.

Computer attitudes were measured by the Computer Attitude Scale, a forty-item questionnaire developed by Loyd and Gressard first in 1984, and later modified. The Computer Attitude Scale is an instrument that measures attitudes towards learning about and using computers. It is perhaps the most extensively used and tested scale of its type in use (Woodrow, 1991). The developers claim that this scale is "a convenient, reliable, and valid measure of computer attitudes, and that it can be confidently and effectively utilized in research and program evaluation contexts." (Woodrow, 1991) The instrument provides scores on four different scales: Computer Anxiety, Computer Confidence, Computer Liking and Computer Usefulness. Positively and negatively worded statements are included in each of the four areas. Alpha reliability coefficients calculated by the creators of the instrument for each of the four subgroups range from .86-.88, .87-.91, .88-.91, and .82 for each subscale, respectively with the total score having an alpha reliability of .95. An independent researcher found similar reliability coefficients (Woodrow, 1991). Each subscale consists of ten items. Students responded to each item by selecting one of four possible responses; strongly agree, slightly agree, slightly disagree, and strongly disagree. Some sample items from the CAS are statements such as "Computers make me feel nervous and uncomfortable" or "Computers do not scare me at all". The correlation between the subscales range from .69 to .84. Scores can range from a low of 10 to a high of 40 on each of the subscales. In general, the higher the score, the more positive the attitude about computers. Any composite score above 90-95 indicates a neutral to positive attitude towards computers. In previous studies, it was found that gender played no significant role in computer attitudes (Loyd and Gressard, 1987), and that computer attitudes were significantly affected by computer experience (Loyd and Gressard, 1984).

The Computer Attitude Scale was administered to four sections of Principles of Mathematics I, the first of two one-semester courses that are required of all elementary education majors at Northern Arizona University. Students in these sections were asked to fill out the survey, but it was not required; a total of 100 students responded to the survey. Of those students, 91 were female and 9 were male; most (56) were freshman, and almost all students (87) were under the age of 22, which is the lowest age category on the Computer Attitude Scale. Surprisingly, a large number (70) indicated having more than one year of experience with or learning about computers; only 25 had less than six months experience. Some of the more common experiences listed by students were using the computer for word processing, for e-mail, and for surfing the World Wide Web.

Results showed that only five of the 100 students had a composite score below a 90, which would indicate that most (95) students indicated a neutral to positive attitude towards computers. Of those five, four had six months or less experience working with and learning about computers, which may have attributed to their negative attitude.

The results from the individual subscales are shown in Table 1.

Subscale	Mean Score	Scores of 40-36	Scores of 35-31	Scores of 30-26	Scores of 25-20	Scores less than 20
Computer Anxiety:	32.10	31	37	19	9	4
Computer Confidence:	29.71	18	31	26	17	8
Computer Liking:	26.62	7	21	29	26	17
Computer Usefulness:	33.28	30	49	19	1	1

Table 1: subscale results of the Computer Attitude Scale

All means indicate that students show a neutral to positive attitude among these four subscales. However, there does exist some variety among the subscales. Students exhibit a relatively strong positive attitude towards the usefulness of computers, yet were not so positive when it came to liking computers. Computer anxiety, unlike mathematics anxiety, does not seem to be a major problem among these students. Also, students overall indicate a fairly positive attitude in their own computer confidence.

The individual numbers in each subscale present some interesting findings as well. The fact that so few students scored above a 30 in the Computer Liking subscale when compared to the Computer Usefulness subscale is of particular interest. This seems to indicate that while many students believe computers are useful, to say that they like computers might be stretching the truth a bit. The fact that almost one in five students scored less than 20 in the Computer Liking subscale (which would indicate a negative attitude) is particularly alarming. However, almost half of the students in that category have less than six months experience working with and learning about computers. This could mean that the more these students experience using the computer, the more positive their attitude would become towards computers. As for those students with negative attitudes that have significant experience with computers, more study is necessary to determine why these students may feel this way.

A quick glance at the individual statement results provides more insight. On the statement "Learning about computers is a waste of time", 97 students either strongly disagreed or slightly disagreed. While this is an excellent result, one must wonder about the three who agreed with the statement. Another finding of particular interest concerned the statement "I'll need a firm mastery of computers for my future work". The results were mixed; fourteen students strongly agreed with the statement and seven strongly disagreed, but the majority either agreed or disagreed only slightly. Of the 10 statements that dealt with Computer Usefulness, this question had the most negative response. Given that these students will be often, as teachers, the first to introduce primary grade children to the educational value of the computer, this result more than any could indicate that they might need more preparation in the use of technology in elementary school. More study into the results of why students responded as they did and the implications of those responses will be undertaken with the results presented during the conference.

References:

Loyd, B.H., and Gressard, C. (1984). The effects of sex, age, and computer experience on computer attitudes, *AEDS Journal*, 18, 67-77.

Loyd, B.H., and Gressard, C. (1987). An investigation of the effects of math anxiety on sex and computer attitudes. *School Science and Mathematics*, 87(2), 125-135.

National Council of Teachers of Mathematics (1989). *Curriculum and evaluation standards for school mathematics.* Reston, VA: National Council of Teachers of Mathematics.

National Council of Teachers of Mathematics (2000). *Principles and Standards for School Mathematics.* Reston, VA: National Council of Teachers of Mathematics.

Woodrow, Janice E. (1991). A comparison of four computer attitude scales. *Journal of Educational Computing Research*, 7(2), 165-187.

Using Databases in Teaching Advanced Mathematics Courses

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Abstract: This paper is a follow up of the papers that discussed how information technologies could be used in teaching Advanced Mathematics (Bouniaev, 1995) and in developing general logic actions (Bouniaev, 1999). Here we discuss the possibility of using databases in teaching Advanced Calculus. The psychological foundations of our considerations are Stage-by-Stage Development of Mental Actions Theory and Constructivism.

Introduction

This paper is a follow-up of research contained in the paper "Some Psychological Aspects of Developing Computer Based Instruction in Undergraduate Advanced Mathematics" (Bouniaev, 1995) as well as in "Computer Based Instruction and General Logic Action Development In Teaching Mathematics" (Bouniaev, 1999) In these papers, we mainly discussed the methodology of using Information Technology (IT) in studying such disciplines as Calculus and Foundations of Algebra and Analysis. They focused on the development of elementary general logic actions such as classification and attributing to a concept. The psychological foundation of the above-mentioned papers was Stage by Stage Development of Mental Actions Theory (SSDMA theory).

Since the first paper in the series was published, long discussions and collaborations with M. Connell led us to the conclusion that SSDMA prescripts for organizing a learning process practically coincide with those of the constructivism (Connell & Bouniaev, 1996).

Thus we would like to emphasize that although we still explicitly proceed from the concepts and recommendations of the SSDMA theory, implicitly there are no contradictions with the theory and practice of constructivism. Proceeding from the above-mentioned psychological theories as a fundamental basis for using information technologies (IT) in this paper we discuss the possibilities of using databases in organizing instruction process of such an abstract discipline as Advanced Calculus. This discipline is a part of most math teacher training curricula and can substantially impact the efficiency of teaching Calculus in high schools.

In the first part of the paper we give a brief summary of the SSDMA theory, which is essential for understanding the paper. Here we repeat most of what we said about it in (Bouniaev, 1995). In the second part we analyze some particular aspects of using IT in studying more advanced math courses as compared with lower level courses and their significance for math teachers training. And finally proceeding from the SSDMA's five stages of development of mental actions we describe the possibilities of using such databases as Access at the initial stages of action development. .

Basic concepts of the SSDMA theory

This paragraph is based on the monograph of Talysyna (Talysyna, 1975). According to this theory the major goal of instruction is developing mental actions with objects of the studied field. Instruction is viewed as controlling students' activities and hence controlling the process of development. Thus, instruction efficiency is determined to a great extent by a well-developed system of control.

All actions can be referred to two categories: general logic actions and specific actions. General logic actions are inherent in every subject field and are different only in objects at which they are directed.

Examples of such type of actions are qualification; break up into classes, comparison, contributing to a concept, action of proof. For example, qualification as a type of action exists in mathematics (qualification of the conics and differential equations) as well as in other disciplines. Specific actions are basically inherent to a given subject field. For example, in mathematics they are arithmetic operations, differentiation, etc.

The SSDMA theory specifies four independent characteristics of any action used to judge the level of development of an action:

Form of action. An action can be in a materialized (material), speech or mental form. A materialized form of action is connected with manual activities (manipulation, hand-on activities, etc.); objects of action (or their models) are presented in a material form; results of action should be real transformations of these objects or of their models. There is no need to discuss the speech form of action. However, it should be noted that according to the SSDMA theory, writing belongs to the same speech form. Mental form of action is the highest form of action development. An action in this form is imperceptible for one's associates and its results are also recorded in an imperceptible for others form. For example, in considering a specific problem a task of qualifying conics may arise, which is a subsidiary problem with respect to the main one. If a number of conics presented for qualification is not excessive then any mathematician can perform this action in his/her head and record its results in memory. As experiments show, for students studying the theory of Conic Sections it is difficult to perform this action in their heads (even if the number of conics at the beginning of study is 3 or 4). The mental form of action also means that its objects are representations, notions, concepts and all operations are performed in the mental form. The ability to perform a whole action in the mental form indicates that it has gone through all the stages of development and interiorization.

- Each of the described forms of actions has another three independent characteristics: (a) degree of generalization; (b) degree of completeness; (c) degree of assimilation.

(a) Generalization of an action means ability to apply it to objects of a different nature. If the degree of generalization is high enough a person can easily apply this action to different objects, or example, if the action of qualification of conics is developed with a high degree of generalization then it can be applied to a similar problem in three-dimensional space. In this case a person has developed some general ideas how to perform a qualification action.

(b) The degree of completeness indicates if all the operations that were to be performed in the process of performing an action have been actually completed. For example, in teaching the action of qualification of animals an operation to be performed is obtaining enough specific characteristics to be able to refer an object to a particular class. It is evident that sometimes all the answers can be correct but based on superficial characteristics which indicates that in the process of performing an action either wrong operations were made, or the order of operations was wrong, or not all of the necessary operations were performed. The common method of establishing the degree of completeness of an action is restoration of all the operations necessary to perform it.

The degree of assimilation, as a rule is connected with such indicators as the speed of performing an action, technical errors and mistakes, the level of automatism, etc. It should be noted that drill-and-practice software first of all is aimed at developing certain actions with a high degree of assimilation.

The SSDMA theory singles out five stages in the process of instruction. Detailed analysis of each of the stages in organizing a computer oriented learning environment is given in "Development of multifunctional dialogue CAT programs " (Bouniaev, 1991), therefore here we will provide just a brief outline of these stages.

The first stage deals with the presentation of the material to students and description of an action to be developed. Note that passive reception of knowledge by students is not performing an action. The second stage consists of developing actions in the materialized form. The third stage deals with developing an action in the speech form (both oral and written). The fourth stage is beginning interiorization. Each of us probably noticed that before performing an action to make it easier we tend to speak it out to ourselves. Speaking out to ourselves is the fourth stage of development. At the fifth, final stage, the action is developed in a mental form. Note that at each of the last four stages the action is developed at a certain given level of generalization, completeness and assimilation.

Construction of materialized objects in studying advanced mathematics

As it follows from most modern psychological theories, for example, constructivism or SSDMA theory, at the initial stage of instruction the object of action should be presented in a material or materialized form of action (Bouniaev & Connell, 1996). Moreover, this action should be developed at a high enough level of generalization, completeness and assimilation. As a rule it is not hard to do when we deal with development of arithmetic or algebraic actions. But the more abstract the material, the more difficult it is to present the object of action in a material or materialized form. Thus in organizing the instruction of more advanced math courses it is common practice to start right from developing the action in the mental form. This negatively affects the level of student's knowledge in abstract math disciplines.

The math teacher curriculum traditionally includes such disciplines as College Algebra, Calculus, Linear Algebra, Foundations of Algebra and Analysis, Abstract Algebra and Advanced Calculus. In training a math teacher each of the above-mentioned courses plays its particular role. A change of this role in studying more advanced courses significantly affects the character of didactic goals to be achieved in the process of instruction. This change can be easily observed in changes in wording of the exercises of the above-mentioned courses.

Thus in College Algebra and Calculus I the majority of exercises deal with finding a new object. For example, find a sum of two algebraic fractious, find a derivative or an integral, etc. At the final stage of instruction of Calculus and in teaching Linear Algebra the number of problems dealing with finding new objects is balanced by the number of classification or attributing to the concept problems. For example, to prove that the given series converges (in Calculus), or to prove that the given system of vectors forms a basis (in Linear Algebra). So we see a new type of problems, however, as we already mentioned they deal with development of elementary logic actions.

As a rule, the object of action of this type of problems can be easily presented in the material or materialized form. For example, it is easy to represent the terms of converging series as a sequence of dots on the plane. However, it should be noted that a model presentation of an abstract notion that looks superficially good is not always helpful in doing a specific problem.

Development of logic actions such as classification is connected with construction of materialized models that physically may not look like the respective actions but present in the materialized form the structure of such actions. For instance, tables can be used that students fill in while doing specific problems. It is also expedient to use electronic text fragments, which can be moved to different places on the screen. The details of using IT in solving this type of problem can be found in (Bouniaev, 1999). Therefore we are not going to elaborate it here.

At the next stage in teaching such courses as Advanced Calculus and Abstract Algebra besides simplest logical actions such as classification and attributing to the concept we have to develop more complicated logic actions such as the action of proof. Bearing in mind that in studying Calculus students have mastered the simplest "transformation problems" like finding a derivative or an integral, then in Advanced Calculus development of the action of proof becomes the major goal of instruction. And not only development of the action of proof, but proof of statements applicable to the whole class or classes of objects. In this case the object of action is a theoretical abstract concept, which makes it significantly different from the situation when the object of action is a particular function even if the action itself is an action of proof.

Thus for example the task to prove that function six x is continuous is significantly different from the one to prove that any continuous on the closed interval function is bounded. In the first case the object of action has materialized representation both in the form of a formula connected with numerous trigonometric identities and in the form of a graphic using which all the actions performed in the course of proof can be "materialized". In the second case the object of action is a math abstract notion for which it is difficult to find a materialized representation. Any continuous function viewed as an illustration is just an example of an object coming under this notion and thus cannot claim to be a materialized representation of a math abstract notion.

Besides that, math abstract notion itself significantly depends on the level of development of an individual in whose mind it exists. For example, the notion of continuity exists both in the mind of a freshman before studying Calculus I and in the mind of a senior ready to study Advanced Calculus. At the same time in the framework of the studied course (Calculus or Advanced Calculus) further development of abstract notions determines different actions that are objects of these abstract concepts.

For example, in Calculus I to develop the notion of continuous function it is enough to use the action of classification of pictures illustrating graphics of continuous and discontinuous functions. We can also effectively use pictures in a formal proof of continuity. However, in the proof of theorems in which continuity is a premise or a result, an illustration may help but it cannot serve as a materialized model of proof. A model should reflect not a particular case of the proof of continuity but general characteristics of any proof. In the framework of the model needed for instruction, "proof" and "proof of continuity" are related as general and particular. As the conducted experiments showed databases or bases of knowledge can serve as materialized models in teaching proofs.

Databases in the Study of Advanced Calculus

A natural information model of any subject field including mathematical theories is a database or a base of knowledge. We consider databases a named complex of data reflecting a stage of an object or a number of objects, their properties and relationships. In fact a database can be viewed as an information model of a given object, and effectiveness of the control system of the object depends on its preciseness and authenticity.

Using databases or bases of knowledge in the process of instruction is not something new. Already ten years ago reference and information systems built within the framework of prevalent databases constituted about one third of all the databases used in teaching math. However, we offer much more than just using databases for reference and information purposes although we do not exclude it either. Let us consider the possibilities of using databases at every of the five recommended by SSDMA theory stages of developing mental actions based on the organized process of instruction of Advanced Calculus.

According to the SSDMA theory at the first stage of instruction a student gets necessary information about a goal of action and its objects. The instructor in familiar from previous courses terms explains a system of reference points (prompts that help the student to master the studied material.) He/she also discusses the content of the studied material. It should be mentioned that even at this early stage of instruction, certain difficulties arise first of all because it is hard to explain to a student what the goal and object of instruction are. The thing is that students have been studying Calculus for three semesters but they still have a very vague idea of theoretical math fundamentals thus making it very difficult for them to understand what kind of proof they are going to deal with in this course. For the majority of students at this level, math is associated first of all with such words as find, calculate, etc. Problems of existence and therefore of proof are still completely alien for them. It becomes even more confusing since in most traditional advanced calculus textbooks the problems (especially in the beginning) are worded in the same way as they are formulated in their Calculus textbooks.

Questionnaires to monitor the students response that we have been distributing and analyzing during the last ten years of teaching Advanced Calculus invariably indicate that even after two or three weeks of instruction students were confused about what is required from them to succeed. At the same time most Advanced Calculus students already took courses incorporating databases. Thus terms associated with them such as table, record, form, report, query, relationship, etc., are familiar to them and do not provoke psychological rejection.

Using this previous experience with databases as an advantage we determine the goals of instruction as structuring the material contained in the textbook and explained in class. By structuring we mean constructing databases using the studied material of the course. Naturally the structure of any database significantly depends on what kind of information this database is used for. Therefore as points of reference for constructing databases we offer students typical questions that will be part of the test. Naturally, the most important points of reference are the examples of proofs discussed in class. By no means we imply by this that this is enough to teach students the action of proof. At the same time we include into the system of prompts questions like: "how to build a database so that using it one could reproduce the proof presented in class?" We also linked questions that students had to answer using their own constructed databases to the points of references. It was mentioned that the tests would include the following questions.

1. Formulate the theorem. 2. What is the theorem's premise? 3.What is its conclusion? 4. What notions are used in the theorem's formulation and what is their meaning? 5.What theorems were used in the proof of the given theorem? 6. Give examples of problems, which are based on solving this theorem. 7. What

theorems need to be used to do this problem? 8. Is the conclusion true in absence of any of the premises? 9.Are all the premises necessary for the conclusion to be true? 10. If you answered, "yes" in 9, demonstrate it. 11. Give an example of an object that can be attributed to this concept. 12. Give an example of an object that cannot be attributed to this concept. 13.Prove this theorem. 14. Solve a proof problem.

It should be noted that at this stage of instruction students are not yet involved in performing the action or they perform it in a perceptive form, i.e. students just observe how it is performed. Besides, in the process of demonstration /observation points of reference (prompts) are determined that help to develop the action at the next stages. At this stage the instructor can also use his/ her own prepared database as an information system to get illustrations of examples, links with respective sites in the Internet, etc. Certain fields in such a database can be "objects" representing different program packages. At the second stage proofs are developed in the materialized form. In the course of experiment the entire group (about 30 students) was divided into subgroups of three. Students took decisions concerning the structure and elements of databases independently. It was assumed that any member of the group could use this database during the test.

At the same time there were certain limitations to the base itself and ways of its use. First, none of the fields could contain more than 50 symbols; second, none of the fields should contain a statement that could be divided into two conjunctive statements. For example, none of the fields could contain the statement "continuous on the closed interval function". Such field should be broken up into three: a) function domain is interval; b) function is continuous; c). interval is closed. This way the students could not record the whole theorem in one field. This requirement also makes students seriously contemplate the possibilities of structuring any material.

The next set of requirements deals with the possibility of using databases during tests. First, students should act quite fast since the number of problems presupposed certain operational speed. Second, to speed up the process, the students could print out certain forms from databases but only those that closely followed the question in the premise of the problem and contained no additional information. That demonstrates how at the second stage of developing the action of proof we used the materialized form to enhance the instruction process. Students worked with texts and databases. The texts were given but they constructed the databases independently. We also focused on all the characteristics of developing the action of proof in the materialized form to ensure its success – generalization, completeness, and assimilation.

A high enough degree of generalization was achieved by involving students in the action of determining for themselves fields of records in a universal way so that they accommodate analysis of all other theorems as well. If the fields of record determined for one group didn't accommodate a new theorem then the whole group had to be reviewed. A high degree of completeness was provided by the process when all the activities were broken up into two classes - determining the structure of databases and creation of new records, queries, filters and relationships. The first part implied breaking up an action into all the included operations and the second enabled its performance in the automatic regime. And finally, a high degree of assimilation was provided by the necessity to structure quite a lot of instructional information. Besides, one of the factors of successful use of databases was the speed of acquiring and utilizing necessary information.

As we already noted, the students themselves determined the structure of databases, fields, records, etc. However, at the beginning of this experiment we had a certain database structure in mind. First of all since we deal with development of the action of proof, it seems expedient to have a table of theorems, with the following fields: "Name of the theorem" (for example "Intermediate value theorem"); " Object of the theorem" (for example "A function f"); "Premise 1" (for example "Domain is an interval <a, b>"); " Premise 2" (for example " Continuous on the interval"); " Premise 3" (for example "Domain is a closed set"); "Premise 4" (For example "f (a)<C<f (b)");"Premise N"; Conclusion 1" (for example "There is a point "c" between "a" and "b" such that f (c)=C);...; Conclusion N"; " Concept 1 used in the theorem statement" (for example "Continuity on a set"); ...;"Concept N used in the theorem statement"; "Model Problem 1";...;"Model Problem N".

It also seems useful to have a table "Theorem Proofs" including the following fields: "Name of the Theorem"; "Object of the Theorem"; "Definition of Concept 1 used in the proof";" Definition of Concept N used in the proof"; "Theorem 1 used in the proof";..." Theorem N used in the proof"; Transformation 1 of the proof";... "Transformation N of the proof"; " Proof structure".

We also believe it would be helpful to create such tables as "Concepts and their definitions", " Model Problems", etc. Creating queries plays an important role in the instruction process. As with tables the students make decisions what queries to create independently. It looks expedient to create queries that provide access to all the records (or their parts) that have the same conclusion; like " sequences converge" It is also useful to create queries enabling to find a model problem solution proceeding from the problem being solved.

The third and fourth stages of action devolvement are designed to develop an action in external and internal speech forms. As we already noted, results of students activity at this stage should be either articulated out loud or written down. If at the previous stages in organizing the instruction process we focused on determining the structure of databases and building them then at this stage it already played a secondary role. At the same time, naturally, in the course of study new records were created and added. As a task, the students were required more and more often to write a standard proof using information from the student databases. If in the first test questions 1-12 were prevalent, then in the second test we included questions immediately related to proofs (13-14) and the third test consisted mostly of proofs with access to databases.

At the last stage the action should be developed in the mental form. At this stage students continued to replenish their databases, however, their use as an information system was limited to an emergency. Using databases during the test was penalized, though insignificantly.

Conclusions

Recommendations proceeding from the theory of constructivism and SSDMA theory in studying abstract math disciplines can be formalized using databases. The database approach is hard to overestimate in forming actions in the materialized form. At the same time using databases proved extremely effective at all the five stages prescribed by the SSDMA theory.

References

Bouniaev, M. (1991). *Development of multifunctional dialogue CAT programs*. Moscow: Publishing House Prometey.

Bouniaev, M. (1995). Some psychological aspects of developing computer based instruction in undergraduate advanced mathematics. *In International Conference on Computers in Education, Proceedings of UCCE 95*, Singapore; December 5-8,1995, (pp.583-591). Charlottesville, VA: Association for the Advancement of Computing in Education.

Bouniaev, M. (1996) Stage-by-Stage Development of Mental Actions and Computer Based Instruction. *In B. Robin, J.D.Price, J.Willis, & D.A. Willis (Eds.), Technology and Teacher Education Annual* (pp.947-951). Charlottesville, VA: Association for the Advancement of Computing in Education.

Bouniaev, M (1999). Computer Based Instruction and General Logic Action Development In Teaching Mathematics. In David A. Thomas (Ed.), International Conference on Mathematics/ Science Education &Technology 99, Proceedings of M/SET 99 - March 1-4, 1999, San Antonio, Texas, 211-215, Association for the Advancement of Computing in Education

Connell M. & Bouniaev, M. (1996) Constructivism and SSDMA - Implications of Two Learning Theories on Technology Use in Mathematics Teacher Education. In B. Robin, J.D.Price, J.Willis, & D.A. Willis (Eds.), *Technology and Teacher Education Annual* (pp.202-208). Charlottesville, VA: Association for the Advancement of Computing in Education.

Galperin, P. & Talizyna, T. (1979) Contemporary condition of SSDMA theory. In *Vestnik MGU, V.14, #4 Psychology (p p.54-63).*

Leontyev, A.N.(1972). *Problems of psychological development*. Moscow: Moscow State University Publishing House.

Talizyna, T. (1975). *Control of a knowledge acquisition process*. Moscow: Mosc. St. Univ. Publishing House.

Using Excel to Explore a Thematic Mathematics Unit: Ideas, Reflections and Suggestions

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Abstract. The fifth grade mathematics curriculum at the University School of Indiana University of PA contained a long-term project on the real-world concept of budgeting. Students were to develop a budget to spend $1 million on a specific interest. Learning to track project expenditures in a spreadsheet was a natural next step. Using PowerPoint to communicate the results added another technological dimension and integrated language arts. Along the way, students learned financial concepts and reviewed mathematical concepts in a real-world context and in a way that supports NCTM standards. As they gained confidence with Excel, students shared their own discoveries. The instructors gained valuable reflections about what works in infusing technology into the curriculum, and the project proved the efficacy of Donald Schoen's model of the reflective practitioner.

Introduction

The fifth grade mathematics curriculum at the University School of Indiana University of PA contained a long-term project to enable students to experience the real world concept of budgeting. Students developed a budget to spend $1 million on a specific project or interest. Learning to track project expenditures on a spreadsheet was a natural next step. The use of PowerPoint to communicate the results to classmates added yet another technological and curricular dimension. The University School is the campus laboratory school, where curricular ideas like these can be developed, field tested and disseminated. This project came about in Spring 2000 when two faculty members became involved in a professional development model created in a PT3 Grant. The objectives of the million-dollar Excel project addressed both content and technology. Students were to see how mathematics is used in their daily lives and learn the fundamentals of budgeting. They were also to learn the basics of the MS Excel program and refine their skill in using PowerPoint as a communications tool. Finally, the project addressed Pennsylvania Standard 3.7.7, Grade 7 D—apply computer software to solve specific problems: i) identify software designed to meet specific needs; ii) Identify basic multimedia applications; iii) Demonstrate basic knowledge of desktop publishing applications.

Methodology and Results

After looking at examples, the class was able to develop an operational definition of a spreadsheet: a table created with computer software; contains information, especially numbers; does calculations for you; often used for spending plans; can answer "what if" questions – e.g., *what* could I buy *if* my allowance went up, *if* the cost of a computer game went down, or *if* taxes went up. Among the examples were small budgets such as an allowance, as well as a more elaborate million-dollar budget. They also saw three 'what-if' scenarios, demonstrating the impact of price changes on one's allowance.

Students then got to work on a "Puppy Budget," where their task was to plan what they would need to acquire and keep a pet for a year, using MS Excel. The simple initial budget contained only a purchase column, a cost column and a total. With little urging, students soon forged ahead in adding formatting. Their first function was AutoSum, which they pronounced "awesome." Next we added columns for unit price, total cost per item, "must have" items, and a "what's left" column or balance. It was now time to learn formulas for multiplication, subtraction and adding. Requiring more work, formulas were not quite as awesome as AutoSum, but the ability to copy rather than type them saved the day.

Our class was now ready to apply their Excel skills to the Million-Dollar Budget. They brainstormed with partners what to buy, entered a list of planned purchases into Excel, looked for prices on the Internet and entered them into their spreadsheets, and calculated costs and a running balance in the spreadsheet. A large spreadsheet requires more formatting to be understandable, and students returned enthusiastically to beautifying theirs. They began to discern the difference between "cool" and "understandable" or "legible," however.

At the next class, students reviewed percentages. Students added columns to show the effect of price hikes and to calculate sales tax. Now that the data were in, we could turn our attention to charts to provide a graphic illustration of where their money was going and the percentage spent on various categories. With many ways to customize, charts proved to be another fertile ground for student creativity. But they learned again that what looked glorious on screen was not always readable in print or when displayed on a projector.

Finally, the students reviewed PowerPoint and created a short presentation summarizing what they would buy and why, incorporating copies of their spreadsheets and charts as well as illustrations from clipart and the Internet. They then delivered these presentations to their peers.

Along the way, students learned financial concepts such as budget and unit price. They reviewed percentages, means, and other mathematical concepts in a way that supports NCTM standards and applied them in the real-world context of budgeting. As they gained confidence, students made their own discoveries and even began to demonstrate them to the whole class. Some things they learned the hard way. The students found it tedious to rearrange their spreadsheets in broad categories and calculate subtotals. When they inserted detailed spreadsheets and charts into PowerPoint, however, they realized their beautiful creations were too large to display effectively on screen. Now they understood that broad categories and subtotals would have been useful. Students often get caught up in the bells and whistles of computer programs. This experience was a first step in learning to use computers effectively—i.e., as a tool that aids understanding and communication.

Dr. Brzycki and Dr. Hechtman also shared some interesting reflections while they planned. Students need a project they can relate to in order to buy into using the Excel program as a learning tool. Models are helpful. Student partnering is not a good method in a project that requires skills acquisition. It is easier to have students hone estimation skills than to determine costs to the penny. This, too, is a real-world lesson in that it encapsulates the difference between accounting and budgeting. It was clear that there were many possibilities for extending the project, and some are already under way—recording and analyzing weather data, Olympic medals, election polls, and states data; and importing data from the web. Spreadsheets are a versatile tool that can serve as a mindtool in many disciplines (Jonassen 2000).

The model of technology diffusion and training used here was a success. A technology expert and a content expert collaborate to design the units. The technology expert leads the first round of classes while the teacher assists; then the teacher leads the class while the technology expert assists; and lastly the teacher can solo. Here Dr. Hechtman gained experience and became enthusiastic about teaching the unit herself. This model was based on the work of Donald Schoen (1988) and is also being used in the university setting in the teacher preparation curriculum at IUP and Clarion University of PA. A PT3 grant (Preparing Tomorrow's Teachers to use Technology) funds an instructor and/or graduate assistant as technology expert. The model permits both teacher and students to gain or consolidate skills without creating dependence on the expert and encourages colleagues to engage in collaboration and mentoring.

References

Adams, E. C. (2000). Transparent Training and Technological Intuition. *T.H.E. Journal.* 27 (9), 115-117.

Jonassen, D. H. *Computers as Mindtools for Schools.* Upper Saddle River, New Jersey: Prentice-Hall, Inc.

Schoen, D. (1988). *Educating the Reflective Practitioner.* San Francisco, CA: Jossey-Bass Publishers.

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Mathematics Teachers on Track with Technology

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Abstract: It is a challenge for teachers at all levels to bring mathematical concepts alive for their students, and to engender excitement about the technology tools used to facilitate data representation and communication. We introduce a teacher training process in which participants actively engage in investigations that integrate information technologies into the teaching and learning of mathematics. These investigations can be used in both teacher training and in the classroom. Our approach has several advantages: Mathematical concepts are introduced through relevant technology-enhanced problem investigations, engaging participants in defining and solving problems. Group interactions promote creativity and variety in ideas and approaches. Participants learn to present ideas in computer-based, multi-media formats. In addition, the training process is a model for the active, small-group learning process that students will experience, and is thus an experience in modeling for teachers. The process also prepares participants to formulate similar instructional techniques of their own.

Introduction

Today's students are facing a world that is becoming increasingly information-driven in both work and the home, creating a more urgent need for all students to develop a clear understanding of mathematical principles and the ability to use technology in communication and problem-solving. In the workplace, students will also be expected to work in teams to solve problems (Felder & Brent 1996), which may not already have known solutions, a very different situation than the traditional math-class problem. And yet, researchers increasingly agree that this type of engaged, active learning, which occurs when students actively participate to learn concepts in a meaningful context, is important in building student comprehension, retention, and internalization (Jones, et al. 1994; Felder & Brent 1996). Girls on Track aims to design and disseminate technology-enhanced, student-centered investigations of urban and social problems to join the strengths of engaged, meaningful learning, with the tools of technology, to help students develop strong, creative skills in problem-solving, mathematics, and data gathering, representation, interpretation, and presentation.

Girls on Track is a multi-institutional program that was developed to encourage middle school girls to continue taking advanced math and computer science classes through high school by introducing girls, educators, and counselors to new ways of approaching mathematics and technology. This program could not be implemented without the foresight of the principal investigators and the help of a dedicated staff, whom you will find listed in our program report (Berenson, et al. 2000). In this paper, we describe the teacher training and investigation aspects of the Girls on Track program, which we believe will be beneficial to educators in all math and science related areas. Our findings are preliminary, but we believe that our methods are supported by educational research theory. In the first section, we describe the summer program in brief. We then discuss the details of our investigation method, how it is introduced to teachers, and how teachers may use the method in their own investigations. In the final section, we reiterate our findings and discuss future plans for the program.

The Program

During the summers of 1999 and 2000, Girls on Track, our 3 weeks of professional development workshops and summer camp introduced two groups of middle school teachers, guidance counselors, pre-service teachers, graduate students, and middle school girls to mathematics and computing in an integrated, small-group learning process centered on primarily math and computer-based investigations of local and national urban and social issues. We designed several investigations for Algebra I that integrate group learning techniques, and information search, gathering, and presentation, all facilitated by the use of our website. We began each investigation with a group brainstorming exercise on a central question like, "What will life be like in our county in the year 2020?" Each team generated their own predictions, and moved to the computer labs where our web page reiterated the brainstorm question, provided links to web sites containing relevant data and provided a direct link to a blank PowerPoint template, which each group down-loaded and modified to create their own presentation. Every presentation was loaded onto our website, which was then accessed to downloaded the slides for presentations to the whole group.

The summer program began with a full week of professional development for middle school math teachers, guidance counselors, pre-service teachers, and graduate students, all of whom we will refer to as camp counselors or simply counselors. Camp counselors were broken into groups of 3-5 professionals, and were presented with our math investigations in the same manner that girls would experience the investigations in the following two weeks. Each group created their own interpretations of each problem we investigated, including topics such as population growth, solid waste disposal and reduction, traffic congestion, and the relationship of math skills to job salaries. Counselors experienced first-hand the excitement and difficulties which the students would later face. Rising to the challenge, each group formulated a problem statement, collected and interpreted data, and presented their findings.

In the course of learning this new investigation technique, counselors also were introduced to new technologies, including Internet browsers (Netscape) and searching (via www.google.com), Excel spreadsheets and graphs, PowerPoint presentation software, and FTP. Each of these technologies was introduced on an as-needed basis during the investigation process, with scaffolding to facilitate their use (see Soloway, et al. 1996). Computers were initially set up with browsers ready and on the appropriate page on our program website, ontrack.ncsu.edu. This page reiterated the investigation questions, gave links to relevant data on the Internet, and also linked to Excel and PowerPoint templates and help sheets. Each progressive investigation web page linked to fewer templates and offered less guidance in technology use, to promote participants to develop their skills in using these tools. This scaffolding prevents the need for educators to become experts in all the technology they use, instead providing the tools to get started, like "handles" for both professionals and students, leaving the door open for more exploration when creativity drives participants to look for new ways to use the tools.

After the first week of professional development, the summer camp began, with sessions in the morning where professionals would act as counselors for middle school girls, joining them in their own investigations of the same problems. As group facilitators for the students, professionals had the chance to apply what they'd just learned about this new pedagogy. This is a crucial aspect of Girls on Track – without this immediate application of new concepts, many professionals would feel under-qualified to bring these same techniques to the classroom. Fear of technology, and the fear of not being an expert in every problem the students face are very strong deterrents to trying new classroom methods. As leaders in the math camp, professionals became aware that this method encouraged both students and leaders to become adventurous explorers in problem solving, working together. This is a sharp contrast with the traditional, unrealistic model of the all-knowing teacher, which makes both students and teachers uncomfortable. Instead, leaders become participants and guides in investigations, and students become peers in problem solving.

Investigations

Experts agree that using multiple representations and problem solving approaches increases mathematical problem solving ability (Jiang & McClintock, 2000; NCTM, 2000). We believe that the creation of such multiple representations and approaches can be greatly enhanced by the use of technology. During the summer professional development program, investigations are conducted in an atmosphere of collaborative learning where multiple pathways to solutions via technology are encouraged. The methodology of the investigations involves four main phases: an exploration phase, where small groups of problem solvers define their specific investigation question and make their data collection plans; a data collection phase, where the problem solvers collect data via the worldwide web or other methods; an analysis phase, where the problem solvers use Excel to represent and analyze their data; and an interpretive phase, where the problem solvers design and share a presentation using PowerPoint and other dynamic presentation techniques, some of which have included skits, video segments, and audience quizzes. In line with other technology teacher preparation programs, the use of technology for the mathematical investigations was not for the purpose of teaching technology, "but for the purpose of enhancing mathematics teaching and learning with technology" (Garafalo, Drier, Harper, Timmerman & Shockey, 2000, p. 68).

By design, the Girls on Track investigations follow the same format, and also connect via a common thread. Participants first brainstorm about what problems our local community will face 20 years in the future. Groups quickly realize that population growth is a central determinant of social problems of the future, from overpopulation, to traffic congestion, to waste generation and disposal. These are the very topics of three of our investigations. As an example, our population investigation is illustrated in the following section.

Population Investigation

The investigation is introduced by initiating a discussion about community problems of the future. After problem solvers have shared their ideas with the whole group and realized that understanding population growth is a major factor in solving other community problems, they are ready to work in their small groups to determine how they want to tackle the population growth problem. They must decide how they will collect and organize their data and are provided with several web sites that contain information about population to aid in their data collection. Once they have data in hand, problem solvers used Excel to represent the data in a table and as a graph. We asked that each group come up with some type of mathematical model for their data that they could use to project future populations. Requiring the creation of a model forced problem solvers to think about issues concerning rate of change and inexactness of solutions to real world problems.

Teacher Preparation

Preparing teachers to use technology to enhance mathematical teaching and learning has been considered a major challenge for teacher educators (Mergendoller, 1994). One of the goals of the professional development program is to encourage this use of technology in the classroom and make the implementation as simple as possible. The approach taken during Girls on Track is to offer teachers one week of professional development before the students arrive and then ongoing professional development during the afternoons of the two-week camp for students. Teachers experience the investigations during the first week of professional development exactly how the students are intended to experience the investigations during the summer camp. They come out of the first week of professional development ready to challenge the students and prepared for technical and mathematical issues that may arise. Some may feel a little uncomfortable due to the alternative approach to professional development that we take, but by the end of the first week of professional development, most are very pleased with the results, as indicated by one teacher's statement:

> I really appreciate the opportunity I have been given to stretch myself professionally. Although my anxiety level has seesawed since Monday morning, I still feel much better about next week than I thought I would by this time.

This confidence comes for the teachers not only through their experiences working through the investigations, but also by knowing that there is a support system available to them at all times during the camp. In essence, teachers get an opportunity to merge theory with practice, actively building new knowledge as they try out new ways of teaching and motivating students to learn mathematics within a "safe" environment.

Teacher preparation is also greatly enhanced through their collaboration with other educators. Educators experience first hand the joys and challenges of group work, and are better prepared to guide students as they face their own challenges in working together. In addition, as they work together to solve investigation and group interaction problems, the varied skills of each professional provide new insights for all into classroom strategies. Teachers can share different approaches they have used before; what works and what doesn't, and also have the opportunity to share their greatest teaching triumphs with their peers. This interaction truly enriches the professional development experience, creating collaboration among professionals that can enhance their career development for many years to come.

> I have really enjoyed getting to know the people on my team and have appreciated their areas of expertise as well as their empathy for my anxiety at times. For the most part, we were very open about our levels of anxiety, learned to depend on each other, and take risks at learning something new.

After experiencing the investigations themselves, teachers are well prepared to create new investigations. The process that we have used to create investigations is quite simple. First, determine a social problem or issue that will be of interest to the problem solvers. (We've used population growth, trash accumulation, traffic congestion, and job salaries, thus far.) The next step is finding resources on the World Wide Web that can provide you with appropriate data, but keep in mind that it is perfectly reasonable to supplement these resources with other data collection techniques. (Our problem solvers were out counting cars near a busy highway for the traffic investigation.) Once data is obtained, the investigation designer should experiment with multiple representations and solutions that are appropriate for the target audience. This experimentation prepares the instructor for possible problems that may arise during the investigation process, ensures that it can lead to appropriate mathematical thinking, and aides in the development of useful scaffolding techniques that may be required in assisting problem solvers throughout the investigation process. One teacher's summer camp 2000 reflections includes the following plans for her own investigation:

> I really like being able to use PowerPoint to have students present any of the skills we are learning in class. ... I also have an activity that requires the kids to take a conventional cereal box and redesign it as a cubical cereal box with the same volume. (It shows that volume can remain constant and the surface area changes) Next year I hope to take them to the lab and input the original dimensions of their cereal box into a spreadsheet, put in the formulas to compute surface area, volume, the edge of a cube with the same volume, [and] the surface area of the cube. I would then have different pairs of kids graph different variables to see if there was any relationship. They would then go to a word processing page, explain the relationships they noticed, and paste the graph into that page.

Conclusions

We believe that Girls on Track has developed a strong, multi-faceted approach to training teachers in technology-enhanced student-centered instructional techniques. Our investigation design garners the benefits of meaningful, engaged collaborative learning, enhancing teacher and student motivation and excitement. Our design also incorporates the use of technology in appropriate ways that encourage creativity and individual exploration. Our training method uses the same instructional techniques we are promoting to engage educators in learning a new pedagogy for their classrooms. As professionals, educators build skills in collaborating with their peers, facilitating student investigations, and designing their own investigations. Our program fosters both independence and interdependence in professionals, offering tools to create new classroom activities, and bringing a network of professionals together to share their knowledge. In addition, Girls on Track enhanced teacher confidence in using technology and in exploring new ideas.

Computers and the Internet are vitally important aspects of this program. Daily schedules online kept everyone up-to-date with last-minute changes, and linked to each activity during the day. Handouts for information technology help were online and available at all times. Investigation guidance, data links, and starting templates smoothed the data gathering and representation. Training in information technologies centered around student tasks, and the creation and expression of ideas, instead of on the applications themselves. Girls and educators were given the opportunity for individual expression and exploration in an open, accepting atmosphere, where ideas were created and shared at impressive rates, and with outstanding results.

This program is evidence that the worldwide web can become a vital part of any education process, enabling creativity and facilitating information gathering and sharing. Both girls and camp counselors created web pages of their own, linking to their own presentations, which could all be accessed through a central location for easy sharing. Our investigations remain on our website (ontrack.ncsu.edu), providing resources for teachers everywhere, and serving as a template for the development of other investigations which integrate curriculum material and the use of information technologies.

In a short time, both teachers and girls became adept in communication through the website. Computers complemented the learning process, giving teachers and girls the confidence they need to continue using computer technologies in the future.

We believe we have successfully met our end goals: to boost confidence and motivation of girls, counselors, and teachers in math, teamwork, sharing ideas, and in using technology to achieve these goals. In program evaluations, both teachers and girls expressed increased confidence in using technology. Educators expressed excitement in the program and in using similar investigations in their classrooms.

Girls on Track has built similar enthusiasm in all its participants, encouraging some to try new software, and new classroom presentation styles and methods. Our investigations have given participants firsthand experience in using any available tools to creatively solve problems and communicate their results. When computers and the Internet are not available, any tools on hand can be used, substituting data collection for web searching, and creating poster or slide presentations instead of using PowerPoint. The result is still the same: investigating relevant issues, using problem solving and analysis techniques, and communicating findings builds confidence and motivation in students and educators alike. In the words of one Girls on Track 2000 pre-service teacher:

> When my friends and family asked me, "What is Girls on Track?" I told them that it is a math and technology camp for middle school girls. After the one week of staff development, my description has changed. I would still say that GoT is a math and technology program for middle school girls, but also a confidence-builder for young women, a community awareness builder, an environmental awareness builder, a computer technology and math camp for counselors, and a wonderful social experience for all. My computer competencies have grown this week as well as my friendships among fellow educators. I only hope that the girls get as much out of this experience as I have.

References

Berenson, S., Vouk, M., and Robinson, T. (2000). *Annual GoT Report (2), July 2000.* Available: http://ontrack.ncsu.edu/GoT/Documents/GoT_Report2_9813902.pdf. [2000, Nov. 3]

Felder, R. & Brent, R. (1996). Navigating the bumpy road to student-centered instruction. *College Teaching, 44(2),* 43-47. Available: http://www2.ncsu.edu/unity/lockers/users/f/felder/public/Papers/Resist.html. [2000, Nov. 30].

Garofalo, J., Drier, H., Harper, S., Timmerman, M.A., & Shockey, T. (2000). Promoting appropriate uses of technology in mathematics teacher preparation. *Contemporary Issues in Technology and Teacher Education, 1*(1), 66-88.

Jiang, Z., & McClintock, E. (2000). Multiple approaches to problem solving and the use of technology. *Journal of Computers in Mathematics and Science Teaching, 19*(1), 7-20.

Jones, B., Valdez, G. Nowakowski, J., & Rasussen, C. (1994). *Designing Learning and Technology for Educational Reform.* Oak Brook, IL: North Central Regional Educational Laboratory.

Mergendoller, J. R. (1994). The Curry School of Education, University of Virginia. In *Exemplary approaches to training teachers to use technology, vol. 1: Case studies* (pp. 4.1-4.24). Novato, CA: Beryl Buck Institute for Education.

National Council of Teachers of Mathematics. (2000). *Principles and Standards for School Mathematics.* Reston, VA: The National Council of Teachers of Mathematics, Inc.

Soloway, E., Jackson, S., Klein, J., Quintana, C., Reed, J., Spitulnik, J., Stratford, S., Studer, S., Jul, S., Eng, J., & Scala, N. (1996). Learning Theory in Practice: Case Studies of Learner-Centered Design. [Online]. *Common Ground: The CHI 96 Electronic Proceedings.* Association for Computing Machinery's Special Interest Group on Computer-Human Interaction, Vancouver, British Columbia, Canada.
Available: http://www1.acm.org/sigs/sigchi/chi96/proceedings/. [2000, Nov. 30].

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Student Satisfaction with Online Math Courses and Its Impact on Enrollments

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Abstract

Convenience is the most important benefit perceived by online students of the asynchronous online delivery format. Students appreciate the flexibility of course access at any time and in the comfort of their homes or at the office. That online courses are well received by Golden Gate University students is not surprising, as our student body is predominately composed of part time students who work full time.

Three years ago the math faculty was asked to put a number of courses online. Anticipating difficulties, the math faculty worked hard to design courses that somehow transcend these problems. In the initial stages of development we feared that the online popularity would not extend to graphics-based courses such as those typically taught in the Math department. How would the student draw a graph or write a formula over the Internet without first learning sophisticated software packages? How would they communicate with faculty and classmates other without this capability?

In this paper we will present enrollment trends of online math classes verses traditionally delivered classes in relationship to enrollment trends university-wide. In addition, we will present an overview of the characteristics of our online courses and present findings from recent research on online instruction.

Online course delivery has been warmly embraced by many of today's students. This phenomenon, as indicated by numerous recent studies, is not unique to Golden Gate University, but evident at a number of other universities.

Convenience is the most important benefit perceived by online students of the asynchronous online delivery format. Students appreciate the flexibility of course access at any time and in the comfort of their homes or at the office. That online courses are well received by Golden Gate University students is not surprising, as our student body is predominately composed of part time students who work full time.

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In this paper we will present enrollment trends of online math classes verses traditionally delivered classes in relationship to enrollment trends university-wide. In addition, we will present an overview of the characteristics of our online courses and present findings from recent research on online instruction.

Aside from the convenience factor, a number of other facets have contributed to the online success of our math courses.

- Serious attention and effort was paid to the design and utilization of effective online pedagogy. Our content delivery, which can be considered "online lectures", consists of multi-faceted activities. For example, in our Introductory Statistics course, we include PowerPoint slides, worked out examples, Excel projects, "micro lectures" disguised as learning objectives, online quizzes, extra credit essay assignments, etc. We partition the content of courses into weekly modules that contains the same structure week after week so that students know exactly what to expect. We encourage discussions by suggesting interesting topics and provide frequent and positive feedback, where possible.

- The online format is basically a learner-centered format as the student sits alone in front of the computer. The instructor must communicate with the student in both static and dynamic ways. All the above mentioned conference postings, except the quizzes can be considered as static communication from the instructor to the student. Our primary dynamic communication is via asynchronous conferencing and email. As many researcher have found, the student is less intimidated and more willing to "talk' online than in the FTF classroom.

- As many of our students have jobs that require computer and Internet skills, their conferencing and working with each other online is perceived as developing good online working skills.

- The emphasizes our statistic course places on the use of Excel is seen as an advantage by the students as most of them perceive that being facile in Excel is an added advantage at work.

Our online students may feel some awkwardness about the inability to readily use symbols or draw graphs over the Internet. They have found ways to get around this and were able to achieve a deeper understanding of the concepts by trying to express themselves verbally.

Analysis of enrollment trends in multi-section key courses throughout the university reveals that students are replacing the face to face (FTF) traditional course with online instruction. Furthermore, this trend is the most clear and evident for math course. In fact, while total enrollments have decrease throughout the university, the math enrollments have stayed about the same. The decrease in FTF enrollment of math courses has been offset by online course enrollment increase.

Teaching Mathematics by Means of *MathTrainer*

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Abstract: This paper describes *MathTrainer*, a system that guides the student while learning mathematical concepts that involve symbolic manipulation, like the resolution of Ordinary Differential Equations. *MathTrainer* shows students the steps that are required to solve exercises with symbolic calculations. The exercises are posed by the system. The student can also modify some of the formulae that appear in a statement and ask *MathTrainer* how to solve it. *MathTrainer* identifies the type of exercise by means of a pattern matching mechanism and then it shows successively the tasks that have to be accomplished in order to solve the exercise. *MathTrainer* has been integrated in the *MathEdu* teaching environment which includes an authoring tool for the design and interactive resolution of exercises of mathematics. Thanks to this integration, *MathEdu* allows the student to learn first how to solve problems of different types; after this, s/he can practice and get feedback about his/her actions.

Introduction

During the last years new tools have been developed that simplify the design of generic user interfaces using *Programming by example* techniques (Myers, 2000; Cypher, 1993). In principle, these techniques can be used in an authoring tool in order to make the work of the teacher who designs the contents of a course more intuitive and simpler to accomplish. This kind of environment facilitates the discovery by the teacher of the difficulties the student can have when working by himself, as well as the enhancements that can be incorporated to the course under development. Moreover, the mechanism of generalization allows the teacher to work just on a specific example or problem and later on to extend his work to a whole set of situations that include the original one as a special case. The development of a module with this feature for an authoring tool is very complex, but it is a task that has to be accomplished just once. Once this work is done, it is reused constantly by the different course designers in each course they develop. Moreover, in this way the course designers do not need a deep knowledge of the language or technology that is used behind the scenery, so most teachers can use the tool without any special training.

In this paper we describe how we have enhanced a tool based on Programming by example for the interactive resolution of problems of Mathematics, *MathEdu* (Díez 1999). A new module, *MathTrainer*, that guides students through the steps that are required to solve exercises that can be specified dynamically, has been added to it. The exercises solved by *MathTrainer* are posed by the system. The student can also modify some of the formulae that appear in a statement and ask *MathTrainer* how to solve it. *MathTrainer* identifies the type of exercise by means of a pattern matching mechanism and then it shows successively the tasks that have to be accomplished in order to solve the exercise. Thanks to the integration of *MathTrainer*, *MathEdu* allows the student to learn first how to solve problems of different types; after this, s/he can practice and get feedback about his/her actions. In case the student repeatedly makes some mistake while s/he is practicing, *MathTrainer* takes control of the session and shows him/her how to finish the resolution of the problem s/he is trying to solve. *MathCAL* (Mei-Chuen, 1999) does something similar for problems that involve trigonometric calculations. The enhanced *MathEdu* system can be used to develop complete interactive courses about mathematical subjects that involve symbolic manipulation, like the resolution of Ordinary Differential Equations. Both *MathEdu* and *MathTrainer* are developed over *Mathematica*® (Wolfram 1999).

Brief description of *MathTrainer*

From the point of view of the student, *MathTrainer* is just a program that allows him/her to visualize sequentially a presentation of an example. At the beginning of an explanation the student can choose the type of problem to be explained, and he can also modify the formulae that appear in its statement. For example, when seeing how to solve a linear differential equation, and after having seen a simple example like the resolution of the equation $y'+y = 1$, the system will explain that any function of x and y that is linear in y can appear instead of y, and any function of x can also appear instead of 1. The student can then ask the system to show him how the solutions of equations like $y'+y/x = x^2$ can be computed, and *MathTrainer* will then give him/her a step by step explanation of the resolution of this problem. In case the example proposed by the student is not appropriate, the system will tell him/her that, and it will also let him/her know whether his/her example can be already solved using some other method s/he has already studied with *MathEdu* or even if s/he is expected to study problems like the one s/he has posed later on during the course.

Another way in which *MathTrainer* is integrated with the previous *MathEdu* module for interactive problem resolution by the student is by giving him/her explanations about how to go on in case of a repeated mistake while solving a problem, or in case he/she just asks for this help. In the original version of *MathEdu*, this kind of help could be provided only in case the designer of the course had foreseen its necessity, and in this case, the designer had to specify the whole explanation *by hand.* This limitation of *MathEdu* was especially important, since the same situation appeared at every step of the student's work, so the amount of work involved if the designer wanted to give support for the student getting additional explanations at any moment of his work was tremendous.

About the design process

The design process can be seen as the designer doing *by hand* the actions that both the system and the student are supposed to do at resolution time, and the design engine recording these actions. When *MathTrainer* is showing the student how to solve a problem, either generated by *MathTrainer* itself or posed by the student, it just reproduces the actions specified by the designer and makes by itself the computations that are involved. On the other hand, when the student is solving a problem, *MathEdu* just executes the actions specified by the designer that correspond to the system, and it checks that the expressions introduced by the student through the dialogs are all right according to the corresponding formulae.

MathEdu also uses the power of symbolic computation of *Mathematica* to allow the designer to define strategies and cases for each type of problem depending on the specific data associated to the problem. Different strategies for the same type of problem differ by the actions that have to be accomplished in each case, while different cases for the same strategy differ by the pattern that characterizes the values of the initial metavariables that are present in the statement. For example, linear ordinary differential equations correspond to the pattern

a_*var*' + f_*function*[b_*var*] a_*var* = g_*function*[b_*var*],

that is specified by the designer.

Both when showing the student how to solve a problem and when checking how s/he solves it, the first thing *MathEdu* does once the precise statement has been specified is to determine the possible strategies and cases that correspond to the problem among those specified by the designer. This is done by means of a pattern matching process between the formulae that appear in the statement and the patterns that correspond to each strategy. For example, if the problem consists of solving the differential equation

$$y' + y/x = x^2,$$

then the metavariables a and b are associated to the variables y and x respectively, and the functions f and g are associated to $1/x$ and x^2 respectively, hence the strategy for resolution of linear differential equations is accepted, which has only one case.

Conclusions

In this paper we have shown the main features of a highly interactive system to train students in solving problems of Mathematics. The specification of the way the system has to show the student how to solve each type of problem and how it has to check the resolution of each problem by the student is done through the use of a variant of the *Programming by Example* paradigm.

MathTrainer incorporates new functionality that was not available in previous tools. This functionality simplifies the definition of courses on subjects that involve symbolic computation. Moreover, these courses allow the student to learn faster how to solve the different types of exercises that they include. The main goal is to make the student feel the system as a collaborator in his learning process.

At this point there is a first prototype of *MathTrainer*. The first version of the enhanced *MathEdu* environment will be ready in some months, and the validation of the system will be done through the development of a course on Ordinary Differential Equations.

Finally, among the future work we have plans to develop mechanisms that allow the system to detect automatically the existence of priorities between different parts of the course, so that in case a student wants to learn some special subject, an optimal path is created automatically that will show him all the necessary prerequisites before teaching him the desired subject.

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References

Cypher, A. (1993). *Watch what I do. Programming by Demonstration.* Cambridge, MA: The MIT Press.

Díez, F.; Moriyón, R. (1999). *Doing Mathematics with MathEdu*, Proceedings of the IXth Conference of Mathematics/Science Education & Technology. AACE. San Antonio (Texas).

Mei-Chuen, J.; Juang, J.; Sun, P. (1999). *An Internet-Based CAL Software for Solving Trigonometric Problems*, Proceedings of the IXth Conference of Mathematics/Science Education & Technology. AACE. San Antonio (Texas).

Myers, B., McDaniel, R., and Wolber, D. (2000). *Programming by example: intelligence in demonstrational interfaces.* Communications of the ACM, Vol. 43, No. 3, pp. 82 – 89.

Wolfram, S. (1999): *The Mathematica Book*, 4th Edition. Cambridge University Press.

Beliefs, Experiences, and Reflections that Affect the Development of Techno-Mathematical Knowledge

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Abstract: The purpose of this paper is twofold. First, the author discusses her views on teachers' development of techno-mathematical knowledge. Second, the author presents key elements from a course and key course activities and experiences that appear to impact preservice teachers' beliefs about teaching and learning with technology, including those activities that allowed preservice teachers to gain a deeper understanding of mathematics by using technology tools.

Introduction

Preservice teachers "have little experience with how technology can change the nature and emphasis of the mathematics curriculum" (Gay, 1994, p. 172). They often have varied experiences with using technology, as both personal productivity tools, and as a learning tool in their own mathematics experiences. These varied experiences affect preservice teachers' beliefs about using technology as a teaching and learning tool. The author has designed a course to provide many opportunities for preservice teachers to engage in mathematical explorations with technology and discussions of subsequent pedagogical implications. The preservice teachers reflect on their course experiences, compare these with prior learning experiences, and critically evaluate their own beliefs.

As a teacher/researcher, the author is interested in identifying key course experiences that appear to affect preservice teachers' beliefs about appropriate use of technology as a teaching and learning tool. The teacher/researcher analyzed all written work by the preservice teachers to help answer the following questions:

1. What are preservice teachers' beliefs about using technology for teaching and learning mathematics?
2. How do course experiences affect preservice teachers' beliefs?
3. What course experiences seem to be critical in the development of preservice teachers' techno-mathematical knowledge?

This paper will trace the beliefs, course experiences, and reflections of several preservice teachers throughout the author's course. The analysis will be used to inform future development of the course.

What is Techno-Mathematical Knowledge?

According to the National Council of Teachers of Mathematics, "technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning" (NCTM, 2000, p.11). The use of the word *essential* in this statement has many implications for school mathematics, as well as preservice and inservice mathematics teacher education. Not only are teachers charged with a vision of transforming their teaching and students' learning of mathematics, but teacher educators are challenged with the task of preparing teachers who can utilize technology as an *essential* tool in developing a deep understanding of mathematics, for themselves and for their students. I claim that such teachers must develop *techno-mathematical* knowledge. Such knowledge consists of several intertwined elements:

- Solving mathematics problems and constructing mathematical ideas utilizing technological tools
- Using technological tools to justify mathematical ideas and engage others in meaningful mathematics
- Designing experiences with technology that will allow others to develop techno-mathematical knowledge. This includes designing lessons with appropriate tasks and questions, as well as

interactive technology templates using tools such as dynamic geometry environments, spreadsheets, and web-based technologies (e.g., java, Shockwave).

- Critically analyzing the value and role of technology to make decisions as to the appropriate use of technological tools in teaching and learning mathematics.

Course Development

A traditional approach to mathematics teacher education assumes that skills needed in mathematics, pedagogy, and technology are distinct entities. In many mathematics teacher education programs, preservice teachers learn their mathematics content separate from their pedagogy content and separate from basic technological skills. These preservice teachers are then expected to combine these separate skills in a classroom as a mathematics teacher. Some teacher education programs do combine content with pedagogy courses, but still have separate technology courses that are often taken jointly by preservice teachers from a variety of disciplines and grade level concentrations. The message behind this type of teacher preparation is that technology is an add-on "subject" rather than a subject-specific learning tool. Garofalo, Drier, Harper, Timmerman, and Shockey (2000) set forth guidelines advocating integrated and appropriate uses of technology in mathematics teacher preparation.

Teaching and learning mathematics effectively in a technological classroom requires multifaceted knowledge that extends beyond what is typically learned in mathematics methods courses. The work of Garofalo et al (2000) can help teacher educators weave appropriate technology experiences into mathematics methods courses. However, several mathematics teacher education programs (e.g., University of Georgia, North Carolina State University, Pennsylvania State University) have taken another approach -- making a separate course in technology and mathematics education a required part of a secondary program, in addition to existing methods courses. Such courses provide opportunities for preservice teachers to learn how to use technology to better understand mathematics themselves and promote students' learning of mathematical concepts. Thus, these courses are a blend of mathematics content, pedagogy, and technology.

"Teaching Mathematics with Technology" is purposefully designed to put an emphasis on teaching and learning a variety of school mathematics topics (e.g., Pythagorean theorem, sequence and series, correlation and linear regression, rational numbers). A primary goal in the course is for teachers to deepen their understanding of fundamental topics in secondary mathematics through using technology such as dynamic geometry tools, spreadsheets, interactive websites (e.g., www.exploremath.com), graphing calculators, and probability simulators. The teachers are engaged in solving rich mathematics tasks with technology, discussing pedagogical implications of using technology in mathematics, reading the NCTM *Principles and Standards* (2000) and various articles describing classroom practices, and reflecting on course experiences and reading.

Data Collection and Analysis

The one semester course met once a week for 2 hours 45 minutes and included 6-9 hours of assignments each week. During the semester studied, there were 9 students enrolled: 3 Master's level teachers, 4 undergraduate preservice teachers, and 2 lateral entry teachers who were currently teaching without a license and taking courses towards certification. The targeted students for this paper are the 4 preservice teachers.

As teacher/researcher, I gathered data from a variety of sources for the purposes of assessment as well as research analysis. Each teacher completed a pre- and post-survey to assess their beliefs and attitudes and to document their own comfort level and past experiences with using technology tools. Throughout the course, they completed many assignments in which they used technology to investigate a variety of mathematics tasks. As part of these assignments, the teachers reflected on how the technology helped or hindered their own understanding of the mathematics, as well as how such use could help or hinder their students' understanding. The assignments were submitted and graded electronically. Thus, there is a chronological electronic trail of all written work, including word processed documents and The Geometer's Sketchpad and Microsoft Excel files.

I coded the electronic documents and files based on the preservice teachers' 1) mathematical beliefs, 2) technology beliefs, 3) pedagogy beliefs, 4) developing mathematical understanding, 5) critical analysis of role of technology in developing understanding, and 6) experiences that seem to affect 1-5 above. The evidence supporting each category was further analyzed chronologically to establish patterns of beliefs and how experiences and reflections may have affected an apparent shift in belief. (I purposefully used *apparent* since there is no evidence of how these preservice teachers put their beliefs into action in a classroom. Such evidence may be gathered as part of a longitudinal study of teachers' development of techno-mathematical knowledge.)

Shifts in Beliefs During Course

Two students (Nick and Gary) had used graphing calculators extensively since high school and had many experiences using computer software in mathematics and statistics as well as for advanced personal productivity (e.g., web development, programming). The other two students (Nancy and Trina) had limited experience with graphing calculators in math courses and only used computers minimally for personal use (e.g., word processing, email, internet). Overall, the initial beliefs of the 4 preservice teachers indicated they believed technology should be used as a complement to "regular instruction" and feared students' dependency on technology to do math "for them." All of them expressed that technology should be used *after* paper and pencil skills were mastered. They emphasized the quick computational and graphing features (e.g., "plugging and chugging", saving time) of technology and appeared to have little or no experience with how technology could be used to develop a deeper understanding of a mathematics concept.

During the course, each of the preservice teachers experienced several "a-ha" moments while using technology to explore a mathematical idea. Nick and Gary often made advanced connections between school mathematics concepts and their college level mathematics. They also proved to be very good at posing questions or tasks to their classmates during group work to allow others to use technology tools to further their understanding. Nancy and Trina were not as comfortable with the technology and often struggled with the mathematical ideas. However, both of them were tenacious and expressed their enthusiasm and pride when they felt they understood a mathematical idea or were successful in solving an advanced task. All of them gradually showed more evidence of careful thought about how and when technology should and could be used. They still advocated the use of technology as a "time saver" to alleviate computational constraints; however, their focus shifted from skill-driven mathematics towards understanding mathematics concepts and solving real world and higher level problems than they remembered solving themselves in high school.

At the end of the course, Nick, Gary, and Nancy had made evident shifts in their beliefs about how students learn mathematics and the appropriate role of technology in that process, especially in engaging students in developing understanding and making connections with various representations. Trina still held strongly to the belief that that technology was best used after students had learned mathematics in a more traditional manner. Although she often reflected that she felt technology helped her understand mathematics better, those experiences did not appear to affect her core beliefs.

Tracing Development: A Glimpse at Nick and Nancy

To further illustrate shifts in beliefs, I have included a brief synopsis of Nick's and Nancy's work throughout the semester. Recall that Nick was an advanced user of technology before the semester began, while Nancy only had minimal experience with technology. Nick was also a high achieving student in mathematics while Nancy was an average mathematics student. Nick was a senior taking this course concurrently with a 5-week mathematics methods course (6 credits) and 10 weeks of student teaching (8 credits). Nancy was a junior and had only taken a sophomore level course that was an introduction to mathematics teaching and learning.

The Development of Nick

On the pre-survey, Nick expressed his belief that calculators should be disallowed below 5^{th} grade, minimally used through Algebra I, and compliment classroom instruction in Geometry – Calculus III. In the second week of the semester, he further noted "I believe in not letting students use technology until they have first demonstrated the ability to reason critically and to think mathematically." Nick appeared to believe that technology could impede a student's ability to think mathematically. I conjecture that this stemmed from his prior experiences with technology being used as a time-saving computational or graphing device, and little experience with teachers asking high level questions and posing challenging tasks with technology tools. However, during the 5th week of the course, Nick did some advanced work in an assignment to use dynamic visualization tools to analyze the standard ($ax^2+bx+c=y$) and transformational ($y=a(x-h)^2+k$) form of a quadratic function to discover how each parameter affected the shape of the graph. In reflecting on his work he noted:

> I had a pretty good idea about how *a, h, k,* and *c* affected the graphs of quadratic equations before I began the assignment. But until this, I had never understood how changing *b* changes the graph. I was intrigued to see that changing *b* will cause the vertex to move in a parabolic path. Likewise, I hadn't realized that changing *a* causes the vertex to move along a line. [He further developed the equation for the parabolic path traced by changing *b* and the line traced by changing *a*. The next week in class, he excitedly led the class in discussing his discovery.]

Nick experienced using technology to gain a deepened understanding of a mathematics concept. I believe this was a critical moment in his development of techno-mathematical knowledge.

During the 6th week (Nick's first week of student teaching), we did an investigation of sequence and series using multiple representations. Nick was enthralled during the investigation and continually used the technology (spreadsheet and dynamic geometry) to conjecture, test, and make connections on his own. In reflection of the investigation and subsequent assignment, he wrote:

> "I liked especially the sequence generator that we used in Excel ... Excel makes it much easier for students to focus entirely on pattern recognition. In this way, I feel that using the spreadsheet can definitely enhance teacher instruction and/or the learning of sequences and series. I also liked the idea of using the geometric spiral to represent the infinite series. Clearly, this representation helps students to 'organize their thinking.' You can use GSP [The Geometer's Sketchpad] to draw the other three spirals [he did this on his own] ...The geometric spiral will also appeal to so-called visual learners."

In the following week, Nick reported that he had used a geometric spiral to model infinite series in a precalculus course. Although he did not have access to technology in the classroom, he had students construct a spiral on paper and make connections with the numerical and symbolic representations of an infinite series. I feel our investigation with sequence and series helped Nick understand the value of multiple representations and affected his pedagogical approach to teaching infinite series. Not only did he incorporate multiple representations, he claimed students were engaged in building connections while he asked guiding questions.

Concurrently in the 7th week, Nick was engaged in an assignment for creating an interactive spreadsheet to explore "nearly golden ratios" (Bradley, 2000) from a generalized form of the Fibonacci sequence. Instead of using the recursive formula $w_{n+1} = w_n + w_{n-1}$ to generate the sequence, one uses the formula $w_{n+1} = k^*w_n + w_{n-1}$ where k is any integer. The nearly golden ratios emerge from the limit of the sequence of successive ratios. Nick wrote the following about his work on this assignment:

> I think it takes much less effort with the spreadsheet to see that the sequences [of successive ratios] always converge to some real limit. The graph also helps to motivate this idea – regardless of what values the students chooses for w(0), w(1), and k, the sequence [of successive ratios] and the graph will always converge to a real number. I was especially intrigued by negative values of k: I experimented by looking at the relationship between the sequences when w(0) and w(1) were unchanged and k was changed to -k. I think this could be a good question to ask students – have them explain what happens and why it happens when the first two variables are left constant and k is changed to its additive inverse.

Not only did Nick use technology to explore a concept that he had never dealt with before, but he extended his experience to imagining high level tasks that would engage students in mathematical thinking with technology tools. This experience was also a critical step in his development of techno-mathematical knowledge.

Another critical shift occurred in the 9th week of the semester. After reading an article about third grade students using a spreadsheet environment to investigate rational number relationships (Drier, 2000), Nick wrote:

> Prior to reading the article, I had always felt that technology didn't really belong in elementary schools. The gist of my argument was that technology (calculators) might impede the progress of beginning students by no longer forcing them to think. But what I read in the article was quite the contrary – the technology was the motivating factor for the students' to think mathematically.

Nick further shared his thoughts in a class discussion. He emphasized that technology tools could help students develop mathematical understanding but that "it really depends on how the teacher decides to use the tools." It seems that reading the article and using the same spreadsheet environment to explore several mathematics tasks affected Nick's perception of the usefulness of technology to engage young students in mathematical thinking.

Throughout the remaining part of the course, Nick continued to share his ideas and emphasize the importance of using technology appropriately to help students understand concepts and "think like mathematicians," as well as "to help students with tasks that would otherwise be time consuming and tedious, after the student understands how to do them the long way because [technology] allows more to be done in less time without compromising learning." Although Nick still has a strong belief in doing mathematics "the long way," he has shifted his belief that technology necessarily impedes a students' ability to "reason critically and think mathematically" to one a belief that technology, when used appropriately, can help students "think like mathematicians." Nick now has experiences stretching his own mathematical understanding by using technology and has read and discussed instances of real students' engaged in mathematical thinking because of the rich tasks posed with technology. It appears that these experiences have affected the shift in his belief.

The Development of Nancy

Although she had little experience with technology and was a product of traditional mathematics education, Nancy had a very open mind and was interested in learning about how to teach mathematics. Nancy had some difficulty in her college level mathematics courses – difficulty she attributed to her own lack of understanding. During the first week she noted, "so many times I remember learning how to do a problem, but having no idea of what it meant to do that problem." She further wrote the following reflection after reading the six Principles from NCTM (2000):

> When students can learn and see for themselves, they have a much greater chance of remembering and understanding concepts ...it is hard for students to focus on a lecture for a good length of time and using technological visual aids can help redirect student thought processes back into the right direction. Students are also able to learn and draw conclusions for themselves ... Teachers are lucky to have the resources in technology they have now ... As a pre-service teacher I am very nervous about going into education with the knowledge that I will have to use technology ... I am just not very good with computers.

Nancy is openly honest about her feelings. Although she seems to think students should learn and see for themselves, her notion of "technological visual aids" indicates that she may have envisioned students using technology as a display rather than a dynamic interactive tool.

Several weeks later, after an assignment on creating a tessellation, Nancy noted that "by using the geometer's sketchpad, students will have a chance to come out of their everyday habit of taking notes and watching their teacher teach. Technology is always good for giving the kids a break." It is evident that although Nancy may think dynamic geometry tools can help students understand better, she believes that a primary benefit is to give students a "break" from "watching" the teacher. Even though she had several "a-ha" moments while solving mathematical tasks with technology during this course, she appears to be strongly influenced by her own educational experiences, and imagines a classroom where students passively take notes while a teacher provides all the "knowledge."

During the 6th week, a critical shift occurred when Nancy reviewed a videotape lesson of students using graphing calculators to examine patterns and quadratic functions. Reflecting on her analysis, she wrote:

> I saw so much interaction between the students and I could really see their brains working. I thought back to my own high school experiences and honestly did not remember ever putting so much thought into any kind of mathematical topic because my teachers never challenged me in quite this way. The material I learned was basically straightforward and here, I saw students learning and discovering ideas for themselves.

Nancy needed to see real students engaged in mathematical thinking with technology. Following this assignment, there was a shift in Nancy's beliefs and attitude towards using technology as a thinking tool and posing tasks that actively engage students in mathematical thought. During the next week, after successfully solving a challenging task with the generalized Fibonacci sequence and discussing ways to engage students in such a task, Nancy commented "I need to break away from my own experiences and branch out my mathematical knowledge."

Further, in the 9th week, Nancy also seemed intrigued by students' thinking with technology in the Drier (2000) article. She noted "more often than not, teachers ask their students the 'obvious' questions, questions that do not require much thought. But, I tend to wonder exactly how beneficial these questions really are. If deeper thought is not called for, then I do not believe that minds are developed to their fullest potential." Again, Nancy appears to be shifting her belief about mathematics teaching and learning. She seems to understand the value of appropriate questions and tasks. In addition, she continued to develop her mathematical understanding with technology and continually proposed ways to use the tasks and technology from her assignments with students.

Nancy's culminating course project was a well-planned investigation using dynamic geometry and graphing calculators to engage students in developing theorems related to parallel lines. In reflecting on her course project, Nancy's words, although lengthy, tell an amazing story of her recognition of her shift in beliefs.

> When I first heard about this project, I was anything but thrilled. I honestly thought that this would be the most tedious thing that I have ever attempted to do. However, I have actually had fun doing this project and through my efforts to produce a meaningful lesson, I really learned just how valuable technology can be in mathematics ... I have always been a little skeptical of this whole "discovery learning" stuff. I do not remember "discovering" anything in high school and therefore wondered why it was necessary for students to figure out ideas for themselves ... I even felt like "discovery learning" was just some sort of new math fad ... This semester has changed my mindset about this idea and this investigation finalized my new attitude. It just makes so much more sense for the kids to learn things themselves because it requires them to think. There is no doubt in my mind that when students actually have to put thought into figuring something out, then their retention rate is much longer and their comprehension is deeper. The technology definitely adds to the discovery process and in the future I plan to look for opportunities where students will benefit from activities in which conjectures are formed. I know that my own recollection of many mathematical ideas is very vague and I believe that this is because I was told everything rather than being forced to think about ideas for myself ...I do not want my students to have this same problem.

Obviously, Nancy's openness and willingness to learn and her experiences, both prior to and during this course, affected her development of techno-mathematical knowledge.

Summary

The evidence from this first semester of the course indicates that several of the investigations, readings, and assignments impacted the development of these preservice teachers' techno-mathematical knowledge. The reflections required as a part of most assignments also seem to be critical components for the teachers to critically think about their experiences and communicate with me. What was not revealed in this paper were the comments and questions that I wrote back to each student as I read and graded each assignment. I believe these personal communications established a mutually respectful and caring environment that allowed the teachers to take risks in their own learning.

I will continue to develop the course and analyze my subsequent students' beliefs. However, I believe that much more than a single course is needed to develop teachers with techno-mathematical knowledge who can enable students to use technology as an *essential* tool in learning mathematics. Meaningful experiences need to be woven throughout a mathematics education program, and continue throughout a teacher's career.

Author's Note: The details of the author's course can be found at http://courses.ncsu.edu/ems480.

References

Bradley, S. (2000). Generalized Fibonacci sequences. Mathematics Teacher 93(7), 604-606.

Drier, H. S. (2000). Investigating mathematics as a community of learners. Teaching Children Mathematics 6(6), 358-363.

Gay, A. S. (1994). Preparing secondary mathematics teachers. In D.B. Aichele (Ed.), 1994 Yearbook: Professional Development for Teachers of Mathematics (pp. 167-176). Reston, VA: National Council of Teachers of Mathematics.

Garofalo, J., Drier, H. S., Harper, S., Timmerman, M. A. , & Shockey T. (2000). Promoting appropriate uses of technology in mathematics teacher preparation. Contemporary Issues in Technology and Teacher Education, 1(1), 66-88.

National Council of Teachers of Mathematics. (2000). Principles and Standards for School Mathematics. Reston, VA: author.

Making geometry on a virtual environment: a proposal of continuous distance education for teachers

Márcia Campos, Alex Sandro Gomes and Hermíno Borges Neto

Tele-ambiente[1] is an environment composed of a virtual site linked to applications that favor the cooperative work, in which the interaction among participants is mediated by tele-conference resources (image, sound, text and mail) plus an efficient protocol of real-time file and software sharing among the the working group participants (for instance student-student and teacher-student).

The final goal is to develop a distance learning tool for middle-school mathematics teachers in-service professional development in the state of Ceará, Brazil. The course focus on selected topics on geometry, using software as resources for teaching geometry and enfasize problem solving instead of algorithms and proofs. The aim is to develop teachers´ conceptual understanding about geometrical topics and at the same time to provide them with tools for planning their classes using internet and educational software.

The present work discusses a pilot experience for implementing this environment. We are currently developing materials for the course. In a previous study conducted in classroom, we observed how teacher interventions could be reduced. In this work we report on findings with a group of pre-service elementary school teachers at the Universidade Federal do Ceará. We first describe the virtual environment called Tele-ambiente.

The Tele-ambiente's Structure

Tele-ambiente is a learning environment composed of a tool, called TELE, and a group of activities that can be used by this tool in real time. We assumed two premises for initiallying implementing TELE. The first was to adopt patterns established by organisms such as ITU (International Telecommunications Union) and IETF (Internet Engineering Task Forces); the second was to adopt the Internet as the basic infrastructural environment.

TELE was implemented using the ActiveX controls, a Microsoft™ NetMeeting product. The interface was developed using a group of parameters to control the interface objects presented to users. The features of NetMeeting are supported by industry patterns designated by the International Telecommunications Union (ITU), the Internet Engineering Task Forces (IETF) and other normatization agencies. NetMeeting allows ITU H 232 for audio and video-conference, ITU T.12o for the multi-point conference, and IETF LDAP for directory services.

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[1] Tele-ambiente (Developing colaborative and adptative aplications for distance instruction) is a research project approved by ProTeM-CC (it Programs Thematic Multi-institutional in Science of the Computation) of CNPq, Brazil

Pedagogical structure of the courses

Tele-Cabri it is a distance course conducted in Grénoble by IMAG, of the Joseph Fourier university, for hospitalized children. We choose to adapt it for a group of in-service public schools teachers in Fortaleza, Ceará, Brazil. The teachers usually have insufficient content knowledge in mathematics and geometry.

Initially, we have students' machines linked to an internet server which has already properly learning situations stored and scheduled, an virtual tutor agent, interventional objects and historical of the sessions. These items are integrated in the Tele-ambiente environment allowing sharing of Cabri-geometre software, and oral, visual and written communication.

To explain them, begin why commenting the term tutor it is used. Pavel (1997) says that Balacheff prefers to use this term because it differentiates the teaching through TeleCabri from a simple tutorial program tutorial containing all the answers rigidally structured. In a certain way, TeleCabri works as a program tutorial because it possesses an virtual tutor agent that generates problem-solving situations, intervening in students' difficulties through an analysis of didactic engineering accomplished a priori in possible ways to solve the subject, taking in consideration, still, possible mistakes and the student's difficulties.

When identifying the students' difficulty, the virtual tutor has two roads to proceed: it makes an automatic intervention, running over the intervention objects, or it falls back upon the human tutor. The human tutor's importance resides in the fact that not all the students' difficulties can be solved in an automatic way. In the Tele-ambiente database, we set up the virtual tutor, the interventional objects with the situations problems and texts and images with explanatory and illustrative routes.

To structure the course, we will select part of the official curriculum for the geometry teaching demanded for 5a and 8a grades of the Brazilian middle school teaching. We will create the activities with Cabri-géomètreto allow active construction of the geometrical concepts. We also intend to use other available resources in the Internet for not limiting ourselves to one only application. We intend to use with teachers a methodology that stimulates thinking, so that they can learn how to propose problem solving situations that contribute in an active way to constructing students' knowledge. It is also our objective to prepare the teacher to accomplish the analysis of children's answers.

Helping Elementary Education Majors Brush Up on Mathematical Modeling: Insights from a Field Test of a New Online Learning Prototype

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Abstract: This paper describes insights related to the potential use of on-line training modules with elementary education pre-service teachers for enhancing their experience and background in mathematical modeling. These insights resulted from a field test of a new online learning prototype developed within a National Science Foundation Proof-of-Concept project. The insights listed in the paper are further supported by two URL addresses that link to detailed notes, background documents, and various demonstration pieces.

Various studies and national reports have suggested that elementary education majors are often weak within academic content areas, and particularly mathematics and science (see web-site for references). Such studies and reports often suggest the need for remedial content instruction within teacher preparation programs. However, these future teachers may have a difficult time receiving the remedial help they need within a traditional university setting, since as a elementary education major they are often already taking a full load of courses representing numerous disciplines. Thus, the potential of other approaches, such as the use of on-line learning modules, need to be examined for filling this remedial content need of pre-service elementary teachers.

Related to this potential assistance, several online learning strategies are being examined at the University of Nebraska at Omaha with pre-service elementary teachers, including the use of a new online learning module, developed within a National Science Foundation Proof-of-Concept project related to mathematical modeling. The module and other simulations used represent several innovations in online instruction, such as a node-based database structure for the instructional pieces. The assessment questions and answers, sequence of nodes visited by the student, and duration of time a student visits an instructional node are all recorded. A detailed map of a student's path through the instructional process is also generated to help in the overall analysis of an individual student's learning process. For more information see the extensive URLs at http://ois.unomaha.edu/aflearn/index.html and http://ois.unomaha.edu.

The investigation of these online learning strategies is just beginning, but some initial insights are already apparent from the results of some initial field tests. These include the following:

1) Response patterns reflect that elementary teachers indeed have a wide range of background and experience in mathematics and mathematical modeling.

2) The pre-service elementary teachers sampled recognized that online learning might be a useful strategy for their own remedial work in mathematics.

3) The pre-service elementary teachers were at first uncomfortable and impatient with the "discovery learning" approaches used within the modules and simulations.

4) The pre-service elementary teachers eventually preferred to work in groups of two or three, rather than to work on the on-line activities individually.

5) A periodic discussion component (that accessed a real teacher) was seen as essential by the pre-service elementary teachers when using on-line learning activities.

6) After some initial resistance with the on-line instruction, the elementary pre-service teachers eventually embraced on-line training that contained some periodic discussion components.

The overall vision for the use of such technology based learning environments is one that is consistent with many national visions and documents. For the pre-service elementary teacher, the use of such learning environments within methods classes may not only help them extend their own backgrounds, but also allow them to experience a potentially powerful new learning environment that will become increasingly available to both themselves and their elementary students.

The Modern Classroom: Using Portable Wireless Computer Networking in the Classroom

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Abstract: In the Spring semester of 2000, the College of Education at the University of Illinois sought to alleviate the lack of available class-time in a standard computer lab by implementing a laptop computer lab that could be transported throughout the building and connected to the World Wide Web via a wireless network connection. This paper reports on the usefulness of such a system in a higher education classroom and on the support aspects necessary to implement such a system and control for user needs. Views by our learners from a one-semester course in advanced statistics reveal that a wireless computer lab is effective in providing students with motivation, mobility, and learning while providing the instructor with increased pedagogical choices.

Introduction

Technology continues to be at the forefront of the modern educational system. The latest technology to inundate classrooms around the world is wireless networking. The recent affordability and speed of wireless networks combined with the power and affordability of current laptop computers have allowed portable wireless computer labs to become a reality in many schools. The College of Education at the University of Illinois serves as no exception to this rule. In order to alleviate the overcrowding of a desktop computer lab, a portable solution was implemented that would also take advantage of recent advances in wireless networking. This paper describes this wireless computing environment and the views by our learners from a one-semester course in advanced statistics. Summaries from the survey are shared along with anecdotal comments from our participants. Finally, conclusions are drawn concerning the effectiveness of the system during our trial.

Advantages of Portable Wireless Computer Networks

Wireless computer networks offer schools a big advantage (mobility) over hardwired network technology. Using a wireless network with laptop computers allows students to use computers as they move around a classroom without having to be connected with a network or power cable. With the use of the wireless network on a portable computer comes greater flexibility and mobility for students and classroom activities.

As the wireless network technology continues to improve and the costs decline we will see more and more schools turning to wireless solutions for their local area networks (LANs). Wireless LAN computers (connected to a server through PCMCIA cards that send and receive) provides classroom instructors with greater flexibility in gaining access to the Internet at anytime from anywhere within reasonable distance. It is also a benefit in school communities that are experiencing rapid student population growth where the installation of a wireless LAN is common place in portable classroom settings. Having a wireless LAN allows students and teacher to communicate with each other without cables, sending and receiving data, accessing the Internet and printers.

Recent support systems (LearningStation.com) are beginning to provide enabling, real-time instructional tools through wireless web-based solutions. With these support systems schools are able to gain valuable information in setting up real-time wireless network access and networked computers while providing a more enhanced learning experience. Schools that are using these wireless computing environments are reporting results that are linked to improved performances on statewide achievement tests (math & writing), improved attendance, improved performance on a writing proficiency test, improvement in students' and teachers' research skills, an increase in student motivation and parental involvement (Greaves, 2000).

Overview of a Wireless Networked, Portable Computer Lab (iLab)

The functioning of our iLab is relatively simple. Apple iBook computers with upgrades to give 96 MB of RAM and Apple AirPort wireless networking cards provide the core component. The networking is achieved via radio signals, thus no line of site contact is required for the system to function. The iLab is contained on a cart that provides mobility throughout the College, security of system components, and a custom built recharging system. Once the iLab is in the classroom, students retrieve their assigned laptops. Within a few minutes, the class can be exploring the Internet or performing other computer facilitated activities.

Our iLab implementation took a student centered approach. Enough computers were supplied to provide a one-to-one student to computer ratio when applicable. Furthermore, the wireless aspect is primarily from the student's perspective. The instructor computer was an Apple G3 laptop. This provided an external monitor/projector connection, but the computer was not included on the wireless network for security reasons. Therefore, the instructor's computer still required a network cable. Furthermore, to insure optimal signal strength, the Apple AirPort network hubs were built into the cart that goes into the classroom with the computers. These hubs also have to be hard wired to the College's network and plugged into a power outlet. To allow connection of all devices to a single network jack and power outlet within all classrooms in our College, a switched Ethernet hub and a power strip were also built into the cart. A single network cable and power cable that extend from the back of our transport cart are then connected within the classroom to activate the system. These additional wires are transparent to the students who need only to pick up their laptop to begin working.

New Roles For Classroom Teachers and Students

With the use of wireless technology a new role emerges for the classroom teacher. Greaves (Greaves, 2000) reports that with the use of wireless networks one sees an improvement in collaborative learning and support for more individual, small group and whole class projects. For teachers that use wireless systems, Greaves reports that teachers are using technology for more effective instructional strategies that allow students to discover knowledge and to develop their own personal learning and growth. Many others have concurred. Bradshaw and Massey explain, with laptops, the students learn advanced communication skills and computing techniques in a laptop-enhanced classroom. Also, the PLAIT project (Gardner, 1994), the Copernicus Project (Fouts, 1997), and Project Pulse (McMillan, 2000) among others have all demonstrated the utility of laptops in education. A common theme among the studies is enhanced student centered learning with increased pedagogical choices for the instructor in a laptop-enhanced classroom.

Few projects, however, have examined the impact that wireless networking in conjunction with portable computing can have on the instructor and students. Stetten and Guthrie (Stetten, 1995) report how diffuse infrared wireless networking lends itself well to collaborative, computer-enhanced classroom experiences. They enumerate a number of useful teaching techniques or modes of instruction. Two of their four modes utilized collaboration while all four modes were enhanced by the laptop presence. The wireless computing provided flexibility that they argue could "serve well for any subject in which human-computer interactions capture the intellectual or creative process."

Such positive classroom environments do not create themselves. Our studies have shown that the positive application of technical components is more than a simple show and tell. Beyond network and computer presence, the instructor needs to have instructionally sensitive programs and activities for use in an iLab environment. Some idea of activities using the technology needs to exist and the instructor needs to have the ability to transform those ideas into functional lessons. When necessary, the instructor must be willing to forgo ingrained power systems within the classroom so that the students can be empowered to carry on their own learning at their own pace within limits that the instructor can still set. In all, the system must provide added value to the educational experience of instructor and students alike.

Model for Supporting an Instructor's Use of a Mobile Computer Lab

Fundamental to the use of a wireless computing environment is the organization of educational materials that can be shared and implemented with a portable classroom environment. To achieve added educational value, some form of support model is necessary to provide the instructor with the tools and knowledge to make use of such materials. In this section we address the support structure that is needed to facilitate a professional learning environment for both the students and the professor. This system must insure computer and networking functionality while providing instructional support for instructors and students so that the computing environment is best utilized to benefit all.

Any use of equipment, independent of its technological nature, requires a support system. An expensive, high-tech piece of equipment quickly becomes an expensive paperweight if the appropriate steps are not taken to ensure the continued functioning of the system as well as instructor support and training. It is only through a continuous stream of communication between the support staff and instructors that viable and effective technology use can be achieved.

Numerous approaches can be executed to maintain a constant connection between the instructors using the iLab and the support staff. To begin with, a communication channel must be opened before the technology is introduced. In our system, all instructors planning to use the iLab must attend an orientation meeting prior to iLab use. Several reasons exist for establishing early communication lines. For one, independent of the desire to implement a system, such action should not be taken if it is against the best interest of the students. It is possible that an alternative method could meet the student's needs better. For example, a video resource may be available that could serve the students as well as World Wide Web access. Secondly, the earlier that communication lines are opened, the more time they have to develop into a functional state. Only once the instructor is comfortable communicating with the support staff can a free flow of information occur to the instructor's benefit. Finally, the support staff must know the needs of the instructor in advance. Early warning is required for the support staff to install required programs, research program effectiveness, test and correct any program conflicts that may exist in the computer systems once new software is installed, and to schedule maintenance of the systems around the class schedule of the instructor.

Once the computer components are in use, the communication between staff and instructor must continue. An instructor needs to feel comfortable with reporting a problem and confident that such problems will be corrected in a timely manner. This comfort leads to greater instructor satisfaction, which can translate into a more diverse and more regular usage of the computer lab in the classroom to the students' benefit. Furthermore, every time that the system is deployed, the support staff should be aware of any changes in instructor needs so that concurrent changes can be made in the computer system to best meet the new needs. Interaction with the instructor was maintained in our system through email, phone, and in-person contact every time that the system was used. The support staff maintains a willingness to communicate and to help the instructor as needs arise.

Helping the instructor is a key concept in creating effective programs. Effective technology use requires more than a simple understanding of how a piece of equipment is turned on, and more too than an understanding of how to start and run a computer program. Instructors should also be given support in the area of ideas. While the instructor is a content expert, the instructor may not be a computer assisted instruction specialist. Therefore, it becomes an important function of the support staff to complement an instructor's existing strategies with ideas concerning how to integrate technology to best meet the course's needs.

A final step in communication between instructor and staff is evaluation of the systems usage. Post-use meetings were established to evaluate the effectiveness of the system and to search for solutions to any problems that may have arisen. Not all problems may have been reported during a semester, since some may have been small or have slipped the instructor's mind. Also, while some problems may have been small on a single occasion, a continued occurrence of a small problem can become a big problem over time. Therefore, the support staff needs to identify these problems and make corrections prior to future system usage.

Not all requirements to system's needs can be gained directly through communication. Support staff should understand that while an instructor knows the needs of the students, these needs might not be reported if the instructor is unaware that these needs can be met with technology. In other words, the instructor does not always know what is possible. Hence, a support staff needs to be proactive and anticipate student needs. Through anticipation, lessons can be envisioned that make more effective use of the system than first envisioned by the instructor, which can lead to greater satisfaction for the instructor, the students, and the support staff from a job well done.

Results & Discussion

In addition to analyzing feedback from the instructor and knowledge of support personnel as outlined in discussions above, pre and post surveys were administered to the 26 students attending a graduate statistical methods course in a Midwestern university setting. The pre survey asked seven background questions and nine Likert scaled (Responses ranged from 1 to 5 where a 1 represented Agree and a 5 represented Disagree) items regarding the use of computers and wireless networks. The post survey consisted of 10 Likert scaled (Similar response scale as the pre survey) items and two open ended items focusing on wireless networking. Copies of the survey are available from the website [http://eval1.crc.uiuc.edu/site2001.html]. The respondents were represented by 11 males and 15 females with an average of 8.6 years of computer experience, 4.3 years of Internet experience, predominantly owning PCs (85%, with only 1 student not owning a personal computer), and typically spending 1.7 hours a day on Internet. No significant differences existed in average computer experience or knowledge based on student status or gender in our study.

The responses to the open ended items revealed the student's perspective on the use of wireless networks in classroom settings. Overwhelmingly, the responses were positive in nature. Figure 1 highlights some of the responses.

"If you are familiar with the computer it can be of great advantage..."

"Nice to have ability to use Internet in a normal class.
Able to use websites to enhance learning."

"Everyone should have the knowledge to access computers."

"With portable computing in an educational setting people will easily access the Internet."

"Nice to relate to book learning...
nice to be able to work on the same thing as other classmates."

"Convenient," "enhanced learning...without having to leave the classroom."

"Easy to use software...easy to get info from a variety of sources."

Figure 1: Student Responses to Use of a Wireless Computer Lab

The results from survey items reveal a strong positive level of agreement with the questions concerning the effectiveness of wireless computing. The mean level of agreement to the question on excited about the use of wireless networking" was a mean of 1.62 where 1 represents a high level of agreement.

Similarly we see a high level of agreement (M = 1.54) with their response to the question of "using wireless networks in the future." The majority of the students reported not understanding the security issues involved with wireless networking (M = 2.85). From the Post survey we see the students reported high level of agreement (M = 1.6) with the "enjoyment" of using iBooks in this class. The use of the iBooks created a greater sense of the security issues as end of course the students rated the question of understanding the security issues involved with wireless networking with a significantly higher level of agreement (M = 2.1). Finally, the majority (85%) of the students viewed the use of wireless networking as enhancing their learning experience (M = 2.2).

Several enhancements to learning became evident from our study (Figure 2 provides a model for our learning environment that includes student outcomes). First, an iLab enhances student mobility. The computer now goes with the student to where learning is taking place instead of the student going to a computer environment that may inhibit typical classroom learning. This mobility provides increased usability of computer-based and Internet-based learning. A second enhancement is motivation. The iLab places the students in control of their learning as they pace themselves through a choice of computer-based activities. This control, along with a general enthusiasm over computer use, can be a motivating factor for many students.

This control requires that proper planning occur to develop and find appropriate materials prior to lessons. In our class, value was added through simulations of statistical concepts that provided visualization of abstract concepts that the students could manipulate to yield better representations of themes. The computers provided real-time representations of data in a visual format. Student participation seemed increased and students mentioned when questioned that the visualizations provided them with a better understanding of statistical concepts.

Appropriate materials can also merge with student assessment. Through the use of online quizzing, assessment choices for the instructor increased while overall meaningful learning was increased. Online quizzing provides instant feedback to students, thus correcting misconceptions while the thought processes that led to them are still fresh in the student's mind. In addition, students can complete multiple non-identical quizzes over the same material through "quiz banking" on the computer, thus providing multiple opportunities for reinforcing concepts. Finally, placing the quizzes in an online format provides the student with control over quiz speed, since the quizzes can be taken when the student wants at their own pace.

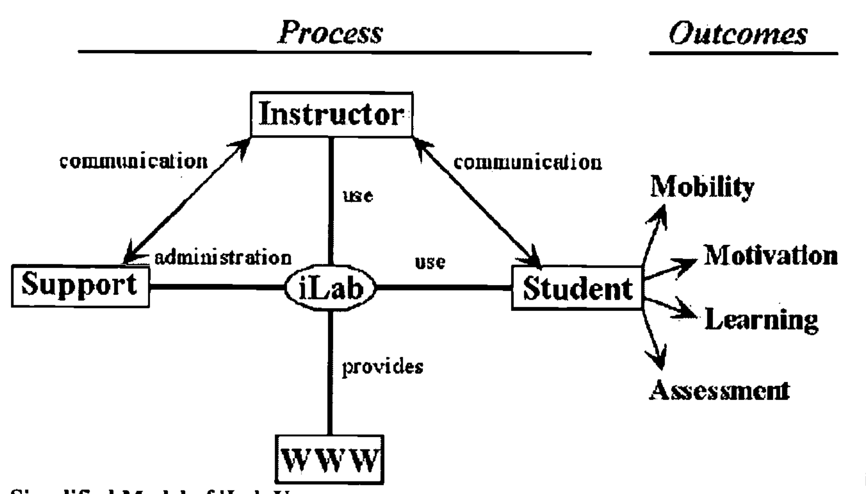

Figure 2 – Simplified Model of iLab Use

Summary

Through dynamic interaction among computers, support systems, instructor, and students, a wireless networked portable computer lab can provide student motivation, mobility, and learning while providing the instructor with increased pedagogical and assessment choices in a standard classroom context. Use of iBooks facilitated small group interactions among students pairing up to solve problems, alternating between acting as the problem solver and listener. The iBooks provided natural small group opportunities to clarify and test student's own ideas and perceptions as well as build teamwork and communication skills. Through this process the students gained insights into their own thinking processes and those of others. Furthermore, active engagement of the students via the iBooks in discussions, practicing what they were learning, and applying concepts and ideas to complex performance tasks can yield added value to the educational experience from the instructor and the students' viewpoints.

References

Fouts, J. & Stuen, C. (1997). Copernicus Project: Learning with Laptops: Year 1 Evaluation Report. (ERIC, ED 416 847).

Gardner, J; and others. (1994). Learning with Portable Computers. *Computers and Education.* 22 (1-2), 161-171.

Greaves, T. (2000). One-to-one computing tools for life. *T.H.E. Journal*. 27 (6), 54-56.

McMillan, K. & Honey, M. (1993). Year One of Project Pulse: Pupils Using Laptops in Science and English. A Final Report. Technical Report No. 26. (ERIC, ED 358 822).

Stetten, G. & Guthrie, S. (1995). Wireless Infrared Networking in the Duke Paperless Classroom. *T.H.E. Journal*. 23 (3), 87-90.

Integrating Mathematics Education Technologies into Teacher Education at the University of Colorado-Boulder

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Abstract: Technology is transforming the face of mathematics education. The National Council of Teachers of Mathematics' *Principles and Standards for School Mathematics (Standards)* states "the existence, versatility, and power of technology make it possible and necessary to reexamine what mathematics students should learn as well as how they can best learn it" (NCTM, 2000). Furthermore, NCTM describes that "the effective use of technology in the mathematics classroom depends on the teacher. Technology is not a panacea. As with any teaching tool, it can be used well or poorly" (NCTM, 2000). Evidence suggests that teachers frequently have difficulty aligning their practice with these *Standards* and that they need financial, cognitive and technical support in order to do so (OTA, 1995). This paper describes ways that the University of Colorado-Boulder has infused technology into their teacher education program in general, and their mathematics education program, in particular, in order to "prepare tomorrow's teachers today" to effectively teach with mathematics education technology.

Teacher Education Technology Framework

The teacher education experience embodied at the University of Colorado-Boulder (CU) is designed to instill in preservice teachers an informed and critical perspective on the uses of new media so that these teachers are provided with the skills and confidence necessary to implement their professional objectives and decisions. The teacher education program at the School of Education at CU has long been committed to training exceptionally well-prepared teachers so that they think critically about education and theories of learning, and establish inclusive classroom environments that foster learning opportunities for all students. Our program is imbued from the ground up with philosophies of teaching toward democratic ideals, and the goals of providing students with constructive, learner-centered classrooms founded on scientific research on education. As we enhance our own capabilities to use – and teach about – educational technology in K-12 education, we are similarly committed to an integrative and systematic approach to teacher education reform. Thus graduates from this new program aimed at preparing teachers to effectively use technology will learn to operate with an inquiring disposition that considers the When?, Why?, and How? of using technology to foster basic skills, knowledge, and conceptual understanding in all students. Because we as teacher educators are obligated to provide our students (preservice teachers) with the best and most up-to-date professional program, we believe that future teachers should be learning to use, teach with, and teach students to think with modern technologies as an integrated component to their teaching practices. Toward this end, educational technology use needs to be infused into the curriculum by education faculty who are modeling technology-proficient instruction, particularly in those courses where preservice teachers develop the subject area expertise they will use in the classroom. In this way, our teacher preparation programs can be sure that future teachers master new instructional strategies, multiple learning styles, and content applications that enable them to make full use of modern technologies for improved learning and achievement.

Secondary Mathematics Methods Technology Framework

Secondary Mathematics Methods (Methods) is taken by preservice teachers the final semester of their teacher education program, just before they begin their student teaching experience. By this time in their teacher education program students have learned much about the discipline of mathematics, taken education courses examining theories of schooling, teaching, and learning; and have observed and participated in various educational settings. An explicit goal of Methods is to help preservice teachers develop their mathematics teaching philosophies and practice (Peressini et. al., 1998). This course strives to help preservice teachers develop the skill of being able to make connections between the discipline of mathematics and effective ways to help students understand mathematics; the ability to help students to learn their way around the discipline while attending to conceptual barriers along the way (NRC, 1999) .

During this course, preservice teachers engage in authentic mathematical tasks. The preservice teacher's participation in these mathematical activities is done in a two-fold manner. First, these aspiring teachers participate as learners in order to experience the reform-based mathematics they will be asked to teach, and then reflect as pedagogues on the instruction and curriculum they have just experienced. Much of the reform-based mathematics that occurs in Secondary Mathematics Methods includes technology rich instruction and curriculum. This technology is integrated through a see once, try once, do once model. In this way, preservice teachers can observe, participate, and reflect upon the Why, When, and How of technology use in mathematics education. Examples follow in the next section.

Utilized Mathematics Education Technologies

"In mathematics-instruction programs, technology should be used widely and responsibly, with the goal of enriching students' learning of mathematics (NCTM, 2000)." The first author of this paper has identified, and worked extensively with four mathematics education technologies, which have demonstrated particular promise towards enhancing student learning. These technologies fit well with multiple teaching and learning styles, especially reform-based pedagogy, and help to foster connections between students' mathematical understandings and other parts of their in-school and out-of-school experiences. These technologies are Geometer's Sketchpad (KCP, 1997), Graphing Calculator's including Calculator-Based Laboratories, Fathom (KCP, 1999), and The Jasper Woodbury Adventure Series (CTGV, 1992). These mathematics education learning tools can be used dynamically, and when utilized effectively, help to meet NCTM's recommendation of using technology to "blur some of the artificial separations among topics in algebra, geometry, and data analysis by allowing students to use ideas from one area of mathematics to better understand another area of mathematics" (NCTM, 2000).

These technologies afford opportunities to link mathematics curriculum and instruction across subjects and to students' lives (Hovermill, J. & Anderson, K., in progress). Calculator-based laboratories allow students to collect data about real-world phenomena via the use of tools such as motion detectors, pH probes, light sensors, and temperature probes. Students can investigate the world around them by using this equipment and then use graphing calculators or Fathom software to analyze the data they have collected. Fathom is a particularly powerful mathematical exploratory tool since students can simultaneously investigate multiple representations of the data they have collected. While students try to understand interesting data sets they are motivated to learn and apply many mathematical concepts (Finzer, 1999).

The Jasper Woodbury Adventure Series is a video-based learning environment that fosters student problem posing and solving. Fifteen to twenty minute videos are presented to students in Jasper Adventures. Embedded in these videos are critical ideas that are necessary towards solving the multi-step problems presented to the students at the end of the adventures. The developers of the Jasper Woodbury Series comment how their design "anchors" students' subsequent project-based learning (CGTV, 1992). Multiple classrooms investigating Jasper problems are often networked together with other schools and learning communities or "collaboratories" are thus created. Learning communities increase student motivation, provide opportunities for formative feedback and assist towards promoting learning with understanding (NRC, 1999).

Geometer's Sketchpad is another dynamic learning environment, which can be used to help connect aspects of the subject of mathematics, within or outside the discipline. Specifically, students can quickly produce dynamic sketches that can lead to conjectures, investigation, and communication (Schattschneider & King, 1997.)

Results

Preservice teachers have responded favorably to opportunities to experience technology-based mathematics as learners and as teachers. They have reflected upon these experiences in regards to student motivation and understanding as well as instructional and curricular issues. They have engaged in meaningful dialogue inside of class and outside, via electronic discussions. These preservice have themselves integrated technology into their student teaching fieldwork experiences. Three themes have repeatedly surfaced as aspects of technology-based mathematics. First, these preservice teachers have concluded that technology affords opportunities for rich mathematical investigation. Second, these investigations involving technology can help to make connections within the discipline of mathematics and between mathematics and other disciplines. Third, technology-based investigations can drive instruction and curriculum in authentic, collaborative ways that help to foster learning for understanding. Examples of these preservice teachers' conclusions are below.

Responding to technology-based activity learning in general, one student responded:

> I think technology-based activity learning offers a richer way (for students) to understand academic subjects. I think that it provides a contextual framework for mathematics so that students understand connections between mathematics and other disciplines.

Another student responding specifically to a light sensor Calculator Based Laboratory activity, which investigated the fluctuations of fluorescent lights and modeled this fluctuation on the graphing calculator with an absolute value sine function, said:

> It is pretty obvious that activities such as the light activity can be interesting, fun, and educational as well. The activity made good connections, it involved thinking about scientific concepts, and also required that mathematical concepts and computations be involved. Activities like this make the learning more fun, simple as that.

Yet another student added:

> I think technology-based activity learning helps students ask why formulas are the way they are. They can see algorithms they have learned in class put to practical uses. If they don't have all the content knowledge while working on the lesson, it will force them to ask more questions about the lesson. When we were working on the lesson, because we didn't all know everything, the lesson was more of a discovery lesson. It integrates technology, content knowledge, and group work and allows students to discover answers instead of just being told them.

Another student concluded:

> students are able to see how ideas and concepts are interrelated across disciplines. This inter-relatedness makes for a stronger foundation of knowledge for students. I believe it lets them see that content areas do not exist solely by themselves.

Conclusions

"Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning" (NCTM, 2000). Although NCTM and other educational organizations recommend integrating technology into mathematics curriculum and instruction, this is still not often accomplished in many classrooms (NRC, 1999). At the University of Colorado-Boulder, we have infused technology throughout our teacher education program and provide students with many opportunities to experiences and discuss the Why?, When?, and How? of technology integration. These multiple learning situations allow preservice mathematics teachers to critically examine issues of teaching and learning and to integrate technology into their personal educational ideologies. Teacher education at CU provides a framework that helps to "prepare tomorrow's teachers today" to teach effectively teach with technology. We utilize a model of observe once, practice once, lead once in supporting preservice teachers towards discovering the affordances for student learning that technology offers and integrating meaningful technology based investigations into their own mathematics curriculum and instruction.

Students in this program have articulated three findings about technology-based activity learning. First, these preservice teachers have concluded that technology affords opportunities for rich mathematical investigation. Second, these investigations involving technology can help to make connections within the discipline of mathematics and between mathematics and other disciplines. Third, technology-based investigations can drive instruction and curriculum in authentic, collaborative ways that help to foster learning for understanding. With continued practice and support these beginning teachers will become the leaders for change in their new schools and help to integrate mathematics education technologies into school mathematics.

References

Bransford, J., Brown, A., & Cocking, R. (1999). *How people learn: brain, mind, experience, and school.* Committee on Developments in the Science of Learning, Commission on Behavioral and Social Sciences and Education, National Research Council. Washington, DC: National Academy Press.

Cognition and Technology Group at Vanderbilt (1992). The Jasper Series: A Design Experiment in Complex, Mathematical Problem Solving. *Design Experiments: Integrating Technologies into Schools.* Hawkins & Collins (Eds.) New York: Cambridge University Press

Finzer, B. (1999). *Design of Fathom, a Dynamic Statistics Environment for the Teaching of Mathematics.* Key Curriculum Press.

Jackaw, N. (1997). *The Geometer's Sketchpad.* Key Curriculum Press.

Schattschneider, D. and King, J. (1997). Geometry Turned On!: Dynamic Software in Learning, Teaching, and Research. Washington D.C.: The Mathematical Association of America.

National Council of Teachers of Mathematics. (2000). *Principles and Standards of School Mathematics.* Reston, VA.

Peressini, D., Elliott, R., & Knuth, E. (1998). *Lessons learned from the mathematics teacher mentoring project.* Paper presented at the annual research pre-session of the National Council of Teachers of Mathematics, Washington, DC.

U.S. Congress, Office of Technology Assessment. (1995). Teachers & Technology: Making the Connection, *OTA-HER-616 (Washington DC: U.S. Government Printing Office).*

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Teaching Technology With Technology: A Case Study. How One Faculty Member is Integrating Technology Into His Pre-Service Mathematics Methods Classes

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Abstract: This case study tracks a secondary mathematics pre-service class. The professor's thoughts give insight into why he is incorporating technology into his curriculum. The pre-service mathematics class is also participating in a pilot project in which wireless Macintosh® iBook computers are put to use. Classroom observations, interviews and documentation of student feedback were used for analysis. This professor's philosophy is that technology should be an instructional tool, a contribution to productivity. This faculty member is pleased with the results of technologies utilized in the course. Students reveal they benefits of technologies used in this methods course. The interesting concern of students was not the use of technology, but "which brand" would offer the best results.

Introduction

We are all familiar with the critical cries that teachers need better preparation in using instructional technology. Accordingly, we hear that university faculty themselves need a better understanding of technology. When a faculty person does have a high level of technological understanding, is there necessarily a gain in that person's productivity?

This study is motivated in part by economist Robert Solow's often quoted remark "we see computers everywhere but in the productivity statistics," This has often been used to describe the phenomenon called the "productivity paradox." The paradox questions the true benefit of computing technology in the workplace; in simple terms, do we get less done using computers than we used to? Until recently, evidence suggested that the productivity paradox did, in fact, exist. The latest results from the business world suggest that computers are contributing to productivity, at least in sectors of the economy that are themselves highly focused on technology.

Is it possible, that a technology paradox may exist in the process of teacher preparation? To explore this possibility, the author has undertaken a case study of a professor of mathematics education who is highly skilled in the use of computing technology. In this paper, the author presents background information on the subject, and describes the methodological approach in process.

The Study

For this on-going case study, classroom observations, instructor interviews, and student written feedback were analyzed. Several students were also interviewed to gain their perception of technology, the use of technology in the classroom, and how effectively technology was being used in this particular class. Data from student journals and observations from other faculty augment the study. The themes, which emerge, were examined in the light of the "productivity paradox" and the increasing mandate for educational colleges to produce technologically literate teachers.

Students in this course were also included in a college pilot project, which allowed students access to a Macintosh® iBook computer during this class period. The iBooks computers were equipped with wireless technology, which allowed the instructor and each student access to the Internet anywhere in the classroom. Mathematica®, Geometer's Sketch Pad®, access to e-mail, and Internet browser tools were installed on each computer. Advanced calculators and other technology tools were utilized during some portion of this course.

A portion of this pre-service methods course involves students going out into the schools. The purpose of these school experiences is to observe, help teach classes, and practice many skills, which have been learned during their pre-service instruction. This study did not track the students into the schools during these practicum exercises.

It should also be noted that this professor has a mathematics and a technology background. Prior to his current tenure as a mathematics professor, he was a faculty member in the technology division of this college.

Findings

The instructor is pleased with the way technology is being integrated into his pre-service mathematics course. Observations and interviews reveal this professor has prepared the coursework and incorporated technology to augment elements being presented. Students have reacted to this form of instruction in a favorable manner. One male student gave the following written feedback. "I thought Wednesday would be a bore ... after all I am an experienced user. Boy was I wrong ... I learned lots of neat features that would work beautifully in my Calc reci as well as the prealgebra we will be teaching." A female student observed, "I enjoy a ... teacher who is trying innovative things in the classroom." Perhaps one male student best summarized the issue of technology in the classroom. "It is amazing what technology will allow you to do in a classroom. It was also amusing ... to see some of the difficulties technology presents and the troubleshooting that is sometimes required."

The use of Macintosh® iBooks created new experiences for both the instructor and the students. Most students found this pilot study very useful and were excited to be part of this project. Students liked being able to work Mathematica® problems in class, so information could be shared and solutions discussed. Students appreciated the fact they could explore web sites as information was being communicated.

The Macintosh® iBook project also presented the instructor and students with several shortcomings. The instructor discussed missed class time when students were checking out machines and returning them to the designated carts. Several students commented that having a laptop in front of them the entire class period lead to distractions, such as reading your e-mail, "surfing" the net, or using other software. Others said, if you are going to be distracted, don't blame it on the computer. Yet, the overall perspective of the iBook project is viewed as a valid and positive experience. Surprisingly, one of the most controversial points of this project arose when class discussion focused on whether Macintosh or Windows computers should be used.

Discussion

Faculties are divided about "how" and "to what extent" technology should be used in today's curriculums. This Secondary Mathematics professor, at a large midwestern university, considers technology an integral part of his curriculum. Students tend to agree with this perspective. A valuable follow-up to this study would be to track these students into future classrooms and ascertain if technology is being infused into their curriculums. The size of a school and a school district's perception of technology have been factors that can alter a teacher's use of technology.

References

Creswell, J. W. (1994). *Research design: Qualitative and quantitative approaches.* Thousand Oaks, CA: Sage.

Drazdowski, T. A., Holodick, N. A., & Scrappaticci, F. T. (1998). Infusing technology into a teacher program; three different perspective. *Journal of Technology and Teacher Education, 6*, 141-149.

Medcalf–Davenport, N. A. (1998, November). *Historical and current attitudes toward and uses of educational technology: A work in progress.* Paper presented at third annual WebNet 98 World Conference of the WWW, Internet and Intranet Proceedings, Orlando, Florida.

Moody, F. (1999). *The Productivity Puzzle: Tech, Ready When You Are.* ABCNEWS.com. From the World Wide Web: http://www.abcnews.go.com/sections/tech/FredMoody/moody990818.html

Museums Meeting Schools: Online and Right On the Mark

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Abstract: Schools, individual teachers, and students are entering museums through the World Wide Web instead of the entrance off Main Street. Museum directors are faced with the challenge of designing and using Internet based technologies to enhance the bond between students, schools and museums. This article discusses some of the technologies that museums are using based on an analysis of the Detroit Institute of Arts Education Department's Internet site and like efforts around the world. Each discussion is followed by an example of a museum that is using a particular technology and information directing the reader to a web site with more information. Design considerations for museum based educational web sites are also briefly discussed.

Introduction

Schools, individual teachers, and students are entering museums through the World Wide Web (WWW) instead of the entrance off Main Street. Museum directors are faced with the challenge of designing and using Internet based technologies to enhance the bond between students, schools and museums. This article discusses some of the technologies that museums are using based on an analysis of the Detroit Institute of Arts Education Department's Internet site and like efforts around the world. Each discussion is followed by an example of a museum that is using a particular technology and information directing the reader to a web site with more information. Design considerations for museum based educational web sites are also briefly discussed.

The following is a description of technologies subsumed under the Internet and examples of their educational use by museums.

On-line Design Considerations

Designing online educational outreach is not difficult. A few design considerations can greatly enhance the value of a museum's educational web site. The following design tips address some of the technologies more commonly used by museums today.

When designing an educational component of a museum web site, the museum's home page should have a hyperlink that is clearly labeled Education. From there, categories like lesson plans, e-mail, chat, video files, and sound files should be clearly visible.

Web sites should be easy to navigate. A visitor should be able to move between major parts of the web site with no more than two clicks of a mouse. Museums should avoid navigation features that frustrate web surfers like automatic pop-up windows and restricted access to going back. E-mail links should include the name of the institution or individual receiving the mail as well as the address.

Teachers and students should be encouraged to download pictures, graphics, sounds, and video. The site should clearly encourage the downloading of these elements and ensure that they are copyright free and identified as such. Cooperating teachers, students, and museum staff should create many, if not all, of the downloadable elements to avoid the unintentional use of protected materials.

If uploading documents is encouraged, simple procedures for doing so should be clearly visible and easy to find. Uploaded materials should be sent to the museum's web master for review and placement on the site. Since any materials on the site will reflect on the museum, careful screening is important.

Chat events should be clearly announced weeks in advance. Rules for participation should also be easy to find. Use the speaker's previous speaking engagements as a guide for estimating the number of people who would be interested in participating in a live discussion. Make sure that the software and hardware can handle the expected number of chat participants.

Video is a powerful tool on the Internet but usually requires more than a standard system to be received. Plug-ins or special programs for running video should be available through links to vendors who are willing to supply free versions of their software. Avoid video formats that are uncommon.

Directors need to remember that the Internet is not a static environment. Materials, listings, and links must be constantly updated and maintained. The Internet offers museums and other academic communities the most dynamic opportunity available today for collaboration.

It is also important to promote the educational component of a museum's web site. Search engines like Yahoo and Excite make it relatively easy to list a web site in their database. Key words should include terms like lesson plans, teacher resources, and educational activities. Content specific terms like Egypt, mummies, and pyramids should also be included.

Examples of Technologies used by Major Museums

Web pages are the most commonly recognized component of the Internet. Created using Hypertext Markup Language (HTML) and a variety of other programming languages, the vast number of web pages linked together through phone lines and satellite make up the WWW. Most museums already use web pages to post schedules and promote exhibits. They can also be used to post educational materials related to exhibits and events at the Museum. The Detroit Institute of the Arts has created a site off of their home page entitled "*Ancient Egypt: Lesson Plans for Teachers* (Ancient Egypt: Lesson Plans for Teachers, 2000, November 28)." This site includes a selection of cross-curricular lesson plans created by teachers in the Detroit Metro area.

This site is an excellent example of the most desirable relationship between museums and schools. The site was not created simply for teachers but with teachers. This integration helps the museum to offer instructionally sound courseware while giving teachers access to the Museum's extensive collection of artifacts and knowledge.

The lesson plans in the site are tied to the Michigan's Content Standards and Draft Benchmarks (Content Standards and Working Draft Benchmarks, 2000, November 28). These standards are not a state mandated curriculum but they are widely used throughout Michigan as a curriculum guide by school districts. This enhances their value to other teachers who are also teaching a curriculum based on the standards. The site includes lesson plans for Art, Science, Math, Social Studies, and Language Arts. The lesson plans at the DIA site include activities, assessments, goals & objectives, pictures of students and projects, preparations & resources, and comments from the teacher who wrote the lesson plan (Ancient Egypt: Lesson Plans for Teachers, 2000, November 28). In fact, more and more museums are providing lesson plans as part of their educational outreach (Classroom Ready Lessons and Activities, 2000, November 28; Kids Project, 2000, November 28; Online Museum Educators, 2000, November 28; Teacher Resources, November 28a; Teacher Resources, November 28b; Teacher Resource Center, 2000, November 28).

The art of writing a letter is making something of a comeback with the popularity of e-mail. This technology gives students a chance to compose thoughtful questions that go beyond what their teacher, their textbook, and even the WWW can answer. Museums, with their in-house collection of experts can provide many of those answers.

The Milwaukee Art Museum has an e-mail link that allows students to pose questions to some of the artists whose work make up the institution's collection (Ask the Artist, 2000, November 28). Even minor celebrities seem remote and impossible to contact. Teachers dream of giving their students the opportunity to meet and interview the author of a children's story, the successful explorer, and the commander of the latest shuttle mission. Museums can host such interviews through the use of chat technology.

Chat refers to asynchronous conversations over the Internet. Typically, a chat room looks like a small box with a list of names. In the case of a museum interview, the names of the children and the name of the expert would appear. Students type in their questions or comments, which then appear on the screen in the order a central server receives them. The expert then replies in similar fashion.

The National Air and Space Museum in Washington, DC maintains a link to NASA's Space Team Online Project (Chats, 2000, November 28). This link provides schools with an access to live interactions with various NASA personnel including astronauts. Schools must register to take part in live chats.

Museums frequently sponsor events and lectures. These can be video taped and then converted to streaming video. Most people are aware that video files take up a substantial amount of room on a computer's hard drive. It also can take many hours to download even a small amount of video through a standard modem connection. Streaming video is a technology that sends only a small amount of video through the line at a time while the video is being viewed. The result is substantially quicker access to video on the web and elimination of disk space problems.

Museums like the Tech Museum of Innovation at have begun offering some of their education-related content in the form of streaming video (Online Events, 2000, November 28). Teachers and students can watch lectures and interviews at any time.

Web based video works by connecting a small camera to a web page. The result is live video available on the WWW. Museums with dynamic or active exhibits can display all of the motion using this technology. Bishop Museum and The State Museum of Natural and Cultural History in Honolulu, Hawaii now offer live video feeds of some of their exhibits (Bishop Museum-Quickcam, 1997).

Interactive video is a similar technology. It doesn't display its video images on the WWW but sends them through phone lines in a similar manner. Interactive video using ISDN lines currently offers better quality sound and picture than web-based video. Unlike web based video, which may be available 24 hours a day, interactive video is used for events like lectures and presentations. The Philadelphia Museum of Art offers a program called ArtLine (The ArtLine Distance Learning Program, 2000). Artline is a distance learning initiative used to offer virtual tours of the Museum or interactive events with speakers.

Summary

Museums can enhance educational outreach through the use of on-line resources for schools, teachers, and students. But to be effective museum directors must understand fundamental design considerations. More importantly, they must reach out to schools, teachers, and students to partner in the creation of educational materials and on-line interactive environments that make the most of museum resources and are relevant to learning situations. Many museums are experimenting with new technologies for educational outreach. With cooperation from other academic communities, museums can find new ways to serve their local communities and the world.

References

Ancient Egypt: Lesson Plans for Teachers (2000, November 28). Detroit, MI: Detroit Institute of the Arts. Retrieved November 28, 2000, from the World Wide Web: http://www.dia.org/education/egypt-teachers/index.html

Ask the Artist. (2000, November 28). Milwaukee, WI: Milwaukee Art Museum. Retrieved November 28, 2000, from the World Wide Web: http://www.mam.org/html/ask_the_artist.htm

Bishop Museum-Quickcam. (1997). Honolulu, HI: Bishop Museum. Retrieved November 28, 2000, from the World Wide Web: http://www.bishop.hawaii.org/bishop/quickcam

Chats. (2000, November 28). Washington, DC: The National Air and Space Museum Retrieved November 28, 2000, from the World Wide Web: http://quest.arc.nasa.gov/space/chats/.

Classroom Ready Lessons and Activities (2000, November 28). Washington, DC: Smithsonian Institution. Retrieved November 28, 2000, from the World Wide Web: http://educate.si.edu/resources/lessons/lessons.html

Content standards and working draft benchmarks. (2000, November 28). Lansing, MI: Michigan Department of Education. Retrieved November 28, 2000 from World Wide Web: http://cdp.mde.state.mi.us/MCF/ContentStandards/

Kids Projects (2000, November 28). Cleveland, OH: Cleveland Museum of Art. Retrieved November 28, 2000, from the World Wide Web: http://www.clemusart.com/educatn/kidsprojects/index.html

Online Events. (2000, November 28). San Jose, CA: TheTech Museum of Innovation. Retrieved November 28, 2000, from the World Wide Web: http://www.thetech.org/exhibits_events/online/

Online Museum Educators (2000, November 28). Philadelphia, PA: The Franklin Institute Science Museum Retrieved November 28, 2000, from the World Wide Web: http://sln.fi.edu/qa98/wiredindex.html

Teacher Resource Center (2000, November 28).Seattle, WA: Seattle Art Museum. Retrieved November 28, 2000, from the World Wide Web: http://www.seattleartmuseum.org/trc/default.htm

Teacher Resources (1998). The Ohio Historical Society. Columbus, OH http://www.ohiohistory.org/resource/teachers/

Teacher Resources. (2000, November 28a). St. Louis, MO: St. Louis Science Center. Retrieved November 28, 2000, from the World Wide Web: http://www.thetech.org/people/teachers/resources/activities/

Teacher Resources. (2000, November 28b). San Jose, CA: TheTech Museum of Innovation. Retrieved November 28, 2000, from the World Wide Web: http://www.thetech.org/people/teachers/resources/activities/

The ArtLine Distance Learning Program (2000). Philadelphia, PA: The Philadelphia Museum of Art. Retrieved November 28, 2000, from the World Wide Web: http://www.philamuseum.org/education/distance.shtml

Bridging Transformational Geometry and Matrix Algebra with a Spreadsheet-Based Tool Kit

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Abstract: This report presents technology-enhanced activities designed for secondary mathematics teachers within the context of matrix algebra, transformational geometry, and fractals. It concerns the ways in which a spreadsheet can be used as a tool kit that enables one, through encoding and manipulating matrices, to create fractals with reliance upon *the Chaos Game*. The authors argue that such use of a spreadsheet can help prospective teachers link properties of matrices and concepts of transformational geometry in a meaningful and representational manner.

One of the central tenets of the current reform movement in mathematics teacher education is the appropriate use of the tools of technology in teaching and learning mathematics at all grade levels. The recently published document *Principles and Standards for School Mathematics,* by the National Council of Teachers of Mathematics (NCTM), included technology as one of its six Principles. The technology principle is based, in part, on the notion that computer-enabled pedagogy extends the range of problems that students can access and provides, with relative ease, more representational forms than a pencil-and-paper environment (NCTM 2000).

Indeed, a variety of representational forms relevant to secondary school mathematics instruction can be created through the use of computer graphics, electronic tables, symbolic manipulators, and dynamic geometry. All these types of software have proven to be useful cognitive tools in technology-rich classrooms and have become an important cultural component of the modern educational system. The various technology tools should not be considered in isolation; rather they should be viewed as a tool kit conducive to mediate mathematical action.

Any technology tool kit is a product of social evolution and cultural development. Thus, it may be helpful to structure the discussion on the mediation (through use of technology tools) of students' mathematical action in contemporary classrooms from the socio-cultural perspective (Wertsch 1991). This theoretical perspective distinguishes three major positions associated with a tool kit approach to mediated action: heterogeneity as genetic hierarchy, heterogeneity despite genetic hierarchy, and non-genetic heterogeneity. The first two positions admit an inherent ranking of available notation systems (electronic tables, graphing tools, etc.) within a learning environment. The third position does not admit the existence of the hierarchy of a cognitive effectiveness among the elements of a tool kit. In this report, we adopt the third position.

More specifically, non-genetic heterogeneity of a mediational tool kit implies that there is no inherent ranking within the manifold of representational formats in human mental functioning. As far as a representation of complex ideas in a computer environment is concerned, this position is in agreement with Kaput's (1992) claim that each notation system in a technology-rich tool kit reveals more clearly than another some aspects of a mathematical concept and hides some other aspects of the concept. From this position, a tool kit approach to mediated action brings about the abundant property of a representational variety in which the whole exceeds the sum of its parts. This paper will show how a variety of representational formats in the context of transformational geometry and matrix algebra can be examined from the third position.

The metaphor of a tool kit in the context of technology-enabled mathematics instruction means an array of representational formats that mediate students' mathematical thinking in a technology-rich environment. The major claim of a tool kit approach to teaching and learning mathematics in a computer environment is that the variety of qualitatively different representational formats (notation systems) provided by the environment affects students' acquisition of new concepts in different ways. While there is basically no inherent ranking among different types of software used in secondary mathematics classroom, the appropriateness of a particular type for a specific classroom depends on the topic being studied. Therefore, the metaphor of a tool kit in the context of a technology-rich mathematics classroom may be associated with the non-genetic heterogeneity position.

Variety in representational format may seem to require diversity in software, whereas many classrooms lack diverse software tools. However, the non-genetic heterogeneity position appears to be particularly helpful in supporting an alternative idea of using a single computer application - an electronic spreadsheet - as a tool kit (Abramovich & Brantlinger 1998). Indeed, this single computer application is comprised of many tools that have properties of their physically separate analogues. Sliders (manipulative parameters), electronic tables, random numbers generators, graphical and geometric charts, and other tools available in a spreadsheet environment comprise a non-genetically heterogeneous tool kit. As this paper demonstrates, such a tool kit can bridge two traditionally advanced topics – transformational geometry and matrix algebra – using a variety of tools that reveal a uniform cognitive effectiveness over the whole kit.

In what follows, a spreadsheet-enabled approach to understanding matrices as geometric transformations is suggested. This particular approach is motivated by students' interest in learning about fractals and self-similarity. Peitgen, Jürgens, and Saupe (1992) rely upon the metaphor of a Multiple Reduction Copy Machine (MRCM) and the use of lenses in describing the encoding of fractal images. Here, the focus is upon the matrix representations of lenses and the linear transformations that the lenses, in turn, represent. The authors argue that linear transformations in the Cartesian plane can be easily represented via their effect on a unit square, and, in turn, these resulting lenses are most efficiently represented as matrices. As such, the lenses used in MRCM constitute a fundamental link between two-by-two matrices and linear transformations of the plane. Using a spreadsheet-based tool kit of numerical, analytical, graphical and geometrical notations, one can develop the conceptual links between transformational geometry and matrix algebra that are needed to fully understand both topics.

In order to frame the mathematical ideas of this report, we will first establish the formal relationship between the two topics, and then demonstrate how the tool kit described above can aid students in bridging them conceptually.

Formal Approach

To formally build the link between matrix algebra and transformational geometry, we can construct a two-by-two matrix to represent each linear transformation of the plane. This construction relies upon the treatment of points in the plane as two-dimensional vectors on which the usual addition and scalar multiplication are defined. First, consider that a line is defined by two distinct points (x_b,y_b) and (x_d,y_d) – the first point indicates a base point and the second indicates a direction relative to the base point. Every other point (x,y) on the line is given by the point (x_b,y_b) plus some scalar multiple t of the point (x_d,y_d):

$$(x,y) = (x_b,y_b) + t\cdot(x_d,y_d) \qquad (1)$$

A linear transformation must take lines to lines. Thus, if the respective images of the points, (x_b,y_b) and (x_d,y_d), under linear transformation M, are known to be $M[(x_b,y_b)]$ and $M[(x_d,y_d)]$, then

$$M[(x,y)] = M[(x_b,y_b)] + t\cdot M[(x_d,y_d)] \qquad (2)$$

For now, let us put one more restriction on M by insisting that it fixes the origin:

$$M[(0,0)] = (0,0)$$

Note that removing this restriction yields an affine transformation - a linear transformation followed by a translation. Thus, throughout this report, we will refer to linear transformations with translations as affine transformations. By using equations (1) and (2), we get the following results:

$$M[(x,0)] = M[(0,0) + x\cdot(1,0)] = M[(0,0)] + x\cdot M[(1,0)] = x\cdot M[(1,0)]$$
$$M[(0,y)] = M[(0,0) + y\cdot(0,1)] = M[(0,0)] + y\cdot M[(0,1)] = y\cdot M[(0,1)]$$
$$M[(x,y)] = M[(x,0) + (0,y)] = x\cdot M[(1,0)] + y\cdot M[(0,1)]$$

Thus, the image of every point (x,y) in the plane is determined by the images of the points (1,0) and (0,1). To illustrate, let M[(1,0)]=(a,c), and let M[(0,1)]=(b,d). Then

$$M[(x,y)] = x\cdot(a,c) + y\cdot(b,d) = (ax+by, cx+dy)$$

In other terms, M[(x,y)] can be defined in a matrix form using four parameters: a,b,c and d:

$$\begin{bmatrix} a & b \\ c & d \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} ax+by \\ cx+dy \end{bmatrix}$$

If we want to allow for translations, we can augment the above matrix by translations e and f, in the x and the y directions, respectively. Finally, we have the following matrix representation of an affine transformation M:

$$\begin{bmatrix} a & b & e \\ c & d & f \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} ax+by+e \\ cx+dy+f \end{bmatrix}$$

We can also represent affine transformation M geometrically by considering the image of the unit square in the plane. Linearity of M will force this image to be a parallelogram, which exemplifies the combination of rotations, reflections, dilations, shearings and translations that M performs on the plane. Figure 1 illustrates an example of an affine transformation that includes a dilation, rotation and translation. The figure also includes labels with the notation mentioned above for matrix representations. While this figure is not part of the tool kit, it indicates a formal relation, through use of notation, between the two representations. An informal (activity-based) approach to this relation is the focus of the first part of the tool kit.

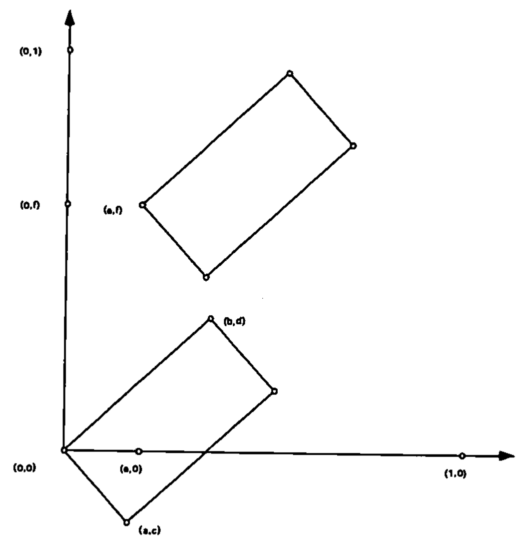

Figure 1: Geometric representation of an affine transformation.

Activity-Based Approach Using the Tool Kit

As an activity, we suggest that (prospective) high school teachers use the spreadsheet-based tool kit in the following manner. Sheet 1 enables the user to change the six parameters (a, b, c, d, e, f) of the three augmented matrices, each representing an affine transformation of the plane. We can make changes to each real-valued entry in a seemingly continuous manner (in increments of .01) using spreadsheet sliders. Also, the dynamics of such changes is interactively illustrated with spreadsheet graphics, which make it possible to generate a graph of the image of the unit square associated with each matrix (Fig. 2).

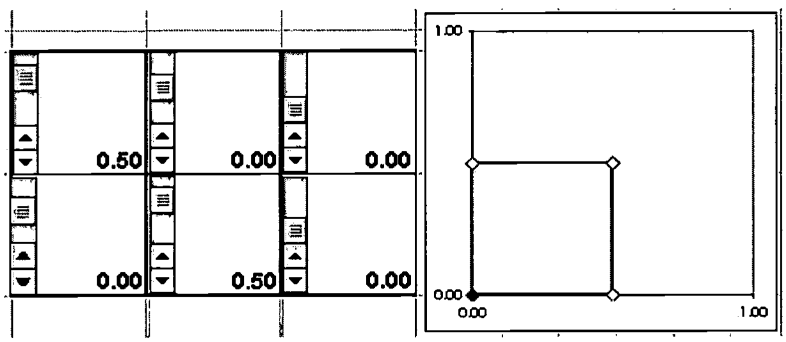

Figure 2: Algebraic and geometric representation of dilation.

The matrix in Figure 2 has entries a, b, c, d, e and f arranged in the conventional manner. We can immediately see the effect of these parameters in the graph of the unit square: the points (1,0) and (0,1) are scaled down to (a,b)=(0.5,0) and (c,d)=(0,0.5), respectively, and the origin is kept fixed at (e,f)=(0,0). Thus, the image of the transformation is the unit square dilated about the origin by one half. This image square illustrates that each point in the plane is scaled by one-half, which we can verify by performing multiplication of the matrix M by an arbitrary vector (x,y). We can use a similar examination to understand the transformation illustrated in Figure 3, except, this time, the origin is not fixed. Note that, according to Figure 3, the points (1,0) and (0,1) are mapped to (a+e,b+f)=(0.5+0.35,0+0.2)=(0.85,0.2) and (c+e,d+f)=(–0.3+0.35,0.5+0.2)=(0.05,0.7), respectively.

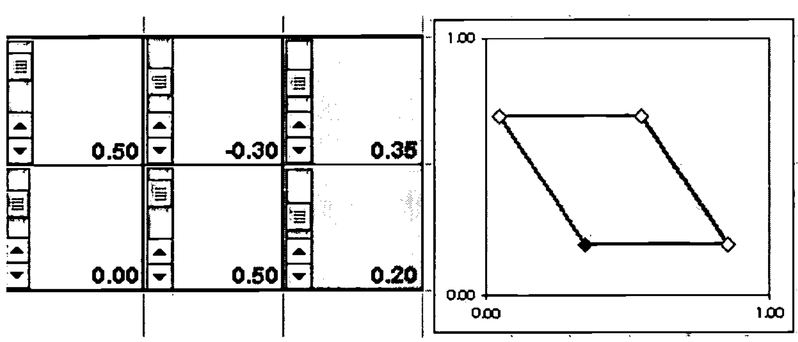

Figure 3: Representations of a combination of dilation, shearing and translation.

Next, students can analyze the values of coordinates of points (recall that these are being treated as two-dimensional vectors) under the transformation of matrix M_1, M_2 or M_3 selected randomly at each iteration from the three defined in Sheet 1. The iterations are performed in Sheet 2 by "teaching" the computer to perform matrix multiplication. The formula used to do this is shown in the formula bar of Sheet 2 (Fig. 4). Teachers may find pedagogical value in having students examine this formula. Note, however, that the matrix entries are now listed as rows (rows 4, 5 and 6). The matrix to be used at each iteration is selected randomly as indicated by the numbers in column C, beginning at C10. By tracking the images of the initial point (x_0,y_0) after each iteration, we can observe that points are, in general, not revisited. In fact, the pattern as a whole appears very chaotic, as we may expect from a random process. However, the subsequent iteration of a few thousand points yields a nice set, which is due to *the Chaos Game*. The graph of the resulting set is displayed in Sheet 3 (Fig. 5), and it represents a very popular fractal known as Sierpinski's triangle.

A10 = =IF(C10=1,A$4*A9+B$4*B9+E$4,IF(C10=2,A$5*A9+B$5*B9+E$5,A$6*A9+B$6*B9+E$6))

	A	B	C	D	E	F	G	H	I	J	K
1	X0 ---->	0	Y0 ----->	0							
2											
3	MATRICES										
4	0.50	0.00	0.00	0.50	0.00	0.00					
5	0.50	-0.30	0.00	0.50	0.35	0.20					
6	0.50	0.00	0.00	0.50	0.25	0.50					
7											
8	x	y	random #								
9	0	0									
10	0.35	0.2	2								
11	0.465	0.3	2								
12	0.4825	0.65	3								
13	0.49125	0.825	3								
14	0.348125	0.8125	2								
15	0.174063	0.30625	1								
16	0.345156	0.353125	2								

Figure 4: The iteration of points by randomly selected matrices.

Sierpinski's triangle is the result of iterating among three matrices, all similar to the one displayed in Figure 2, except e_2=0.5, f_2=0 for the second matrix, and e_3=0.25, f_3=0.5 for the third matrix. The fractal can be constructed geometrically by repeating the following simple algorithm (Fig. 6): start with a triangle with base and height of length 1 and construct the midpoint segments creating four new triangles; delete the inner triangle and iterate on the outer three triangles. Note that the sketch in figure 6 is used to illustrate the algorithm, but is not part of the tool kit itself. To understand more about the results of the geometric process and our point-wise iteration by randomly selected matrices, we should consider the matrices themselves.

Figure 5: Point-wise generation of Sierpinski's triangle.

Each of the three matrices used for Sierpinski's triangle dilates points about the origin by a factor of one-half. In effect, given a point *p* in triangle A (created at an n^{th} iteration), matrices M_1, M_2 and M_3 without translation map *p* to a point in triangle B_1 (created at the $n+1^{th}$ iteration). Now, the e and f values of M_i translate this point to B_i. As this process continues, points get deeper and deeper into the triangles created by the geometric process and ultimately approach points on Sierpinski's triangle.

Arguments like the one described above provide opportunity for insight into the workings of *the Chaos Game*. This phenomenon explains the dense distribution of points in Sierpinski's triangle that we have only begun to demonstrate. A more analytical argument might involve us giving addresses to points (see Peitgen et al) based on the various combinations of randomly chosen matrices. Indeed, the tool kit element displayed in Figure 4 could be modified to aid this analysis as well, but this is left to motivated readers. As further motivation, we can try to generate other interesting fractals by altering the given matrices, thus altering the transformations of iteration.

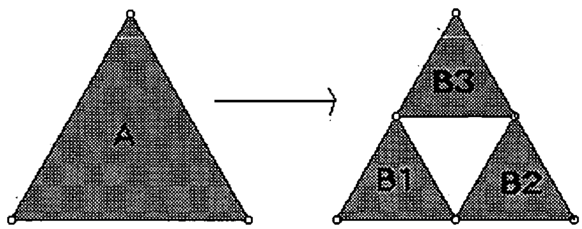

Figure 6: Geometric algorithm for Sierpinski's triangle.

Closing Remarks

This report illustrates how non-genetically heterogeneous tool kit mediates the unfolding of a fundamental relationship between matrix algebra and transformational geometry. The spreadsheet environment described here provides a meaningful and representational manner in which to explore and discuss these topics jointly, rather than separately. In such a way, it boosts the idea that the appropriate use of technology "blurs some of the artificial separations among topics in algebra, geometry, and data analysis" (NCTM 2000, p. 26). In fact, such artificial separation may lead mathematics educators to question the meaning of matrices outside the context of algebra. On the contrary, we propose a bridge, made possible by appropriate use of spreadsheets that would enhance meanings for both topics. Indeed, we can now view matrices as a useful notation and computation device in describing linear (affine) transformations, and can better see connections between transformational geometry and vectors. Moreover, the computation device can be motivated by and used for the generation of fractals in the plane. It can even be extended to perform in-depth analysis of point addresses in the fractals. The Excel file comprising the tool kit described here can be found under "Papers" at http://jwilson.coe.uga.edu/EMT668/EMT668.Folders.F97/Norton/Anderson.html.

References

Abramovich, S., & Brantlinger, A. (1998). Tool Kit Approach to Using Spreadsheets in Secondary Mathematics Teacher Education In S. McNeil, J.D. Price, S. Boger-Mehall, B. Robin, J. Willis (Eds) *Technology and Teacher Education Annual*, 1998 (pp. 573-577).Charlottesville, VA: AACE.

Kaput, J. J. (1992). Technology and mathematics education. In D. A. Grouws (Ed.), *Handbook of research on mathematics teaching and learning* (pp. 515-556). New York: Macmillan.

National Council of Teachers of Mathematics [NCTM] (2000). *Principles and Standards for School Mathematics*. Reston, VA: (author).

Peitgen, H., Jürgens, H, & Saupe, D. (1992). *Fractals for the Classroom. Part One. Introduction to Fractals and Chaos*. New York: Springer-Verlag.

Wertsch, J.V. (1991). *Voices of the mind: a sociocultural approach to mediated action*. Cambridge, MA: Harvard University Press.

Examining Pedagogical Trends within a Graphing Calculator Environment: An Analysis of Pre-service Teacher Perceptions

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Abstract: This paper summarizes the findings of a research study designed to collect pre-service teacher perceptions on factors relating to the use of graphing calculators in the secondary math classroom. The study was designed as a way to help improve instruction in university mathematics methods courses. Data collected as part of the study addresses questions of how to overcome barriers of infusing graphing calculator technology in secondary math instruction, and how to create modeling and problem solving oriented activities that use graphing calculators, but still support a traditional textbook based curriculum. Results from the study suggest that greater emphasis on fostering creativity should considered in mathematics methods courses. The target audience for this research paper include pre-service teacher educators in mathematics and science.

Introduction

Despite the current popularity of the new Process and Content Standards from the National Council of Teachers of Mathematics (2000), many teachers of mathematics tend to remain relatively passive in the implementation of new "Standards" based ideas. Although many traditional factors such as time and training constraints contribute to this phenomenon, it appears that the dynamics of classroom instruction emerges even more from a belief system related to the *perceived* demands of the traditional curriculum. New teachers in particular are highly impressionable when it comes to incorporating innovative ideas. Most appear to desire to try new ideas, but in many cases they feel bound to the lecture/seatwork model that is still so pervasive. Experienced teachers of mathematics are even slow to try new ideas because they believe that they must abandon necessary topics in order to include these new ideas as *enrichment*. In addition, instruction tends to be inefficient during the initial attempts at enrichment activities, which adds the threat of more lost time.

The question then becomes how to encourage teachers to incorporate new ideas and methodology while supporting the traditional curriculum. During a short brainstorming session with a group of pre-service math teachers, mathematical modeling and graphing calculator use quickly emerged as potential avenues for enhancing traditional instruction in very meaningful ways. Mathematical modeling and problem solving activities using graphing calculator technology have allowed for traditional curriculum topics to remain the focus while encouraging new ways of thinking about mathematics, as well as providing better contexts and reasons for learning it. However, neither mathematical modeling instruction nor graphing calculator instruction has been largely emphasized in the secondary classroom.

The Research Study

As a result of these observations, a research study was conducted in which pre-service mathematics teacher perceptions were collected related to the value of infusing graphing calculators into secondary level mathematics curriculum and instruction. This paper provides a summary of research data gathered from twelve pre-service teachers for the purpose of identifying instructional factors that would lead to conditions in which graphing calculator technology would be used more appropriately and to a much greater extent in the secondary classroom. The research focused on the perceptions of secondary level, pre-service mathematics teachers for several reasons. First, these students had very recently completed collegiate study in mathematics, which does not necessarily emphasize technology based learning environments; consequently, they were likely not to have preconceived notions concerning the use of graphing calculators. Second, all of the students had completed a field placement in secondary school classrooms where they were able to gather the opinions and perceptions of their field mentors. Finally, the views of these pre-service teachers were considered valuable because they were all enrolled in a university mathematics methods course. Information obtained from the research allowed the university to adapt course content and instruction in some very productive ways.

The primary focus of this research was to identify factors that make the calculators and other technology easily adaptable to the classroom, as well as determining the best ways to build mathematical modeling lessons that support existing curriculums. Three research questions were used as guides for the study: 1) what type of graphing calculator technology do pre-service teachers perceive as most conducive to current secondary mathematics curriculum and why, 2) What are pre-service teachers' perceptions of current secondary mathematics curriculum in which graphing calculator technology would be most appropriate for inclusion in the instructional process, and 3) What are pre-service teachers' perceptions of why graphing calculator technology is not commonly incorporated into the instructional process in a mathematical modeling or problem solving format in secondary classrooms.

Results

Results from the study indicated popular trends for all three questions; moreover, open-ended portions of the questionnaires focused on some very useful suggestions and strategies for how technology might be better infused into the curriculum, even for teachers who prefer a traditional format. Each of the research questions was addressed using an open-ended survey instrument and open dialogue from individual interviews.

Question 1: The TI-83+ emerged as the unanimous choice for most "user-friendly" graphing calculator based on several factors (top three listed): 1) Effective manual descriptions and examples, 2) most logical key sequencing and built-in menus, and 3) only a reasonably short learning time was necessary.

Question 2: The most appropriate course topics that emerged were at the intermediate algebra and pre-calculus levels and encompassed factors related to translations, reflections, and asymptotes for the base functions containing linear, quadratic, absolute value, trigonometric, logarithmic, and exponential components. Additional enrichment topics were mentioned for combining modeling with optimization as a central focus. These most commonly supported existing curriculum but focused on mathematical interpretation.

Question 3: The teachers felt (based on a variety of factors) that the primary reasons their field mentors did not use graphing calculators did not have to do with availability but rather a lack of time to learn the calculator functions. When asked what would influence them to use graphing calculator technology to a greater extent, the following responses emerged: 1) empirical evidence suggesting that higher student test scores would result from implementation, 2) all students in the class having access to the *same model* of calculator, 3) curriculum ready activities designed specifically to support textbook based curriculum.

Summary

Although these results are in no way exhaustive, they do provide some initial insights into factors that may help graphing calculator technology become more commonplace in the secondary mathematics classroom. Particularly valuable will be the leadership that these teachers provide once they have become established in their own classrooms. In addition, they themselves have gained special insights into the potential value of effective, focused uses of appropriate technology.

System Development and Fundamental Design of Interactive Mathematical CAI System "MEIKAI"

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Abstract: Computers provide opportunities for users including both teachers and students to make knowledge, to gain access to knowledge, and to share knowledge with one another that are not possible before. Our projects consider system environments and minimum requirements for interactive Math CAI systems that must support to assist building students' preparation for the college-level mathematics, and set three basics for Math CAI system such as to keep track of study processes, have the exact interpretation for math symbols, and construct the dynamic curriculum organization. This paper shows brief description of Dynamic Curriculum Control, Algebraic Editor Ma and Easy-To-Use Authoring System.

This work was supported in part by the Ministry of Education, Science and Culture under Grant-in-Aid for Scientific Research No.06452383 and No.08458031.

Introduction

Private technical colleges and universities have to secure a certain number of students from the management point of view in Japan. Therefore those incoming students' mathematics backgrounds are varied. The Second Subcommittee of the Tokai University Consistency Educational Committee had questionnaires to ask university teachers and students what were in mind for basics and mathematical disciplines from secondary schools to tertiary schools. The analysis focuses on establishment of fundamentals and mathematical disciplines for incoming students. We discussed which mathematical concepts are important for various universities and colleges (Shibata '98). Reforming mathematics curriculum need to be concerned and personal computers provide opportunities for users including both teachers and students to make knowledge, to gain access to knowledge, and to share knowledge with one another that are not possible before. In recent years, awareness of the importance of Mathematical CAI system has increased in the school education. We have observed and tried to resolve the difficulties on Math CAI systems. The establishments of new educational perspectives give guidance to CAI systems' Development (Clements '89). The characteristics are WYSIWYW, WYSIWYG and WYWIWYG. Our interactive *MA*th *CAI* System, MACAI, proposed three basics such as Dynamic Curriculum Control, Algebraic Editor Ma and Easy-To-Use Authoring System.

Characteristics of MACAI

Our project, the development of MACAI system called "MEIKAI" in Japanese, considers system environments and minimum requirements for interactive math CAI systems that support to assist building of students preparation for college-level mathematics. Our major distinguishing feature among CAI designs is that MACAI should be able to keep track of learning processes, have the exact interpretation of math symbols, and give the individual curriculum organization. The Easy-To-Use authoring system has Text Editor that consists of Algebraic Editor Ma , Simulation Editor, Exercise Editor, Help Editor, and *S*cientific *Lan*guage for *G*eometry, SLanG, based on regular expressions. In the user system, Text Reader that students are able to study based on Dynamic Curriculum Control also has these editors. As the other functions there are preparation windows for students' making and submitting reports under LAN environments. We observe their learning processes and accumulated points by three tables of Students-Points, Time-Points, and Time-Progress. For the authoring and user systems as a new user interface design we introduce MCA, Model and Control Agent, which is enhanced

MVC model from Goldberg (Goldberg '83). Hutchins classifies user interfaces from two axes, Distance-Engagement (Hutchins '86). We introduce Distance-Concurrence as a new user interface classification and furthermore Compatibility-Flexibility evaluation design for CAI contents.

Dynamic Curriculum Control controls the direction of each learner on the CMI Hub Flows that we have established are called the Adaptive Search based on the Genetic Algorithms. The original curriculum DB contains four different levels of contents on the same subject in the MACAI system. The individual curriculum for each student can be chosen from the DB, and set parameters for the allotment of points. The accumulated points determined the course among these contents on Hub Flows. The Algebraic Editor Ma , which provides the consistency of mathematical symbols and formulae, keeps the mathematical meanings of symbols and best human interpretation for the algebraic system Mathematica through the Math Link and the Tex System. In Easy-To-Use Authoring System, SLanG is the two-dimensional turtle graphics language on the WINDOWS system by using the regular expressions for the simple geometric figures such as regular polygons. The SLanG, which we have developed, is able to choose from two coordinate systems such as xy-coordinate system and non-coordinate system, change the turtle moving speed, paint the designated territory, and draw regular polygons and ellipses which could not be drawn by conventional graphical applications. This is our purpose to provide a strong support for mathematical CAI systems. Simulation Editor can draw figures in the first year university mathematics, and also numerical solutions of linear systems of equations, numerical integration, evaluation of matrices and determinants, linear regression, Lagrange interpolation, and statistics. Therefore we can change the three tools such as Mathematica, Simulation Editor and SLanG of drawing figures to suit the occasion. As a result of that, we were able to apply for patents on December in 1996 and as CAI software with the indispensable CMI and the MCA new interface Control Agent Model on October in 1998. Furthermore SLanG presented on our Internet home page for your convenience. The Handwritten Recognition was also considered especially for mathematical symbols and formulae (Sugamoto & Shibata '98). The research result were released and explained in detail at the Science News in Japan.

Looking to the Future

To make the interactive electronics book is so expensive. For instance we still need more than several hundreds thousands dollars to complete our project and need to build up a network of supporting groups or organizations. Also the Microsoft upgrade versions were inferior goods such as some upgrade versions did not cover old versions. Therefore every time we have to reconstruct our system programming and pay more money. To get rid of these difficulties we need a new OS and a free language not depending upon Microsoft to construct shell systems and agents for CAI systems. Web version using Java would be the one, and the effective use of programmable calculators could be an alternative.

References

Clements, M., The Old Industrial Technology and Education, The New Personal Computer Technology and Education, New Media International Symposium on The 50th anniversary of Osaka University, pp18-31, 1989.

Goldberg, A., Robson, D., Smalltalk-80 the language and its implementation, Addison Wesley, 1983.

Hutchins, E., Holland, J., and Norman, D. A., Direct manipulation interfaces in D.A. Norman, and S. Draper (Eds) User Centered System Design, New Perspectives on Human-Computer Interaction, Hillsdale, N. J., Lawrence Erlbaum Associates, 1986.

Shibata, M., Fundamental Mathematical Disciplines for Incoming University Students, -from the Report of Tokai University Consistency Educational Committee-, Transactions of Kosen & Daigaku Bukai, Japan Society of Mathematical Education, Vol.5 No.1, pp.147-168, 1998.

Sugamoto, M., Shibata, M., Handwritten Character Recognition by Fuzzy Classification, Rules and Genetic Algorithms, Technical Report of the Institute of Electronics, Information and Communication Engineers, Vol.ET97-105, pp.17-24, 1998.

Yamamoto, H., Shibata, M., Construction of Turtle Graphics Language SLanG based on Regular Expressions and its application, Technical Report of the IEICE, Vol.ET97-105, pp.25-32, 1998.

Making Sense of Number: A Resource for Pre-service and In-service Education

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Abstract: This paper reports on the development of a multi-media/web/cd package which provides users with opportunities to consider issues in the teaching and learning of numeracy in the early years of elementary school. By viewing exemplifications of classroom activities and listening to commentaries from teachers, children, school managers and parents, users are invited to reflect on and critically evaluate their own practices and contexts. The package also provides a basis for the establishment of an on-line learning community where ideas and resources can be shared and issues discussed.

Background

The latter half of the 1990s saw a fundamental re-examination of the psychological and philosophical bases of elementary mathematics teaching in the UK. During the previous 25 years the influence of the developmental model of learning, principally associated with Piaget, was all-encompassing. Teachers were encouraged to construe their role as that of facilitator or enabler in contrast to their traditional role as instructor. Mathematics lessons virtually ceased and were replaced by small group and individualised work, often based on the completion of fill-in worksheets, supported by the use of manipulatives (reflecting Piaget's contention that children under the age of 7 are typically incapable of logical thought and therefore require concrete models to make a bridge to the abstract processes inherent in number operations (Piaget 1952). For some years, however, there had been an increasing body of research illustrating young children's possession of many and complex abilities (Donaldson 1978) (Hughes 1986).
The arguments of those who favoured an earlier and more interventionist approach to the teaching of rational counting at the expense of Piagetian pre-number activities such as sorting and matching, (Merrtens 1996) (Thompson 1997) were given credence by the increasing evidence from a number of sources, of declining standards of achievement in basic numerical processes by children in Scotland and England.

In England, a reaction to this has been the establishment of the National Numeracy Strategy which has published a detailed (some would say prescriptive) Framework document (DFEE 1999) which promotes the teaching of mental strategies and advocates a delay in the introduction of standard written methods of calculation. The Framework also provides exhaustive lists of learning targets for students in each year of schooling.

In Scotland, it is recognised that the national curriculum guidelines in mathematics (SOED 1991) are somewhat obsolete in terms of their content and expectations of students. The Scottish Executive, however, sensitive to teachers' oft expressed feelings that they have been subject to a surfeit of innovation, has decided not to review the guidelines immediately and has instead provided only a series of worthy but general suggestions about changing practice. This is the educational vacuum that *Making Sense of Number* seeks to fill.

Making Sense of Number

The goal of *Making Sense of Number* is to inform and enhance the teaching of numeracy in kindergartens, elementary schools and pre-service teacher education programmes. This action research-based multi-media/web/cd package is designed to illustrate effective learning, teaching and assessment and to provide information about specific activities and resources. It is it is intended to provide a framework for discussion and development rather than to be used as a manual for teaching.
The national publication, Improving Mathematics Education 5-14 (SOEID 1997), based on evidence obtained from HM Inspectors reports, the Assessment of Achievement Programme Survey (SOEID 1996) and TIMSS international comparative studies (SOEID 1997), summarised the Scottish situation concerning standards of student achievement and teaching practice in mathematics.
The report focused attention on several areas of concern and recommended the following:

relatively more time to be devoted to teaching number within the overall mathematics curriculum particularly at the early stages

greater emphasis to be given to mental calculation and particularly the teaching of appropriate and flexible strategies

teaching to be more interactive/participative, with fewer groups,

schools to raise expectations for student achievement including, where appropriate, increasing the pace of progression through mathematical topics specified in national curriculum guidelines

schools to further acknowledge the potential role of home learning and to encourage the active participation of parents.

Making Sense of Number deals with these issues in a variety of ways, it provides both a structure to help teachers think about and plan the teaching of number and a supporting resource for staff development in this area. It has been designed to enable school and pre-school managers, teachers, student teachers and possibly auxiliary staff and parents to view the types of resources and approaches used in schools actively developing numeracy programmes.
'Making Sense of Number' gives practical help to teachers in identifying useful activities and resources and in assessing learners' progress. By observing the real teachers and children featured in the package, users are encouraged to reflect on their own practice and to relate what they see to their particular classroom or school context. Schools across Scotland were used as sources of the extracts. The package contains some pointers raised from schools who have implemented numeracy programmes over a longer period and who have addressed the implications for later primary years of early intervention (e.g. the impact of an emphasis on the development of mental strategies on the teaching of written methods and the role standard algorithms).
The package also anticipates and facilitates the establishment of an on-line numeracy learning community (via a dedicated website) where 'experts' can be consulted, ideas and resources can be shared , common issues discussed and action research projects and evaluative/qualitative studies developed. It also provide thc basis for national training programmes in numeracy as it delivers a consistent message regarding the key principles underlying successful numeracy teaching.
While its main anticipated audience is teachers and student teachers, it could also be used under teacher guidance to inform and train support staff such as nursery nurses and classroom assistants and to help parents understand what schools are seeking to achieve.

References

Donaldson, M. (1978). *Children's Minds*. Fontana.
Hughes, M. (1986). *Children and Number: difficulties in learning mathematics*. Basil Blackwell.
Merrtens, R . (Ed.)(1996). *Teaching Numeracy*. Scholastic.
Piaget, J.(1952). *The Child's Conception of Number*. Routledge and Kegan Paul.
Thompson,I. (Ed.)(1997). *Teaching and Learning Early Number*. Open University Press.
SOED (Scottish Office Education Department). (1991). *National Guidelines:Mathematics 5-14*. HM Stationery Office.

SOEID (Scottish Office Education and Industry Department). (1996). *Assessment of Achievement Programme: Fourth Survey of Mathematics.*

SOEID. (1997). *Third International Mathematics and Science Study (TIMSS): Achievements of Scottish Primary 4 and Primary 5 Pupils.*

SOEID. (1997). *Improving Mathematics Education 5-14.* The Stationery Office.

The National Numeracy Strategy. (1999). *Framework for Teaching Mathematics from Reception to Year 6.* Department for Education and Environment.

COMPUTER ASSISTED MATHEMATICS LEARNING ENVIRONMENT- A STUDY ON THE COMPUTER, MATH, AND HUMAN INTERACTION

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Abstract: Integrating CAI into the math curriculum is a challenging process. Computers change the way teachers teach and the way students learn. The learning process is affected by a combination of factors; for example, learners' attitudes toward math and computers, learners' computer skills, quality and the suitability of the computer learning system, and the way the instructor conducts the course and interacts with the student. This study is designed to explore factors affecting the Guam Community College students' math learning experiences via CAI interactive learning system. The primary instrument for this study was a modified survey questionnaire. In order to gain a fuller insight into the students learning process, the data for this study were also drawn from other sources: (1) student interview; (2) faculty interview; (3) classroom observation; (4) documentation such as student drop-out rate and grades.

Background of the Study

The island of Guam is the U.S. unincorporated territory in the Western Pacific Rim. It is located between Hawaii and the Philippines. Guam is the largest and most heavily inhabited of the Marianas Islands with a population of 146,000. In addition to the native Chamorro people and "mainland" Americans, Guam hosts many diverse ethnic groups including Filipinos, Chinese, Koreans, Japanese, Pacific islanders from Saipan, Palau, the Marshall Islands, and the Federated States of Micronesia including Pohnpei, Chuuk, Yap, and Kosrae.

With 85% to 90% of college students forced to take remedial math, clearly, students in this region are mathematically challenged. To counter this problem, the Guam Community College introduced interactive multimedia computer-based instructional software into their math courses.

Perspective

The application of CAI in the area of math has nearly as a long history as CAI itself. The earliest attempt to use CAI to teach math was initiated in mid 1960s. Recent years have seen an increasing use of CAI in mathematics instruction, impacted significantly by rapid advances in computer technology. Research indicates that CAI is most effective when it is targeted to disadvantaged groups such as low achievers and at risk students.

Integrating CAI into the math curriculum is a challenging process. Computers change the way teachers teach and the way students learn. The learning process is affected by a combination of factors; for example, learners' attitudes toward math and computers, learners' computer skills, learners' confidence level in learning math and computers, learners' learning styles, the quality and the suitability of the computer learning system, and the way the instructor conducts the course and interacts with the student. This study is designed to explore factors affecting the Guam students' math learning experiences via a CAI interactive learning system.

Significance of the Study

This study was inspired by several major concerns related to CAI research.

(1) Although a substantial CAI research in math is available in the literature, most CAI research was conducted in the 1980s. There is a need to renew CAI research, taking into the consideration that CAI learning systems have made tremendous progress qualitatively in recent years, equipped with sophisticated features not even conceivable a decade ago. "This need is emphasized and reinforced by the increasing use of technological devices in mathematics instruction" (Galbraith & Haines, 2000).

(2) Major CAI work has been concentrated in the four countries: the United States, the United Kingdom, Canada, and Japan. There is no CAI research conducted in this region, targeting this particular ethnic group. The subjects for this study are Pacific islanders on Guam with the majority of them being local indigenous Chamorro students.

(3) Most CAI research was conducted in elementary or secondary schools. "There are still many unanswered questions about the effectiveness of CAI for post-secondary students" (Owens & Waxman, 1994; p. 328). This study was conducted on the campus of a community college. As the result, this study will contribute to the literature in the area of post-secondary students' experiences learning math in a computer environment.

(4) This review of the literature reveals that CAI research in math is limited in utilizing multiple research methodologies. Most research involved one research methodology, either a qualitative method or quantitative method. The present study employs a combination of research methods to gain an insight of the post-secondary students' math learning experiences in a computer environment. The research methodologies in this study include a survey questionnaire, classroom observation, student-researcher e-mail communications, face-to-face interviews with students and the instructor.

(5) Last, but not the least. The previous studies tended to study learners' attitudes towards CAI as an isolated phenomenon. Factors that impact learners' attitudes towards CAI remain largely unexplored. This study investigates the determinant factors that impact the learners' attitudes towards CAI and introduces a new conceptual framework to explore the complicated interaction of computers, math, and learners.

The Design of the Study

The primary instrument for this study was a survey questionnaire. A portion of the questionnaire was adapted from the Mathematics-Computing Attitude Scales developed by Peter Galbraith and Christopher Haines (2000).

The survey questionnaire contains nine sections; (1) demographic information (e.g. ethnicity); (2) math confidence (e.g. Math is always a difficult subject for me.); (3) math motivation (e.g. I'd rather spend my time and efforts learning subjects other than math); (4) computer confidence (e.g. I expect to do well if I take a computer course.); (5) computer motivation (e.g. Once I start to work with the computer, I find it difficult to stop.); (6) math learning styles (e.g. When learning new mathematical material I make notes to help me understand and remember.); (7) math-computer interaction (e.g. Visualizations on the computer help demonstrate math concepts.); (8) computer math learning environment (e.g. The computer reduces the necessary interaction between the student and the math instructor.); (9) evaluation of the CAI math learning system (e.g. This software explains and presents math content logically and clearly.). Except for section 1, all the other sections contain 10 items on a Likert scale (1-5).

Mean for each item (except for section 1) will be calculated and the group mean for each section (except for section 1) will be calculated. Factor analysis will be conducted to identify to what extent each factor correlates with math-computer interaction and computer math learning environment.

In order to gain a fuller insight into students learning experiences, the data for this study were also drawn from other sources: (1) student interviews (e-mail interviews and face-to-face interviews); (2) faculty interviews; (3) classroom observation; (4) documentation such as student drop-out rate and grades.

Data collection will span over a period of three semesters. Final report of the study will be completed in the fall of 2001.

Numeracy CD – Whole Number Concepts and Operations

Numeracy II CD – Understanding, Using, and Applying Fractions

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Abstract: The purpose of this project is to develop a CDROM to address the numeracy problems faced by many adult learners. The CDs will help adults improve their numeracy skills in whole numbers and in fractions. By using multimedia, users will be able to overcome a number of barriers facing adults with low numeracy skills. Most of the learners returning to the classroom feel they simply cannot do math. The traditional style of education did not work for them in the past and by presenting the material in an innovative, interactive environment with audio and visual presentations, we offer these learners a new beginning and added incentive. The programs are interactive and use a step-by-step approach to math, simple language, and specific learning guides.

Acknowledgments

The development of the Numeracy CD was supported by a grant from the National Literacy Secretariat of Canada, and funds from SIAST Education Equity. The development of the Numeracy II CD was supported by the Department of Post-Secondary Education and Skills Training, Government of Saskatchewan.

Introduction

Our CDs are being developed in response to requests by educators for material to help teach basic math skills. Literacy levels for many adult learners exceed numeracy levels. Lack of understanding of basic number concepts and the inability to do math computations leave adults in a very difficult situation. Improved numeracy skills are vital to achieving independence and economic goals. Mathematics is a subject that builds on itself and if the basic skills are not there for the foundation, success is difficult to achieve. Our CD programs prepare learners for work-based training opportunities. They are seen as a companion to existing education programs and a bridge to further studies in math.

Learners need a great deal of rehearsal and repetition. CDROM delivery facilitates this well. It directs students who have mastered the concepts to move on quickly and reroutes those having difficulties to a review of the material. The self-instructing and self-paced style of the CDs provides increased flexibility for students and instructors. The programs teach basic math skills, so the content will not change, making it a cost-effective tool.

The scope of this project is broad, both in prospective clients and in areas of use. These programs can be utilized in the areas of literacy, corrections, equity, and remote schooling programs. These CDs are a valuable resource for people with learning disabilities, ESL students, slow learners, youth at risk, remedial learners, and corrections inmates. They can be used by learners in Basic Education, and students in Competency Based Education programs needing to upgrade their math skills in courses such as carpentry, cooking, welding, and mechanics. The universal content and nature of the storylines make the CDs appealing to children and young adults, furthering the field of applicability. The multimedia approach accommodates the diverse needs of learners on campus and in alternate settings, such as home, communities, and the workplace.

Numeracy CD

Objectives

- Create an interactive CD program, focused on whole numbers, which uses a step-by-step approach, simple language, and appealing graphics.
- Develop a CD that helps students understand ten basic concepts in whole numbers, concepts vital to understanding and working with numbers.
- Develop a CD that helps students understand how to add, subtract, multiply, and divide whole numbers and apply this knowledge to word problems.
- Provide students and instructors with an additional learning resource that can be easily accessed and allows flexibility with its self-instructing and self-paced style.
- Develop tutorials, drills, practice, tests, and learning aids to achieve the desired outcomes.
- Teach the use of a calculator as part of the process.
- Make learning basic numeracy skills enjoyable.

Outcomes

- Students will have an understanding of ten concepts in whole numbers.
- Students will be able to apply these concepts to real life situations and be able to use the operations in everyday problem solving.
- Students will be able to use a calculator and will acquire basic computer skills, skills necessary in the majority of employment opportunities.
- Students will have increased their self-esteem through the development of math skills that have eluded them in the past.

Description of Numeracy CD

The program teaches whole numbers and consists of two parts. The first part explains ten concepts that are important to understanding whole numbers. They are: place values, standard and expanded, rounding, averages, odd and even, greater than - less than - equal to, exponents, prime and composites, order of operations, and Roman numerals.

The second part of the program focuses on the four operations of addition, subtraction, multiplication, and division and includes a unit on word problems to help students learn to choose the correct operation and to solve problems, relating to everyday situations.

The student accompanies George on a journey through the jungle to help save a village facing grave peril. To complete his journey and overcome the obstacles along the way, George must understand whole number concepts. There is a pretest at the beginning of each unit to assess prior knowledge and if understanding of the concept is verified, the student continues to the next unit. If not, the student works through the unit with instruction being provided by a wise parrot named Pinkerton. Numbers, his monkey, provides assistance and comic relief. Practices are included after each idea is covered. If the student demonstrates competence on the practices, he goes to the unit test. If mastery is not evident after a practice or after the test, the student is returned to the instruction section. As George and the student progress through the instruction for each unit, hint charts are established. These charts give an outline of the concept being learned or the steps to follow in order to complete an operation. The student can access each chart by clicking on a toggle switch. A calculator and timestable are built into the program and available to the student by a click of a button. Each unit follows a similar pattern to make the program easy to follow and the instruction is clear and concise. The text on screen is kept to a minimum, with only very important information appearing for clarification. Audio is used extensively to keep the student progressing at a good pace. The program is interesting and entertaining, keeping the attention of the student.

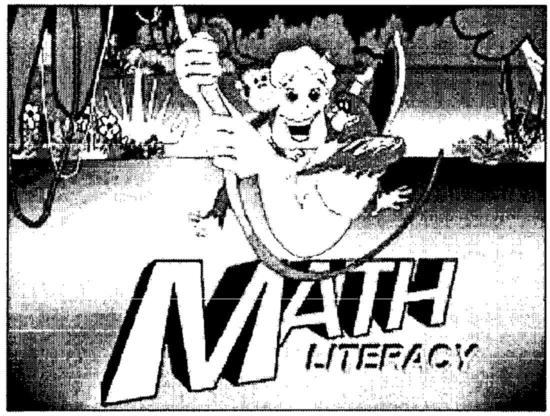

Figure 1: Welcome to Math Literacy

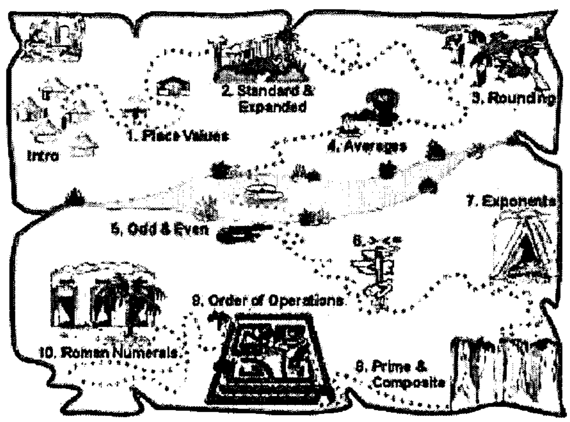

Figure 2: Navigating the Numeracy CD

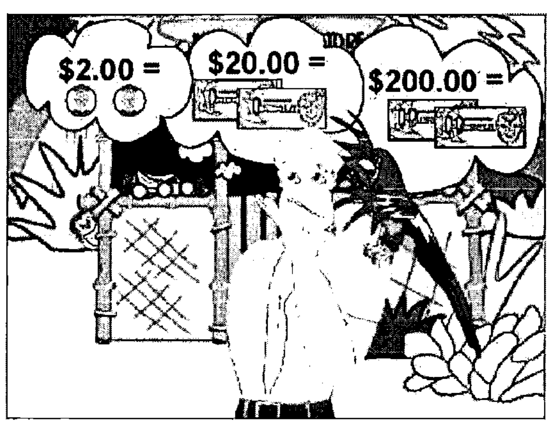

Figure 3: Instruction Screen from Numeracy CD

Numeracy II

Objectives

- Create an interactive teaching CD program, focused on fractions that uses a step-by-step approach, simple language, and appealing graphics.
- Develop a CD that helps students understand fractions and use this knowledge to perform the four operations of addition, subtraction, multiplication, and division and then to apply their knowledge to ratio, proportion, scale, probability, and metric measurement.
- Provide students and instructors with an additional learning resource that can be easily accessed and allows flexibility with its self-instructing and self-paced style.
- Develop tutorials, drills, practice, tests, and learning aids to achieve the desired outcomes.
- Teach the use of a calculator as part of the process.
- Make learning basic numeracy skills enjoyable.

Outcomes

- Students will have an understanding of fractions and be able to add, subtract, multiply, and divide fractions.
- Students will have an understanding of ratio, proportion, scale, and probability.
- Students will be able to use both standard and metric measurement.
- Students will be able to apply these concepts to real life situations and be able to use the operations in everyday problem solving.
- Students will be able to use a calculator and will acquire basic computer skills, skills necessary in the majority of employment opportunities.
- Students will have increased their self-esteem through the development of math skills that have eluded them in the past.

Description of Numeracy II CD

The program teaches fractions and has three parts. The first part focuses on understanding fractions. The introduction helps the student to understand fractions, read and write fractions, name the parts of a fraction, and identify the different kinds of fractions. The student learns the concept of equivalent fractions and how to establish equivalency. To manipulate fractions, the student learns how to raise and reduce fractions, compare fractions with like and unlike denominators, and change fractions from one form to another.

The second part of the program then focuses on the four operations of addition, subtraction, multiplication, and division and includes word problems to help the student learn when to use each operation. Each section includes the basic skills necessary to work with fractions in all different forms. The word problems relate directly to everyday practical issues.

The third part of the program utilizes fractions to teach ratio, proportion, scale, probability, and measurement. As part of ratios, the student deals with measurement, time, and money. In the proportion section, the student uses ratio and cross products to find unknowns and to use this knowledge in comparisons. Scale is taught using proportion, and map scale is part of the application. Ratio is used to explain the concept of probability. Measurement includes understanding and using both standard and metric units and applying this knowledge to drawing plans and construction.

In Numeracy II, the learner accompanies a young Aboriginal woman on a journey of discovery through the North where she experiences the beauty of the country, learns about the native plants and animals, and discovers ways to overcome obstacles she faces along the way. In the same way that she learns the ways of nature, she comes to understand fractions, learns how to work with them, and applies her knowledge to solve problems involving fractions. The girl's grandmother accompanies the girl on her journey and provides the instruction.

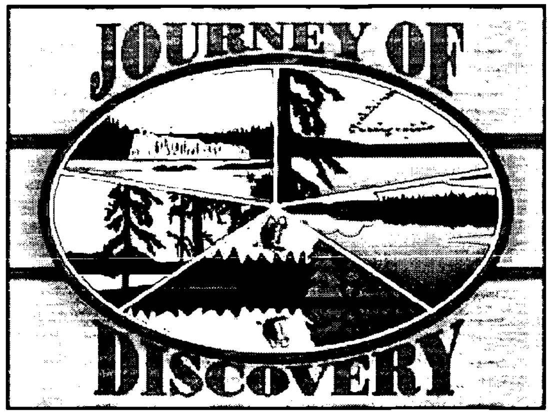

Figure 1: Journey of Discovery – Numeracy II

Figure 2: Navigating the Numeracy II CD

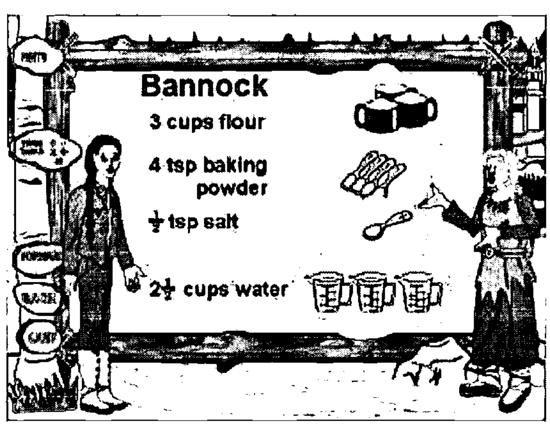

Figure 3: Instruction Screen from Numeracy II CD

The Reasons

I have instructed in a literacy classroom for ten years. Although the makeup of each class was different, I faced certain similar challenges each year. There was always the challenge of teaching a group of adults from very different backgrounds and with very different skill levels, without holding some back and leaving others behind. Then came the challenge of teaching math to unwilling learners. Most students entering my class felt they simply couldn't do math. Math was a mystery, a subject with a million rules that they didn't have a hope of learning. They hated math and the barriers were up. The reading level in most books was too high, and the problems contained words and ideas that were unfamiliar and irrelevant to the students. The traditional style of teaching had not worked for them in the past. How could I subject them to more of the same?

I needed to find a way to teach math so that it became part of the student's lives, it had relevance, and the stigma was removed. Math skills are essential for everyday living, and most of my students lacked even the basic math skills. I needed to find a way of making math fun for the students. I became an entertainer. I made up stories, I drew pictures, and I created situations that put the students in the problem that needed solving. I tried to show the relevance of math in their lives and the need for an understanding of basic math concepts. The students enjoyed the learning and began to lose their fear of math. They began to make slow, steady progress and their self-esteem grew.

A second teaching method that worked well in class was the use of computers as a teaching tool. Introducing my students to a computer opened a whole new world for them, giving them freedom to explore and confidence in their ability to learn new things. They took great pride in any work they produced and worked diligently to get it done. However, it was difficult to find material at a basic level. Either the programs overwhelmed them with text, or were geared toward children. The most glaring error in most math programs, was the assumption of prior knowledge. Most of the students couldn't work through the programs because they lacked certain skills that the program assumed they had.

The Results

Armed with a love of math and an understanding of what is required to have students succeed in the basic skills area, I began the task of creating the material for the development of CDs to teach basic math skills to adults. I tried to follow the methods that had worked in the classroom. The CDs entertain. Each CD tells a story, using characters with which the students can associate, and situations that put students in a problem that needs solving. There are wonderful graphics that are a fundamental part of the CDs, adding clarity and visual reinforcement to the instruction. The instruction is clear and concise, using small steps and many examples with relevance to the students. The programs demonstrate patterns for learning and outlines steps needed to work with each concept.

To overcome the reading barrier, text is kept to a minimum and is accompanied by audio. The audio component reduces difficulties created by reading deficiencies, reinforces the instruction, and appeals to auditory learners. The voices interact on the CDs rather than simply reading the text, adding to the students' enjoyment.

The programs have a calculator built into the programs. The student can use the calculator to perform basic math operations by using the mouse to click on the keypad on screen. There is a timestable for those students who cannot memorize math facts, accessed by a click of a button. There are hint charts in each unit, built as the instruction proceeds and accessible for the remainder of the program. These charts allow the students to review steps and procedures at any time. Rather than memorization, the focus is on understanding concepts and operations.

These programs provide one-on-one interaction and allow students to proceed at their own speed. The interactive aspect encourages student participation and gives students a feeling of ownership of their learning. Integrating technology and math instruction, with stories and graphics, can be a powerful way to teach and reinforce basic skills.

Technology and Basic Math Skills

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Abstracts: This paper intends to report on a variety of innovative ways to utilize technology in teaching basic math skills and to motivate students in mastering the basic skills. Teachers will be able to turn so-called boring practice routines into interactive enjoyable learning experience for students to learn the basic concepts necessary for further exploration in the depth of mathematics, therefore to lay a solid foundation. Our experience also showed us that using technology in teaching does not mean simply putting students in front of the computer. The instructional materials have to be carefully designed which will provide opportunities for authentic learning, hence to achieve the outcomes that are expected.

As science and technology have come to influence all aspects of life, mathematics has come to be of vital importance to the educational agenda of our nation. Mathematics is the foundation of science and technology. However, there is a cry for reform in math education because of the poor performance of our students at all levels. It is time for all educators to examine what we are teaching and how we are teaching.

Traditional mathematics teaching is still the norm in our nation's schools. For most students learning mathematics is an endless sequence of memorizing and forgetting facts and procedures that make little sense to them. More and more students go into remedial programs that may assist them to obtain their basic math skills. However, the results have not been so impressive. Teachers are facing serious problems and concerned about the poor math skills that may directly impact students' future career and even the quality of their life.

Math anxiety is a widely spread and accepted reality. While many people won't openly admit that they cannot read, they readily admit that they are not good at math. As a result our children have an excuse for poor performance.

Many studies have showed that computer technology has positive impact on learning mathematics among k – 12^{th} students. The dynamic and interactive capability of various computer software packages can improve the somewhat static environment that had traditionally existed in classrooms using paper-and-pencil procedures and routines. Technology assisted mathematics activities provide students with an opportunity to explore an even wider range of mathematics problems that ever imagined, and it allows students to visualize the connections among various mathematics topics. Computer technology makes it possible to create a situation in which a graphing utility can be used to enrich the investigative environment for learning mathematics.

The National Council of Teachers of Mathematics (NCTM, 1991) promotes student use of technology to model real-world phenomena that possess a variety of interpretations. Implementation of technology in the classroom can help shift the focus of mathematical ideas from computations and manipulation to modeling and representation of functions or other phenomena in the real world. Mary C. Enderson (1997) in her paper of "Old Problem, New Questions" discusses her experience of teaching students mathematics using computer technology. She believes, "A computer can help eliminate obstacles in doing mathematics – particularly problems involving formulas and calculations." (p32).

More evidence shows that computer assisted instructions (CAI) hold a great deal of promise for providing mathematics instruction to all students, especially to those who suffer from mathematics anxiety which may well be caused by their poor performance in learning mathematics. In addition of offering individualization and flexibility, CAI is impartial, reinforcing, appeals to students' interests, and also offers a sense of privacy for students who are concerned about their performance (Wittman et al. 1998).

Computer technology can positively impact students' learning of basic math skills because it can provide visual effects which can assist learning of better understanding the SEQUENTIAL OPERATIONS math concepts, therefore they may better apply these math skills learned at school in their real life. Technology used as an effective teaching tool in mathematics education will provide students with opportunities to practice basic skills in an interesting and enriched way, to solve complex and challenging problems, to combine reading, writing skills and communication skills in exploring, discussing and formulating the validity of personally constructed mathematical ideas so that students can draw their own conclusions. Students can use visual aids, drawing, graphics and real-life objects to convince themselves and their peers of the validity of their solutions.

Approximately 104 students in sixth, seventh and eighth grades who have been assigned to participate in the remedial math lab participated in a fourteen-week study. Their selection is based on three criteria: their teacher's recommendation, their last year declining performance and their MAT (Metropolitan Achievement Test) scores (below 21percentile). These students were not qualified for any special education programs. They were placed in the remedial math lab in an addition to their regular math class to assist them in mastering the basic skills within a semester. Besides attending regular math class everyday, all participants were in the math lab daily for 45 minutes. The students were randomly assigned into one of the two groups. Both groups used a software application on Apple II GS computers for drill and practice to raise the competency level in the areas of addition, subtraction, multiplication and division. The control group used the traditional method, textbooks, paper and pencil exercises and worksheets, while the experimental group used Internet as a practice tool and a multimedia application Astound 2.0 on Macintosh computers. The concepts involved were Surface Area of a Cylinder, basic math facts, subtraction and division problems of 3 or 4 digit numbers.

A Criterion-Referenced test was used to evaluate the growth of students' basic math skills. This set of tests was designed to be used in the district to measure student achievement on the goals set by the district. The evaluation instrument was established by a committee of math teachers within the district, which was comparable to other established instruments to ensure that bias was neutralized and content was sufficient. The test results from this study showed that among the sixth and seventh grade students, the experimental group average criteria-referenced pretest score was 18.75 and the posttest score was 41.63 with an increase of 22.88%. The control group average pretest score was 16.93 and posttest score was 38.22 with an increase of 21.29%. There was some improvement in the MAT test scores in both groups but there was very little difference between the two groups. The average pretest score for the eighth grade experimental group was 37.77 and the posttest average score was 51.05 with an increase of 13.28%, while the pre- and posttest averages in the control group were 40.57 and 45.48 with an increase of 4.91% respectively, which shows significant difference between the experimental group and control group.

It would be difficult to say that there were significant differences in the improvement of basic math skills between the two groups of the 6th and 7th graders even though the growth in each group was noticeably significant. There was, however, an obvious attitude change among the students in the experimental group according to the teacher's observations. The students enjoyed working on the computers to present the problem-solving strategies and to share their experiences with their classmates. They showed more enthusiasm in learning math skills. The one important lesson we learned as teacher educator and classroom teacher is that simply putting a student in front of a computer does not equate with integrating technology in a math curriculum. Desirable learning outcomes from technology-based learning cannot be realized in the absence of meticulous planning, identification of appropriate resources and materials, and carefully organized presentations dedicated to leading the students through the entire problem-solving process.

References:

Enderson, M. C. (1997) Old problems, new questions, *Learning and Leading with Technology*, Vol25, No2, 28-32.

National Council Teachers of Mathematics (1991). Professional standards for teaching mathematics. Reston, VA: Author

Wittman, T. K.; Marcinkiewicz, H. R. & Hamodey-Douglas, S. (1998). Computer assisted automatization of multiplication facts reduces mathematics anxiety in elementary school children. *Selected Research and Development*, Association for Educational Communications and Technology (AECT), St. Louis, MO

An On-Line Math Problem Solving Program That Stimulates Mathematical Thinking

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Abstract. This paper presents a case study in which the authors developed a Web-based instruction (WBI) unit—an on-line interactive math problem-solving program, and explored the means of using this WBI program to stimulate young children's mathematical thinking and develop their skills of and interests in solving mathematics problems.

Problem solving is a primary objective for math effective learning, and a required proficiency in real life. Instead of spending a high proportion of instructional time in practicing basic algorithms for the four operations, teachers need to use problem-solving to address computational needs (Peterson et al., 1989); not only teaching how to start from a middle point – to computer with an equation, but also how to proceed from a beginning line – to write an equation using the given data. Problem solving process becomes more and more imperative, especially when technology assists students in computation fluency and accuracy. A calculator does not solve a problem; a human with a calculator does.

Word problems bring various real life situations to a math class, and encourage the students analyze and interpret information as the basis for a solution. Poor reading and comprehension of word problems, and lack of good strategy use are two main causes of the students' inability in problem solving. (Benko et al., 1999) To lead students to deeper understanding and to avoid depending on cues words, researchers suggest using indirect language (Pawmar, Cawley & Frazita, 1996), i.e. word problems without direct cues words.

A schema is involved when students attempt to understand semantic relationship in a problem (Riley, Greeno, & Heller, 1983). Seven types of word problems are found under the four operations (Vandewalle, 1998). In this program, they are simplified into four types, and further developed into 11 categories.

	Types	Semantic Structures	Semantic Structures
Addition / Subtraction	Join / Separate	Part + Part = Total	Total – Part = Part
			---
	Addictive Comparison	Smaller + difference = Bigger	Bigger – Difference = Smaller
			Bigger – Smaller = Difference
Multiplication / Division	Equal Groups	Group x Each = Total	Total / Group = Each
			Total / Each = Group
	Multiplicative Comparison	Group x Amount = Multiple	Multiple / Group = Amount
			Multiple / Amount = Group

Table: Semantic Structures of Word Problems

100 math problems were developed without direct cue words , divided into the four basic operations, and further sorted into 11 categories at three difficulty levels. Studying the semantic structure and recognized characteristics of the known and unknown information helps students understand the relationship among the numbers involved in word problems, and discriminate between operations required to solve word problems.

The KWHL format is used to organize the data. Students analyze the given information—I know, find the goal—I want to find, choose an appropriate operation— how I can find, and write an equation —I have learned. The above process follows the five-step word problem attack strategy, i.e. to recognize the problem, analyze and organize the data, devise a plan, do the computation and check the answer (Howell & Barnhart, 1992). Additionally, using the KWHL format encourages multiple reading of the problems and prolongs mental attention to their semantic structures (Benko et al., 1999). Research shows that US students tended to favor verbal statements over mathematical expression, and less sophisticated methods of solution, e.g. using addition instead of multiplication (Silver et al., 1992). Adopting semantic structures can also promote students' mathematical expression and encourage them to choose more effective operations.

Next was to set an active learning environment and choose an appropriate way to deliver these problems to students. The authors determined to create a drill program on the Web for students to construct math problem solving skills. First, Web is the multimedia portion of the Internet that delivers information interactively from different media—text, sounds, graphics/animations, pictures/movies or information from other Web sites. As suggested by previous research, such learning environment enables young learners to be more motivated and active in their learning. Second, the authors hoped that larger population of students could access this program. There were many multimedia authoring tools, such as *ToolBook, Director*, or *HyperStudio*, that could be used to develop this program. The problem is, however, most classrooms did not have the expensive multimedia software. In today's schools, the most convenient and least expensive tool is the Web—a Web browser and Internet access. Therefore, the on-line drill program was designed as a WBI unit, and delivered as a Web site. Microsoft FrontPage was used to create all the pages.

The program was structured into the 11 categories and three difficulty levels. Basically, this math problem-solving program gives one problem in one page, with text, graphics, and colors. The "thinking processes" of solving each problem were provided in a list of "fill-in-blank" sentences, and a list of answer options. The answer/solution of the problem can be multiple choices or text-input. The feedbacks to the answers were provided and the learner has the option to try several times until he/she reaches the correct answer. The program was designed in a non-linear approach, navigating by categories and difficulty levels. Learners/teachers can select appropriate problems for their learning/teaching purposes.

The math problem-solving program has been used with elementary students. The children started to use this program with specific learning goal, that is, the students would be able to write correct equations to solve different word problems, involving addition, subtraction, multiplication and division. The authors have been observing the eight children's performances focusing on how they (1) organize data using KWHL format, (2) choose correct operation, (3) write correct equations, (4) compute correctly, and (5) answer the question in a complete sentence. Their interaction with the program was another observation focus. The screen design, use of objects, orientation and navigation of the program, to certain extent, attracted children's attention, and influenced the speed of their problem solving. Since the set of problems was designed reflecting the process of mathematical thinking, it is assumed that the on-line program could stimulate this mathematical thinking process. Their performances showed a clearer path of thinking during the process of solving these problems. Also, informal interviews were conducted before, during and after their performances. Children's interests in mathematics problem solving were increasing with the use of the on-line program.

The current case study was the preliminary part of an on-going project, which is extending to a larger population. An experimental design is suggested for further study. The implementation of the program is suggested to include the use of an authoring tool such as Hyperstudio, which could be converted into a HTML version and delivered through the Web.

References

Benko, A., Loaiza, R., Long, R. Sacharski, M., & Winkler, J. (1999). *Math Word Problem Remediation with Elementary Students*. ERIC Document Reproduction Service No. ED 434 015.

Howell, S., & Barnhart, R. (1992). Teaching word problem-solving at the primary level. *Teaching Exceptional Children*, 24 (2), 44-46.National Council of Teachers of Mathematics. (1989). *Curriculum and evaluation standards for school mathematics*. Reston, VA: Author.

Parmar, R.. Cawley, J., & Frazita, R. (1996). Word problem-solving by students with and without mild disabilities. *Exceptional Children*, 62 (5), 415-429.

Peterson, P., Fennema, E., Carpenter, T., & Loaf, M. (1989). Teachers' pedagogical beliefs in mathematics. *Cognition and Instruction*, 6 (1), 1-40.

Riley, M., Greeno, J., & Heller, J. (1983). Development of children's problem solving ability in arithmetic. *The development of mathematical thinking*. New York: Academic.

Silver, E., Leung, S., & Cai, J. (1992). The marble arrangement problem: Results of an analysis of U.S. students' solutions and a comparison with Japanese students. ERIC Document Reproduction Service No. ED 351 204.

Vandewalle, J. (1998). *Elementary and middle school mathematics*. New York: Addison, Wesley, Longman, Inc.

NEW MEDIA

Section Editor:
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As an educator in the field of instructional technology, I am often challenged by deciding what technology skills and software should be added to the courses in our graduate program. I've found that the papers in the New Media section of the SITE Annual are good predictors of future trends in technology. This year is no exception! I've organized the papers in this section around four themes involving several aspects of multimedia: Digital Audio and Video; Research in Specific Multimedia Technologies; Multimedia Portfolio Development; Innovative Multimedia Projects, Tools, and Software; Technology Collaboration of Students and Teachers; and Course and Instructional Model Design and Development.

Digital Audio and Video

This year, the New Media section contains five papers that describe and document different methods of creating and integrating audio and video into teaching. As the technology for capturing and editing audio and video becomes simpler, the growth of these enhancements in teaching and learning environments will flourish. Many of these authors include product descriptions as well as practical guides for creating and using audio and video in educational settings.

Bauer and Bauer present a brief overview of the advantages of audio as an instructional medium. The authors also discuss information about basic audio capturing and editing, and include recommendations for processing audio for both Web and CD-ROM development. Specific information about software tools and program is also detailed.

Yao discusses the differences between traditional video and digital video and examines the current technology. Yao also includes a step-by-step guide on how to create digital video and provides educators with practical suggestions of how to create digital video economically and effectively.

Handler, Benavides, Morgan and Houghton, a group of Apple Distinguished Educators, describe an interactive session at SITE that will allow participants to develop hands-on practice with digital video cameras, PowerBooks, and iBooks. Imovie software will be demonstrated and examples of how iMovie may be integrated into both K-12 settings as well as higher education will be shown. The organization of workshops for new users will also be discussed.

Borzov examines ways to integrate digital video into a language classroom. This paper describes the process of shooting, editing, and formatting videos for students who are learning English as second language. Borzov also compares VCR/camcorders with digital cameras for shooting video and CD-ROM, DVD, and Web technology for disseminating the projects.

Pan presents the results of a study that examined the perceptions of teachers as well as other people in non-education related fields toward the use of text-to-speech technology. Synthetic speech, produced by a computer, has matured considerably over the past few years, and this study indicated that few people are aware of or use this technology. Participants were given a pre-test, and then introduced to the synthetic speech functions and activities; finally a post-test was given. The results of the study showed a statistically significant difference between pre-test and post-test scores, and most participants became engaged in developing ways of integrating text-to-speech technology into their teaching activities. Pan suggests that teachers are more likely to adopt the synthetic speech technology and integrate it into instruction if properly introduced.

Research in Specific Multimedia Technologies

Four papers highlight research conducted about specific multimedia products. Albion discusses the initial evaluation of an interactive multimedia CD-ROM called *Integrating Information Technology into Teaching* with pre-service teachers. The evaluation of the materials based on a problem-based learning framework indicates positive changes in these students' beliefs. A variety of data was gathered through a teaching efficacy instrument, questionnaires, and journals. This data indicated that the interactive materials using a problem-based learning framework assisted students in increasing their knowledge of the work of teaching as it relates to the use of computers and also increased their self-efficacy in teaching with computers.

Unfred and Crooks also report on a pilot study that measures learners' self-efficacy, as well as attitudes and access/utilization patterns. The study was initiated to discover areas that could impact an expanded study on factors influencing the use of electronic textbooks. Participants were given a self-efficacy questionnaire, assigned readings in an electronic textbook on CD-ROM, and participated in open-ended questions about the advantages and disadvantages of electronic textbooks. Preliminary results showed that students overwhelmingly preferred print-based textbooks to electronic textbooks, but acknowledged the fact that electronic textbooks provided advantages in color, animation, and hyperlinks.

Stuckey, Hedberg, and Lockyer describe the first phase of a research study to examine the role played by Internet-based teacher professional development in the implementation of an innovation. The innovation in this study is the software application, *StageStruck*, a educational multimedia CD-ROM designed for the performing arts. StageStruck has won many awards since it was launched in 1999, and the authors describe the development of an online community to support K-12 teachers in their classroom use of the software. The Web site offers professional development, support and resources for teachers as well as activities and projects for students. The authors will demonstrate the CD-ROM and online community in an interactive session at SITE.

Santos and Dias describe a study focused on the use of hypertext in the design of a Web-based learning environment designed to support the understanding of poetry for high school ESL students. Preliminary results show that students had a deeper involvement in suggested reading activities and a higher level of interactions with poetry when supported by a Web-based learning environment. Positive attitudes about poetry and greater feelings of participation were also noted.

Multimedia Portfolio Development

Two papers in this section focus on the development of technology tools that assists pre-service teachers in portfolio development. Holt presents a description and evaluation of a multimedia CD-ROM project, *Developing Your Professional Portfolio for Internship and Beyond.* It includes feedback from pre-service teachers who used the CD-ROM to help prepare their professional portfolios during internship, supervising professors, and educational personnel at teacher education institutions both nationally and internationally. Holt also provides an overview of professional portfolio literature.

Mullen, Bauer, and Newbold describe a collaborative process used in conceptualizing a digital portfolio requirement for all teacher education majors. The authors describe the development of a digital portfolio model by a team of university faculty with input from community and business representatives. The overall goal of the portfolio is to meet the learning and competency objectives of the teacher education program; the emphasis of the process is on reflection and to highlight the developmental process of portfolio construction. The authors also discuss portfolio structure, development process, and assessment.

Innovative Multimedia Projects, Tools, and Software

Eight papers in the New Media section report specifically on the design and development of innovative multimedia projects, tools, and software. These examples are certainly imaginative and provide exciting examples of multimedia product development.

MacKinnon and Bellefontaine describe a CD-ROM resource for a Middle School Teacher Education Course. Since the university setting for this course requires all students have a laptop computer, the use of this technology is a logical and innovative way to effectively use available resources. The authors provide and overview of CD-ROM technology and discuss the categories of educational applications and examples for each type. The approach to using the CD-ROM in one teacher education course is described and ways to integrate it are proposed.

Laufer, Blois and Choren report on an application tool for the development of case-based Web environments. This tool is described as a reusable, component-based application that can be specialized to produce custom applications. The authors provide a brief overview of the case-based learning model which is closely aligned with social constructivism and problem-based learning. The tool, called *Case-based Training Environment*, has a student area and an administrative area. It also has a stand-alone application for module authoring. Because it is primarily Web-based, students only need a browser to use the tool's functionalities. A specialist environment will be developed next where content specialists can share training modules.

O'Brien and Van Der Kuyl describe the development of a CD-ROM, *Dealing with Disruption*, for teacher professional development in dealing with disruptive students. The authors provide a brief description of the problems and challenges of dealing with students with disruptive behaviors and emotional problems in the context of the Scottish education system. The CD-ROM contains effective methods for dealing with classroom disruption and aggressive behavior with a wide range of scenarios available from a menu. The authors describe the methodology for the project and relevant development phases.

Pivec and Mauer describe the theoretical framework and development of "Situation Learning" modules. The authors give an overview of situation learning and explain the characteristics of the environment in which the learning takes place. Educational aspects of situation learning and examples of applications are also described. Pivec and Mauer also illustrate the authoring of situation learning modules and point out the levels of authoring supports.

Gutl and Lackner describe the design and development of *WebSave*, a Java-based tool that supports the research process by managing relevant information by importing bookmark files from common browser clients. The authors provide an overview of archiving and discuss the process of archiving Web resources for later retrieval. They also note problems involved with archiving and organizations involved with archiving Internet resources. Gutl and Lackner conclude by describing future implementation plans.

Yacine reports on the architecture of the system SACA (syteme d'Apprentissage Cooperetif base sur the modele d'Agent), a multi-agent system to support cooperative learning. He describes the different sets of agents, both human and artificial, which offer the possibilities for the learner to cooperate and collaborate with peers.

Hert and Cafolla present an overview of Macromedia Flash, a software program used to create multimedia Web presentations. The authors provide an overview of Flash, and describe advantages and disadvantages of developing interactive, multimedia Web sites with the software. Hart and Cafolla also discuss ways to use Flash to create presentations and animations for online delivery.

Musgrove, Knee, Rodney, and Musgrove discuss how a course authoring program, WebCT, can be used to make Web-based learning appealing and effective for a variety of individual learning styles. The authors provide an overview of learning theories as it pertains to Web-based learning and argue that professors need to adapt their course materials utilizing the same foundational learning theory concepts that are effective in live classrooms. A description of three types of WebCT tools, communication tools, content tools, and assessment tools, is also provided.

Technology Collaborations of Students and Teachers

Two papers explore the technology collaborations between students and their teachers. Zdravkovic discusses the relationship of higher education students and their instructors. He proposes different approaches and techniques to encourage better student-teacher relationships and foster learning.

Pierson, Booth, McNeil, and Robin describe the development of a school-university partnership composed of three groups: student "consultants," teacher "clients," and university "experts." The authors describe the yearlong project that is designed to develop a cadre of technologically and pedagogically skilled middle-school students who can assist the technology development of their teachers. Activities, challenges, and achievements of the two-year project were also included.

Course and Instructional Model Design and Development

Five papers discuss the design and development of courses in new media or instructional models that facilitate construction of knowledge in a less formal sense. Drazdowski describes the evolution of a media design course into a multimedia design course over the past five years. He compares the physical changes in computers, presentation hardware, and peripherals available for the course, and he includes ideas and recommendations for other teacher educators seeking such changes in the preservice curriculum.

Zdravkovic discusses teaching environments for computer visualization, especially in the areas of 3-D modeling, animation and special effects. He proposes that a different learning paradigm is needed with a more flexible approach that incorporates project-based learning techniques. The task of combining theoretical knowledge with production capabilities is difficult, and Zdravkovic describes several strategies for developing the required competencies and assessing student progress.

Putnik proposes a learning model that allows teachers to actively communicate with others electronically, participate in online discussions, use Web-based resources, and contribute to a shared body of knowledge. He proposes an outline for the course that includes characteristic elements about interactions, collaboration, and skills. Putnik notes that it is important for interactivity to move beyond short moments between student and teacher and to invoke a feeling of togetherness between students, teachers, and the instructional materials.

Pelton and Pelton describe the Enhanced Instructional Presentation (EIP) model for the development of educational hybrid linear/hypermedia presentations. The EIP model is a hybrid, combining a linear presentation with playback control and a synchronized, hyperlinked network of supplementary linear and hypermedia segments. The authors provide an overview of the EIP model and describe future activities for developing a tool to support construction of modules.

McNeil describes the design of a graduate course in visual learning based on constructivist teaching principles. The conceptual framework is described, and guidelines and examples of each project are presented. Innovative strategies that contribute to a constructivist teaching and learning environment are discussed. Student and instructor comments are also shared.

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Interactive Multimedia Problem-Based Learning: Evaluating its Use in Pre-Service Teacher Education

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Abstract: Interactive multimedia using problem-based learning as a design framework (IMM-PBL) has been proposed as a method for influencing teachers' beliefs about integrating computers in their teaching. Initial evaluation of IMM-PBL materials with pre-service teachers found evidence of changes in beliefs, including a statistically significant increase in self-efficacy for teaching with computers among participants who recorded initially low values on the same measure.

In a previous paper (Albion 1999b) it was argued that teachers' self-efficacy beliefs about teaching with computers are an important influence upon their tendency to integrate computers into their teaching. Based on a consideration of self-efficacy theory, it has been proposed that interactive multimedia using problem-based learning as a design framework (IMM-PBL) might be effective for increasing teachers' self-efficacy beliefs about using computers in their teaching through exposure to examples of appropriate practice (Albion 2000; Albion & Gibson 1998). The underlying theory of IMM-PBL (Albion & Gibson 1998) and aspects of the development (Albion 1999a) of a CD-ROM using the design framework have been described elsewhere. This paper reports the results of initial evaluation of the completed multimedia package, *Integrating Information Technology into Teaching* (Gibson & Albion 1999), in use with a class of pre-service teacher education students.

Evaluation Methods

A pretest-posttest design was used. The experimental group (N = 22) comprised students who had self-selected into a class in which the IMM-PBL materials were used as the basis of two-hour sessions attended over a five week period. The control group (N = 27) comprised an equivalent group of students studying alternative electives. The key research question sought to determine the effects of IMM-PBL materials on pre-service teachers' self-efficacy beliefs in respect of teaching with computers. This variable was measured using the Microcomputer Utilization in Teaching Efficacy Beliefs Instrument (MUTEBI) (Enochs, Riggs, & Ellis 1993). Both the experimental and control groups completed the MUTEBI as part of a battery of instruments prior to and immediately following the five-week period in which the experimental group used the IMM-PBL materials.

Additional research questions sought to describe users' reactions to the content and presentation of the materials and to determine the effect of the materials on users' perceptions of their knowledge and understanding of using computers in teaching. Data relevant to these questions were gathered from the experimental group using a questionnaire which included both Likert scale and open-ended, journals maintained while working with the materials and interviews with a small sample of participants (Albion 2000).

Results

Users responded positively to both the content and presentation of the IMM-PBL materials. They agreed that the four problems framed in the materials were relevant to their future work as teachers and cited new insights about various aspects of teaching obtained as a result of working with the materials. The element which attracted most favorable comment was the digitized video, especially that which presented interviews with teachers. Although all participants used the materials under equivalent conditions in a computer laboratory, patterns of use varied. Some worked systematically through the four problems, while others preferred to browse the resources, especially the video segments. This variation in patterns of use resulted in different outcomes for different users.

Increases in self-efficacy for teaching with computers (SE) were observed for some participants. Participants were partitioned according to their initial levels of SE (high or low) and the changes for each group were examined (Fig. 1). A statistically significant increase in SE ($t = 2.71$, $df = 23$, $p = .013$) was recorded for participants who had recorded initially low values of SE.

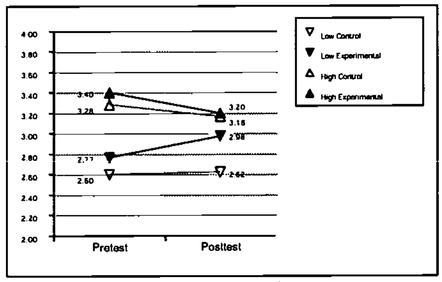

Figure 1: Pretest & posttest mean SE scores by initial SE group (Albion 2000)

Statements made in open-ended responses, journals and interviews indicated that some students had experienced significant conceptual change as a result of working with the IMM-PBL materials. These data supported the conclusion that the materials were effective in changing the beliefs of participants.

Conclusions

There is evidence that the use of the IMM-PBL materials assisted students to increase their knowledge of the work of teaching especially as it relates to the use of computers. There were increases in self-efficacy for the use of computer technologies and for teaching with computers. Technical difficulties experienced in the trial and the variations in patterns of use may have restricted the effect of the materials but the available evidence suggests that the presentation and content were appropriate and that further investigation of IMM-PBL and its use in teacher education would be worthwhile.

References

Albion, P. R. (1999a). PBL + IMM = PBL^2: Problem-Based Learning and Multimedia Development. In J. D. Price, J. Willis, D. A. Willis, M. Jost, & S. Boger-Mehall (Eds.), *Technology and Teacher Education Annual 1999,* Association for the Advancement of Computing in Education, Charlottesville, VA. 1022-1028.

Albion, P. R. (1999b). Self-Efficacy Beliefs as an Indicator of Teachers' Preparedness for Teaching with Technology. In J. D. Price, J. Willis, D. A. Willis, M. Jost, & S. Boger-Mehall (Eds.), *Technology and Teacher Education Annual 1999,* Association for the Advancement of Computing in Education, Charlottesville, VA. 1602-1608.

Albion, P. R. (2000). *Interactive Multimedia Problem-Based Learning for Enhancing Pre-Service Teachers' Self-Efficacy Beliefs About Teaching with Computers: Design, Development and Evaluation.* Unpublished PhD thesis, University of Southern Queensland.

Albion, P. R., & Gibson, I. W. (1998). Designing Problem-Based Learning Multimedia for Teacher Education. In S. McNeil, J. D. Price, S. Boger-Mehall, B. Robin, & J. Willis (Eds.), *Technology and Teacher Education Annual 1998,* Association for the Advancement of Computing in Education, Charlottesville, VA. 1240-1244.

Enochs, L. G., Riggs, I. M., & Ellis, J. D. (1993). The Development and Partial Validation of Microcomputer Utilization in Teaching Efficacy Beliefs Instrument in a Science Setting. *School Science and Mathematics*, 93 (5), 257-263.

Gibson, I., & Albion, P. (1999). *Integrating Information Technology into Teaching* [Multimedia CD-ROM]. Toowoomba, Australia: University of Southern Queensland.

Digital Audio Production for the Web

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Abstract: Examine most web-based courses and you will find that very few of them make use of audio support for instruction. Quality audio on the web once meant large files and clogged bandwidth. However, new data reduction formats such as MP3 make it possible to include quality audio support for instructional materials. Most computers come equipped with the necessary hardware and software for web developers to use their existing equipment to produce good quality audio programming. This paper presents a brief overview of the advantages of audio as an instructional medium. Information regarding basic audio capturing and editing on a typical PC is presented, followed by recommendations for processing audio for web and CD-ROM development. Samples of the author's work can be found at www.mp3.com/jeffreybauer.

Research in the Effects of Audio on Learning

Audio is an important instructional medium that can significantly enhance web and multimedia based learning. Research in this area reveals several benefits. Allen (1973) has shown that audio can be skillfully included to direct learner attention to particular elements of an instructional message. Just as animation can be used on the web to gain attention, audio can also be included to help the learner focus attention on particular elements such as the starting point, or help links of a web site. Severin (1967) has also shown that multi-channel communications enhance learning because of the impact of the summation of cues between channels. Audio also provides an opportunity for the learner to "relate" to the narrator (Hoban & van Ormer, 1950). Verbal simplification in media commentaries has been shown to increase teaching effectiveness (Travers, 1967).

In the area of music, Seidman (1981) concluded that musical accompaniment enhances the emotional impact of a media production. He found that music could also provide continuity by tying together scenes in a script. Thus, a case can be made supporting of the use of music as well as narration in web based training environments.

Basic Audio Capturing on a Typical PC

Audio Inputs and Microphones

Most current computer systems, both desktop and laptop varieties come standard with nearly everything needed to capture and edit good quality audio files for web and multimedia instructional purposes. Many computers even come equipped with built in microphones or external microphones that plug into the audio in port on the back of the computer. How do you know whether you have such an option? Simply examine the back of your computer and see if there is an audio in receptacle or an input receptacle with a picture of a microphone associated with it. If there is, you have the basic hardware necessary to capture audio.

You may need to purchase an external microphone in order to capture sound on your computer. A medium quality dynamic microphone ($30-$100) by a reputable manufacturer such as Shure, AKG, Audio Technica, or Realistic should be adequate for producing good quality instructional audio. Radio Shack carries the adaptors necessary to convert the cable on the microphone to the proper format for your audio card on your computer. Usually, computers accept 1/8" stereo mini plugs. Computers with more sophisticated A/V capabilities, such as PowerMac G3s and G4s, accept a pair of RCA cables. Again, consult with someone who is familiar with audio adaptors in order to get the proper connectors.

Audio Capturing Software

The only other ingredient necessary for digital audio production is a program that will allow you to capture the signal from the microphone to your hard disk. Again, many computers come standard with a utility that allows you to do this. For example, the current Macintosh Operating Systems, 8.6, 9.0, 9.04, and X, include a program called *Simple Sound* which allows you to capture audio either from the built in microphone or the sound input receptacle.

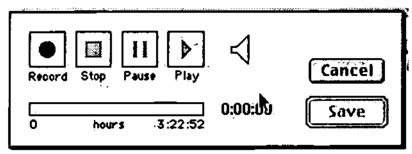

Figure 1. SimpleSound recording interface for the Macintosh.

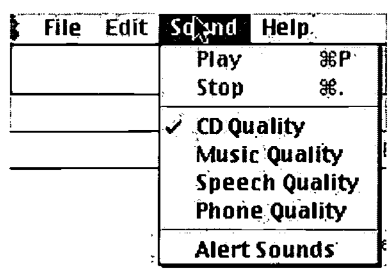

Figure 2. Quality level choices on SimpleSound. Higher quality such "CD" and "Music" will create larger, better sounding files.

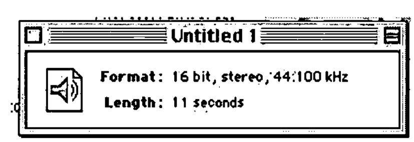

Figure 3. SimpleSound Dialog box providing technical details about the recorded sound clip.

Programs such as Adobe Premiere, Digidesign ProTools, CakeWalk Home Studio 8, Steinberg Cubase and many others have more sophisticated audio capturing and editing capabilities. While these programs are intended for more advanced applications, all are reasonably priced and most have both Mac and PC versions. It is beyond the scope of this article to explain the intricacies of these programs; suffice it to say that all of them offer more exacting editing capabilities. They also allow the user to add special effects such as echo, chorusing, audio compression (not to be confused with file compression), and hundreds of other options. All of the programs listed above allow multitrack recording and editing, meaning that you can add multiple layers of audio. For example, using ProTools, you might want to start by recording an instructional narration using a microphone hooked into the computer. Later, you might want to disconnect the mic and hook a cassette tape player to the audio input and capture some background music. This music can be put on its own separate track so that it can be edited separately from the narration track. Gain levels and stereo panning (left/right soundfield placement) are additional typical features. High end programs such as ProTools and Cubase offer different ways to view files such as an edit view which graphically displays the audio file, and mix view which looks like a typical analog mixer that audio engineers are sure to recognize. A free version of ProTools for either the PC or the Mac can be found at www.digidesign.com.

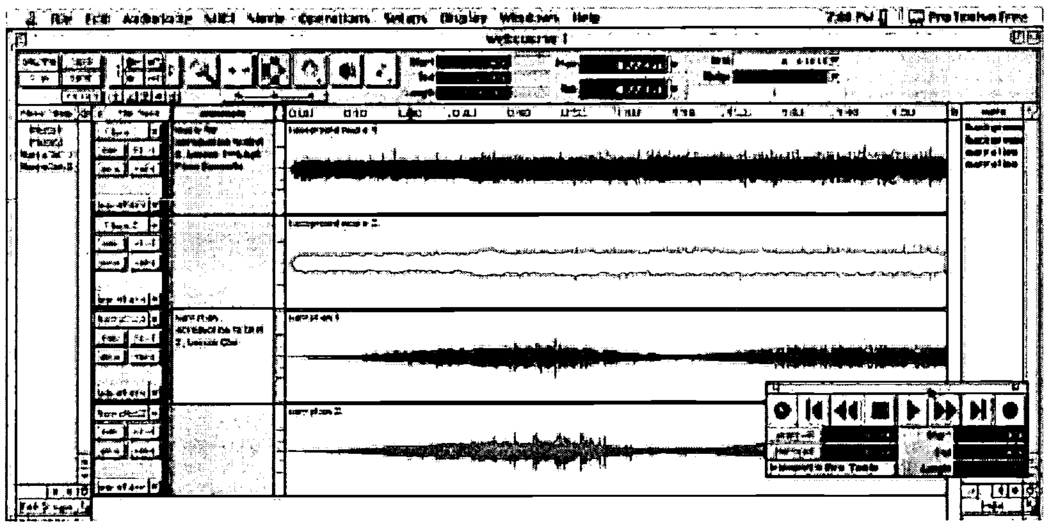

Figure 4. ProTools Edit View offers many professional editing features. A free version is available at www.digidesign.com.

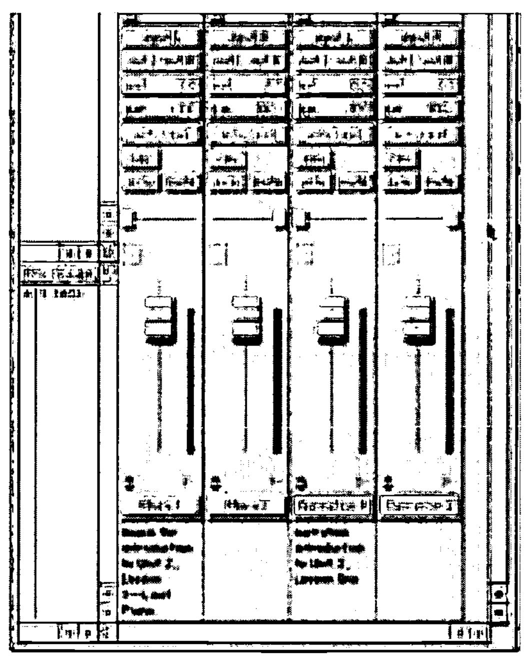

Figure 5. ProTools Mix Window allows real time editing of sound levels and special effects.

Selecting a Quality Level

When capturing and editing audio that will eventually end up on the web or on a multimedia CD-ROM, it is best to start with the best quality possible. This means that the initial file sizes will be quite large. Later the audio file will be converted to a more compact format such as .wav or .mp3. Data reduction and compression works best when the raw product is of the best possible quality. It is a good idea to optimize hard drive space using Norton Speed Disk or another similar defragmenting program before you begin capturing audio. Your computer will run much more smoothly, and the chance of a glitch will be greatly reduced. Set the audio capture preferences to CD Quality which is a capture rate of 16 bits at 44100 kHz. To save hard disk space, you can select mono instead of stereo if it is available. This is the raw file. Typically this file occupies about 10 MB of hard drive space per minute. A five minute piece of instructional audio will occupy about 50 MB on your hard drive, but remember that this file will be compressed later.

Processing the Captured Audio Files

Helpful Tools

Two tools that can help improve the quality of your audio recordings are audio compressors (not to be confused with data compression), and audio mastering software. Audio compressors smooth out the dynamic range of the sound that you are recording. Basically, compression boosts the quiet parts of the audio program and cuts or limits the loud parts of the audio program. Inexpensive compressors such as the Alesis Nanocompressor (about $100) are fully adjustable so that you can determine how much the signal is squashed. A simple setup would be to plug the microphone directly into the input on the compressor, and then run a line from the output of the compressor to the audio input of the computer. Compressors are the single most useful tool to improving the sound of a recorded program. Their effects are deceptively subtle, but when the audio material is converted to a format that will work well on the web or in multimedia, it is essential that the audio be without overly soft and loud extremes.

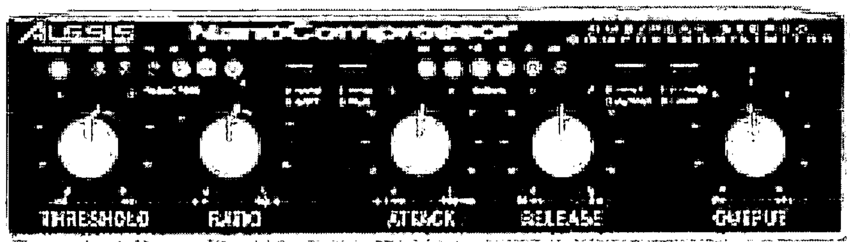

Figure 6. Alesis NanoCompressor. An essential tool for improving audio quality.

Another helpful tool is mastering software such as Berkley Integrated Audio Systems PEAK (about $40 for the LE version). Mastering software is useful if you have several audio clips that are going to be used on your instructional website or multimedia program. This software allows you to normalize the various individual files so that they are all of approximately the same loudness. It also allows you to cut and paste pieces of audio or fade in or out on a track. Mastering is the second to the last step in preparing audio for the web.

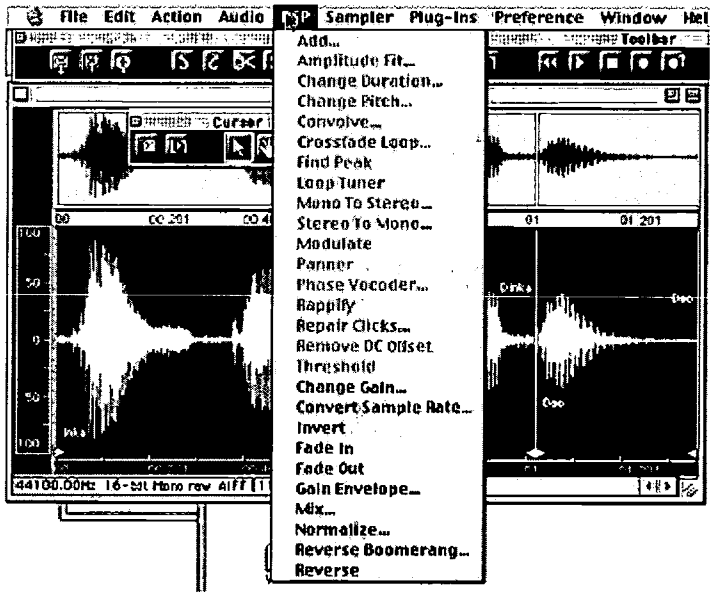

Figure 7. Mastering software such as BIAS Peak can help you control the consistency of your audio files on your website or multimedia CD.

Converting the Audio File for the Web or Multimedia Applications

The final step in the production process is to convert the edited and mastered files to a format that will work well on the web or in multimedia software. The format that offers the best compromise between file size and quality level is MP3. The raw audio files that you captured and edited which occupy about 10 MB of hard drive space per minute of audio can easily be reduced by a factor of 10 without significant deterioration of quality. Data reduction of up to 20:1 can yield very usable results in an MP3 format, and the audio can be formatted on your website for either streaming or downloading. Your users will need to download a free MP3 player (www.mp3.com) in order to playback your audio files. The original uncompressed 10 MB per minute file is reduced to 1 MB per minute for good quality or 500 KB per minute for fair quality—good enough for narration. Using an MP3 program such as SoundJam, converting audio files to the MP3 format is as easy as dragging and dropping to a conversion window. The user then chooses the quality (bit rate, stereo/mono, sampling rate) that will work for the instructional program. I usually make several conversions of the same file and test them to see which settings give me acceptable quality while trying to keep the file size manageable. You can check my results at www.mp3.com/.

Real Audio streaming formats are also very good for the web. Various file formats (.wav files, Quicktime, and others) can be processed as Real streaming audio during the mastering stage. It is simply a matter of performing a "Save as..." and selecting the desired format. You should experiment with different file types and compression settings to see what works best for you.

Final Thoughts

Using your PC to produce good quality audio support for your web based courses or multimedia CDs is not a difficult endeavor. Research supports the use of multimodal teaching materials, and audio can bring life and personality to an otherwise bland web course. Three major steps were discussed: (a) capturing the audio, (b) processing and editing, and (c) converting the audio to the appropriate file format. Data reduction technology has advanced to the point where high quality audio takes up very little hard drive space and bandwidth.

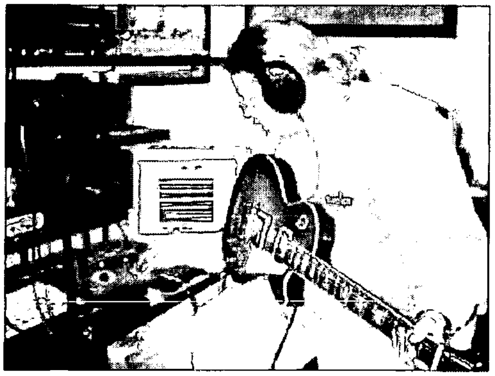

Figure 8. The author prepares audio tracks on his Mac G3 using Digidesign's ProTools. You can hear a sample of his work at www.mp3.com/jeffreybauer.

References

Allen, W. H. (1973). Research in educational media. *(In) Educational Media Yearbook.* James W. Brown ed. New York: R.R. Bowker.

Severin, W. (1967). The effectiveness of relevant pictures in multiple-channel communications. *AV Communications Review, 15* (Winter).

Hoban, C.F., & van Ormer, E.B. (1950). *Instructional film research. Technical Report No. SDC 269-7-19.* Port Washington, NY: U.S. Naval Special Devices Center.

Travers, R.M. (1967). Research and theory related to audiovisual information transmission. *Kalamazoo,*Western Michigan University.

Seidman, S.A. (1981). On the contributions of music to media productions. *Educational Communications and Technology Journal, 29* (Spring).

Teacher-Developed Video for Classroom Use: The Transition from VCR to Digital Format

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Abstract: This presentation will examine the ways to integrate digital video technology into a language classroom. The process of shooting, editing and formatting educational video films for students learning English as a second language will be discussed. The focus will be on a comparative analysis of traditional VCR/Camcorder technology versus digital cameras and modern CD-ROM/DVD/Web technology for disseminating the resulting video. The examples of effective techniques and original QuickTime movie clips will be included in the presentation.

Introduction

Educational video has become an essential part of instructional technologies, but its integration into curriculum is often limited by utilizing commercial films, rather than self-made productions. Digitized video is often considered too raw for effective use in more than a very short clip, while the picture is quite small (only by 2 in. by 2 in. or 4 in. by 4 in.) and may be jerky and unclear, especially if blown up to a large size (Healey, 1999,p.131).

Still, digitized video holds promise for the future. Students, who will make presentations in the scientific, business or academic realm need to know how to look as well as sound good in a presentation, and video offers them a full picture of what they do well and what they need to improve (Healey, 1999,p.132).

Teachers, dcvcloping cducational films for classroom usages may take advantage of analog and digital video technologies, depending on the resources and tools available. The video I produced for English as a Second Language classes may represent both a traditional approach, focused on camcorder /VCR technology, and a more progressive one, utilizing advanced computer-assisted technologies, based on digital audio and video processing.

Analog Video Production.

The equipment necessary to produce an analog video film may consist of a camcorder, a VCR with editing functions, a tape-recorder or a CD - player, a microphone and a TV. Once all the original footages are specified and chosen for a film, a long and time-consuming process of editing begins. All selected fragments are exported step-by-step from the source tape to the target one. This manual way of putting pieces together may not guarantee a seamless video picture. Some unfortunate noise bars and unexpected frames may show up at transition areas, making a producer start a new round of attempts to eleminate these flaws.

Setting a precise duration of a footage may also be a hard thing to do, because a synchronous manipulation of a "start" button on a camcorder and a "record" button on a VCR may appear quite problematic in the beginning, but the teacher is sure to improve after some practice.

Audio dubbing is the next challenge for a producer after the video is done. The most complicated task is to strike a balance between a background voice/music track and a foreground narration. My experience proved to be successful after I managed to acquire some accuracy in handling a CD-player and a microphone switch at the same time. Some special care should be taken about a distance between a microphone and a background sound source. This may be crucial for the narration to dominate over musical tracks.

Any video production without titles or script messages cannot be considered complete. Some analog camcorders (JVC RG-AX48) have a character generator, which is able to store up to 18 letters and superimpose it over the scene being shot. The teacher may actually use a different and a very simple way to entitle the film by making a close-up picture of a text printed on a sheet of paper.

This approach in constructing analog video films may challenge teacher's skills and demand a lot of industry and patience, but it is quite good and practical particularly for those circumstances, when the facilities are limited and the resources are scarce. Teachers with absolutely no computer literacy may practice this type of movie – making, since no software is meant to be used in this process.

Digital Video Production.

Most digital semi-professional camcorders on the market today use MiniDV format, which meet the demands of extremely high-quality audio and video production. DV differs from analog in that it stores all sound and image information in digital form and enables to copy video between a DV camcorder and a computer with no loss of quality. So every time when video is captured, edited and exported back to tape, the quality of the original footage is retained. This is not so with analog video, where electronic signal is likely to lose strength, when the video is copied from one medium to another.

Digital audio sound is also a perfect match to digital quality images. Most MiniDV camcorders offer two recording modes: two - channel (16 - bit linear, 48 kHz sampling) for optimum quality and four - channel (12 – bit non - linear, 32 kHz sampling) for stereo dubbing.

The process of digital editing is entirely computer-based and the teacher has a number of options to choose between quite easy and friendly software, like iMovie or Avid Cinema and more professional, like Ulead Video Studio and Adobe Premiere. Some manufacturers of digital camcorders (JVC) may include editing software (JLIP Video Capture, JLIP Video Producer) into a purchase package and provide a lot of useful instructions online (www.jvc-victor.co.jp/english/cyber/us/software/index.html).

All the problems and challenges, related to analog video production, can be easily solved by digital technologies. Elaborate applications and tools may ensure perfect selecting, cutting, pasting, random assemble editing, adding scene transitions, audio dubbing, importing and exporting sound and images, creating still-images, renaming video clips.

But perhaps the most dramatic advantage of a digital format lies in the ways to disseminate the resulting video. The iMovie tools I used to produce my educational video, made it possible to convert the footages into a QuickTime format movie, ready for different compression strategies and delivery mediums, including videotape, CD-ROM, DVD and the Internet.

The Web dissemination is an exciting opportunity to include personal video into global distant learning schemes. A movie can be posed to a home page site to have people download it. In this case the film should be short enough, otherwise the downloads may be too lengthy for a waiting viewer to enjoy. A compression used for publishing my Quick Time movie in the Internet gave me a 1/8 – screen image (240 x 180 pixels), 12 frames per second and a stereo sound 22 kHz. JPEG compression with Avid Cinema may allow exporting a Quick Time movie to a compositing program, such as Adobe Premiere After Effects with even more dynamic resolution:

- ¼ screen (320 x 240 pixels NTSC or 397 x 288 pixels PAL)
- CD - quality stereo sound (44 kHz, 16-bit)
- 29,97 frames per second NTSC or 25 frames per second PAL (same as Television)
- 55 MB disk space per minute of video

Quick Time movie may be streamed online, so that people can see the resulting media play right away on the screens of their computers, using Quick Time Player. One more advantage of direct streaming is that the video files are not limited to reasonable sizes, as opposed to HTTP downloads. Long feature films, that would make multi - gigabyte files, can stream easily and rapidly.

It is also important to know, that streaming makes it possible to gain control over the distribution and copyright issues. When somebody tries to save the incoming media, the actual data is never copied, but is simply displayed as it arrives by the Quick Time plug - in and in Quick Time player. So the audience may have access to the Quick Time movie's URL, rather than have a chance to copy it on a hard disk.

References

Healey, D. (1999). Classroom Practice: Communicative Skill-Building Tasks in CALL Environments. In J. Egbert, & E.Hanson-Smith (Eds.) *CALL Environments: Research, Practice and Critical Issues*, TESOL, Alexandria, VA. 116-136.

Tales, Trials, Triumphs, and Trends: The Evolution of a Preservice Multimedia Course

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Abstract: With the introduction of our new multimedia computer lab in the Spring of 1996 (Drazdowski, 1997), our preservice teacher education program at King's College began the transition of its traditional "Media Design" course to one in "Multimedia Design." This paper will discuss the evolution of this course over the past five years, including ideas and recommendations for other teacher educators seeking such changes in their preservice curriculum.

Tales

First, some tales. Probably one of the most dramatic developments in the evolution of our multimedia course over the past five years is in the rapid advancements in hardware, software, and Internet resources. Where our initial multimedia lab consisted of Power Mac 5200/75 LC's, our upgraded machines are Apple G3 computers with 450 megahertz processors, 12 gb hard drives and 256 mb of memory connected to Pioneer laser disc players with their own separate Sony color video monitors. The built in Zip drives in the new towers have provided tremendous flexibility for storing and sharing large files, projects, and QuickTime movies. The current data projection system is three times as bright as the old LCD panel, eliminating the need to totally darken the room. The *HyperStudio* program is now version 4.0, which offers many improvements, especially in the areas of animation, special effects, enhanced transitions, and printable storyboards. The new scanner is USB compatible, has higher resolution dpi and 42-bit color, and has trays to scan slides, pictures, and transparencies. A Sony Mavica digital camera has replaced the old Apple QuickTake 150, and its built in disk drive has eliminated the need to download pictures through a serial port and then use cumbersome software. Our video camera for making QuickTime movies is now digital instead of analog, and can be connected and controlled by the computer through FireWire technology. Third party vendors have developed a large variety of texts (see Drazdowski, 1996) and resources (see Drazdowski, 1998) such as *Month by Month for HyperStudio* and *HyperStudio Project Resource Kit*, and other vendors have designed complimentary software packages, such *as Sound Companion for HyperStudio*, *Morph Pro 2.5* , and Apple's *iMovie 2* that can enhance student projects. And the Internet has exploded over the past five years with sites that serve as resources for text, pictures (see Picts4Learning at http://pics.tech4learning.com), clip art, video clips, sound effects, and music tracks. Students today are literally overwhelmed with available multimedia components. Finally, the teacher station now has a recordable/rewritable CD-ROM, so that all projects can be easily copied, saved, and distributed to students for use in their student teaching assignments. The course continues to model constructivist and cooperative learning theories, and serves to anchor our "Professional Semester" requirements. Education department faculty members are making an earnest effort to model effective technology use in their own teaching, and I encourage them, as Brown (2000) has pointed out, to go first for the "low-hanging fruit," and then decide if it's worth the effort to climb higher in the tree. Faculty also continue to take advantage of professional development opportunities to enhance their own technology skills. We have made significant progress, and hopefully our department will continue to receive the administrative and financial support needed to accomplish and sustain all of our technology infusion plans (Drazdowski, Holodick, & Scappaticci, 1998).

Trials

The literature is replete with examples of the barriers educators are confronted with when attempting to integrate instructional technology into the curriculum: lack of training, insufficient time to develop instructional innovations, enlarged class sizes, lack of equipment and technical support, resistance from faculty and technology anxiety, the need to revitalize faculty attitudes toward teaching, underfunding and lack of sustained administrative support, little system-wide planning and vision for technology use, and other simultaneous innovations in pedagogy, curriculum, assessment, and school organization not being coupled to the use of instructional technology (Albright, 1996; Dede, 1998; Lee & Johnson, 1998; Middleton, Flores, & Knaupp, 1997; Pink, 1989; Selwyn, 1999; Tapscot, 1999). Our program continues to face all of these challenges in various degrees which often impedes the pace of the progress that we desire. Like all educators who wear a variety of hats, I occasionally suffer from what Fullan (1996) has identified as "overload and fragmentation," which can combine to reduce educators' motivation for working on reform. But one of our biggest barriers, which the OTA Report (U. S. Congress,1995) also cited, continues to be the lack of technology rich field settings for our students' practicum experiences. As I read my students' journal entries that are required as part of the multimedia course, many write that they are disheartened when they visit their school sites to find that little technology will be available for their use in student teaching, and much of what is available is old and obsolete. Some local districts have made a few technology strides over the past five years, but many continue to struggle with weak property tax bases that are their foundation for funding and are also facing major financial concerns with the burden of structurally upgrading or replacing their old school buildings. Our student teachers write that their students often do not even have access to their own textbooks, never mind advanced technologies. Without a major infusion of money from the state and the federal level to address these serious concerns, many of our school districts will continue to limp along the road to the information super highway.

Triumphs

Various authors in the educational technology field have noted that computer use in schools is framed by the beliefs of users about computers and schooling (Bigum, 1998), that computer use often requires changes in a teacher's educational ideologies (Robinson, 1995), and that teacher computer use often hinges on their computer experiences (Hadley & Sheingold, 1993). As Michael Dertouzos, a columnist for *Technology Review,* writes:

> Learning may critically depend on what humans, not computers, do best: Lighting a fire in the student's heart, role modeling, and nurturing may contribute more to learning than the neatest hyper-linked courseware. (1998, p.20)

Therefore I feel that one of most beneficial aspects of providing preservice teachers with a required course in multimedia design is to provide teacher educators with the opportunity to model what Jonassen, Peck, and Wilson (1999) refer to as "meaningful learning," that is using technologies "to engage students in active, constructive, intentional, authentic, and cooperative learning" (p.7), and to show students how to use technologies as "mindtools" (Jonassen, 1996) or as an intellectual toolbox that can be used to engage them in critical thinking about what they are studying. Instructor modeling of these concepts is critical, for we are all aware of the old but true adage that "teachers teach as they have been taught."

As I have read the students' journals over the past five years, I am struck by a continuing pattern of student thought: usually initial anxiety as they enter the course, followed by growing confidence as they master the authoring program and become more comfortable with the various pieces of technology equipment, to finally a great sense of accomplishment as they complete their projects and an endless list of possibilities for technology integration into their own teaching curriculum. We now have available on CD-ROM some 250 educational stacks prepared for a variety of grade levels, topics, and content areas that students can utilize in their own teaching assignments, and our department continues to provide two laptops and portable video projectors for student use in their field settings if necessary. Graduates continue to contact me with exciting stories of their technology use with their own students and their inservice work with veteran teachers, and several have become technology teachers and computer coordinators for their districts, all doing their best to act as "change agents" (Strudler, 1991) for their learning organizations. As for me as instructor, I couldn't agree more with the CEO Forum School Technology and Readiness Report (1999) that stated, "technology, applied well, can enhance and reinvigorate education, making schools richer and more exciting interactive communities of learning for students and teachers alike (p.6)."

Trends

The introduction to the report entitled *Technology and the New Professional Teacher – Preparing for the 21st Century Classroom* (NCATE, 1997) clearly states the technology challenge facing teacher education programs:

> The nation's teacher education institutions must bridge the teaching and learning technology gap between where we are and where we need to be. Although progress has been made and exemplary practices exist, recent research indicates most teacher education programs have a long way to go. Teacher education institutions must prepare their students to teach in tomorrow's classrooms. Rather than wait to see what tomorrow's classroom will be like, they must experiment with the effective application of computer technology for teaching and learning in their own campus practice. Today's teacher candidates will teach tomorrow as they are taught today (pp.2-3).

Some other recent reports support the concept that teacher education programs have a long way to go in technology preparation. For example, the National Center for Education Statistics (U. S. Department of Education, 1999) found that only 20 percent of teachers reported feeling well prepared to integrate educational technology into classroom instruction. The Milken Exchange on Education Technology (1999) and the CEO Forum School Technology and Readiness Report (1999) both conclude that, in general, teacher-training programs do not provide future teachers with the kinds of experiences necessary to prepare them to use technology effectively in their classroom. Recently the International Society for Technology in Education (ISTA, 2000) and NCATE have specified the technology skills that teachers are expected to have as they enter the teaching profession. The state of Pennsylvania, where my college resides, is currently reviewing new Academic Standards for Science and Technology (Pennsylvania Department of Education, 2000), which will also effect what preservice teachers need to know and demonstrated before receiving initial teacher certification. Hopefully these technology standards will serve as a catalyst as well as a blueprint for change in preservice technology instruction. Schools of education must integrate technology into the entire preservice teacher curriculum, faculty must effectively model technology integration and new pedagogic methods in their own courses, and education programs must provide preservice teachers with meaningful field experiences in technology rich settings if we are to meet these new standards. To paraphrase the poet, we in teacher education "have promises to keep, and miles to go before we sleep, and miles to go before we sleep."

References

Albright, M. J. (1986). The instructional improvement function: An approaching imperative in higher education. *Media Management Journal, 5* (1), 21-26.

Bigum, C. (1998). Solutions in search of educational problems: Speaking for computers in schools. *Educational Policy, 12* (5), 586-601.

Brown, D.G. (2000). The low-hanging fruit. *Syllabus, 14* (4), 28.

CEO Forum. (1999). *The CEO forum school technology and readiness report: Professional development – a link to better learning.* [On-line]. Available: http://www.ceoforum.org/reports.cfm

Dede, C. (1998). The scaling-up process for technology-based educational innovations. In C. Dede (Ed.) *Learning With Technology – ASCD 1998 Year Book* (pp. 199-215). Alexandria, VA: Association for Supervision and Curriculum Development.

Dertouzos, M. (1998). The people's computer. *Technology Review, 101* (5), 20.

Drazdowski, T. A. (1996). HyperStudio 3.0 in one hour: A case study book review. *HyperNexus Journal, 6* (4), 28-29.

Drazdowski, T. A. (1997). Multimedia in teacher education: A small college approach. In T. Muldncr & T. Reeves, (Eds.)*Educational Multimedia/Hypermedia and Telecommunications, 1997* (pp.1188-1189). Charlottesville, VA: Association for the Advancement of Computing in Education.

Drazdowski, T. A. (1998). Teaching HyperStudio multimedia: A six-pack of resources. *HyperNexus Journal, 8* (3), 11-13.

Drazdowski, T. A., Holodick, N. A., & Scappaticci, T. A. (1998). Infusing technology into a teacher education program: Three different perspectives. *Journal of Technology and Teacher Education, 6* (2/3), 141-149.

Fullan, M. G. (1996). Turning systemic thinking on its head. *Phi Delta Kappan, 77* (6), 420-423.

Hadley, M. & Sheingold, K. (1993). Commonalities and distinctive patterns in teachers' integration of computers. *American Journal of Education, 10* (3), 261-315.

HyperStudio. [Computer Program]. Torrence, CA: Knowledge Adventure.

HyperStudio Project Resource Kit. [Computer program]. Bloomington, IL: FTC Publishing Group.

iMovie 2. [Computer program]. Cupertino, CA: Apple Computer. Inc.

ISTE. (2000). *National Educational Technology Standards for Teachers.* Eugene, OR: International Society for Technology in Education.

Jonassen, D. H. (1996). *Computers in the classroom: Mindtools for critical thinking.* Englewood Cliffs, NJ: Prentice-Hall, Inc.

Jonassen, D. H., Peck, K. L., & Wilson, B. G. (1999). *Learning with technology: A constructivist perspective.* Upper Saddle River, NJ: Merrill/Prentice Hall.

Lee, J. R. & Johnson, C. (1998). Helping higher education faculty clear instructional technology hurdles. *Educational Technology Review,* (10), 13-17.

Middleton, J. A., Flores, A., & Knaupp, J. (1999). Shopping for technology. *Educational Leadership, 55* (3), 20-23.

Milken Exchange on Education Technology (1999). *Will new teachers be prepared to teach in a digital age? A national survey on information technology in teacher education.* Santa Monica, CA: Milken Family Foundation. [On-line]. Available: http://www.mff.org/edtech/

Milone, M. (2000). Staff development: Getting it right the first time. *Technology & Learning, 21* (2), 58-61.

Month by Month for HyperStudio. [Computer Program]. Torrence, CA: Knowledge Adventure.

National Council for Accreditation of Teacher Education (1997). *Technology and the new professional teacher – Preparing for the 21st century.* Washington, D.C.: National Council for Accreditation of Teacher Education Task Force on Technology. [On-line]. Available: http://www.ncate.org/pubs/m_pubs.htm

Pennsylvania Department of Education. (2000). *Proposed Science and Technology Standards.* Harrisburg, PA: Pennsylvania Department of Education. [On-line]. Available: http://www.pde.psu.edu/standard/stan.html

Pink, W. (1989). Effective development for urban school empowerment. Paper presented at the annual meeting of the American Educational Research Association, San Francisco.

Robinson, B. (1995). Teaching teachers to change: The place of change theory in the technology education of teachers. In J. Willis, B. Robin, & D.A. Willis (Eds.)*Technology and Teacher Education Annual 1995*, (pp.40-45). Charlottesville, VA: Association for the Advancement of Computing in Education.

Selwyn, N. (1999). Why the computer is not dominating schools: A failure of policy or a failure of practice? *Cambridge Journal of Education, 29* (1), 77-91.

Sound Companion for HyperStudio. [Computer program]. Bloomington, IL: FTC Publishing Group.

Strudler, N. B. (1991). Education faculty as change agents: Strategies for integrating technology into teacher education programs. *Journal of Computing in Teacher Education, 8* (2), 5-8.

Tapscott, D. (1999). Educating the net generation. *Educational Leadership, 56* (5), 6-11.

U. S. Congress, Office of Technology Assessment. (1995). *Teachers and technology: Making the connections*. OTA-EHR-616, Washington, DC: U. S. Government Printing Office.

U. S. Department of Education, National Center for Education Statistics (1999). *Teacher quality: A report on the preparation and qualifications of public school teachers*. Washington, D. C.: U. S. Department of Education. [On-line]. Available: http://nces.ed.gov/pubs99/19999080.pdf

WebSave - Archiving the Web for Scholar Work

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Abstract: The WWW provides a variety of scholar information, like theses, studies, etc, which may be valuable basics for further and new scholarly work. Referred information of the WWW has to be archived (at the time of writing) for further usage because Internet resources could be changed. The working prototype *WebSave* - described in this paper - support users in their research process. The advanced and novel system manages relevant information of the WWW by importing bookmark files from common browser clients. The system allows adding a wide range of local metadata, storing the referred resources and generates a literature list. Furthermore, it is capable of interacting with other services like preparation for building a background library on CD ROM, building a document archive using *Hyperwave*, building a scholar dynamic Web library by quality metadata exchange to *xFIND*.

Introduction

More and more information, citations and conclusions in scholar works refer to information on the World Wide Web (WWW). This statement may be confirmed e.g. by observations of scholar works and theses at the Institute for Information processing and Computer supported new Media (IICM) at Graz University of Technology. This applies also to publications and reports of conferences and journals. As a matter of fact the WWW is a large – most likely the largest - information repository. However, there is also the serious problem of changing and moving documents on the Internet. It is well documented that the WWW is a highly dynamic Information repository and a perfect media for a fast publishing process. To get revisable Internet references it is necessary to archive and provide the referred information of the WWW for further usage. This may be backed by different basic studies (archiving information from the Internet) by organisations like National Libraries and further institutions. The consideration results in specific requirements within the archiving process of Internet resources for scientific papers and scholarly works. Therefore, the authors of this paper emphasise that it is necessary to suggest possibilities on assistance for users and institutions within their scholar work to archive cited information from the WWW.

The structure of the remaining chapters is given as follows. The first part of the paper, a survey, discusses in brief the archiving process in a historic view as well as the archiving process of electronic documents in general. The second part describes the prototype implementation of the advanced and novel WebSave tool to archive and administrate Internet resources within the process of scholar works, which is based on the conclusions on the first part of the paper.

The Archiving Process of Web Resources

Basically, the motivation for archiving Web pages is to represent snapshots of society for later retrieval and to preserve knowledge for mankind. Therefore, archiving is a long-term process that never ends. Today, search robots or offline browsing tools are used to collect Web sites and to build local archives. However, such tools do not support the process and the requirements of scholarly work. New interactive systems (e.g. chat facilities) require new efforts to gather such documents. It is quite obvious that the archiving process of objects in history is quite different from the requirements on archiving Web pages today, which is discussed as follows.

Archiving from a Historical Perspective

In history, since about 2500 B. C. archives can be found. *Archiving* is the process of collecting and managing objects with historical background. In general these documents are not prepared for publication (e.g. official documents) and are called dead documents (Weiß 2000), because these documents or objects never change. The term *archiving* describes also the classification of documents by formal methods (e.g. grouping, indexing, etc.). Indexing parameters can be subjects, locations and authors. Result of classification tends to an index summary in a printed and / or electronic version.

Tree different types of the archiving process can be identified: *Archives* stores only important records or documents, which are not publicized but worthwhile to preserve for mankind; *Libraries* archives published (reviewed) documents; *Museums* archive artistic and scientific documents, images, objects, etc. The storage media and the process of archiving are basically in the analogue sphere (Alscher 1999).

Today, the motivation for archiving is the same, but new technologies (for objects to be archived and within the archiving process) have to be regarded. It is to be mentioned that e.g. on the Internet nearly everyone can publish without any quality control, but also huge valuable amounts of research work and technical reports can be discovered for further scholarly work. A deeper discussion of electronic archiving and detected problems are discussed in the following sections.

Electronic Archiving of Information

The term *electronic archiving* (Weiß 2000) is similar to the concept of imaging (the process of digitizing, storage in databases and retrieval). In general, electronic archiving may be the first step to a digital office. Considering the electronic archiving process, it is subdivided into data storage, data retrieval, and data migration. The process of archiving depends on the characteristics of the document (VSA 2000), which can be categorized in different ways: readability - human and / or machine-readable; type of storage media; document type (text, images, videos, music, etc.).

As a special scope, electronic archiving or imaging can also be understood as the preparatory operations to build Web pages and Web archives. That means the Internet can be used to archive valuable information and enables access also by the Internet. On the other hand, information available on the Internet should be archived, which can also be performed by an Internet archive.

It is well documented that the Internet is a huge - maybe the biggest - knowledge repository of mankind. The Internet offers a cheap and simple way to publish documents without nearly any restrictions. Because of this, the Internet is a disordered, decentralized and mostly not censored worldwide library. It is well known that humans have produced more information since 1945 as in the whole history before. The increase of knowledge is estimated to be exponential. Therefore Internet archives also have to process increasing amounts of data.

Following the idea of archiving (process of collecting and managing), different types of already existing Web archiving methods can be identified like: (1) link collections (e.g. annotated link lists), (2) search engines (e.g. full-text index and document cache), (3) data collections (e.g. ftp) and finally (4) Web archives. All these types provide similar viewing techniques and hierarchical data structures. One advantage of Web archiving methods is the ability of systematic access, which can be performed simultaneously and from different places. Considering the development of mobile communication, this will be increasingly important. The storage is cost effective in relation to the quantity of data. The information can be requested in *real time*. However, one of the main disadvantages is the dynamics and malleability of Internet resources. In addition, information depends on the context, which means that a bit sequence can be interpreted in different ways (digital codes). It is absolutely necessary to use a tool (computer, PDA, etc.) reading and understanding a digital code. Thus, the representation the information depends on the used hardware and software. Because of changing technology over the years, data must be copied to other storage media keeping the information safe (migration). Furthermore, today common transformation rates cause problems related to media objects (video, sound, etc.) performed by remote requests. To sum up, the demands on future archiving systems consist of standardized retrieval interfaces, standardized storage formats and specially standardized document formats. Detected Problems, as followed, has to be considered.

Detected Problems

Some problems related to electronic archiving (focused on Web archives) can be identified as follows:

Information overflow and duplicates: The digitizing of pictures, sound and music data, videos and films produce a huge amount of information. Most of this information should be archived at least for years or even forever. There exist many copies of the same documents at different places.

Information malleability: Information of electronic documents, especially Web resources, could be highly dynamic, and location of documents could be changed or even be deleted. E.g. the average live span of a Web page is about 75 days (Kahle 1996).

Migration and Lifetime of Documents: The capacity of storage media has been increased in the last ten years about hundred times. The transfer rate increases only four times in the same period (Phelps et all. 2000). The result is that the entire set of data cannot be copied in acceptable time. Migration is the process of storing documents permanently. This includes periodical copying into new system environments. Thus, metadata has to be transferred and in general the documents must be converted into a new document format. Parts of information may be lost (VSA 2000).

Access Rights: When people buy a printed journal, they never lose the access right and the content cannot be changed. Online journals can change ownership and therefore the copyright could be changed and the access right will be lost. No one knows how long and who should manage user data concerning access rights.

Related Work and Concluded Requirements

The following paragraphs are focusing especially on archiving Internet resources. Few organizations can be identified, which archive country-specific information. The mentors of these projects are national libraries and governments. They define specific guidelines about registration and documents that have to be archived. Furthermore, single initiatives of public or commercial organizations can also be identified, which effort to archive the entire Internet. A selection of examples is discussed as follows.

EPPP (Electronic Publication Pilot Project) is a project of the National Library of Canada. It has been founded in the time of June 1994 to July 1995. They decided to use the WWW as the primary gateway to access electronic publications. Collection guidelines define that archived documents must be published in Canada, sponsored or produced by a Canadian company (see EPPP 1996).

The *PANDORA* project of the National Library of Australia (NLA) may provide long term access to significant Australian online publications for national preservation. The usage of metadata based on Dublin Core attributes improves the searching process. The online publications are categorized in monographs, serials, home pages and ephemera. The NLA cooperates with other Australian libraries to ensure that there is no duplication of archive materials (see NLA 1997).

ETEXT: Paul Southworth founded the ETEXT archives in the summer of 1992. The project was started in response to the lack of organized archiving of political documents and discussions disseminated via Usenet on newsgroups. In the last five years three GB of mostly ASCII text are stored (see http://www.etext.org).

PURL: The PURL (Persistent URL) service provides an archive server solution avoiding the "*404 page not found*" error. A PURL is like an URL and associates the PURL with the actual URL and returns that URL to the client. The client can then complete the URL transaction in the normal way. PURL's are the result of OCLC's URN (Uniform Resource Name) standard and library cataloguing communities (see Shafer et all. 1996).

The *Internet Archive (IA)* is an association, which collects and stores materials from the public Internet (WWW, Gopher, Newsgroups, FTP). Any Web page that uses CGI requests or needs to authentificate to get access is blocked by the gathering procedure. The archive is not yet publicly available but provides free access to researchers, historians and scholars. The IA archive size is about 14 TB (mostly Web sites) since 1996 to the time of writing this paper (see http://www.archive.org).

Alexa: Alexa is a free Web Navigation Service that gives a public access to the IA and rates Web sites of IA. The navigation tool works with common Web browsers. Information about the page recently visited are available (related links, quality, traffic, actuality, etc.). Alexa provides a "*non-dead link*" service by offering archived pages of IA (see http://www.alexa.com).

Google: Google is a fast search engine which uses the patented PageRank™ – technology. PageRank counts incoming links to a document and assesses also outgoing links. "*Google stores many web pages in its cache to retrieve for you as a back-up in case the page's server temporarily fails*" (see http://www.google.com).

Offline browser: Offline browser tools gather single HTML pages or structures including embedded objects (images, scripts, audio and video files). Such systems follow the idea that reading takes much more time than to replicate the pages. Thus, the reading process can be done offline. Examples of free tools are WebStripper™ (see http://webstripper.net) and WebCopier (see http://www.maximumsoft.com.)

Based on the survey (see above) and the related work (stated so far), the authors of this paper propose a solution in the field of scholarly work. Existing commercial and non-commercial mirroring tools provide only offline browsing on the local file system. Furthermore, online archiving systems cannot guarantee that documents of interest are archived. Therefore, the proposed scholarly solution follows a different idea. Users have to be supported in the process of collecting relevant information from the WWW or Internet by less or even no further effort. In addition, they have to be supported to manage these resources and enabled to enrich these resources with remarks, quality metadata, etc. Because of the human effort within the process for discovering *good* and *relevant* information, such resources and its meta-information should also be provided other users, research teams, scholar organisations and Internet communities for further research. Based on the results stated so far, the *WebSave tool* was designed, which is discussed in the following Chapter.

The WebSave Tool

On a glance, the *WebSave* tool is a Java based prototype implementation, which supports users at their research process within the scholar sphere. Unlike existing offline browsing tools, the advanced and novel system manages relevant information of the WWW by importing bookmark files from common browser clients. First, the users' view of the WebSave tool is discussed, followed by brief information of the administrators' view and the cooperation with the xFIND system. A more detailed discussion of the archiving of resources in electronic media and a detailed description of the WebSave tool can be found in Lackner (2000).

Simply by using a common Web client, interesting links can easily be collected as *bookmarks* placed in particular folders. Different folders can be assigned to different projects or chapters of scholarly works. The WebSave tool imports these *link collections* and supports the user to manage these resources. In addition, any of these projects can be titled and described in an abstract by additional attributes. It should be noted that also incremental updates from the bookmark list could be performed. That means that users can search for relevant information on the WWW, set bookmarks and finally import the bookmark information in the WebSave environment. Within another session, further relevant information can be added to the corresponding bookmark folder and incremental imported. Because of the short life of Web sites, it is recommended to gather the documents of interest within some days (at the time of writing a paper).

WebSave append additional information (WebSave system information and metadata) to the imported bookmarks. System information is e.g. identifier, last visit time, last modification time, etc. Metadata are e.g. notations as well as quality metadata (xQMS), etc. The xQMS (xFIND quality metadata scheme) consists of descriptive (e.g. subject domain, etc.) and evaluative (e.g. authority, target audience, etc.) quality metadata. xQMS is developed by the xFIND group (http://xfind.iicm.edu) and described in detail in Weitzer (2000). In addition, the WebSave tool provides literature entries of the resources by compiling reference identifiers, the reference descriptions (author, organisation, year of publication, title, version), the time of last visit and finally the time of the saving process (see also below).

Furthermore, the resources can be gathered and locally stored on the file system. That means that a relevant bookmark imported by WebSave refers to a document available as HTML with embedded graphics, scripts, applets, etc. The tool stores the HTML files as well as the embedded objects. The WebSave tool manages several projects for any user and allows the cooperation of users. After finishing a project the literature list can generated automatically by the system. Furthermore, WebSave generates an HTML version of the list of literature and prepares links to the local (cached) Internet resources. WebSave supports the preparation of the Internet resources and its metadata for a CD-ROM production. The HTML reproductions of a project comprise the project abstract, summary, reference list including links to local stored sources as well as links to the original Internet sources. Users who are finishing diploma theses can also provide an electronic version of their work and in addition provide local (saved) versions of referred Internet resources (CD-ROM version of the work).

WebSave allows the usage by more than one user. All data are stored in a subfolder of a predefined network directory. The subfolder contains the entire set of user data (personal data, project data, etc.), which can be managed by the user and administrators. Within any subfolder, Web resources are stored also project dependent and managed in the original hierarchy. Also the embedded objects of HTML files are mirrored within the same structure if these objects are located on the same origin then the HTML files. It is to be mentioned that duplications of objects are enabled, because in different projects different version of objects can occur.

The WebSave administrator view provides more options. Administrators can admin a group of user (e.g. a. course, a research group, a research institution, etc.) by adding, editing and removing user records. Administrators are enabled to collect user folders or user projects building a scholarly knowledge pool. An HTML reproduction of the knowledge pool can be built to place them at the disposal of an institution library (e.g. CD-ROM, Intranet, etc.). They also allowed to evaluate, edit and add xQMS metadata (Fig. 1). In addition, they can prepare the repository to render them searchable by the xFIND search system (see below).

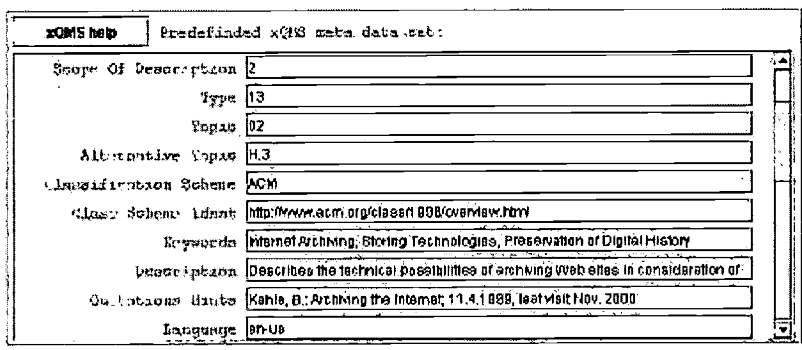

Figure 1. Web resource metadata editing form

As already stated above, discovering relevant information causes substantial human effort (a scientist looks up to 100 documents before finding a relevant one). Because of that, *good* and *relevant* information as well as additional information (descriptive and evaluative quality metadata) should also be archived and provided for further scholarly works by users, organisations and communities. In addition, these (local) metadata have to be used to improve the retrieval process of the resources. A possible solution meeting this requirement is the novel xFIND (extended Framework for Information Discovery) system (see xFIND 2000), which can build an index of the local Internet resources. Furthermore, the system combines the full-text index of the resources with the quality metadata and allows an improved search process (e.g. looking for a peer reviewed paper containing the phrase "*web based training*" in the full-text). In addition, the system also allows to index the original sources and to track changes of the resources. In a further version, a notification (e.g. user who referred the Web resource) will be performed. The human-created metadata (provided by the WebSave tool) and the computer-automated information (processed by the xFIND system) of the resources represent a helpful and growing information repository based of references of scholarly works. The idea follows the strategy of causing little effort by any individual within their research process (e.g. working on a paper), and accumulated output (a big background library of distributed Web resources and valuable metadata for the retrieval process) for the scholar communities or mankind. It is worth mentioning that the aim of the xFIND system is to build up a distributed, huge knowledge management system for Web resources enriched with descriptive and evaluative metadata.

Current and Future Work

Current work is going on to develop an interface layer for data exchange between the xFIND system and the WebSave tool. As a future work, in addition to local archiving of Web resources, an interface for an online document archiving system will be implemented. The first prototype implementation will be done on a Hyperwave Information Server (see http://www.hyperwave.com), which supports versioning and an advanced rights management. Thus, new relevant information of Web resources provided by the WebSave tool is transmitted to the xFIND system. The later system gathers the new documents and renders the full-text as well as the additional metadata searchable. In addition a document repository is requested to archive the Web resource. If the xFIND system detect any changes of the document, the document archiving system will be informed to archive also the new version.

Conclusion

It is obvious that increasingly Web resources are cited in scholar works. However, the problem of changing and removing of these resources requires solutions to preserve this referred information for further access. The WebSave tool in combination to the xFIND system is a possible solution to counteract the shortcomings stated so far. First experiences by the usage of students have shown that the tool will support their scholarly work preparing studies and diploma theses. The preservation of valuable Web resources and the enrichment of quality metadata allow to build up a growing scholarly knowledge repository, which supports further scholarly work. The xFIND system can be perfectly used to renders such repository searchable and provides an interface to the original sources and tracks changes of them.

References

Alscher, H. J. (1999). Organisation und Geschichte des Bibliothekswesen; May 1999, last visit Nov. 2000 http://sites.netscape.net/hansjoachimalscher/BIBLKURS/biblorg.htm

EPPP (1996). Electronic Publications Pilot Project, Summary of the Final Report, National Library of Canada, 07.05.96, last visit Nov. 2000. http://www.nlc-bnc.ca/pubs/abs/eppp/esumreport.htm

Kahle, B. (1996). Archiving the Internet; 11. Apr. 1999, last visit Nov. 2000. http://www.archive.org/sciam_article.html

Lackner, W. (2000). Archiving the Web for Scholar Work, IICM TU-Graz Austria, Okt. 2000, last visit Nov. 2000. http://www2.iicm.edu/cguetl/education/projects/WebSave

NLA (1997). National library of Australia: Jasmine Cameron. PANDORA - Preserving and Accessing Networked DOcumentary Resources of Australia, Review of progress to June 1997; 7. Dec. 1999, last visit July 2000. http://www.nla.gov.au/policy/pandje97.html

Phelps, A., T. & Wilensky R. (2000). Division of Computer Science; University of California, Berkeley, Robust Hyperlinks Cost Just Five Words Each, UCB Computer Science Technical Report UCB//CSD-00-1091. 10. Jan. 2000, last visit Nov. 2000. http://http.cs.berkeley.edu/~wilensky/robust-hyperlinks.html

Shafer, K. & Weibel, S. & Jul, E. & Fausey, J. (1996). OCLC, Online Computer Library Center, Introduction to Persistent Uniform Resource Locators; last visit Nov. 2000. http://www.isoc.org/inet96/proceedings/a4/a4_1.htm

VSA (1999). Verein Schweizerischer Archivarinnen und Archivare: Archivieren im Informationszeitalter; last printed version: 1.0, 31. Mar. 1999, online version: 1.0.4, 26. Apr. 1999, last visit Nov. 2000. http://www.staluzern.ch/vsa/ag_aea/dok/Basisdokument_d.html

Weiß D. (2000). Informationen über elektronische Archivierung. Archiv & Workflow; 26. Mar. 2000, last visit Nov. 2000. http://www.dr-weiss.com/archiv01.htm

Weitzer J. (2000). Verwendung von Qualitäts-Metadaten zur verbesserten Wissensauffindung und Testimplementierung im xFIND System, IICM TU-Graz Austria, 31. Mar. 2000, last visit Nov. 2000. http://www2.iicm.edu/cguetl/education/thesis/jweitzer

XFIND (2000). The Official xFIND Homepage. IICM TU-Graz Austria, last visit Nov. 2000. http://xfind.iicm.edu

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iMovie and Educators: the Right Partnership for Making Digital Movies

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The use of digital video and video desktop applications is spreading. So is the word about the ease of use of iMovie, the Macintosh software, used for creating finished digital video products. IMovie is a digital video editing application to help beginning users create digital movies from existing digital video footage. Beginning moviemakers can transfer clips from their digital camcorders, edit and arrange them into stories, add transitions, animated on-screen titles and publish them to the web.

The main focus of this interactive session, organized by a group of Apple Distinguished Educators (ADE), is to demonstrate the ease of use of this Macintosh application in the creation of digital videos in education. The demonstration would include:

- Transferring video from a dv camera into iMovie on the computer
- Demonstrating the digital video editing process
- Adding transitions and titles
- Adding narration, music and sound to the video track
- Transferring digital video back to tape

Digital video cameras, PowerBook's and iBooks will be available to session participants so that, in small groups, they can try some of the demonstrated techniques with sample video/audio files provided during the presentation. New and experienced users will find value in exploring the software and in seeing the examples of how iMovie is used.

Following this hands-on experience presenters will share examples of how iMovie and digital video are integrated into the educational arena. Examples will include projects created by K12 students and current practitioners as well as examples of efforts to improve technology experiences in pre-service and graduate teacher education. Participants will see examples from teacher credential students and early education teacher iMovies. Creating these clips can serve as a teacher tool as well as an opportunity for student involvement in the process. Presenters discuss the ways in which digital video's importance as an instructional tool can be demonstrated through its use in improving student learning by expanding the skills of emerging teachers. It is one example of a tool that allows faculty to focus on the critical need for teacher preparation reform to effectively use technology. As the ability to 'read' and plan visual communication becomes more and more important in students' lives, these tools help teachers to provide the needed skills in an authentic experience. There will also be opportunity to discuss the organization of workshops for helping new users of iMovie.

Creating Multimedia Web Sites in a Flash

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Abstract The challenge of developing engaging, interactive webs site has spawned a variety of technologies including Java, ActiveX, Shockwave and Flash. Those teaching educational technology courses that include some web design are finding that they need to incorporate some of these technologies in their courses. The purpose of this paper is to present an overview of Macromedia's Flash, one of the most popular tools used in creating multimedia web presentations. Flash is a program that allows users to easily create full-scale interactive multimedia splash pages that can be delivered over the web (DelRossi, 2000) and allows both professional and amateur Web site designers to deliver fast interactive web pages even over slow modem connections.

Introduction

This session will provide an overview of how to use Macromedia's Flash to develop engaging, interactive web sites. Flash makes it possible to develop fully animated web pages that allow learners to discover concepts that are not readily accessible on pages in a textbook or on static web pages. Educators can use Flash to create sophisticated presentations for the Web. For example, animation can be used to show water flowing into a beaker or to show shapes dividing to illustrate the concept of halves. With the help of Flash, web sites can contain interactive timelines and maps. Today's teachers need to be trained how to create educational Web sites where users are able to interact with the information. Davitt (2000) states, "the use of Flash and other interactive animation software as a visual thinking tool looks set to take off in schools." The session will provide a discussion of the advantages and disadvantages of Flash and provide participants with specific examples.

Flash makes it possible to develop fully animated web pages that allow learners to discover concepts that are not readily accessible on pages in a textbook or on static web pages. Educators can use Flash to create sophisticated presentations for the Web. Animation can bc uscd to show watcr flowing into a beaker or to show shapes dividing to get across the concept of fractions. With the help of Flash, web sites can contain interactive timelines and maps. Today's teachers need to be trained how to create educational Web sites where users are able to interact with the information. Davitt (2000) states, "the use of Flash and other interactive animation software as a visual thinking tool looks set to take off in schools."

For example, the School Board of Palm Beach County, Florida has adopted Macromedia Dreamweaver as the standard authoring software for all Palm Beach County schools to use for Web page development. A majority of the schools have purchased the software in a bundled educational package that also includes Flash and Fireworks. The teachers have this software at their fingertips, and the county is offering free training that grant in-service points. Other counties are sure to follow in their footsteps.

The basic paradigm used to develop Flash applications is similar to other Macromedia development tools like Director and Premier. Flash applications, called movies, can include animations, buttons, pictures, sound, and text. Flash allows users to create interactive web sites with little or no computer programming. In working with Flash, you create a movie by drawing or importing artwork, arranging it on the stage, and animating it on a timeline. You make the movie interactive by making its objects respond to events and to change in specified ways. When the movie is complete, you can export it as a Flash Player movie, embed it within an HTML page, and transfer it and the HTML page to a Web server. The session will discuss some of the advantages and disadvantages of developing interactive, multimedia web sites with Flash. Topics will include vector versus bitmapped graphics, animation techniques, the Flash interface, and scripting and other features of Flash.

Vector graphics Versus Bitmap Graphics

To optimize graphics for transmission on the Internet, Flash uses vector graphics wherever practical. Because vector graphics represent the images as a series of mathematical formulas rather that storing information on each pixel, they tend to be much smaller files. Smaller files, of course, are essential in any technology delivered over the web.

Animation techniques

The basic animation technique used by Flash is page flipping. Page flipping works by simply placing an object on a background, taking a "snapshot" of the scene, moving the object slightly, and taking another "snapshot." This process continues until the animation is complete. By rapidly "flipping" these pages, the object appears to move across the background. Flash also allows you to designate a starting point and an ending point, and Flash fills in the frames between. This process is called, descriptively enough, tweening. Using tweening, you can even specify a specific path that the graphic object will follow. This section of the paper will give specific details of how Flash implements animation including several screen shots.

Interface

The Flash interface will be familiar to users of other Macromedia's multimedia development products like Premier and Director. The metaphor is "making a movie" and Flash applications have scenes, frames and a stage. Objects are placed on the stage at various points along a timeline. This section will describe the process of developing a simple Flash Movie.

Scripting

While it is possible to develop fairly sophisticated Flash movies without doing any computer programming, Flash does support its own simple programming language called ActionScript. ActionScript is really more of a scripting language that a programming language, so it works more likes creating a macro than writing a computer program. Stringing a few basic commands together lets you add more complex interactivity to a web project (Price, 2000). Flash also makes it easy to create a fill-in form on a web site. Flash associates every editable text field with a variable containing the value currently entered in the field. You can pass the variables between Flash movies and CGI scripts (Long, 1999). This allows you to interact with user input.

Advantages of Using Flash

Flash provides a user-friendly environment that allows the user to develop high quality vector graphics. The resulting Flash movie is a compact file that has been optimized for Internet delivery. Flash movies scale to the viewer's screen size without increasing the file size or deteriorating the graphic quality. The smaller files mean less memory requirements and faster download times. Also you can export Flash movies to QuickTime or import QuickTime files (Price, 2000).

The Flash graphical user interface allows the designer to easily include interactive elements, multimedia, and hypertext links. Flash animated vector graphics are superior to any GIF animation - the file sizes are smaller and they can be changed as easily as any vector graphic). Flash makes it easy to create graphics react to the visitor's actions, creating multimedia Web interfaces to add sound, transparencies, and color blends (Teague, 1998).

Conclusion

Macromedia's Flash program is a significant technology for developing interactive, multimedia web sites that can be used to develop educational applications. As leaders in the field of Learning and Instructional Technology, it is important to keep abreast of such new technologies.

References

Davitt, John. (2000, May 16). Website Design: Website 4: Digital Philanthropy. The Guardian.

DelRossi, Robert A. (1997, June 23). Create Pages in a Flash with Macromedia Program. InfoWorld, 19, p. 88.

Long, Ben. (1999, October). Flash 4. Macromedia's Web Authoring Package. MacWorld, 16, p. 35.

Price, Richard. (2000, May 2). Upgrade is a Flash Creation. The Australian, p. C11.

Teague, Jason Cranford. (1998, July 27). Network: Superior Web Graphics in a Flash, Independent, p. 13. Online. Electric Library. 25 July 2000.

Using CD-ROM to Guide the Development of Professional Portfolios

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Abstract: This article presents a description and evaluation of a multimedia CD-ROM project, "Developing Your Professional Portfolio for Internship and Beyond, First Edition". It includes feedback from pre-service teachers who used the CD-ROM disk to help prepare their professional portfolios during internship. With the help of the CD-ROM, pre-service teachers developed portfolios that displayed their mastery of Florida's Pre-professional Accomplished Practices, including the use of educational technologies to facilitate student achievement of Florida's Sunshine State Standards. Contained on the CD-ROM disk are examples of electronic and multimedia portfolios.

Introduction

The College of Education and Human Services at the University of North Florida (UNF) has established a pre-service teacher education program that emphasizes portfolio assessment and clinical experiences in school classrooms. At UNF portfolio assessment is defined as the practice of collecting data to make decisions on the progress of pre-service teachers as they develop their understanding of teaching and acquire skill in facilitating student learning. Clinical education is the organized and supervised program of school-based teaching and learning experiences that serves to gradually induct pre-service teachers into the profession of teaching.

This article presents a description and an evaluation of a CD-ROM project titled "Developing Your Professional Portfolio for Internship and Beyond, First Edition". During the past year the CD-ROM disk was field-tested. Feedback on its usefulness was received from pre-service teachers, supervising professors, and education personnel at teacher education institutions across the USA and abroad.

Portfolio Assessment and Clinical Experiences at UNF

The teacher education program of the College of Education and Human Services at the University of North Florida (UNF) prepares professional teachers to effectively participate in diverse and evolving learning communities. The program emphasizes structured clinical experiences in school settings. The evaluation of these experiences by UNF personnel is accomplished through a portfolio assessment process carefully designed and supervised by the faculty.

In the freshman year pre-service teachers complete their first portfolio for EDF 1005 - Introduction to Education. Details of the requirements for their portfolios are contained in the course syllabus. The 18-hour clinical education component of the course provides opportunities to link the applications of their learning with actual classroom experiences with students in school settings. In the sophomore year students complete EME 2040 – Introduction to Educational Technology. A portfolio of technology products linked to teaching tasks is required. Details of the course requirements are contained in the course syllabus.

During the completion of 100 hours of clinical experience through two, two semester hour field laboratory courses, pre-service teachers prepare working portfolios through which they document their work with students in classroom settings. These working portfolios contain collections of carefully selected documents used to portray their professional growth. (Boulware and Holt, 1998) Details of the requirements for the courses are contained in the course syllabi.

The culminating experience of the teacher education program is a sixteen-week internship during which pre-service teachers produce their professional portfolios. These portfolios are a selective and streamlined collection of teaching and learning materials that include a documentation of their mastery of Florida's 12 Pre-professional Accomplished Practices. (Florida Education Standards Commission, 1996) Details of the requirements for internship and the portfolio assessment process are contained the internship handbook.

Professional Portfolio Literature

During the past few years an interest in portfolio development for teacher education has gained considerable momentum. There are several excellent books and articles that provide comprehensive information on the current state-of-the-art of portfolio development.

Campbell, Melenyzer, Nettles and Wyman (2001) provide helpful details to pre-service teachers for developing their portfolios. They state that the creation of portfolios is an authentic and holistic way to illustrate the developing professional competence of pre-service teachers. They found that portfolio development enables pre-service teachers to chart their own professional growth while following step-by-step procedures. In another publication (2000), the authors provide information for teacher educators on the portfolio development process. The critical elements of a well-designed portfolio assessment system are defined and illustrated. The authors provide directions to link performance assessment tasks to adopted state and national standards for success in professional education while making them faithful to real-life teaching. They provide specific help with the design and use of portfolio rubrics to assess the performance of pre-service teachers.

Farr and Tone (1998) provide a multitude of illustrations and helpful information on portfolio and performance assessment for improving teaching and learning in the school classroom. The authors define portfolio assessment as "the practice of saving lots of things that a student creates so that the student and the teacher can look at the collection and see how the student is doing" (p. 11). Portfolios are viewed as collections "organized in such a way as to reflect, promote, and report a considerable amount of thinking that students have applied to the contents in them" (p. 11). They believe that portfolios should "inform the teacher about the student's progress as a thinker and language user, while indicating how effective the instruction has been and what additional instructional emphases are needed" (p. 11).

Cole, Ryan, Kick and Mathies (2000) provide definitions, strategies and details on the uses of portfolios and electronic portfolios across the teacher education curriculum. They define and describe a variety of useful tools for incorporating educational technology into college teaching and learning. They note, "bringing the learning process alive and using portfolios to document the products of this process requires various technologies" (p. 53). They suggest teacher educators consider the incorporation of the following with their use of computers in education: Local and wide area networks; servers; school networks; on-line databases; global educational networks; optical media; laser discs; Zip and Jaz cartridges; CD-ROM disks; scanners; digital still cameras and camcorders; and multimedia software.

Barrett (2000) defines several categories for the evolution of electronic portfolios and provides a conceptual framework for thinking about their development. She describes two bodies of professional literature that define the process for developing electronic teaching portfolios to support long-term professional growth: The multimedia development process and the portfolio development process. She illustrates levels of technology for developing electronic portfolios that are appropriate at each stage of the professional development of teachers.

Read and Cafolla (1999) provide an extensive review of the portfolio literature. They base their portfolio assessment work on a constructivist theory of learning which "views the learner as actively engaged in the construction of his or her own representations of knowledge" (p. 98). They found that the process of creating professional portfolios requires pre-service teachers to "engage in self-reflection as they select performance items for their portfolios" (p. 99). The authors view the production of portfolios as a means for pre-service teachers to provide evidence that they have met national and state professional education standards. They found that standardized and criterion-referenced tests fail to fully reflect the actual learning that takes place during instruction in teacher education. They describe the computer software and hardware used for the successful production of multimedia portfolios in their pre-service teacher education program.

Hartwell-Young and Mouriss (1999) offer help to teacher educators interested in digital portfolio development. The purpose of their textbook is to help teachers learn how to use multimedia to describe their unique teaching and learning experiences and to reflect on how they grow and develop their professional life. The textbook is designed to help teachers "understand ways in which technology can assist them to record and communicate their professional achievements, and how they can share what they have learned with students to help them unlock the secrets of multimedia" (p. 3).

Holt and McAllister (1999) provide a research-base for their work with electronic portfolios. They describe the implementation and evaluation of a five-year project with electronic portfolios for pre-service teachers linked to the electronic folders of their students. They provide details on how computer software for language arts, mathematics, and science was successfully employed in school-based professional development classrooms through collaboration between a school district, university teacher education program, and business partners.

CD-ROM Development

Read/write compact disk technology, commonly called CD-ROM was selected because of its effectiveness as a means for presenting the multimedia needed to accomplish the teaching and learning outcomes of the project. CD-ROM enabled the author to include computer graphics, digital video, photographs, recorded sound, scanned documents and text as integral parts of the learning product. The media also provided a means to illustrate a large number of examples that included samples of electronic and multimedia portfolios.

The computer hardware and software used in the production of the CD-ROM included a powerful multimedia personal computer with large RAM and hard drive equipped with stereo sound; read/write CD-ROM recorder/player; digital capture card; color scanner; digital still camera; camcorder; video capture card to convert analog video from a video camera or VCR to compressed video for storage; large storage devices for graphics, sound and video, including an Iomega Zip drive (Iomega, 1998); software to accompany the hardware, including Photoshop (Adobe, 1998); and software for pre- and post-production digital design. The student documents were created in Word (Microsoft, 1998) and the CD-ROM was created in Director 7 (Macromedia, 1998).

The author was responsible for planning the project, including the overall design, script and budget. Help was contracted to complete the storyboard, graphics, audio, video and related production work.

Findings

During the 1999-2000 academic year pre-service teachers used the CD-ROM disk during their internship semester along with other materials to complete their professional portfolios. They completed a feedback form by answering five questions. The results are summarized below.

A. What were the key concepts you learned from this CD-ROM?

How to display mastery of the 12 Florida Pre-Professional Accomplished Practices; The value of educational technology as a means for illustrating the contents of a portfolio; Ways to include educational technology in teaching and learning; The ease of preparing a portfolio; Becoming aware that portfolios help provide prospective employers with a clear view of teaching skills; Ways to provide reasons for the selection of portfolio artifacts; Professional portfolios do not have to look the same.

B. What did you find most useful/meaningful in this CD-ROM?

A better understanding of accomplished practices and the criteria for their documentation; Attractive and interesting artifacts, including bulletin boards, unit and lesson plans, photographs and video clips; Being able to print any page contained on the CD-ROM disk; Receiving a personal copy of the CD-ROM disk so that it could be viewed when convenient; Viewing portfolio examples which were direct and to the point, without a lot of extraneous material; Reasons why portfolios are necessary for professional growth and development; Viewing different approaches to portfolio development; How to write a resume and develop a PowerPoint presentation; Sample video segments on various topics, such as a personal teaching philosophy and classroom management plans.

C. What would make this CD-ROM even more useful/meaningful?

Add more detail on navigating through individual accomplished practices; Refine the back buttons; Add more video episodes of classroom teaching; Include additional artifacts illustrating the accomplished practices; Make the CD-ROM disk cross-platform for both the PC and Macintosh computers.

D. What ideas or information will you apply?

Incorporate lots of educational technology into the professional portfolio; Use the CD-ROM disk as a reference guide while building the professional portfolio; Include videotaped examples of classroom teaching to document teaching skills and learning outcomes; Incorporate ideas found in the table of contents from the sample portfolios as an organizational structure for the professional portfolio; Include student electronic folders to illustrate knowledge gained from instruction; Develop a personal CD-ROM portfolio from the professional portfolio.

E. What additional comments do you have?

The CD-ROM disk helps with the preparation of a professional portfolio; Learning how to develop a professional portfolio and incorporate good video clips is good preparation for the process of preparing for National Board Certification of teaching. The CD-ROM disk helps relieve anxiety about the task of developing a professional portfolio by providing model examples to clarify the expectations for doing the assignment.

Summary

CD-ROM technology can help pre-service teachers with the production of their professional portfolios. Through the uses of multimedia, pre-service teachers were able to learn that portfolios are a natural way to document their professional growth and development during internship and throughout their teaching careers.

References

Barrett, H. (2000). Electronic teaching portfolios: Multimedia skills + Portfolio development = Powerful professional development. *Proceedings of SITE 2000,* (February), 1111-1116. (http://transition.alaska.edu/www/portfolios.html)

Boulware, Z. & Holt, D. (1998). Using CD-ROM technology with preservice teachers to develop portfolios. In S. Charp (Ed.) *Technological Horizons in Education Journal*, 26 (2), 60-62.

Campbell, D., Cignetti, P. B., Melenyzer, B., Nettles, D., and Wyman, Jr., R. (2001). *How to develop a professional portfolio: A manual for teacher (Second edition).* Needham Heights, MA: Allyn & Bacon Publishers.

Campbell, D., Melenyzer, B., Nettles, D., & Wyman, R. (2000). *Portfolio and performance assessment in teacher education.* Needham Heights, MA: Allyn & Bacon Publishers.

Cole, D., Ryan, C., Mathies, B., & Clemens, R. (1999). Professional development of students via the electronic portfolio: Impact on learning. Paper presented at the 10th International Conference on College Teaching and Learning. Jacksonville, FL.

Cole, D. Ryan, C., Kick, F., & Mathies, B. (2000). *Portfolios across the curriculum and beyond (Second edition).* Thousand Oaks, CA: Corwin Press, Inc.

Cushman, K. (June, 1999). Educators making portfolios; First results from National School Reform faculty. In *Phi Delta Kappa*, 80 (10), 744-750.

Farr, R. & Tone B. (1998). *Portfolio and performance assessment: Helping students evaluate their progress as readers and writers (Second edition).* Orlando, FL: Harcourt Brace College Publishers.

Florida Education Standards Commission (1996). Accomplished, professional, and pre-professional competencies for teachers of the twenty-first century. Florida Department of Education, Tallahassee, FL., 1-31 (http://coe.fgcu.edu/Faculty/Honeychurch/ap/apindex.htm)

Hartnell-Young, E., & Morriss, M. (1999) *Digital professional portfolios for change.* Arlington Heights, IL: Skylight Training and Publishing, Inc.

Holt, D. and McAllister, P. (1999) Lone Star 2000: Technology for today. *Proceedings of SITE 99* (March), 1029-34. (http://www.unf.edu~dholt)

Read, D. & Cafolla, R. (1999). Multimedia portfolios for preservice teachers: From theory to practicc. In J. Willis and D. A. Willis (Eds.) *Journal of Technology and Teacher Education*, 7 (2), 97-113.

Reeves, T. C. (1992). Evaluating schools infused with technology. *Education and Urban Society.* Sage Publications, Inc., 24 (4), 519-534.

Salvia, J. & Ysseldyke, J. E. (1998). *Assessment*: Chapter 13 Performance and portfolio assessment. Boston, MA: Houghton Mifflin Company, 266-295.

State of Florida, Department of State (1996). PreK-12 sunshine state standards and instructional practices. Tallahassee, FL. (www.firn.edu/doe/menu/sss.htm).

Wigle, S. & White, G.T. (Fall, 1998) Conceptual frameworks, portfolio assessment and faculty mentoring: Bridges to standards-based teacher education programs. In D. L, Jones (Ed). *Action in Teacher Education*, 20 (3), 39-49.

Software Sources

Adobe Systems Incorporated, 345 Park Avenue, San Jose, CA 05110-2704. Available online [http://www.adobe.com]

International Business Machines Corporation, New Orchard Road, Armonk, NY 10504. Available online [http://www.ibm.com]

Iomega Corporation, 1821 West Iomega Way, Roy, UT 84067. Available online [http://www.iomega.com]

Macromedia, Incorporated, 600 Townsend Street, San Francisco, CA 94103. Available online [http://www.macromedia.com]

Microsoft Corporation, One Microsoft Way, Redmond, Washington 98052-6399. Available online [http://www.microsoft.com]

Multi-agent system for supporting cooperative learning

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Abstract: Over the last several years there has been significant progress in techniques for creating autonomous agent, i.e, systems that are capable of performing tasks and achieving goals in complex and dynamic environments. In this paper we presente the architecture of the system SACA(Système d'Apprentissage Cooperétif basé sur le modèle d'Agent). Which is a multi-agent system to support cooperative learning.
In this system, the agent is modelled in terms of their capabilities and mental states. This system is composed of a set of agents(human and artificial). We present here its main features.

1. Agent Model :

Shoham proposes an agent architecture in which each agent possesses the concept of mental state(e.g. belief, intention, obligation) as an internal expression(Shoham 1993). Also, the agents in GRACILE have already been designed adopting the framework proposed by Shoham (Ayala & Yano 1995). To design and construct an agent model, we reffered to their view of an agent model.
For us, an agent consistes of a knowledge base wich includes beliefs and commitments to itself and to other agents, a set of function modules that constitute the agent's capabilities, a communication module in order to communicate with other agents and a reasonning module for updating the mental state/commitments of the agent.

2. Architecture of SACA :

SACA is composed of a set of agents (human agent and artificial agent). The human agents are: Learner agent, Author agent and Formative agent. The artificial agents are: Tutor agent, Domain agent and Evaluator agent. Artificial agents are cognitive agents.

1. *Domain agent* : allows to represent the matter to be teached. This matter is organised on educational objectives related by a « prerequest » relations(Lafifi & Bensebaa 2000).
2. *Tutor agent* : orients the learner (propose an educational objective to the learner, this educational objective is adopted to his knowledge level) and provide learner with informations about cooperation opportunities with their peers.
3. *Evaluator agent* : evaluates a learner in an educational objective.
4. *Learner agent* : has informations about learner and facilates the task of learner to communicate with their peers or in the learning task.
5. *Author agent* : is the responsible of the construction of the matter to be learned. It creates the educational objectives and makes the conditions to present theses educational objective, i.e. « prerequest » objectives.
6. *Formative agent* : is the responsible of the formation process of learner from the initialisation to the achievement of their formation goals.

3. Conclusion :

We had presented an architecture of a system that offer the possibilities to the learner to cooperate/collaborate with their peers. For doing this, the tutor agent posseses information about the knoweledge state of learner(Student Model). This tutor can give advices to learners and can provide them by informations about cooperation opportunities. Our system is a multi-agent system that is composed of a set of agents(human and artificial). Now, we are in the step of implementing this system.

References :

G.Ayala & Y.Yano (1995). GRACILE: A framework for collaborative intelligent learning environments. J.JSAI, Vol 10, N° 6, pp 988-1002, 1995.

Y.Shoham.(1993) Agent-oriented programming. Artificial intelligence, Vol 60, pp 51-92, 1993.

Y. Lafif &, T.Bensebaa(2000). Hypermedia and cooperative learning. Accepted to be presented in EDMEDIA'2000. Montréal, Canada, 2000.

Practice on the Web: A Tool for Learning from Cases

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Abstract: Cascs and casc methods of teaching represent a promising approach in education. This approach has always been best used to teach people about realistic decision-making situations. Case methodology is especially effective if students are required to identify facts and issues, to view events from different perspectives, to apply current professional knowledge and research, and to predict consequences of various courses of action. The purpose of this work is to present an application tool for the development of case-based web environments. This tool is a reusable, component-based application that can be specialized to produce custom applications.

1. Introduction

Cases and case methods of teaching represent a promising approach in education. This approach has always been best used to teach people about realistic decision-making situations. Nevertheless, cases have been used extensively for professional preparation, and are only now beginning to be widely employed in education (Merseth, 1991). Case methodology is especially effective if students are required to identify facts and issues, to view events from different perspectives, to apply current professional knowledge and research, and to predict consequences of various courses of action (McNergney, Herbert, and Ford, 1993).

The use of case methods can help students to forge important connections between knowledge and practice (Cooper and McNergney, 1995). Case-based learning is a flexible model where an lecturer uses leading questions to direct students toward "correct assumptions". Cases are like stories or story lines that students read or explore interactively. They can direct students toward a conclusion, or provide the resources and context to discuss and debate issues dynamically. During a case-based process, the students must be involved in authentic practices.

From the point of view shown above, the case-based learning model is not far removed from direct instruction. However, if the students are allowed to formulate their own opinions of a case by promoting group-coordinated research activities, debate, or simulated decision making, the model is more closely aligned with social constructivism (problem-based learning).

Two primary methods are possible to deliver cases (Jarz, Kainz, and Walpoth 1997). The first is a low-tech option of simply presenting the case to a class, then debriefing and discussing orally. This way is best suited for face-to-face lessons, with both students and lecturers on the same place at the same time. The second is using technology. A system can contain case information and increase the possibilities for student interaction with the data (collecting, sorting, organizing, etc.).

The purpose of this work is to present an application tool for the development of case-based web environments. The tool is a reusable, component-based application that can be specialized to produce custom applications.

2. The Case-based Training Environment

The Case-based Training Environmet (CbTE) is intended to aid the acquisition a specific ability, using a series of cases. A case places a practical problem for a student, who needs to choose the action that solves the problem shown in the best way. For example, a company wants to train its management staff in Organizational Leadership. The following case could be created: a very productive employee informs his manager that he is unhappy because his wage is below the market's average for his position. However, the company cannot afford a wage raise. What is the best way to handle this situation?

A set of cases can be created to develop a specific ability. A case describes a situation and presents a list of possible actions among which the student must choose the best way to handle the situation shown. A set of cases build what is called a training module in the CbTE. Training modules are created with an authoring tool, and they are saved in a format that allows its easy installation into the environment. An author can create a training module in three different modes: Training, Evaluation and Outline.

In the Training mode, each case shows its references and all its action options. When a student selects an action, the best answer and a feedback for the chosen action are shown before the next case is exhibited. In the Evaluation mode, each case presents all its action options, but its references are omitted. When a student selects an action, the next case is exhibited immediately, showing neither the best answer nor the feedback for the chosen action. In the Outline mode, each case shows only its best answer, along with its references and feedback.

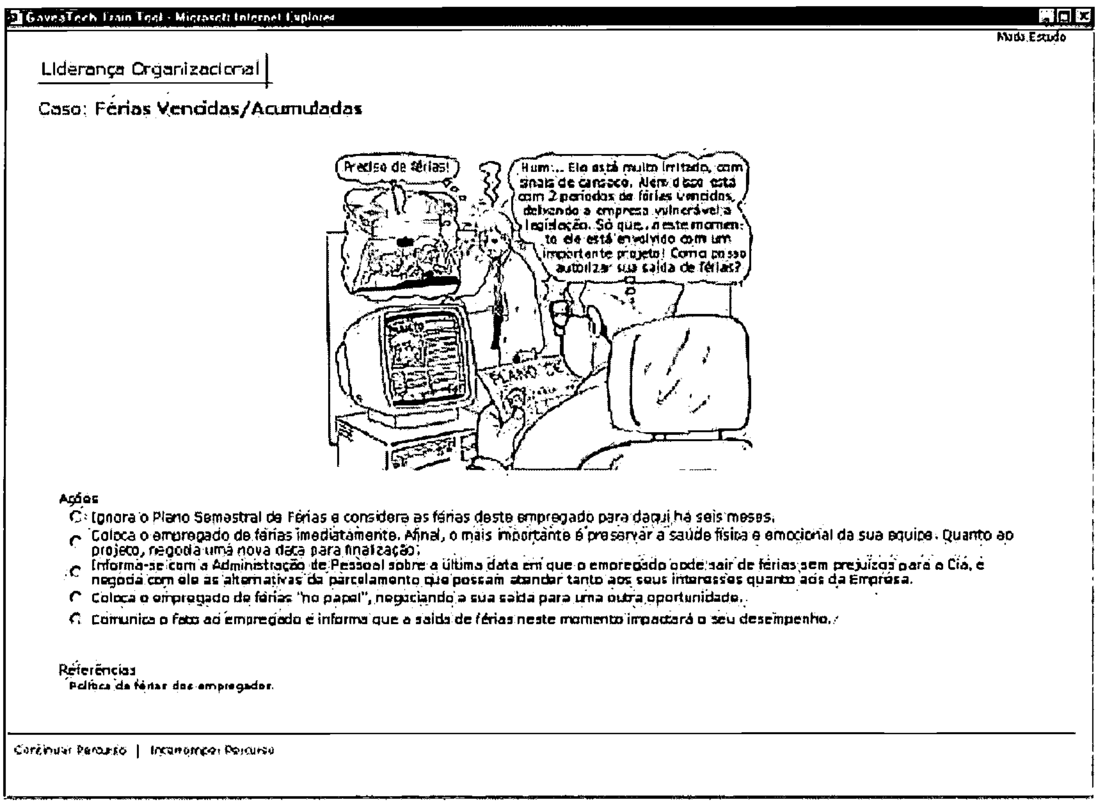

Figure 1. A case sample (in Portuguese)

While solving the cases presented in a module, a student leaves his passage track. The CbTE does not require a student to go through all the cases of a module at once, except in an Evaluation module. The student can stop, continue or restart his track.

A student can go through the cases of a training module in three different ways. In the Pre-ordered way, the cases are shown in a pre-defined sequence defined by the author. In the Random way, the cases are shown randomly, in an order sorted by the environment. In the Custom way, the student chooses the sequence he wants to follow the cases.

There is also the Free Access module. Any student can access this type of course, which does not even require enrollment.

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3. Administrative Area

The CbTE has an administrative area where it is possible to have a comprehensive control of the learning environment. An administrator is responsible for installing training modules created by instructors in an offline tool (as we shall see later in this work) and registering the students who will participate in each module. As a result of a module closure, the administrator can view a whole set of student performance statistics, such as, case most common mistakes and students tracks. These statistics can serve as reports for the faculty board or for the HR department, for example.

The CbTE'a has an open architecture based on components. This component-based architecture allows the integration with other faculty/corporative systems and with other existing training environments. This way, it is possible to create a fully customized training environment using a subset of CbTE's components and an all-new Web GUI.

All the communication exchanged between the CbTE and a corporative system is done using XML (extensible markup language) with predefined DTDs (document type definition) for each type of communication. XML has been designed for ease of implementation and for interoperability (W3C, 1998). So, the tool's persistence mechanism becomes completely transparent for the corporative system. This feature aids the integration with other systems, simply requiring the development of a "driver" that is able to understand both the corporate system and the tool's XML interface.

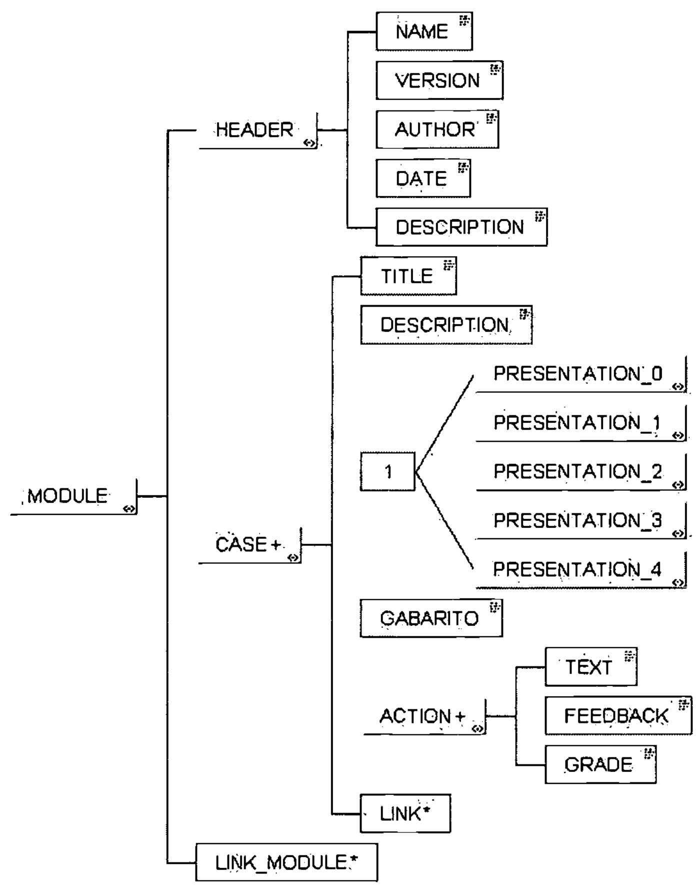

Figure 2. Module DTD

4. Authoring Tool

There is also a standalone (non-Web) authoring tool that allows the independent creation of training modules. The instructor does not need to be online to develop modules. Since some module cases may have rich multimedia contents, such as videos, animations and so on, the offline aspect of module generation allows for rapid development without the burden of multiple file uploads and downloads to the CbTE server.

The instructor must indicate what module he is creating: Training, Evaluation or Outline. He also needs to indicate how the students will access the module cases and, whenever it applies, how many times a student can go through the module cases.

Currently, cases within CbTE's training modules support the use of images, applets, videos, texts and shockwave animations, i.e., basically all kind of media a browser can display. Thus, the instructor can choose the way he finds best to introduce the case problem, enriching the students learning experience. Besides case introduction, the instructor can insert context-specific references (only for Training mode modules) for each case for student consultation during the case problem solving. These references serve as the support didactical material in the training module.

These modules can be easily installed (imported) to the CbTE by the local administrator. The authoring tool generates a XML representation of the module data. XML representation releases the instructor from having to worry about interface aspects, which is a administrative task. In addition, XML is a step forward learning environments integration. Since the contents of a training module are represented in XML, they do not hold proprietary interface properties. This makes possible for a specialist to develop a training module that can even be commercialized with institutions that use the CbTE as their training solution.

5. Conclusion and Future Work

This article presented an application tool for the development of case-based web environments. The case-based training method is a powerful hands-on/experimental approach for learning process. The tool is a reusable, component-based application that can be specialized to produce custom applications.

The CbTE has an area for students where they are able to go through the training modules and an administrative area where an administrator can install modules, register students, etc. These areas have a Web-based interface, requiring them (students and administrator) only to have a browser to use the tool's functionalities. The CbTE has also a standalone application for module authoring. This application allows the independent creation of modules, serving as a work tool for content generator enterprises.

Cases within training modules are multiple choice-like questions. In next versions of CbTE authoring tool, it is intended to provide other kinds of case representation, such as true or false, matching etc.

Currently, the CbTE is an all self-paced training tool. However, the Web brings a whole set of capabilities for collaboration that can be used to enhance learning experiences. The CbTE will support online learning groups. Doing so, it will be possible for the students to share their experience with others. Student interaction is always helpful, increases the motivation and saves time, leading to a better overall learning process. It may also be used a help desk to allow the communication between students and instructors (and possibly the administration).

The CbTE has a component-based structure to facilitate its integration with other pre-existing corporate systems. The data communication between legacy systems and the CbTE is done through XML documents with specific DTDs for each type of communication required. XML is a tool to help solve data-management problems.

The XML nature of training modules generated by the CbTE's authoring application aids content exchange and commercialization. We seek to create a specialist environment, where specialists (content providers) can exchange and trade training modules.

6. References

Cooper, J. M., and R. F. McNergney (1995). Introduction: The Value of Cases in Teacher Education. In J. M. Cooper (Ed.), *Teachers' Problem Solving: A Casebook of Award-Winning Teaching Cases*. Boston: Allyn & Bacon, 1-10.

Jarz, E. M., Kainz, G. A., and Walpoth, G. (1997). Multimedia-based case studies in education: Design, development, and evaluation of multimedia-based case studies. *Journal of Educational Multimedia and Hypermedia*, 6 (1), 23-46.

Johnson, R. E., and Foote, B. (1988). Designing reusable classes. *Journal of Object-Oriented Programming*, 1(15), 22-35.

McNergney, R. F., J. A. Herbert, and R. D. Ford (1993). *Anatomy of a Team Case Competition*. Paper presented at the annual meeting of the American Educational Research Association (AERA): Atlanta.

Merseth, K. K. (1991). *The Case for Cases in Teacher Education*. Paper presented at the annual meeting for the American Association for Higher Education (AAHE) and the American Association for Colleges of Teacher Education (AACTE): Washington, D.C.

W3C. (1998). Extensible Markup Language (XML) 1.0 W3C Recommendation, 10 February 1998. Available at: http://www.w3.org/TR/1998/REC-xml-19980210.ps.

Middle School Education and CD ROM Technology

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Abstract: This paper presents a cursory overview of CD ROM applications to instruction. This is followed up by a specific example of how a CD ROM resource was created for use in a Middle School Teacher Education Course. The CD ROM was purposefully designed to allow instructors flexibility in how it may be integrated into the curriculum. In closing, the paper will entertain the notion of designing software with an understanding that the instructor may subvert the intended classroom usage.

The Promise of CD ROM Technology

The advent of recordable and rewritable CD ROMs has revolutionized data storage due to the low cost of the media and associated CD burning hardware/software. As an instructional tool, CD ROM technology has many advantages by comparison to other recordable media. Stibbons, (1997) suggested these include: (1) significant capacity for storage of graphics, (2) rapid and facile access to the storage medium, (3) the potential for information sharing through hypertext linking and (4) the ability to treat the CD ROM as a searchable database.

The CD ROM has enjoyed a plethora of applications in a variety of educational settings. Table 1 outlines but a few of the categories and specific examples where CD ROM has been successfully implemented.

In the Middle School Project described herein we have capitalized on the ability to store documents on CD ROM in the efficient Adobe Acrobat format. The ready availability of Acrobat reader software has made the *pdf* file format a very useful tool to the educator. The companion Acrobat Writer program allows you to save text and graphics together as a single document using far less memory than either scanned documents (graphic format) or text and graphics separately. The Acrobat software environment allows for a user-friendly interface that includes a simple hyperlink table of contents menuing system and a built-in search engine. In this project the Acrobat Writer software was used to create the Middle School resource which students in turn could access using the Acrobat Reader.

The Infrastructure for The Middle School Project

At Acadia University we offer teacher preparation programs which include a course in middle school education as part of our two-year post-degree teacher certification program. Students completing the program receive a Bachelor of Education and are issued a public school teaching license. Acadia University however is unique in that it is the first laptop university in Canada. The so-called "Acadia Advantage" program was initiated in 1996 in partnership with IBM. In effect this puts a laptop computer in the hands of every student on the fully-wired campus network. This has had profound instructional implications (MacKinnon & Hemming, 1998).

The CD ROM project I am about to describe makes particular use of the fact that all students in our middle school courses have anytime-anywhere use of an A20m IBM ThinkPad®. Student computers are equipped with the latest multimedia capabilities as well as a complimentary software package that includes Adobe Acrobat reader.

CD ROM Applications	**Examples/ References** (full citation in bibliography)
To support textbooks with additional resources such as pictures, videos and tutorials.	ChemCDX software by Kinsland, L. & Perkins, R. accompanies the text General Chemistry 2nd ed. by Petrucci & Hill
Individual softwarc programs for: a) teaching content b) teaching process	Opheim, C.& Stouffer, W (1997).
Use of CD ROM databases for research and to simulate authentic learning environments	©Microsoft Bookshelf Seedhouse, P. (1996). Manzari, L. (1998). Dalhousie University Medical School
Searchable Conference Proceedings	Mathematics & Science Technology
Storage of professional information in the form of an electronic portfolio.	Corwin, T. & Hagen, S. (1997).
Graphic and textual information retrieval in public school education	Hayden, T. (1997).
Interactive CD ROM integrated into curriculum & instruction	Hilgendorf, T. R. (1998). MacKinnon G. R. & Forsythe, T. (1999).
Distance education applications such as correspondence courses	Gallagher, J. & Stevenson, D. (1999).
"Hybrid disks" which compliment internet delivery of learning	Summers, J.& Reck, L. (1998).
Elaborate CD ROM tutorial systems which include self-testing components	Welch, M. (1999). Rhodes, J. M. & Bell, C. C. (1998).
Electronic books	Guernsey, L. (1998).
Multimedia development of CD ROMs as a participatory research & learning exercise	Wilson, M. & Sullivan, T. (1999).
Professional development applications for public & private sector employees	Fabris, M. (1999).

Table 1: Some Categories of Educational CD ROM Use

Contents of the CD ROM

The Middle School CD ROM has the following components:

- An essay summarizing the middle school movement, the nature of the adolescent and middle school curriculum.
- Adapted case studies surrounding the challenges of middle school teaching.
- Hyperlinked access to current academic articles on the middle school.
- Videotaped interviews of middle school administrators and teachers around a series of relevant topics.
- Powerpoint slide presentations of actual middle schools, highlighting the teaching environment

The interface for the interactive CD ROM is shown in Figure 1. The CD was formatted in such a way that it auto-loads to present this menu to students. From this page students could hyperlink to the theory behind middle school education (as shown in Figure 2). The menuing system in the left column allows students to access printable course notes. The second component of the interactive CD ROM is the database of case studies. The ready access of these studies as compared to sending students to the library has the potential to promote more efficient use of the class time. On-line articles were prepared by scanning them into pdf format and then placing them on the local campus network. The format and content of video interviews is shown in Figure 3.

Figure 1: The Middle School CD ROM Interface

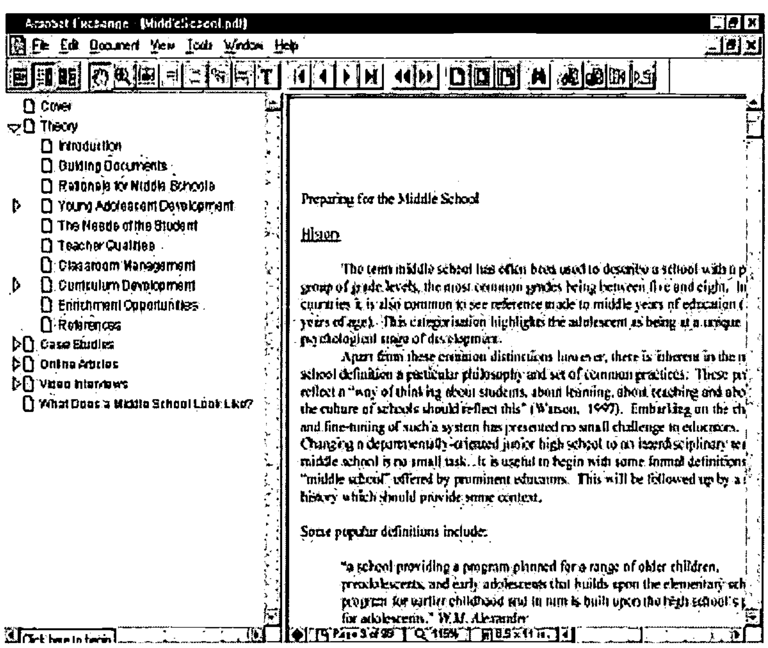

Figure 2: Hyperlinked Menu

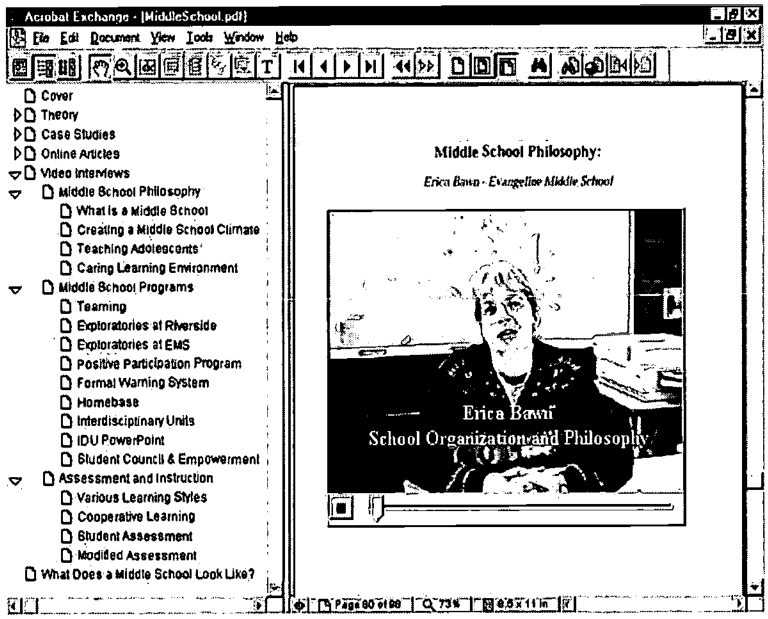

Figure 3: Video Interviews

Design of the Middle School Resource

In teacher education the notion of constructivism (Greening, 1998; Jonassen, 1994) arises frequently. This resource has the potential to be used in a constructivist teaching environment but what about the software itself? In preparing constructivist software the designer faces a dilemma. Clearly knowledge construction has its roots in the experience of the student and as such prior knowledge should have a significant impact on the direction of the instruction. At the same time the software designer no doubt has a vision for how the software might be used in a classroom. Particular structuring of the software may then be counterproductive to true constructivism and more likely to lead to behaviorist responses from students.

Squires (1999) has suggested that despite the software designer's best intentions, instructors will often subvert the intended use of the software and promote more unique applications in their own classrooms. Could this not be accounted for in the design? The Middle School software is a resource which in its simplicity allows the instructor to integrate the resource into their more traditional modes of instruction. Squires calls this approach "volatile design". This flexibility can improve the utility of such a resource to a wide range of educators.

Using the CD ROM in a Real Course: One Approach

The CD ROM acts as a central resource for the Middle School Course. The following is an outline of how the CD ROM is used in one teacher education class.

Class notes: The Middle School essay serves as a basis for discussion in the course. Each small group of students is assigned a topic from the essay and presents this topic to their classmates. There discussion of the materials also includes reference to the database of 95 online articles which they also access from their CD ROM.

Case Studies: Each group of students is assigned a case study from the CD ROM. The group then leads an electronic discussion of the case with another assigned group in the class. The discussion is peered monitored and evaluated using an electronic discussion group coding system (Aylward & MacKinnon, 1999).

Issues/Strategies in Middle Schools: Students review the CD ROM video clips of topical issues in the schools and use this as a basis to visit a local middle school and conduct teacher interviews/classroom observations around a particular issue/strategy. There are also guest speakers (administrators/teachers) invited to the class. This entire exercise culminates in a short review on the focus issue/strategy.

Online Articles: In their electronic discussion of case studies, students are expected to support their arguments/contributions via reference to an online library of academic articles. Students leading the discussion groups are expected to submit a paper that summarizes the discussion group exchange and integrates this with synopsis of at least three related academic articles from the database.

Interdisciplinary Unit: Students are assigned a theme. Using the CD ROM resource notes on curriculum design, students create concept webs (using Inspiration©) of an interdisciplinary unit on their theme.

In ensuing university semesters education faculty will have the opportunity to use the Middle School CD ROM in the their classrooms. It remains to be seen whether the volatile design of the resource will allow instructors to utilise the CD ROM in novel instructional approaches.

References

Aylward, L. & MacKinnon, G. R. (1999). Exploring the Use of Electronic Discussion Group Coding with Pre-service Secondary Teachers, Journal of Information Technology for Teacher Education 8(3), 335-348.

Corwin, T. & Hagen, S. (1997). Creating student CD ROM portfolios. Proceedings of the Association for the Advancement of Computing in Education Ed-Media & Ed-Telecom, Calgary, Alberta, Canada.

Dalhousie University Medical School, Halifax, Nova Scotia, Canada uses a CD ROM developed in-house (with ©Macromedia, Authorware) to teach radiology using multimedia case studies.

Fabris, M. (1999). A classroom view: A tool for professional development. Society for Information Technology and Teacher Education, Published Proceedings, 800-805.

Gallagher, J. & Stevenson, D. (1999). Multimedia applications and their impact on the sequencing of learning for remote, disance and flexible situations. Society for Information Technology and Teacher Education, Published Proceedings, 1064-1068.

Greening, T. (1998). Building the constructivist toolbox: An exploration of cognitive technologies. Educational Technology, 38 (2), 23-35.

Guernsey, L. (1998). Exploring the future of electronic books and journals. Chronicle of Higher Education, 44, 27.

Haydn, T. (1997). Interactivity and the CD ROM. Educational Computing and Technology. April-May. 60-61.

Hilgendorf, T. R. (1998). CD-ROM technology for developing college-level skills. Journal of Adolescent & Adult Literacy, 41(6), 475-76.

Jonassen, D. (1994). Thinking technology: Toward a constructivist design model. Educational Technology, 34(4), 34-37.

Kinsland, L. & Perkins, R. (2000). ChemCDX. Englewood Cliffs: Prentice-Hall.

MacKinnon, G. R. & Aylward, L. (2000). Coding electronic discussion groups. International Journal of Educational Telecommunications 6 (1) 53-61.

MacKinnon G. R. & Forsythe, T. (1999). Integrating interactive technology into science curriculum: A pilot study. HyperNexus: Journal of Hypermedia and Multimedia Studies 9(4), 4-9.

MacKinnon, G. R. & Hemming, H. (1998). The Acadia advantage: Linking pedagogy and computer technology. Computers and Advanced Technology in Education (CATE '98), 189-192. IASTED/ACTA Press 1998. Anaheim,Calgary, Zurich.

©Microsoft Bookshelf contains the Concise Columbia Encyclopedia, The American Heritage Dictionary, The Hammond Atlas, Roget's Electronic Thesaurus, Bartlett's Familiar Quotations, The Concise Dictionary of Quotations and the World Almanac.

Manzari, L. (1998). Student preferences for CD-ROM instruction. Journal of Academic Librarianship, 24 (6), 481-484.

Opheim, C. & Stouffer, W. (1997). Using "Capitol Hill" CD ROM to teach undergraduate political science courses. Political Science and Politics, 30(1), 68-70.

Rhodes, J. M. & Bell, C. C. (1998). CD-ROM based multimedia homework solutions and self test generator. Journal of Interactive Instruction Development, 11(1) 11-20

Seedhouse, P. (1996). Using newspapers on CD-ROM as a resource. Language Learning Journal, 13, 65-66.

Squires, D. (1999). Educational software for constructivist learning environments: Subversive use and volatile design. Educational Technology, 39(3), 48-54.

Stibbons, P. (1997). Behind the scenes: CD ROM development. Educational Computing and Technology July 23-25.

Summers, J. & Reck, L. (1998). A paradigm for enhancing course offerings using CD-ROM, interactive Video and e-mail. ERIC document ED423864

Welch, M. (1999). The PREP project: A multimedia approach of preparing educators for collaboration. Society for Information Technology and Teacher Education, Published Proceedings 362.

Wilson, M. & Sullivan, T. (1999). Using CD ROM technology to teach the process of history. Society for Information Technology and Teacher Education, Published Proceedings 750-752.

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Developing a University-Wide Digital Portfolio System for Teacher Education

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Abstract. This paper describes the collaborative process we've utilized in conceptualizing a digital portfolio requirement for all teacher education majors. We entail the philosophical, logistical, and infrastructure considerations that have been part of the process along with the portfolio model adopted. Finally, we discuss the assessment timeline for portfolio evaluation.

Throughout the country, three conditions guide how schools of education approach the integration of technology into teacher education programs. (1) University faculty and students need the tools, environments, and on-going professional development to integrate technology into the teacher education curriculum. (2) New national accreditation standards are requiring schools of education to prepare new teachers and administrators who can integrate technology into their curricula. (3) Licensure and certification are now requiring proficiency in technology integration for new teachers and administrators. These national and local imperatives are the foundation of our institutional reform.

As our institution plans for the implementation of such issues, the digital portfolio has emerged as a tool that we envision enabling us to assess students' competencies. We also believe that engaging in the electronic portfolio process will help students to develop technology-related knowledge and skills.

Background

By June 2002, our university is mandated to have an institution-wide performance-based Unit Assessment System (UAS) approved by the Indiana Professional Standards Board. The UAS has multiple "Decision Points" that are being discussed. A standards-based approach is being used for licensing. The standards, which serve as a foundation for these licenses, include the INTASC Core Standards as the conceptual framework, Indiana Developmental and Content Standards, and the ISTE Standards.

For two years, a campus-wide group called the Teacher Education Performance Assessment Steering Committee (TEPASC) has worked on creating procedures for reaching this goal. In regard to the knowledge, disposition, and performances for teaching majors, TEPASC has recommended that: (a) licensure areas provide multiple opportunities for each student in the program to demonstrate and to document an understanding of the state P-12 proficiencies, and (b) students demonstrate and document successful experiences in planning and executing lessons directly related to relevant P-12 proficiencies. Our institution has identified student digital portfolios as one performance assessment instrument for demonstration of multiple competencies.

In recent years, a number of portfolio types have been used on our campus by faculty from a variety of disciplines. The medium of these portfolios has included paper, PowerPoint, and the World Wide Web. Likewise, the specific purpose of the portfolios has varied according to the needs of the discipline and the preferences of the faculty member teaching the course. As the university began to discuss a campus wide portfolio model for teacher education, it was recognized that cross-disciplinary expertise should be utilized, and that a consensus needed to emerge as to the type of portfolio best suited for teacher education. The decision to recommend a digital portfolio over a paper-based portfolio emerged in part, as a result of parallel initiatives to infuse computer technologies in the teacher education curriculum. The interactive, non-linear attributes of digital media, which may include audio, video, text, numerical data and graphics, may potentially bring a depth and richness to student work and understanding.

As one initiative of our PT3 grant, a team of university faculty met weekly to develop the portfolio model. In addition, a series of experts from other universities and corporations such as Apple computer were brought to campus to provide their insights regarding conceptual frameworks, technological infrastructure, and portfolio logistics. These sessions, which were open to all of the university community, stimulated discussion about the shape and form of our portfolio system. We sought out and examined other teacher education institutions attempting to implement similar initiatives as well as individual faculty across the country working in this area.

Portfolio Purpose

There is no universal portfolio in terms of purpose and structure. Portfolio types include process portfolios, reading portfolios, showcase portfolios, and exit portfolios (see Katz & Johnson-Kuby, 1996). The portfolio structure we envision responds to a variety of needs – personal, pedagogical, and program related. While the overall goal for the digital portfolio is to meet the learning and competency objectives of the program, our goal is to maintain the emphasis on reflection and to highlight the developmental process of portfolio construction. The primary purpose of the student digital portfolio is a cumulative and on-going reflection of their progress and readiness in learning to teach. The portfolio as a whole must reflect the students' entire certification program. That is, students are expected to draw on as many of their courses and experiences as possible. Klenowski (1998) writes that portfolios provide a structure for documenting and reflecting on teaching and learning practice. The portfolio allows for the collection of a range of tasks and information about teaching over time in different settings. Consequently a richer portrayal of teaching practice is possible. Good (1992) writes that portfolios should enable students to think critically about important identifiable content as well as develop particular dispositions.

Given the longitudinal nature of the student portfolio, we hope that student reflection will become more rich and complex as they continue in the program providing quality information that can be used to examine growth and progress over time. Wolf, Whinery & Hagerty (1995) indicate that

> by engaging teachers-in-development in the practice of documenting and reflecting on their teaching, and in holding regular and focused conversations with their colleagues about their practice, we are building individual dispositions and a professional culture that values reflective, collaborative practice (p. 37).

The portfolios our students develop will serve many purposes. A primary goal of the digital portfolio will be to provide a vehicle for students to demonstrate they have met the learning and competency objectives of the teacher education program. Another important objective will be to emphasize reflection and to highlight the pre-service teacher's developmental process. Students will be expected to draw on as many of their courses and experiences as possible. Given the longitudinal nature of the student portfolio, we hope that students' reflections will become more rich and complex as they progress in the program, providing quality information that can be used to examine growth and progress over time. Finally, students will need to continue to document their development as a teacher via a portfolio during the "induction" phase (first two years) of their professional career. The portfolio students develop throughout their undergraduate curriculum will continue to evolve during these initial years as a fulltime teacher.

Portfolio Structure

A web-based medium has been chosen for our digital portfolios. The web is advantageous for several reasons. First, it is cross-platform. Therefore persons creating and viewing the portfolio can use the computer of their choice. Second, many media types can be utilized on the web including text, graphics, sound, and video. Multimedia will allow for rich representations of student learning and development. Third, HTML is not a proprietary format. As it is an international standard, with each new version slated to maintain compatibility with previous versions, it will endure. Fourth, web files are easily transportable and can be displayed either online or distributed through other media such as CD-ROMs. Finally, a web-based portfolio can be more easily accessed for asynchronous assessment by all stakeholders (teacher education faculty, content area specialists, and P-12 teachers).

Requirements for documenting student competencies in numerous state and national standards compelled us to frame the structure of the portfolio on a more holistic and broad level. To do this, we returned to our institution's conceptual framework based on the Interstate New Teacher Assessment and Support Consortium (INTASC) Standards . Students will reflect on and document their development as teachers in relation to each of the ten INTASC standards. Appropriate artifacts supporting their development in each standard will be hyperlinked within the portfolio.

The categories of artifacts that can be used for sources of evidence are mandated by the state and may include:

1. Classroom Performance – Video
2. Lesson Artifacts (e.g., lesson/unit planning, handouts, slides, assessment documents)
3. Paper/Pencil Tests of Knowledge
4. On-Demand Tasks (e.g., simulations, case studies, problem-based scenarios)
5. Interviews of Candidates
6. Testimonials (e.g., cooperating teachers, university supervisors, students)
7. Products Reflecting Learning of Candidates' Students (e.g., student artifacts)
8. Other Assessments (e.g., self-reports, special projects)

Portfolio Assessment

We have chosen four main stages for the portfolio development process, within which students build toward "decision points" in their teacher training. Table one illustrates the progression through the program and

describes each of the decision points. At each of these decision points, assessment of the portfolio will occur. In addition, selected artifacts of the portfolio will be developed and assessed as part of courses in the

students' curriculum. Artifacts are submitted and assessed at different stages of a student's progress, from admission to graduation. Table one (Tab. 1) demonstrates the progression through the program. Students must successfully complete each stage in order to gain admittance to the subsequent stage.

Description of Stage in Decision Points	Resulting Action
Stage 1: The focus of Stage One is the required introductory teacher education course. Course content centers on informing students of the INTASC and IPSB standards, expectations of the program, and the arena for introduction of computing skills related to portfolio production. Students create a self-assessment document or "autobiography that represents them as learners and individuals. This self-assessment focuses on students' initial reflections about the nature of teaching and education in relation to INTASC standards and the university conceptual framework. The course requirement will include the initial development of a digital portfolio	Decision Point 1: Builds on successful completion of introductory courses in Teachers College and content areas. Becomes teacher education aspirant.
Stage 2: This stage focuses on gathering artifacts to demonstrate acceptable performance with content knowledge and mastery of skills and dispositions, and meeting the ISTE General Preparation Performance Profile in portfolio. Students again submit a self-assessment document. Successful completion of this stage leads to formal acceptance into the Professional Education sequence.	Decision Point 2: Culminates in admission to the Teacher Education Program and may enroll in the Professional Education sequence.
Stage 3: During this stage, students select from their body of increasingly extensive artifacts (essays, evaluation, video clips, lesson plans, etc.) examples that demonstrate sufficient mastery of performance and knowledge relative to content and developmental standards, before admitted to student teaching. Students must also perform at the Professional Preparation Performance Profile defined by ISTE. Students again submit a self-assessment document.	Decision Point 3: Culminates in Admission to Student Teaching
Stage 4: This final stage adds the student teaching experience. Students will select artifacts generated in classroom performances (lesson plans, video of classroom performance, evaluations, etc.) to add to their prior collection in the portfolio. Students must meet the ISTE Student Teaching/Internship Performance Profile. Students again submit a self-assessment document. The purpose is to demonstrate sufficient mastery of standards for subsequent licensure.	Decision Point 4: Culminates in graduation and possible recommendation for initial licensure.

Figure 1: Decision Points and Outcomes

Infrastructure Considerations

Parallel yet related initiatives involve the development and implementation of large-scale Web-based databases that support longitudinal portfolio construction and distribution as a core service of our licensure program. The portfolio database will be integrated into other Web-based representations of competence. A new critical need is to integrate the portfolio with performance assessment records.
This is the systems and infrastructure that will support large-scale, Web-enabled, relational databases that sustain and promote the competency profiling, performance assessment, and digital portfolio initiatives. Teams are building an advanced data engine to support the representation and development of performance and competence. We are building upon established models for examining the NCATE, ISTE and NETS, INTASC, IPSB and P-12 competencies and standards and the ways they interface into the academic cycles of teacher education majors. For the duration of their teacher education experience, students, faculty, and cooperating teachers and administrators will interact with the competency database for the following services:

1. Providing Web-based diagnostics in relation to INTASC, ISTE, NETS, and content area standards and competencies.
2. Evaluating progress towards competence.
3. Represent performance for assessment and licensure.
4. Maintaining student portfolio and coursework relevant to licensure.

Summary

Other infrastructure considerations under discussion include the need for faculty professional development, staffing for support of portfolio development, and a university-wide plan to support and update technical resources . While the development of a digital portfolio system has presented us with many challenges, it has also provided a glimpse into an exciting future for our teacher education program. At the time of this paper, ultimate decisions about the nature of the portfolio and its place in the unit assessment system have yet to be finalized. For example, while we have decided that the portfolio will be web-based, we have not yet come to consensus on issues such as the extent that individual licensure areas will be allowed to customize the "look and feel" of the portfolio. Many of these decisions will be made early in 2001. In addition, ongoing pilot testing of portfolio structures and processes will continue during the Spring, 2001
semester. The current status of our portfolio model will be reported during our presentation.

References

Campbell, D.M., Cignetti, P.B., Melenyzer, B.J., Nettles, D.H., and Wyman, R.M. (1997). *How to develop a professional portfolio: A manual for teachers.* Boston: Allyn & Bacon.

Katz, C.A., Johnson-Kuby, S.A. (1996). Like Portfolios for Assessment. *Journal of Adolescent & Adult Literacy*, v39(6), pp. 508-511.

Klenowski, V. (1998). *Guidelines for Portfolio Use in Initial Teacher Education.* Paper and Monograph Series in Education. Centre for Research and International Collaboration. Hong Kong Institute of Education.

Wolf, K., Whinery, B. & Hagerty, P. (1995). Teaching portfolios and portfolio conversations for teacher educators and teachers. *Action in Teacher Education*, *17* (1), *Spring*, 30-39.

Using WebCT 3 to Create Web-based Learning for Multiple Learning Styles

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Abstract: Web-based learning (WBL) is rapidly becoming a staple at all levels of education. Statistics from a national study by the Department of Education in 1997-98 showed almost 44 percent of all higher education institutions offered distance-based courses, an increase of one-third since 1994-95. Estimates are that by the year 2002 there will be more than 2 million students in higher education participating in distance education. In this period of rapid change as education adapts to use the new tools of web-based learning, educators need to consider the foundational concepts of learning theories. Modern learning theories, based on constructivism, emphasize individual differences in learning styles. Focusing on how to use some of the information that learning theory offers can improve WBL just as it has helped with traditional educational environments. This paper discusses how WebCT3.0 can be used to make WBL appealing and effective for a variety of individual learning styles.

Introduction

Web-based learning (WBL) is rapidly becoming a staple at all levels of education. Statistics from a national study by the Department of Education in 1997-98 showed almost 44 percent of all higher education institutions offered distance-based courses, an increase of one-third since 1994-95 (CHEA, 2000). The Council for Higher Education Accreditation found most of the growth in distance education was in higher education institutions that use asynchronous computer-based technology (primarily over the Internet). The Army announced in July of this year that it would spend $600-million over the next six years to enable any interested soldier to take distance-education courses on the Internet at little or no cost (Carr, 2000). Estimates are that by the year 2002 there will be more than 2 million students in higher education participating in distance education.

In this period of rapid change, as education adapts to use the new tools of web-based learning, educators need to consider the foundational concepts of learning theories. Modern learning theories, based on constructivism, emphasize individual differences in learning styles. The most effective learning environments offer content that caters to these individual differences in learning styles. The distance educator must employ a number of strategies focusing on planning, student understanding, interaction, and teaching to ensure a successfully delivered course (Cafolla & Knee, 1999).

Learning theories 101: everything old is new again

The question of how we learn is at the core of all educational theory. Educators and philosophers have been trying to theorize how we learn since ancient times. Theories evolving in more recent times focus on the learner and differences in those learners. Learners are considered to be unique individuals whose learning preferences may significantly vary. Creating content that is learner-friendly for students who prefer a sequential linear content presentation or a more random non-linear preference is important. Older, foundational learning concepts such as Vygotsky's "zone of proximal development" and scaffolding are very applicable to WBL. In computer-mediated learning, scaffolding is more important than in traditional education settings because computer-mediated learning is typically collaborative, and all participants will provide scaffolding to other participants at different times during the learning process (Bull et al., 1999). A second concept is that of dual coding. Memory researchers agree that dual coding is a very effective learning tool (Craik & Tulving, 1975). Dual coding helps in the learning process by using two or more sensory avenues to reinforce memory. Using such dual coding techniques such as relevant visuals and the prominence of imagery use during accretion and retrieval greatly improve learner outcomes (Hodes, 1993). Simonson (2000) uses an Interactive Study Guide (ISG) to help cue visual learners. The ISG is a series of visual cues that link to key lecture concepts to aid memory formation. WBL allows for many different instructional opportunities for dual coding including still images and video elements. Multimedia elements are a critical part of content development on an education web site (Knee et al., 2000).

Instructor/designers who consider the information that learning theory offers can improve WBL just as it has helped in traditional educational environments. The focus of this paper is to show how WebCT3.0 can be used to make WBL appealing and effective for a variety of individual learning styles.

WebCT 3.0 as a tool for creating individual learning environments

WebCT is a multifaceted management tool for creating WBL courses. WebCT 3.0 is the newest version of the software and was released in summer of 2000. This is a widely used WBL software application and version 3.0 will be used in many universities beginning in early 2001 as their primary delivery tool. This most recent release of WebCT 3.0 has a greatly improved designer interface that eases the initial course implementation. Distance learning software such as WebCT 3.0 can be used to facilitate the creation of individual, learner-centered environments. WebCT 3.0 offers a rich variety of communication tools, and has the capacity for the inclusion of sophisticated multimedia elements like streaming video. One of the greatest strengths of WebCT 3.0 is that it allows content to be organized along a linear path, or in a more hypertext driven non-linear fashion, or both dependent upon student needs or desires. Some learners are more comfortable with a structured sequential topical organization and others need to reorganize the content in order to make optimum sense of the presented information. WebCT 3.0 has new features such as the Compile tool, which allows the student to reorganize content into their own set of notes. WebCT 3.0 has introduced a new feature called "breadcrumbs." A breadcrumb is a list at the top of the page that shows the path the student has taken to get to the current page. This breadcrumb tool helps the student build a cognitive map of the web site. The breadcrumbs are especially useful in courses with lots of content where it can be difficult for some learners to navigate down through levels of materials.

WebCT 3.1 Communication Tools

Both synchronous and asynchronous computer mediated communication are key elements in WBL. Communication is a vitally necessary for effective distance learning. Instructors and learners must have the opportunity for frequent and open interaction both between individual students and the instructor and between students themselves. WebCT has a variety of communication tools available for the instructor/designer. These tools include the staples of distance learning communication: email, discussion board, chat rooms, and a whiteboard. The asynchronous WebCT email tool allows every student easy access to every other participant in the class, including the professor. Email in WebCT is server based and not available outside of the WebCT program. Chat rooms are a synchronous communication tool available in WebCT. The instructor can set up multiple chat rooms devoted to separate subject areas, or interests. The whiteboard tool is another synchronous communication tool, which allows all participants to draw and type on a common screen. The contents of the whiteboard can be saved and reloaded as well as erased by anyone using it. The whiteboard can be useful as a flow chart or concept-mapping tool for visual learners. Synchronous communication is valuable but can be difficult to realize in many WBL situations. Often students chose WBL because their busy schedules do not allow them the opportunity to join in a traditionally scheduled classroom situation, which often means that the email tool gets heavy use (Digilio, 1998).

The discussion tool in WebCT 3.0 can be used to create similar collaborative groups. Collaboration is another key element in learner-centered constructivist theory. Collaborative groups help individual students understand convergent and divergent concepts. In a traditional face-to-face classroom, a teacher may foster collaboration by dividing students into small heterogeneous groups to discuss important topics. There are many creative ways that a teacher can use the discussion tool. The discussion tool in WebCT 3.0 allows you to create topic areas for discussion. Topics can be public or private. Public message discussions can be read and replied to by anyone in the course. Private topics are only available to a set of select students and teaching assistants. The critical feature of such electronic forums is that they tend to put the teacher in the role as first among learning collaborators, rather than as instructor and leader (Doucette, 1996.) The discussion feature can also serve as a scaffolding tool to direct and focus topical discussions. Electronic communication can also serve as the great equalizer, allowing quieter, more reflective learners to participate more in these collaborative learning situations.

Another way of fostering collaborative learning environments with WebCT is by utilizing the student presentation tool. Student presentations are created as HTML based web pages. The instructor can select the members of the presentation groups or WebCT can randomly select the groups of any given size. All members of the class can view the final presentation products.

Because WBL takes place with students physically separated from each other, it is important to try to create a sense of connectedness between them. We use the discussion tool to help create a virtual learning community by encouraging all participants to post an introductory statement and a picture of themselves. We post the names and pictures of our students under an icon on the opening page within the WebCT course structure. Making each student more real with a name and a face makes collaboration more personal and meaningful. This combination of pictures and written introductions also aids the visual learner. Students and professors can refer to these pictures during the duration of the course to help them make personal connections with their fellow participants.

WebCT also has a tool for the creation of student homepages. Encouraging students to create their own homepages helps foster a sense of community. Students can use their homepages to learn more about each and their shared or diverse individual interests. These homepages can also spark other, sometimes-unexpected learning opportunities.

Course Content Tools

The course content tools in WebCT 3.0 include: Content modules, syllabus, glossary, image database, calendar, index, CD-Rom and compile. WebCT3.0 allows for course content to be offered in a linear and non-linear sequence. Course content can be placed outside of the content module tool but it isn't usually advantageous to do so. Certain tools such as the compile tool, the CD-Rom tool, and the glossary tool can only be used with content that is inside the content module tool. Instructor/designers can organize these content modules in any sequential fashion they might choose. Content module materials can include text files, html files, or multimedia files and materials within a content module are set up in a table of contents. The heart of the content module tool is that table of contents. The table of contents is a hierarchical path where individual components can be hyperlinks to the subject materials, or simple organizational titles. Students who are most comfortable in a linear learning mode can simply start at the top of the path and progress downward. A student who has a non-linear preference can jump around in a hypertext mode and access the materials in a fashion that makes sense to them. A student can use the Compile tool in WebCT to reorganize and customize course materials into notes. This allows students to use the materials in a way that makes the most sense to their individual learning style. The content compiler tool then allows the student to save the personally reorganized notes and then view the notes on screen, download the notes to their computer, or print them. WebCT also has an index tool which acts like the index in the back of a textbook. Entries are listed alphabetically, with each entry having one or more additional subentries associated with it. The subentry is followed by a link to the page on which the index entry is located. The index tool is a very effective tool for students trying to locate important concepts in the course content.

Multimedia components are yet another important part of WBL. WebCT can incorporate images, video, and audio into the instructional environment. Simple images used in instruction help visual learners and help with dual coding as well (Burton et al., 1995). Video and audio elements can be streamed which means that the presentation is viewed as it downloads and is much quicker and more time-friendly in terms of download delays for the end-user, the student. Video and audio presentations are both excellent for encouraging dual coding thus increasing learner retention of information. Two of the tools WebCT has to help display multimedia are the Image database tool and CD-Rom tool. The image database defaults to display thumbnail images for quicker screen loads. These Images in the database can be displayed with text descriptions and can be associated with keywords so the students using those keywords can then search the database. The CD-Rom tool allows multimedia elements to be presented via CD-Rom. The student's can either use a CD-Rom provided to them by the instructor for the course, or can view the contents by downloading the content from the server.

Evaluation and Assessment Tools

WebCT contains a variety of evaluation and assessment tools for the student and the instructor/designer. Student evaluation tools include the more traditional types of evaluations such as calculated, multiple choice, matching, short answer, and paragraph style tests. Evaluation has often been a controversial subject in educational theory. Current theorists do often not endorse traditional evaluations and alternative assessment methods are often encouraged. If portfolio assessment is being used as an evaluative tool, then the student presentation tool could be useful. WebCT also has an assignment tool, which lets the instructor place a downloadable file for the student to download, complete, and upload again for evaluation. The assignment could be such items as photographs, a spreadsheet you want the student to modify, or articles that you want students to reflect on and respond. Feedback is useful for any and all learning styles and WebCT has a self-test tool in multiple-choice format that gives students immediate feedback. The self-test can be placed directly with the relevant content.

The elements of good instruction require constant evaluations of content and the organization and presentation of that content. Instruction and course design are often represented by flowcharts, which emphasize feedback loops for adjusting instructional components to improve the overall course product. WebCT has two features called track student, and track page that give the instructor information needed to adjust instruction. Using these tools the teacher can answer questions such as: What pages are the students using? What pages are the students skipping or missing? Instructor/designers can use the information from track student and track page to adjust and reorganize course materials in order to improve instruction.

Conclusion

When teaching in the relatively new environment of the Internet, professors need to adapt their course materials utilizing the same foundational learning theory concepts that are effective in the live classroom. WBL just creates a new set of tools that needs to be exploited in the best way possible for the individual learner. In fact many instructors find that as they create distance learning, the same tools used in WBL such as e-mail, bulletin boards, interactive technology, and graphic designs, can enliven a classroom just as easily as they can liven up a distance student's home computer (Carnevale, 2000). WebCT 3.0 has introduced new features that allow creators if WBL environments to gear their instruction such that the appeal and effectiveness of this instructional medium can be optimized for individuals who have various styles of learning.

References

Burton, J. & others (1995). Hypermedia Concepts and Research: An Overview. *Computers in Human Behavior*, 11(3-4), 345-69.

Bull, K., Shuler, P., Overton, R, Kimball, S., Boykin, C. & Griffin, J. (1999). Processes for Developing Scaffolding in a Computer Mediated Learning Environment. *American Council on Rural Special Education*, Albuquerque, NM.

Cafolla, R, & Knee, R. (1999). *Add*ing Interactivity to Web Based Distance Learning. *SITE 99: Society for Information Technology & Teacher Education International Conference*, San Antonio, TX.

Carnevale,D.(2000, August 4). Turning traditional courses into distance education. *The Chronicle of Higher Education*, 46 (48), A37-A38.

Carr, S. (2000, August 18). Army bombshell rocks distance education. *The Chronicle of Higher Education*, 46 (50), A35-A36.

Craik, F. &Tulving, E. (1975, September) Depth of Processing and the Retention of Words in Episodic Memory. *Journal of Experimental Psychology,* 104(3), 268-94.

Council For Higher Education Accreditation. CHEA Update Number Two. *Distance Learning in Higher Education*. URL: http://www.chea.org/Commentary/distance-learning-2.cfm#distance-learning-students

Digilio, A. (1998, Fall) Web-Based Instruction Adjusts to the Individual needs of Adult Learners. *Journal of Instructional Delivery Systems.* 12(4), 26-28.

Douchette, D. (1994). Transforming Teaching and Learning Through Technology. In T. Banion (Ed), *Teaching and Learning in the Community College* (pp 217). Washington DC, Community College Press.

Hodes, C. (1993). The Effect of Visual Mental Imagery on Speed and Accuracy of Information Retrieval. *Annual Conference of the International Visual Literacy Association*, Pittsburgh, PA.

Knee. R., Musgrove, A., & Musgrove. J. (2000, September) Lights, Camera Action: Streaming Video on Your Web Site, Learning and Leading With Technology, T*he Journal of the International Society for Technology in Education*, 28 (1), 50-53.

Simonson M., Smaldino S., Albright M., & Zvacek, S. (2000). *Teaching and Learning at a Distance: Foundations of Distance Education*. Upper Saddle River, NJ. Prentice Hall.

MULTI-MEDIA APPROACHES TO TEACHER CONTINUING PROFESSIONAL DEVELOPMENT: DEALING WITH DISRUPTIVE PUPILS

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Abstract: Concerns about how teachers deal with disruptive pupils led to the Scottish Executive funding the development of a CDRom to be used for teacher professional development. The Project involved literature searches, field research and dialogue with teachers in schools to identify a range of scenarios and how they were best dealt with practically. The results and optimum approaches suggested on the CDRom are treated as problematic with users being presented with a range of interactive situations in video/audio and text. Teachers are encouraged to review and develop their own skills and school policy and are provided with exemplars and additional references for consideration.

Introduction

Despite losing its Parliament in 1707, Scotland remained a constituent part of the United Kingdom, keeping its character and many formal institutions. It has always had a legally and politically distinctive and autonomous education system (Greaves & O'Brien 1996; Clark and Munn 1997). The 1997 referendum determined that the Scots would once again have a Parliament and even more distinctive Scottish education initiatives are now emerging.

Policy Context

The Scottish Executive Education Department (SEED) believes that effective learning and teaching are crucial factors in school effectiveness. Improving the quality of learning and teaching in classrooms is an important strategy to help improve pupils' attainment. Schools and education authorities are being assisted in implementing a range of approaches to raise levels of pupils' attainments as part of the *Raising Standards - Setting Targets* initiative. Policy initiatives include attempts (Lloyd & Munn (Eds.) 1997; Munn (Ed.) 1999) to cater effectively for pupils with emotional and behavioural difficulties within mainstream settings and special units attached to mainstream schools.

Continuous Professional Development (CPD) of Teachers

Kirk (1995 p.15) suggests that the

> ... changes that have occurred in teacher education have to be seen as integral to a wider restructuring of education and of curricular renewal, which have made new and increased demands on teachers. We are under an obligation, therefore, to ensure that teachers are trained to enable them to discharge effectively the new responsibilities expected of them.

The Scottish Office Education Department (SOED 1992) issued a statement of the competences expected of the beginning teacher. These have recently been revised and a series of standards or sets of competences are planned for other career stages as part of a developing Framework for Professional Development. The Scottish Qualification for Headship (SQH) which prepares teachers for principalship is an example of a standards driven qualification (O'Brien and Draper 2001 forthcoming). There is clear official recognition that teacher education is a lifelong enterprise and teachers and higher education have important partnership roles to play (Sutherland 1997). Since 1985 the locus of in-service has become increasingly the school, reflecting what Hargreaves (1994) described as a move from traditional INSET to staff development and subsequently to the concept of professional development but many teachers have taken award bearing courses offered by universities (Landon 1995). There is some evidence that for CPD opportunities the universities are regarded as offering too academic a style of provision (van der Kuyl et al. 1994), and the trend despite the possibilities of national standards and associated award-bearing courses, is towards an increased reliance on in-school or school-based staff development.

The learning organisation and school based CPD

Teacher lifelong learning in the form of CPD is increasingly regarded as an important means of contributing to the creation of more effective schools and as integral to learning organisations. O'Brien and MacBeath (1999 p71) defined the learning organisation,

> ... as a place in which there is an infectious desire to learn, to build, to exchange good practice, to problem solve together, to question the most deeply held prejudices, to be open to change and new ideas and to experiment and learn from mistakes. Leadership, culture and planning are important ingredients in the realisation of such an organisation as is effective staff development which builds on existing strengths, and individual and organisational needs.

SEED and its predecessors play a strong central role in the provision of national guidelines and centrally funded support for school-based CPD initiatives including funding a multi-media interactive disk for school based staff development coordinators (O'Brien and MacBeath 1999) who might promote and encourage learning organisations. Since the late 1980's government has supported the development of interactive technology resources to meet a range of staff development needs in schools (van der Kuyl et al. 1994). This has involved special funding to provide schools with hardware at advantageous prices and funding the development of a number of software titles. Cost effective training for staff was attractive as it might allow greater penetration of training materials, a consistency of approach and meet 'value for money' targets. Early experimentation with the technology in schools centred on the production of curriculum support materials but it was soon realised that teachers needed to be made more confident in their use of such technology and to recognise its potential. While curriculum focused materials in interactive format continued to be important, the targeting of staff development as a focus for interactive resources emerged as a strategy for extending teaching and learning approaches within schools, this is evident in the range of disks produced eg Mathematics, Health Education and Differentiation and now also in relation to dealing with disruptive pupils.

The "Dealing with Disruption" CDRom Project

The promotion of social competence and social inclusion through meeting pupils' needs in schools and classrooms and building on alternatives to school exclusion is major SEED policy. However, increasing concerns about disruptive behaviour by pupils in Scottish schools has led SEED to fund the "Dealing with Disruption" Project to research and produce an accessible user-friendly dual format [PC/Apple] CD-ROM for teacher professional development use. This involved *inter alia* researching in schools, the strategies and approaches that teachers use to deal with these problems at individual, whole class and whole school levels. The CDRom provides best practical advice, help and focus for training for teachers on managing behaviour effectively, concentrating on:

- low-level interruptions in everyday classroom situations
- challenging behaviour by individuals or groups of pupils and by parents and other adults
- whole school and departmental policies.

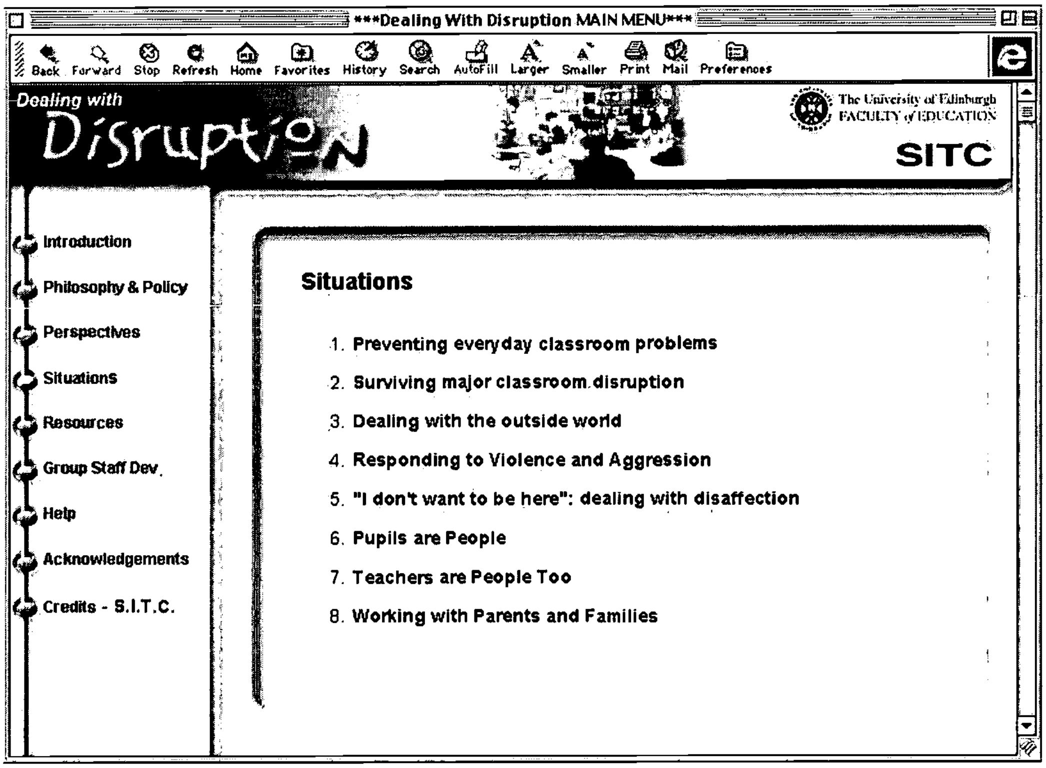

Figure 1: Disruptive Situations Menu

The CD-ROM resource

The CDRom exemplifies for primary, secondary and special school teachers effective methods for managing behaviour and dealing with classroom disruption and other forms of aggressive behaviour. In doing so, the exemplars highlight a full range of scenarios, from managing mild but persistent disruptive behaviour to addressing the needs of pupils with major emotional and behavioural difficulties. It also deals with potentially difficult situations involving parents and other adults. A comprehensive range of disruptive situation and behaviours which may be encountered by teachers in mainstream schools are considered. The CD-ROM includes a menu of situations including sequences of classroom incidents and good practice in managing the interruptions (cf Figure 1). It provides advice on avoiding or pre-empting difficult situations. The identified range of potential audiences include classroom teachers, student teachers, senior management of schools, staff development coordinators in schools, EA personnel including advisers and staff tutors, community agencies and school boards; while identified potential uses include:

- staff development for specialist staff
- in-service training for all school staff
- management training
- inter-agency training.

Key issues for the development team included taking account of the diversity of backgrounds of the target audiences including ICT familiarity and expertise; the need for training materials to be interactive, flexible, of the highest quality and using multi-media on CD-ROM; the possibility for written resources, if disk space allowed, to be downloaded by users and the potential migration of the materials to Internet format in the future. The final product is written in 'browser' mode to facilitate such transfer.

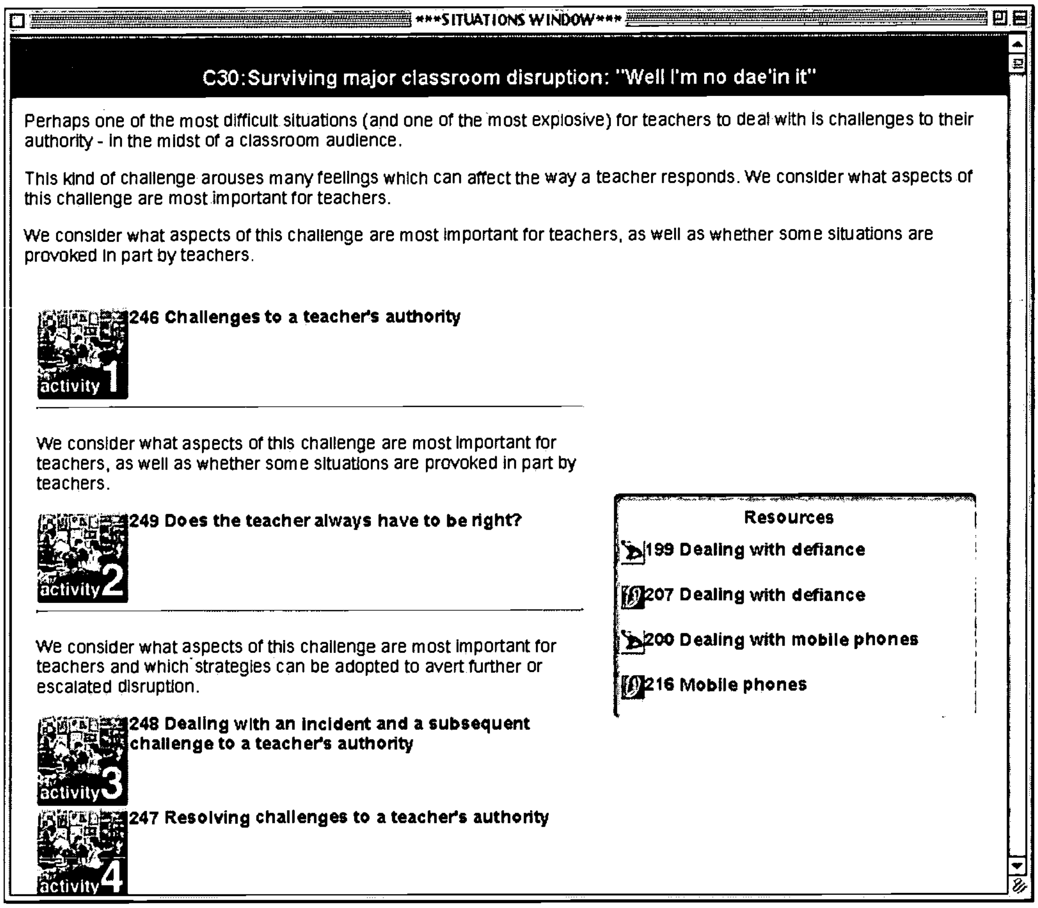

Figure 2: A Typical Sub-Menu Illustrating Interactive Activities available

The product developed has a core of exemplification materials in text, audio and video formats (cf Figure 2) to provide advice and strategies relating to:

- whole school approaches
- positive ethos and reward systems
- departmental and individual responsibilities
- classroom approaches.

Project methodology and approach

Drawing on good practice, the disk illustrates

- identified common principles in dealing with disruption
- comprehensive management strategies for dealing with disruption
- a range of teacher skills and behaviours derived from current knowledge about dealing with disruption and identified good practice

and provides suggestions about sources of support which will help individuals and schools deal with presenting issues while recognising the diversity of approaches.

Many recent publications contain case study examples of whole school and whole class approaches in this field. A literature search revealed publications with illustrations of work with individual children/young people with social and emotional behavioural difficulties. In addition to trawling recent advice and publications key individuals and organisations with direct knowledge of school and classroom practice were engaged. Existing materials and resources, including video, dealing with the management of disruptive behaviour were identified and reviewed. The most useful material was cited in the resource which also built on good practice and experiences from other initiatives which promote positive discipline and the development of social competence.

Project Phases

Complimenting a search and evaluation of existing materials and packages in this field and a literature review, the *field research phase* involved a team of professional field officers managed by key university researchers who visited primary and secondary schools; these visits were focused and areas of investigation including schedules of inquiry were developed and agreed in advance by the Project team. Discussion with headteachers and teachers identified effective classroom practices. Case studies based on such practices were prioritised and agreement reached with practitioners to video classroom practices and secure copyright clearance.

The *concept development phase* involved the identification of an appropriate curriculum design for the proposed CD-ROM and included scripting, scenario and interactive materials development. Resources required were identified or confirmed at this stage. Discussions matching screen design and formats to curriculum design and intentions were significant. This phase was iterative, formative and responsive to the quality and richness of video, audio and text assets realised so that the final product was optimised. Several approaches were developed only to be abandoned in favour of simpler more economic designs which encouraged sensible navigation through the resource.

The *asset production phase* involved co-ordination of professional and technical staff who produced video/audio case study materials and scenarios. Activities, text commentary and feedback were produced which closely matched the collated case studies and exemplified the strategies adopted. The commentary provides background to the situations illustrated and highlights the methods adopted to manage them. Advisory material in the form of text enables visual sequences and activities to be cross-referenced to more detailed information on methodology.

Technical production of the CD-ROM including all programming, engineering, de-bugging and beta-mastering was completed by 31 December 2000. Evaluation in a limited number of schools began in February 2001, this is designed to test the product in the field and provide a final check of curriculum and technical standards before production and dissemination.

The *dissemination phase* will commence in September 2001 and involve distribution of the completed CD-ROM to all Scottish schools in association with 25 national conferences.

References

Clark, M.M. and Munn, P. (Eds.) (1997). *Education in Scotland: policy and practice from pre-school to secondary.* London: Routledge.

Greaves, E. A., and O'Brien, J. (1996) Recent Changes in the UK System of Teacher Education. *Teacher Education in Europe: Evaluation and Perspectives* (Eds.) T. Sander, F. Buchberger, A. E. Greaves and D. Kallos. Osnabruck: SIGMA Project of European Commission.

Hargreaves, D. H. (1994) The New Professionalism: The synthesis of professional and institutional development. *Teaching and Teacher Education.* 10 (4) 423-438.

Kirk, G. (1995) The changing context of teacher education in Scotland. (Ed.) J.O'Brien. *Current Changes and Challenges in European Teacher Education: SCOTLAND.* Bruxelles: Moray House Institute of Education Professional Development Centre in association with COMPARE-TE European Network..

Landon, J. (1995) In-Service and Professional Development: the Emergence of Post-Graduate Award Schemes. (Ed.) J.O'Brien. *Current Changes and Challenges in European Teacher Education: SCOTLAND.* pp.55-65. Bruxelles: Moray House Institute of Education Professional Development Centre in association with COMPARE-TE European Network..

Lloyd, G. and Munn, P. (Eds.) (1997) *Sharing good practice: Prevention and support concerning pupils presenting social, emotional behavioural difficulties.* Edinburgh: Scottish Office.

Munn, P. (Ed.) (1999) *Promoting positive discipline: Whole school approaches to tackling low level disruption.* Edinburgh: Scottish Office.

O'Brien, J and Draper, J. (2001, forthcoming) Developing effective school leaders? Initial views of the Scottish Qualification for Headship (SQH). *Journal of Inservice Education,* 27 (1).
O'Brien, J and MacBeath, J. (1999) Coordinating Staff Development: the training and development of staff development coordinators. *Journal of Inservice Education*, 25 (1) 69-83.
Sutherland, S. (1997) *Teacher Education and Training*. Report 10 of the Dearing Report.
Van der Kuyl, T., Evans, B., McLaughlin, P. and Black, S. (1994) *Current perceptions of interactive technology and its application to staff development in Scottish secondary schools.* Edinburgh: SiTC, Moray House Institute of Education.

TEACHERS' PERCEPTION ABOUT THE TEXT-TO-SPEECH TECHNOLOGY

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Abstract:
As the computer technology rapidly advanced, the text-to-speech function, or the synthetic speech, has matured on the Macintosh computers. Most computer users, though aware of the existence of such a technology, did not have real hands-on experiences with it and did not hold positive expectation on it. The current study examined the perceptions of teachers as well as of other people in non-education related field toward the use of such a technology. The results showed teachers' perception changed after they had been exposed to such a technology.

Teachers always look for innovative ways to create activities using available resources. Current computers have come with the text-to-speech function (or the synthetic speech) which may be used to enhance teaching and learning. Many current reading and writing programs and authoring tools, such as Hyperestudio, KidWorks, Storybook Weaver, KidPix, and others, have integrated the text-to-speech function as a part of the essential built-in features. The text-to-speech feature can be easily used in some word processing documents. After text is entered or selected, the sound or speech command from the program can accurately produce authentic speech. Currently the text-to-speech application is also available in Spanish. In addition, the synthetic speech can simulate different voices to represent different personalities. The text-to-speech function may allow various potential uses in the classroom and is worth exploring.

While the synthetic speech has provided a great potential for instruction, it has not been researched for its usefulness to computer users as well as how it may be effectively integrated in education. The purposes of this study aim at the following.

- Investigating how familiar teachers are with the computer text-to-speech function.
- Examining teachers' perceptions and attitudes about the computer text-to-speech function; comparing teachers' perceptions and attitudes towards the computer text-to-speech function before and after they have been exposed to a few teaching and learning activities using the text-to-speech features.
- Comparing teachers' perceptions and attitudes toward the computer text-to-speech function with people from other non-education professions.

Methodology

One hundred thirty seven preservice and inservice teachers who registered in a computer literacy course were surveyed (or pre-tested) for their perceptions about the text-to-speech technology at an early stage of the course. These teachers were then introduced to features of computer synthetic speech and various instructional activities designed specifically for the use of the text-to-speech functions. They were surveyed again (or post-tested) to see if their perception towards such technology had been changed. These teachers were then assigned to interview three non-education related people to find out about how other people perceive the usefulness of the computer text-to-speech function. The written reports of their interview results was collected and analyzed.

Results

- There was no significant difference between preservice and inservice teachers. One hundred nine preservice teachers and 28 inservice teachers who registered in the computer application courses participated in this study. The preservice teachers, in general, were younger and more computer-literate than the inservice teachers. Seven inservice teachers reported that they had some prior experiences using the Macintosh computers. Others reported that they had only Windows computer experience. The results of the pre-test showed that there was no significant difference between the preservice and inservice teachers' attitudes and perceptions toward the computer text-to-speech functions.
- Most teachers were not familiar with the computer text-to-speech functions. As shown in the pretest survey, all the preservice and inservice teachers had heard of the computer synthetic speech function. However, only four teachers had some prior working knowledge and experiences with it. Most teachers did not have any idea of how to generate speech based on typed text on a computer. Several teachers expressed that current Windows-based computer did not provide an easy text-to-speech function. This is evidenced by the fact that most teachers were Windows users.
- Teachers' initial ratings about the usefulness of text-to-speech function were low. In the initial survey, before they were introduced to the synthetic speech functions and activities, neither inservice nor preservice teachers gave a high mark for the text-to-speech function.
- There is a significant difference between teachers' pre- and post-test results. Most teachers were amazed by the sophistication of the synthetic speech while they learned about the nearly authentic speech generated by the Macintosh computers. They were also surprised to learn that computer can read sentences like "I love to read and I have read many books", where the word "read" may pronounced differently under different grammatical context. The paired t-test results showed a statistically significant difference between teachers' pre-test and post-test [$t(272) = 3.41$, $p < .01$]. Most teachers began seriously engaged in developing ways of integrating synthetic speech technology after they had some hands-on experiences.
- The attitudes and perceptions of synthetic speech from people in non-education related professions were similar to those of teachers prior to their taking the computer literacy course. After learning ways to integrate synthetic speech into teaching and learning, participating teachers were assigned to interview three people that were not in the teaching profession for their opinions toward the synthetic speech. Altogether, opinions from 411 people were collected and reported. After comparing these opinions, we found that teachers' initial perceptions and attitudes toward the computer text-to-speech technology were very similar to those of people from other professions. Most of these people that teachers interviewed had no experience in using the synthetic speech and 327 (80%) of these people suggested that the synthetic speech was a useless device to them. Also as reported by participating teachers, most of these teachers agreed that their perceptions and attitudes towards computer synthetic speech were similar to those of non-education people. They considered it basically an add-on feature for fun or specifically designed for people with special needs. However, after teachers were exposed to several synthetic speech enhanced learning activities, they became aware of the value and power of such a technology.
- Some valued the synthetic speech more than others. The basic information about interviewees' gender, age, and occupation was collected. The results of the analysis showed that there was no significant difference between people of different gender and age. Not everyone would truly value the computer text-to-speech technology. Among all participants in this study, the typical groups that considered the synthetic speech function useful were teachers, people with vision or hearing problems, young children, and ESL students.

Summary

New synthetic speech technology has provided a great potential to serve instructional purposes. Such a potential, however, was generally neglected. The results of this study showed that most computer users, including teachers and people in non-education related fields, were aware of the existence of the synthetic speech technology, but were not familiar with it and did not value it for its usefulness. The results also showed that teachers' perceptions toward the synthetic speech changed to become more positive after they had been introduced to the use of such a technology. This study suggests that teachers are likely to adopt the synthetic speech technology and put it to use in effective instruction if they were properly introduced to such a technology.

The Enhanced Instructional Presentation Model

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Abstract: In this document we describe the Enhanced Instructional Presentation (EIP) model for the development of educational hybrid linear/hypermedia presentations. Our proposed EIP model addresses the learners' needs for organized and synthesized content while providing for individual differences in background experience, learning orientation, and cognitive abilities. The EIP model is an instantiation of van Merrienboer's 4C/ID model (1997).

Learning from linear presentations.

Linear presentations (expositions, demonstrations, activity sequences, etc.) are efficient from the perspective of the instructor and the institution. They aim to maximize the overall learning effects for a target audience by identifying the state of understanding and needs of the average learner and building the content to meet those needs. Presentations are often well polished and moderately effective for large portions of their target audiences.

Unfortunately, for some learners, this industrial model does not work well. Because the intended audience is an amalgamation of learners, any given presentation will include varying amounts of content redundancy or delay in progress for some learners and insufficient content or time for other learners.

When viewing film or video, learners tend to become passive or adopt a "learned helplessness" (Flanagan, 1996). Even with programmed activity sequences, learners know from experience that they will not be able to process all of the content, reconcile every contradiction or explore all perplexions in the allotted time. If they allow themselves to be distracted by any portion of the content, their inattention to the new content and structures being presented will likely cause them greater confusion. The learners' conditioned response is to become a passive receptor of content whenever the pace of information exceeds their ability to cope.

That linear presentations are often partially effective for the majority of the target population is only a testament to the resiliency and capacity of the human mind. Learners can store up content (information and experiences) for later reflection and learning. Yet we suggest that this is an inefficient process with uneven results depending on the individual learner's capacity for storing and recalling presented content and access to additional resources (supplementary experiences, books, experts, etc).

We are suggesting the EIP model as an alternative model that will allow the learner unlimited real-time opportunities to view, review and process content (accretion), reconcile contradictions (restructure), and reflect and improve their understanding (fine-tuning) (Rumelhart & Norman, 1978).

Questions and Tutoring.

Constructivism tells us that individuals have different backgrounds and understandings, and will have widely varying needs for supplementary explanations and examples (Bruner, 1966). Aristotle suggested that our learning is composed of question answer propositions and Dillon claimed: "No event better portends learning than a question arising to the mind"(Dillon, 1986). Yet student generated questions are typically scarce in the industrial model of education. Factors limiting the use of questions in the classroom include social constraints, limited time and limited background knowledge. Even when questions are asked, they may be different from the students' real questions, or laid aside because they are too marginal or too difficult.

Individualized tutoring has been demonstrated to be a near ideal learning situation yielding two standard deviations of improvement over traditional instruction (Bloom, 1984). Learners lacking sufficient conceptual understanding or verbal confidence to enable them to form or present adequate questions are prompted and led in the direction of the intended learning outcomes. Learners lacking in self-direction, or needing to overcome a learned passive response, are encouraged and prompted with options frequently. Unfortunately, it is not feasible to provide every learner with unlimited live tutoring.

As an alternative to tutoring, the EIP model facilitates the learners' use of their own intelligence to choose paths through a synchronized network of supplementary content in order to meet their individual needs.

The EIP model

If a good educational presentation is like a fine string of pearls, then an Enhanced Instructional Presentation puts that fine string of pearls, along with access to any supplementary information needed, into the hands of the learner in order to ensure full appreciation.

The EIP model has four main components:

1. The traditional linear presentation
2. The playback control which allows the learner to pause the presentation, skip back and review earlier concepts, skip forward over redundant material and control the presentation sequence through a table of contents.
3. The supplementary content is synchronized with the traditional linear presentation to provide a short list of "just-in-time" and "as-needed" material that may be selected by the individual learners. Each piece of supplementary content might be augmented with a further short list of supplementary materials allowing the learners to continue exploring until their questions are satisfied. (thus creating the network of supplementary content)
4. The feedback and interaction mechanism is adjustable to meet the needs of individual instructors, researchers, and/or students. Feedback opportunities could include assessments, surveys, access to the instructor via email, and access to a related web pages and discussion forums.

We are in the process of developing a tool to support the development of EIPs. Once completed, the construction of an EIP will involve three main activities:

1. Collecting and generating original and supplementary content segments in the form of quicktime movies, powerpoint presentations, text files, images, audio clips, simulations etc.
2. Constructing a control matrix, using a spreadsheet, that specifies the names (or URLs) and descriptions of all of the content segments along with arrays of appropriate links between segments and some simple control variables.
3. Constructing a feedback page for the learner to access additional content, communicate with other learners or the instructor, access formative or summative evaluations, etc.

Some examples of how the EIP model might be used:

a. A lecture of a mathematical proof with a supplementary network of prerequisite skills, explanations of "the obvious", potential applications, related theorems, etc.
b. A narrated example of a physical education activity, supplemented with descriptions of the rules as they are applied, basic strategy and alternative strategies, focused training exercises, access to related web sites, etc.
c. A pre-service teacher report on a classroom observation with a supplementary network of their comments related to the activity observed including: discussions on pedagogical issues, management issues, reflections etc.

The EIP model we have described is a hybrid, combining a polished linear presentation with playback control and a synchronized, hyperlinked network of supplementary linear and hypermedia segments. By adding the strengths of these two instructional media modes we hope that Enhanced Instructional Presentations will promote more efficient learning for individuals.

References

Bloom, B. S. (1984). "The 2 sigma problem: The search for methods of group instruction as effective as on-to-one tutoring." Educational Researcher **13**: 4-16.

Bruner, J. (1966). Toward a Theory of Instruction. Cambridge MA, Harvard University Press.

Dillon, J. T. (1986). "Student questions and Individual Learning." Educational Theory **36**(4): 333-341.

Flanagan, R. (1996). Unintended results of using instructional media: A study of second and third graders. Annual Meeting of the American Educational Research Association, New York, NY.

Rumelhart, D. & Norman, D. (1978). Accretion, tuning and restructuring. Cognitive Skills and their Acquisition. J. R. Anderson. Hillsdale, NJ, Lawrence Erlbaum Associates.

van Merrienboer, J. J. G. (1997). Training Complex Cognitive Skills: A Four-Component Instructional Design Model for Technical Training. Englewood Cliffs, NJ, Educational Technology Publications.

A School-University Partnership Model for Developing Student Technology Leaders

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Abstract: *Multimedia Masters* is unique a school-university partnership of student "consultants," teacher "clients" and university "experts." The year-long project begins with a development day to collaboratively set goals for the year, and four remaining sessions, two on the university campus and two at the district, assist students with meeting these goals. Each session focuses on developing technical, pedagogical, mentoring, and reflective skills. At the end of the project, students present their finished multimedia projects to parents and school administrators. Year 1 achievements include students learning to communicate more effectively, think critically, and reflect upon themselves as learners, in addition to increased technical skills. Teacher clients expressed increased interest in using technology both personally and within their curriculum. Challenges during Year 1 and areas to improve for Year 2 involve student time commitments, more effective teaching of the teacher clients, improved communication with the district technology team, and more effective structuring of session activities.

Professional development remains a pivotal requirement for successful technology diffusion among classroom teachers. Quality professional development opportunities are difficult to design and maintain so that they provide customized training at the level each teacher requires, as well as immediate reward and learning applicability for each teacher's students. To that end, *Multimedia Masters* is a partnership that was forged between the University of Houston College of Education and Spring Independent School District in Spring, Texas. Recognizing that student technology leaders are in abundant supply and possess ready enthusiasm for multimedia development, the ongoing goal of the project is to develop a cadre of technologically and pedagogically skilled middle-school students who can assist the technology development of their teachers. This brief paper will establish the project design, technical issues, strategies, achievements, and future goals of this model project so that others may consider a similar solution.

Development

Multimedia Masters students are 8^{th} graders who apply for a "special experience" extracurricular opportunity. If selected, student teams invite a teacher whom they have had in the past to be their "client" throughout the year. Students work with their clients, special experience teacher leaders, and university Instructional Technology faculty to learn the necessary technical skills to transform the content material into quality multimedia learning products for the teacher clients to use with their students. A parallel goal of the students is to teach their clients the technology skills as they learn them.

The year-long project begins with a development day at the district with students, teachers, teacher planners, and university faculty to collaboratively set goals for the year, which for Year 1 included proficiency in reflection and planning, mentoring, pedagogy, and technology. Four remaining sessions, two held on the university campus and two held at the district, are planned by faculty members and teacher planners, with regular student input, to assist students to meet these goals.

Activities

Throughout the year, students keep reflective journals of team and teacher relations and personal accomplishments. Students work closely with their teammates, learning together and mentoring each other on technical skills, and all participants brainstorm approaches for students to work with their teacher clients. A portion of each session focuses on developing technical skills, including productivity tools, multimedia formats, and website design and development. Students practice teaching skills by planning and teaching technology skills to university preservice teachers, as research findings have shown that students acting in teacher roles tend to demonstrate accelerated growth in social skills, confidence building, communications skills, and critical thinking. The culmination of the project involves students presenting their finished multimedia projects to parents and school administrators.

Challenges

The project faced several technical challenges in Year 1. There were software incompatibilities between the University and school computer labs. The K-12 labs presented further difficulties with downloading and filtering restrictions. The entire group attempted to move beyond the "coolness factor" of technology to get students to think about how technology can be used to solve problems and communicate new ideas.

Achievements

At the conclusion of Year 1, *Multimedia Masters* can boast of achievements on a number of levels. Along with using technology tools to create teaching materials for their teacher clients, students learned to communicate more effectively, think critically, and reflect upon themselves as learners. Student participants described increased technical skill, confidence with teaching, and positive experiences working with team members. Teacher clients overwhelmingly expressed an increased interest in using technology both personally and within their curriculum. A vital partnership developed between the district's technology and curriculum departments as a result of facilitating the project, and other classes in the district were able to make use of the multimedia materials for student learning. Finally, university faculty members took advantage of the authentic learning experience for their future teachers.

Goals

As successful as the first year was, we unanimously identified areas to improve for Year 2. Students had a great number of daily extracurricular commitments, making meeting with teachers and team members challenging; we hope to work with them to better organize their time. Students often created learning products and simply gave them to teachers; we will help students better meet the technology learning goals of the teachers. Challenges with technology are expected to continue, but the project team plans to improve communication with the district technology team. The faculty members hope to retain a constructivist, student-driven atmosphere, while at the same time better structuring the session activities to use time efficiently. A final long-term goal is connecting the teachers in this project with real content providers, a concept currently being explored within in the graduate IT program.

A New Approach - Situation Learning (SL)

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Abstract: The presented solution offers a new approach to knowledge module presentation that is different from the majority of presently used approaches. The interactive component of the SL approach increases students' involvement and motivation for learning. Learners can experiment and investigate within the 'virtual world' of the SL knowledge module. Such experimenting and interacting with different knowledge presentations makes it possible to construct own specific knowledge thus making the factual knowledge more permanent.

Situation Learning - General Description

In the field of Web based learning, numerous attempts have been made to use hypermedia for learning in many different ways. In the first half of the 90s, many scientists have already stated (Maurer92),(Maurer93),(Lcnnon94),(Elliot95) that hypermedia can be used as a cognitive tool for learning, and have also outlined a number of other potential advantages that hypermedia systems offer. Among the researchers of hypermedia use for education, the following basic questions were proposed: How to design effective learning opportunities? Why is learning by experience very often more efficient than learning by studying? How to provide the learning experiences needed to respond to current challenges?

As reported in (Biljon99), Haque (Haque, Evens & Michael, 1987) emphasised that many students, in spite of possessing the required amount of knowledge, are unable to effectively utilise it and apply it to solve problems. The aim of SL is to facilitate the knowledge presentation and thus to improve the learning process. Using SL for educational purposes two primary aspects of the learning process are supported:
(i). - learners are encouraged to combine knowledge from different areas to chose a solution or to make a decision at a certain point,
(ii). - learners can test how the pathways and outcome of the situation change based on their decisions.
David reported (David97) that there is an increasing demand for greater interactivity to be built into learning materials. SL knowledge modules provide a complex level of interactivity that stimulates users engagement. In SL knowledge modules, different interactivity concepts are (and can be) applied, as object, linear, construct interactivity and hyperlinked interactivity. Also some simplified non-immersive contextual interactivity and immersive virtual interactivity can be applied in the general concept of the SL.

A Situation Learning knowledge module can consist of one or more related situations. The term "Situation" in the context of Situation Learning denotes a specific simulated environment in which the learning objective is embedded. The situation is a collection of different scenes that are related in the sense that they describe a certain event or task. The users are offered some context dependent possibilities or possible courses of action. Based on previously acquired knowledge and described scenes, users make a choice and move on to another scene within a situation. The "scene" consists of several hypermedia and HTML documents (e.g. on request available additional information). The displayed hypermedia document consists of an image, video / audio, text, meta-instruction and for example four selections. Only a few possibilities (in general 2-6) are offered to users. Based on users chosen courses of action, they then proceed to the next scene and eventually to the end of the situation e.g. summary. Each consecutive scene is different and depends on the previously made choice. By being confronted with the consequences of chosen course of action, users can stepwise construct the feedback on their choices made. With the help of the "virtual" world users can explore where a chosen course of action could lead them in the "real" world. In the same way, users can safely explore possible outcomes when less appropriate choices are made. Using SL knowledge module, users get the opportunity to learn appropriate responses for different situations / cases. Such opportunities enable users to improve their ability to discern relevant from irrelevant information and to combine unrelated (or less obviously related) elements. The interaction provided within each consecutive step, encourages users to think about the case and to reflect back on their own knowledge base. Based on this they make a decision. In this way SL effectively facilitates the decision-making process and helps users to understand and evaluate their choices.

With interactivity and stepwise constructed feedback there is a support to students' productive thinking and promoting subconscious or incidental learning. Feedback helps users to build a new picture about how much they know about a certain topic and if they can use the acquired knowledge within a certain situation. SL can influence users' awareness in terms of what the users think they know. Being able to build their own picture of the knowledge mastered increases users' motivation for learning. Consider an example: when reading a book with an interesting topic and good structure, the reader will have a feeling of having understood everything. But later, when confronted with a specific problem, the reader might want to use the theory and facts he/she acquired from the book in order to solve a specific problem. At this point at the latest, the reader will realise that although he/she had a feeling of having understood the content at the time, he/she did not memorise enough to be able to formulate a solution i.e. to use the acquired knowledge. Based on such experience it becomes clear that in order to solve a problem conscious learning and a deeper level of knowledge has to be achieved. Or as the (Queen99) expressed, *"Failure is motivation for learning"*.

Through the process of applying the knowledge acquired learners can build their own mental concepts e.g. can check the understanding of the material learned within the concept. Situation learning may bridge the gap between isolated learning of theory and practical work i.e. applying theoretical based learning to a practical situation. Situation learning is a way of facilitating the natural learning process, whereby thc successful acquisition of new facts is enhanced by the learners ability to consolidate this information with their own knowledge base and experience. Such links allow people to master very complex or seemingly unpredictable situations. Situation learning helps to build and improve learners' mental model.

Theoretical Background of the SL

From the didactical aspect SL knowledge modules can be used also to increase the dynamics of learning hence SL knowledge modules are less formal and have completely different approach compared to regular hypermedia used for Web education. SL can be placed in the group of didactical programs. Such programs are characterised by their interactivity, adaptability, and additional explanation on request and the possibility to test the acquired knowledge.

SL uses constructivist learning approach where each learner constructs their own individual world and learns how to manage problems within this world. Using SL knowledge module learners are active participants in knowledge acquisition. Learners can experiment and investigate within the 'virtual world' of the SL knowledge module. Such experimenting and interacting with different knowledge presentations makes it possible to construct own specific knowledge thus making the factual knowledge more permanent.

"Situation Learning" is a similar expression to "situated learning" but should not be mistaken for it. Although both approaches do emphasize that learning should be meaningful to the domain and contextualised, there are also significant differences between these approaches. Situated Learning is a general theory of knowledge acquisition whereas SL focuses on knowledge utilisation. In the SL approach knowledge is primarily acquired by means of individual learning. In SL, in contrast to situated learning, the emphasis is on knowledge utilisation and development of mental models based on acquired knowledge. In

SL users construct their own personal approach to problem and task solving. With the help of the simulated situations learners have the opportunity to create and experiment with so-called different scenarios of behavior within the situation. The behavior reflects the learners' understanding of different theoretical topics, their ability to connect interdisciplinary knowledge and to utilise it in a proper way e.g. to solve a problem or to offer help. Transparency of such systems enable learners to understand sequences of the whole process. Furthermore, learners have to define the problem area, use several different sources of information to justify their decision reasoning and use the support of technology to process their inputs. The aforementioned activities encourage interdisciplinary thought and action that is similar to the situations we get confronted with in real life.

Educational Aspects of SL

In contrast to traditional linearly oriented learning, there are other possibilities for learning for example incidental learning, often called implicit learning (Holzinger99). For the learning process, motivation is a very important factor. Therefore learning programs should be entertaining and challenging to get the learners' attention and give them motivation at the same time.

SL knowledge modules contain both elements, entertainment and challenge. High content interactivity stimulates user's engagement and mental involvement. Higher levels or attention and motivation of learners can facilitate learning. In the SL knowledge module learners use a chosen course of action to directly influence the development of the situation. The principle of constructed feedback in the form of different possible pathways and situation outcomes has some similarity to adventure games and contains other principles of edutaiment (Al-Ubaidi00). (Quinn99), (Lepper92) have shown that enhanced learning (which is fun) can be more effective. Using some simple educational tasks, they demonstrated that learning embedded in a motivating setting improved learning outcomes.

In the SL microworld there is a direct relationship between action and feedback. On one hand students can influence the situation development with their decisions. Based on courses of action taken, students proceed from scene to scene. When arriving at the end of the situation at the latest, students obtain feedback in the form of a summary with a thorough explanation of results or behaviors that were expected of them. With the help of information obtained within scenes and partially with the help of information provided in form of a summary which is a concluding scene of a situation, students can construct the whole experience of "actions taken and consequences". Students can get feedback after the session also in form of the computer LOG file, where they can see their pathway and analyze chosen courses of action. This feature gives students, in conjunction with the feedback, the possibility of assessing their own activities to see how they were doing and to be able to more objectively evaluate their decisions / courses of action. Feedback could be provided in different representation forms and could also be used for students overall performance evaluations.

Being able to see students' overall performance and the development of their decision making process the teacher or tutor can effectively test if the learning material was understood. If the content was understood differently, analysis of chosen courses of action and pathway evaluations provide the information required to identify where the problems occurred, e.g. in what context students' performance indicate a misconception. With help of this information the system or tutor can suggest to students a list of additional topics that could be beneficial for acquiring additional knowledge.

Use Cases

In order to present the value of the SL knowledge module in practice, several application examples of the SL knowledge modules for learning are outlined in this chapter. The SL knowledge module approach could be applied to stimulate students' involvement, fight boredom and increase retention. This approach could be applied for different representation of a particular topic or to demonstrate the application of the theory.

Example 1: An SL knowledge module could be created to depict how different parameters influence the ecological balance within the environment.
The ecological balance could easily be disrupted by an inconsiderate action. Namely, before wastewater is released back into the waters outside the plant, several parameters have to be checked according to the legal regulations. The temperature, pH, the quantity of biologically decomposable elements, presence of halogen element, should all be controlled and regulated, along with many other factors. When the regulations have not been followed, irreparable damage to the environment could occur. Even if the water is not contaminated but is released back into the water source too hot, micro-organisms, plants and fish could be killed. However, if the water is contaminated, the consequences are much worse as pollution could take place.
Within the SL knowledge module the procedures for chemical engineers when handling the wastewater could be discussed. Students should be confronted with cases of differently contaminated wastewater. Students should have the possibility to choose an industrial sector. Related to the industrial sector defined, specific cases should be created. Based on knowledge of regulations, testing procedures, and prescribed handling in the case of overly polluted wastewater, that has previously been acquired within the course, students can choose one of several offered courses of action. In each scene students are stimulated to think hard and decide which course of action is the most appropriate. Within the next scene students can see the result of their decision. Based on the result, students can see if it was the result they expected or if another decision could be better. If students are not satisfied with the result, they could apply a plausible corrective action and check the outcome with the help of the next scene, and so on. When working through the situation, students can explore different behaviours like what would happen if they were to take actions according to predetermined decisions. In the worst case, they could cause water poisoning and jeopardise the living in the whole area of the "virtual world".
Students can work through the SL knowledge module several times to improve their performance and to encounter different cases offered. Within the described SL knowledge module, students can access numerous theoretical details and explanations available in the course background library. To repeat and acquire additional knowledge students could also 'switch back an forth' between SL knowledge module and the rest of the courseware.

Example 2: Application of SL knowledge module to teach history could bring the possibility to present the life in the past from different perspective. There is a variety of very good movie materials that depict different historical periods from the past. Although the materials are very good and interesting, they do not support active participation of students. When watching a movie, students have the role of observer, whereas SL knowledge module makes it possible to be an active participant. Students could interactive explore different historical periods when they build villages, cities, and infrastructure. Within the knowledge module, a rich collection of pictures and video-clip sequences could be available. Students could have a possibility to build and decorate a typical house of a particular era. Among different domestic and decorative objects offered, that were used in different time periods, students should collect appropriate objects for a specific era.
Active participation of students in activities like collecting objects, building and decorating houses, also provide support for haptic learners that memorise and learn better when they have an opportunity to interact with the learning material.

Example 3: Another possible application of the SL knowledge module for teaching chemistry could be for making experiments with toxic chemicals in the "virtual world". The initial scene of the knowledge module could be in form of a task where an experiment should be executed. Different stages of the experiment could then be presented within several scenes of the knowledge module. Students would have to plan the experiment: resources, chemicals, etc. They would have to check which equipment is needed for the experiment, when the laboratory and the equipment is available, make calculations of chemicals needed, etc. In another situation within this SL knowledge module, students could prepare all of the equipment needed for the experiment and arrange the pieces to put everything together as necessary. When the equipment is arranged properly and everything else is prepared they could proceed with the experiment in the safe - virtual environment. Students should be aware of proper procedures, like not to put water into sulfuric acid because this might cause a turbulent exothermic reaction or how to react in case where part of their skin comes in contact with strong acid.

In the aforementioned knowledge module a variety of interactive paradigms could be applied, like object interactivity, clickable image maps, choosing courses of action, writing calculated parameters and quantities, etc.

The pilot project LIFE, based on the SL knowledge module application, is presented as a part of the medical server in Austria (www.infomed-austria.at). The goal of the project is to educate the population in the areas of fitness, stress regulation and nutrition, in order to increase the common awareness of the importance of these factors on our lives. SL modules were created for knowledge mediation in each of the topic areas.

Authoring of the SL Knowledge Modules

It is relatively easy to design and produce the SL knowledge module. It does not require any additional programming skills, apart the basic knowledge of HTML page creation. The course production requires minimal cost and relatively short development time that is justified with the applications benefits and many varied uses within learning. The authoring is divided into the following topics: software engineering approach, importance of the scenario, proposed interface structure, and existing authoring support, including any authoring difficulties that arose.

When developing an SL knowledge module software engineering principles should be considered. Though the SL is different from a conventional program, there are certain parallels that can be drawn. Designing the SL application, in the first step the learning objective is defined e.g. presenting certain facts, comprehension testing, etc. In the second step the situation (story setting) is defined in which the learning experience along with a possible solution will be embedded. In the third step each scene and connections between them is described in a scenario. With the help of a graph and table the knowledge module structure is illustrated. In the implementation phase, the situation author or the programmer makes the hypermedia documents based on the scenario.

A scenario contains a detailed description of the situation, different situation developments i.e. scenes with all screens and multimedia. To enable the production of a learning knowledge module, e.g. situations where a detailed description is needed, the teacher or knowledge module author should write a scenario where each particular scene is described. Based on this description the programmer or media producer is able to make the product without the knowledge of the whole knowledge module or didactical / methodical co-relations. The scenario production takes more that one third of the courseware development time.

Each presented scene of the situation can be divided into four main areas as follows.

Meta instruction	Situation description
Possible courses of action	Media display

In general the entire left side of the screen is intended for the user interaction. The right screen side gives information about the scene e.g. description, media, links to pages with additional data, ect.

On one hand, authoring is facilitated with the templates for scenario and hypermedia content production, on the other hand, smaller-less complex situations can be re-used and embedded into more complex content. Three levels of SL authoring supports are defined as follows: (i) - authoring supports for facilitating the scenario writing with templates for scene description, (ii) - authoring supports for visualisation of the described situation and connection between scenes, (iii) - authoring supports for facilitating the hypermedia document production with the use of templates (Dreamweaver SL Extensions).

In more complex situations e.g. adaptive situations, the author can find it becoming increasingly more difficult to keep an overview of the situation and possible connections to other scenes or situations. Therefore the present authoring tools should be developed further to support the scene production based on the semantic structure defined by the author or the expert. The possibility should be given either to follow the path along one choice or to describe the key scenes, define levels and then to define the different pathways connecting the levels.

Conclusions

The main purpose of the SL knowledge modules is to offer the opportunity to apply the knowledge acquired thus making it possible to indicate a deficiency in understanding or a misconception. Therefore, a connection to other specific learning programs can be provided to make it possible for students to acquire factual knowledge. SL knowledge modules can also be connected with other programs like Mathematica for learning mathematics, or a program for learning a foreign language, etc. With help of such programs students can explore details or acquire some specific knowledge. For instance in Mathematica students can receive help by calculating integrals, or carrying out other mathematical operations.

It is evident that the major benefit for the learning bring the SL knowledge modules when being offered within an on-line learning environment. Users can profit from the different perspective that knowledge modules are providing, and at the same time from the rich annotation and communication possibilities offered within the learning environment.

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Literature

Al-Ubaidi, Dietinger T., Maurer H., Pivec M.(2000) *Situation Learning or what do adventure games and hypermedia have in common.* Campus 2000: Lernen in neuen Organisationsformen (Ed.: F. Scheuermann), Waxman Verlag, Germany, 2000, 83 - 96

Biljon J.A., Tolmie J. C., Plessis J.P. (1999). *Magix - an ICAE system for Problem-Based Learning.* Computers & Education 32, 65 - 81

David B., Werbin K.C., Shaw S.G. (1997). *Integrated Development and Production Tools for Building Hypermedia Courseware and Interactive Scenarios.* Proceedings of ED-MEDIA / ED-TELECOM'97, Calgary, Canada, 1997, 241- 246

Elliot G.J., Jones E., Cooke A., Barker P.(1995). *Making Sense: A review of Hypermedia in Higher Education.* Proceedings of ED-MEDIA 95 (Ed.: H. Maurer), Graz, Austria, 1995, 205-210

Holzinger A., Maurer H.(1999). *Incidental learning, motivation and the Tamagotchi Effect: VR-Friend, chances for new ways of leaning with computers.* CAL99: Virtuality in Education, Abstract Book, p.70, London: Elsevier

Lennon J., Maurer H. (1994). *Lecturing Technology: A Future With Hypermedia.* Educational Technology 34 (4), 5-14

Lepper M.R., Cordova, D.I. (1992). *A Desire to Be Taught: Instructional Consequences of Intrinsic Motivation.* Motivation & Emotion, 16 (3), 187-208

Maurer H. (1992). *Why Hypermedia Systems are Impotrant.* ICCAL'92, LNCS 602, Springer Pub. Co, 1-15 (Invited paper)

Maurer H.(1993) *Spekulationen über die multimediale Zukunft.* CAP debis Reprint

Quinn C.N. (1999). *The Play's the Thing: Enhancing Learning Design Through Game Elements.* Tutorial at AI-ED99, LeMans, France.

Session #435

Corporate Demonstration
Improving the Use of Media in the Classroom

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Emerging technologies continue to change and improve the landscapes of our classrooms. Computers, Internet, and video have played a large role in changing how students learn. One way to integrate the use of emerging technologies is to enhance older and proven methods of instruction. Schools have created video libraries to augment and improve student retention for years. Now, using a combination of computer software, high speed network access and large screen classroom monitors, teachers can quickly access and control a large cadre of video media, without the past burden of hardware set up and scheduling. ETR, Educational Technology Resources, Inc., provides a software product to assist teachers in using media in the classroom with ease--the product MediaMaster. Whether traditional media or digital media, MediaMaster allows teacher to rapidly deliver video content with ease and confidence.

New Teachers and New Technologies

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Abstract: A key moment in emancipating the teacher from the physical limitations of the classroom and encouraging a sense of collaboration, cooperation and collegiality would be introduction of principles and responsibilities of electronic collaboration. Teachers have to be introduced to Internet, electronic mail, news-groups, list-servers, bulletin boards and other means. By those, they can act jointly and communicate with colleagues near and far. They should be acquainted to online resources and the means of connecting and using them as well as contributing to them. In this paper, I will try to outline a learning model that will succeed in such education of a teacher.

Introduction

The perception of computer assisted learning is shifting from its current position as an optional extra in our fund of course components, to that of a key teaching medium. Learning with computers is a multi-layered, interactive experience. Interactive multimedia is defined as a computer tool that includes a combination of text, graphics, sound, video, and animation sequences packed together (see Lee 1996). With the growth of the World Wide Web, this becomes widely available to more and more people every day, forming a visual/audio presentation of information and knowledge. It can be successfully used to support education and training, to serve as a reference tool and to provide dynamic presentation. Traditional "textbook learning" is one component for learning a subject, laboratory projects provide actual experience, but only multimedia and WWW can synthesize and expand the learning process. With the advent of the WWW, education has a new tool to utilize. It offers the ability to easily distribute educational material around the globe. Also, with a web implementation of educational material, changing the content is trivial, and students need not be made aware of such changes. Facts supporting this, are studies showing that people retain 25% of what they hear, 45% of what they see and hear, and almost 70% when they actively participate in the process (see Myers 1990). Moreover, additional effort that professors may and should incorporate into creation of lessons and courses using WWW and multimedia "offerings", will help in personalization of these lectures. How much this is important, can best be described through findings in (see Goldstein 1997) that: "98% of students receiving individualized instruction, outperform those receiving computer-based training." Even WWW browsers themselves, overcome many of the shortcomings of traditional computer-based learning by affording platform independent, easily updated training materials. Personalization and adaptation to individual student is performed through their profiles and through planning software. As individual lesson components are selected, many of them are adapted to student, based upon constraints attached to the materials, and those "attached" to the students' profile. A student's performance with using materials, in turn, updates his profile.

There's one interesting observation that can be made in connection with the usage of WWW in education. Hypertext organization and interconnection of Internet, confirms to a nonlinear form of presenting information, in which interlinking modules of related information are associated to a central topic. The associative links allow instant access to any of the modules, enabling cross-referencing and browsing. On one hand this confirms to a structure of a World Wide Web, while on the other hand is akin to the manner in which the human mind works to gather facts.

Teachers should be taught not only how to use web, but also how to contribute back to it - how to author for the web, integrate graphics, create links and produce useful content. For some time now, this process - "authoring", has been described as "the design and production of computerized multimedia learning materials", carried out by a single person - the author. This perhaps has never been completely true, although the early authoring systems for computer-based learning did seem to assume that teachers wanted to and could produce their own teaching material. Besides, there is a view that the wide range and quantity of material now available on the Web, electronically, make possible the notion of "student as an author", searching the Internet for material to incorporate into a multimedia "story".

Although both notions contain a lot of truth, there is one specific point in authoring process I would like to emphasize. Despite the decline in costs of equipment, the cost of the time of those involved in production of learning material, remains high. And, not only remains, it goes higher and higher. To "author", teachers themselves need time to become familiar with the technology, understand the instruments and experiment. Provision of articles for teachers through news-groups or list-servers incorporates and advocates collegiality and stimulates thoughtful and profound discussions. Besides, as teachers are in some extent expected to act as a scientists, it is interesting to suggest a usage of a "collaboratory", or a virtual laboratory created by the means of world wide web (see Cerf 1993): "... center without walls, in which the nation's researchers can perform their research without regard to geographical location - interacting with colleagues, accessing instrumentation, sharing data and computational resource, and accessing information in digital libraries." Educational reform calls for a drastically different kind of teaching - one that asks school to move from lecturing in whole class instruction to the facilitation of learning in small group collaboration and interdisciplinary projects. IF learning takes place in classes that are collaborative, supportive and inclusive, *more* students can contribute and participate in their own learning.

Another important point is a need for "re-training" of teachers in some areas concerning WWW-based teaching. Most professors come to "multimedia teaching" with traditional teaching experience and find that the theoretical-based assumptions that worked successfully in face-to-face instruction, do not translate well into technologically mediated education. This retraining should initially focus on moving the teacher from the podium to the sideline, from teacher-centered instruction to student-centered. Once this is achieved, the following retraining components can encompass redesign of lessons, continuous and proper usage of technology and integration of interaction in the course content, as few of the first needed changes. During these, a teacher and a student (or students) can have a non-contiguous dialog, exchanging information and ideas, questions, assignments, feedback, etc.

Learning Model

It's been argued (see Winn 1992) that a strength of the free interaction with virtual scenes and Internet is that it gives children - and we add, teachers - the opportunity to explore the same place repeatedly, building their understanding. Besides, as an educational tool, WWW has little in common with the teach-test-correct model of a "traditional" computer assisted learning, providing opportunities for children to construct their individual learning.

A teaching-teachers model should be developed for effective training for lecturers, not only on how to use Internet but, more important, on how to include these technologies into everyday teaching practices. They have to be trained how to be "knowledgeable end-users" AND "creative builders" of learning experiences on the Internet. Yet, with a rather high pace of new developments emerging, training model should drastically reduce the learning curve and enable fast application and retention of skills gained.

More often than not, training concentrates (and emphasizes) on discrete skill development, while in a certain manner "ignores" practices that enable user to increase an understanding of the relation between the training and use of acquired knowledge in the classroom. In contrast to that, (see Kinnaman 1996) advocates one different approach: "Teachers don't need to be "trained". They need activities that engage them with the process of teaching - activities that encourage them to explore, create and reflect upon the benefits and limitations of teaching with technology". In other words, teachers are now being asked to examine thinking and learning process; collect, record, and analyze data; formulate and test hypothesis; reflect on previous understandings; and construct "subjects' own" meaning. Good teachers are constantly making decisions and formulate ideas about goals of education they are "giving". Those ideas must not ever be conclusive - after the initial formulation, those decisions and ideas are subject of careful reconsideration in light of newly acquired knowledge and techniques, in light of information from current theory and practice, from feedback, and from contemplation about social and ethical consequences of their results.

Training is usually given in a form of providing information that may or may not have relevance and importance to the end user. Instead, a good learning model should be made highly meaningful and personalized to the individual teacher, encouraging usage of skills that can be implemented easily and promptly in the classroom. The intention is to enable teachers to think consciously beyond just adopting new skills, automating, simplifying or duplicating current teaching practices. They should be able to reevaluate, reexamine and reconsider teaching in the light of the new skills and produce original learning actions that display these qualities. Still, every step of the way, teachers should be allowed broad opportunities to practice their skills in meaningful activities. This will assist them in accomplishing the greater goal - creation of a project, a teaching plan, a subject curriculum, that shows evidence of the teacher having rethought a lesson in the light of newly adopted skills and technologies. Consecutively, as the skill level increases, authority over one set of skills leads to introduction of the next one. This progress is derived through a proposed learning model, consisting of:

- determining objectives for the training;
- outlining the elements of a training content;
- creating the activities for successful practice;
- inventing a system for evaluation, and
- devising a reward system.

Course Outline

The usage of Internet services becomes an essential part of teacher training. The education profession should realize that this is not some futuristic and frightening development, but merely an extension of the kind of responsibility that schools have long accepted for helping children to be discerning in their use of other media, and to develop skills and judgement in relating to others and caring for themselves.

Given elements of learning model should be adequate to include teachers into a "team" of successful technology users. As always - learners need to approach a subject in more than one way to move from surface knowledge to substantive, in-depth understanding. Here, we will outline elements that should characterize the "course":

- teachers are given the freedom to create their products and give them meaning in their own manner, while implementing the skills they have learned;
- teachers are clearly informed that the trainer's role is only to provide the training concerning the necessary skills, while their creative implementation, are their own responsibility;
- teachers are introduced to different methods of exploring technology - searching the web, gathering relevant data, collecting information on a given subject and similar;
- the trainer uses prepared materials and live demonstrations to teach data acquisition, analysis techniques and scientific principles;
- the necessary real-time interactions between trainer and student/teacher go far beyond standard conferencing - they must be able to work collaboratively and interactively;
- some practices require teachers to use data "hidden" somewhere in the web to make calculations and suggest some conclusions based on these calculations;
- course uses an integrated set of communicating tools such as electronic notebooks, (video)-conferencing systems, shared screens, information-access tools and similar, to the extent when they become a regular part of everyday tool for teachers;
- the course should facilitates scientific interaction between teachers by creating a new, artificial environment in which individuals interact;
- a lot of newly adopted information processing skills are used in creative ways to learn new, or re-learn old concepts through interdisciplinary connections;
- while advocating the use of technology takes time, the schools are also obligated to reward teachers initiating those changes within their schools;

While the need to interact with others is an inmate tendency, that most teachers possess when they begin working in education process, the introduction of technology that will mediate in this interaction often hinders and delays that tendency. Therefore, it is essential that course includes such kind of technological instruction, coupled with periodic question and answer sessions, which will assure that the interaction will persist and will include both pedagogical and social attributes.

At the same time, several strategies that will enforce constructivist and inquiry based teaching, include these:

- Accepting and encouraging teacher initiation of ideas and thier questions;
- Using open-ended questions and encouraging teachers to elaborate on their ideas;
- Encourage teachers to test their own ideas, answer their own questions, hypothesize causes, and predict consequences; and
- Encouraging self-analysis, collecting data to support ideas, and reforming ideas in light of new experiences and new evidence.

Although new technology addresses shortcomings in current practices, it is obvious that the "higher" the technology is, the more limited is the access and the more knowledge is required for its' usage. Integrating the use of Web into education, however, has more to offer than simply faster and more convenient communication for those who have access. By preparing a study guide that takes advantages of what the Web has to offer, a more interactive experience can be offered to students, stimulating their motivation, curiosity, learning and dialog. Success of those highly depends of teachers' reactions. For example, successful dialog via e-mail, depends on the instructors' rapid response to students' questions and comments. At the same time, teacher might want to suggest taking certain discussions to a more open forum, where more students could participate - from forwarding e-mail messages to conferences.

Conclusions

The fusion of computers and electronic communications has the potential to dramatically change and enhance the quality and "productivity" of schools and faculties. Still, a technology often exists without being used because it is perceived as adding little or no value (see Kouzes 1996). While we claim that the time is right for "collaboratory" solutions helping the scientific and teaching interactions, we still have to make it a necessity for systematic and methodical progress, psychosocially acceptable. Today's modern technology allows for interactivity between student and instructor to take place in many formats - starting with simple e-mail messages, and going all the way "up" to teleconferencing, interactive video, conference calls, or CUSeeMe, being just some of the possibilities. It is important, therefore, for the interactivity to move beyond brief encounters between student and teacher and to invoke a feeling of togetherness between them, between students themselves, and finally between student and the material being studied.

Increased usage of Internet in the classrooms has been reported through the professional publications. Momentarily noticeable advantages of the Internet-based training are the integrated communication capabilities, connecting people, and the use of the huge content already on the Web. Besides, it allows flexibility of the time and place to study, and even enabling flexibility of changing the content and supplying of additional resources, without students being even aware of that. While, in the past, relatively slow adoption of newly introduced technologies into the classroom usage was acceptable, today, all over the world, daily practices of both teaching and learning have been enriched with these in unusual and never seen rate. New technologies, with easy-to-use interfaces, allow both students and teachers to access, develop, make use of, apply and donate to the Internet world of information. They can also add to the world of relevant, applicable and meaningful information, communicate and collaborate with colleagues worldwide and "escape" from formerly separate and disconnected world of isolated classrooms. This chance must not be overlooked and neglected in our schools and our teachers have to be trained to use contemporary resources and technologies and engage the students and pupils in the learning process by making them active partners.

The revolution caused by Internet is providing much needed motive and impulse for large-scale technology implementation into our schools. More importantly, research shows (see Ainge 1997), that interest remains high even after a long time usage, almost without any significant sign of reduction. Even without funds needed for complete computerization of every classroom in each school, we must be able to use wealth of information offered, knowledge and experience "funds" applicable in our environment.

The use of Internet, electronic mail, newsgroups and other elements of electronic communication for supporting classroom instruction is still in its beginnings. However, this innovative method has great potential in enhancing traditional teaching methods. Applied correctly, it can prepare teacher to bring breadth and depth to subjects being taught, provide efficient use of class time, create flexibility in teaching and enhance student's learning. Examples of Web based teaching (see Hidalgo 1996) show successful implementation of Web-based, multimedia teaching at MIT, used for extending communication beyond the classroom. It allows teacher to post information on the Web both for subject review and for subjects not covered in class. It is also sucessfully used for easy monitoring of student progress and student interactions in bringing critical discussions on the course.

Internet, WWW and their other services, are here to stay and become inevitable part of childrens' everyday lives. Initial usage of it by teachers and their incorporation of courses should prepare both children and teachers not merely to know something about them, but to think about how best it might be used in classrooms and, generally, in society. If teacher educators do not act soon, or if teachers themselves do not take a challenge, teachers will miss a unique and brief opportunity for having a possitive impact on children in this field. Besides, in a few years, teachers will be almost unable to catch up with their students on issues and concerns that they should incorporated in teaching practice some time ago.

It might seem therefore that we, as educationalists, have little choice but to become "Internet surfers", picking up interesting and useful items which can be downloaded and used with our students, or to buy the CD-ROMs we can afford, in the hope that there is within them items which can be helpful in meeting our classroom aims and objectives. But, what guarantees do we have that there will be useful material there? We cannot expect the contributors to WWW to follow goals and objectives, which we see as important. We, as teachers, lecturers, or professors must take that responsibility. We must select and organize, guide ad instruct our pupils and students to use what we can make available, in a way that we find will be educationally profitable. This, in some sense, turns us into authors. As teachers, we play not only "organizing" role, but while creating lessons, we also design and produce original material for them, often making changes as we go along. This material will be directed towards achieving goals used to provide structured learning environments and help improving learning altogether.

References:

Ainge, D. (1997). Virtual Reality in Schools: The Need For Teacher Training, *Innovations in Education and Training International*, 34 (2), 114-118.

Cerf, V.G. et al. (1993). *National Collaboratories: Applying Information Technologies for Scientific Research*, National Academy Press, Washington, D.C.

Goldstein D.G., (1997). Next-Generation Training Over The World Wide Web, *Workshop "Intelligent Educational Systems on the World Wide Web", 8th World Conference of the AIED Society*, 1997, The International Artificial Intelligence in Education Society, Kobe, Japan, (web-edition)

Hidalgo, C.L., Williams J.R., (1996). Web-ducation: Extending a Teacher's Communication and Mediation Capabilities Through the Internet, *Engineering Education Innovators Conference,* 1996, sponsored by NSF, Washington D.C. , (web-edition)

Kinnaman, D.E. (1996). *Staff Development: How To Build a Winning Team*, In T.R.Cannings, L.Finkle (Eds.) The Technology Age Classroom, Wilsonville, OR: Franklin, Beedle & Associates.

Kouzes, R.T., Myers, J.D., Wulf, W.A. (1996). Collaboratories: Doing Science on the Internet, *IEEE Computer*, August, 40-46.

Lee, P.M., Sullivan, W.G. (1996). Developing and Implementing Interactive Multimedia in Education, *IEEE Transactions on Education*, August, 430-435.

Myers, D.K. (1990). Interactive Video: A Chance to Plug the Literacy Leak, *Industry Week*, April, 15-18.

Winn, W., Bricken, W. (1992). Designing Virtual Worlds For Use in Mathematics Education: The Example of Experiential Algebra, *Educational Technology*, 12-19

Hypertext Flexibility in a Web Learning Environment to Promote Extensive Reading Activities in School Learning

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Abstract: This paper describes a study in progress aimed at secondary school students of English as a Second Language, concerning poetry as a possibility for extensive reading activities, supported by an hypertext approach to the design of the learning environment.

Introduction

Poetry has been a challenge for English as a Second Language (ESL) teachers and students. The former evaded the issue by simply not using poetry in their classes and the latter were quite content in not having to deal with texts that they considered "difficult" (Lazar, 1993; Ur, 1996).

The aim of this in progress study is to understand the importance of the hypertext flexibility in the design of web based learning environment to the literary text and mainly the use of poetry in the second language learning process in every level of teaching as a possibility to be taken into account in the domain of extensive reading activities.

The design of flexible, collaborative and open learning environments directed to building up knowledge in straight relation to the subject's own pace and the user's needs has its roots in the educational approaches of social construtivism and situated learning.

The change in the design of new learning environments is shown through the flexibility of the learning processes, the multidimensional exploration of the learning materials, a personal and collaborative commitment in the learning goals and the working out of a individual and collaborative strategy for knowledge construction and experience (Spiro et al., 1995; Jacobson et al., 1996; Romiszowski, 1997; Collis et al., 1997; Dias, 1999, Rogers, 2000).

The Study

The research design is a qualitative based analysis of the student learning interaction and understanding of poetry text through the hypertext and hypermedia support of flexibility and contextual learning. This goal is provided by an hypertext based learning environment, that offers to the student the possibility to explore the dimensions of meaning construction, through associated links to words and images. This associated web of links perform a dynamic view of multiple texts, and suggest a deeper understanding of the internal relationships of the poetic text.

The hypertext based learning design allow students to produce a reconstruction of the poetic text, through the changing and introduction of new words or images to the original poem, composing a personal view that incorporate the choices performed by the student, during the extensive reading activity.

To implement it the research design includes a web based learning workshop in reading poetry and a discussion forum to promote the sharing of personal understandings among students.

The flexibility of hypertext in constructing the representation network is closely related to the construction of meaning in learning. The construction of meaning is a dynamic process, as well as the arrangement of hypertext nodes; meaning develops through the relationships between nodes (Borsook,1997:724).

This approach doesn't regard the learning process as an acquisition of knowledge externally organized and separated from his contextual framework. Furthermore, it stresses the importance of contextual building up of knowledge representations in learning, which is supported by the creation of a web of links among the informational materials of the hypertext representation. The educational hypertext is based on non-linear information organization that allows the user to choose his own individual or collaborative paths on a network, configuring it to his learning needs, previous knowledge and learning goals. The hypermedia approach was particularly innovative in terms of training since the hypertext doesn't only *display* the information but it *works out* as a dynamic web of representation.

In order to test this possibility, one class of twenty students, aged between fifteen and eighteen, in a large urban secondary school in Porto, Portugal, was selected to have classes on poetry as a part of their extensive reading activity. As in the Portuguese syllabus poetry is not included in the list of options the students have to fulfill this activity, they were given the possibility of working with several poems during the school year, in order to read a poem by e.e.cummings and from it to produce several different readings of the same poem using web based learning environments.

Conclusions

Results from the survey study shown a deeper involvement of students in suggested reading activities, namely: i) the high level of interaction dedicated to the exploration of the poem; ii) the construction of a personal understanding of the suggested poem using the associated links of words and images to produce the individual view; iii) a strong feeling of participation in the activities of reading and developing a personal and collaborative understanding of the poem; and iv) a positive attitude to the challenges of the exploration of the multidimensionality of the meaning in an hypertext based environment.

References

Borsook, T.K.(1997). Hypermedia: Harbinger of a New Instructional Paradigm? In C.R. Dills & A.J. Romiszowski (Eds.), *Instructional Development Paradigms.* Englewood Cliffs, N.J.: Educational Technology Publications.

Collis, B. & Remmers, E. (1997). The World Wide Web in Education: issues related to cross-cultural communication and interaction. In B.H. Kahn (Ed.), *Web-Based Instruction*. Englewood Cliffs, NJ.: Educational Technology Publications.

Dias, P. (1999). Web-Based Learning Communities. In P. Dias & C. V. Freitas (Eds.) *Challenges'99/Desafios'99, Actas da Iª Conferência Internacional de Tecnologias de Informação e Comunicação na Educação.* Portugal: Centro de Competência Nónio Século XXI da Universidade do Minho.

Jacobson, M., Maouri, C., Mishra, P. & Kolar, C. (1996). Learning With Hypertext Learning Environments:Theory, Design, and Research. *Journal of Educational Multimedia and Hypermedia*, 5 (3/4), 239-282.

Lazar, G. (1993). *Literature and Language Teaching*. Great Britain: Cambridge University Press.

Rogers, J.(2000). Communities of Practice: A Framework for fostering coherence in virtual learning communities. *Educational Technology and Society*, 3(3), 384-392.

Romiszowski, A.J. (1997). Web-Based Distance Learning and Teaching: Revolutionary Invention or Reaction Necessity. In B. H. Kahn (Ed.) *Web-Based Instruction*. Englewood Cliffs, NJ.: Educational Technology Publications.

Spiro, R., Feltovich, P., Jacobson, M. & Coulson, R.(1995). Cognitive Flexibility, Constructivism, and Hypertext: Random Access Instruction for Advanced Knowledge Acquisition in Ill-Structured Domains. In L.P. Steffe & J.Gale (Eds.), *Constructivism in Education.* Hillsdale, New Jersey: Lawrence Erlbaum Associates.

Ur, P. (1996). *A Course in Language Teaching.* Great Britain: Cambridge University Press.

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StageStruck - Technologies For The Performing Arts

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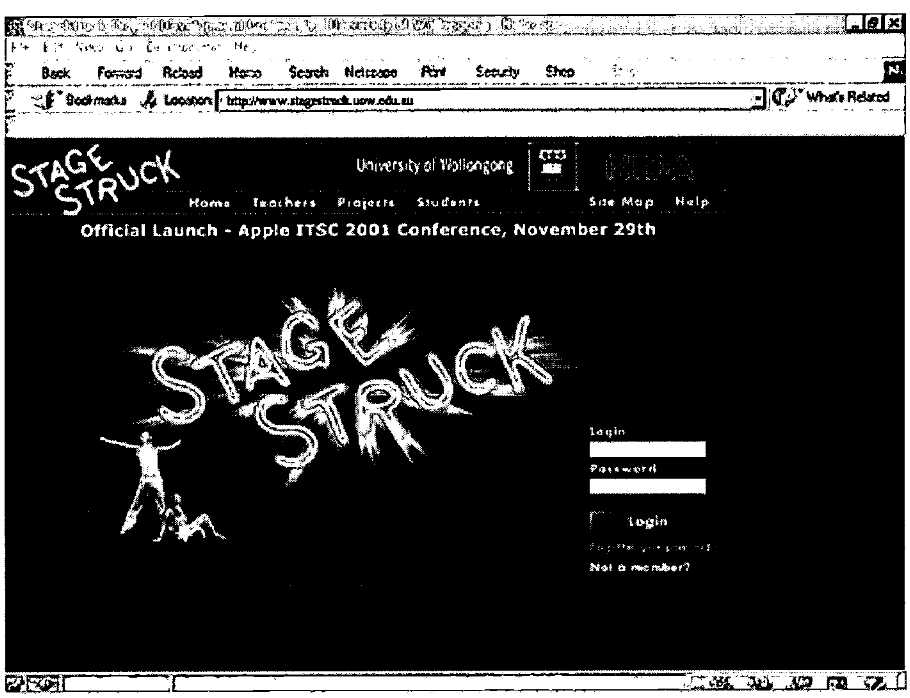
Abstract: This session will demonstrate the first phase of a research study to examine the role played by Internet-based teacher professional development in the implementation of an innovation. The innovation in this study is the software application (*StageStruck*) for the performing arts. The professional development web site has been developed to support inservice teachers in best practice use of the software. The StageStruck CD-ROM and web site community (http://www.stagestruck.uow.edu.au) will be demonstrated in this poster session.

In this first phase of development the web site portal has been established to build and support a community of practice in the performing arts areas of learning. The web site development has been an iterative process based on an understanding of best practice in professional development, a review of the literature and exploration of cases available in and about on-line communities, and the contributions and ongoing evaluation of our community members (teachers and students).

StageStruck Professional Development On-line Community



http://www.stagestruck.uow.edu.au

StageStruck - Technologies For The Performing Arts

StageStruck CD-ROM

" The winning choice is a project so all-encompassing in its objectives and execution that it represents a pinnacle of co-operation between art, culture, education and New Media. In addition to impressive content, the technical goal of creating an educational experience for the 12 - 18 year old age group is achieved in a highly relevant and inventive way". This is how the judges of the International Gold Emma Award described StageStruck.

StageStruck, produced by Wollongong University and National Institute for Dramatic Art (NIDA), was launched on 29 January 1999. It is recognised as an innovation in the teaching of performing arts. It is an innovation both as a multimedia technology for performing and creative arts teaching and learning. (StageStruck won BAFTA and EMMA awards in 1998 for educational interactive CD-ROM technology). More importantly it has been recognised as a pedagogical innovation because of its constructivist underpinnings and design realisations as a multimedia knowledge construction tool (Hedberg & Harper 1997).

Students can take on the role of directing a performance through the selection and manipulation of actors, actions, scripts, sound effects and set design elements or become involved in backstage exploration activities learning more about what goes on 'behind the scenes'. This product allows students to interactively create and display the production of scenes from classic plays and or build new performances to share with other users of the package.

StageStruck introduces the learner to the world of performing arts by exploring a performing arts venue (the Sydney Opera House) which showcases contemporary companies. performances, processes and people, and provides theatres and "tools" with which to design, build and direct soundscapes, costumes, sets, scenes and performances.. The StageStruck project sought to focus on the construction of multiple meanings in a field that many would argue is highly subjective and open to numerous interpretations. This field of performance enables the student to construct their own ideas about a script and how it might be performed.

By extending the boundaries of interactivity in the context of a virtual setting, learners are provided with opportunities to express their own cultural interpretations and understandings. In this theatrical journey there is the advantage of working with many visual metaphors. The world of theatre, opera, music theatre, dance and contemporary performance styles can be explored through devices such as "The Green Room" where the user can investigate a database of the contemporary world of performing arts. The "Stage" space provides the opportunity to view sample scenes from productions which have been created by professional directors, and, more importantly, to individually direct and design their own scenes with access to the same theatrical elements. In this process individual users explore processes of visual design, sound development, and the concept of direction and motivation. In this project the construction tools have also been extended to enable the user not only to collect from a defined set of resources, but also to construct their own resources based upon combinations of sets, costumes and performers.

Key to the communication of the experience within this application is the facility to save, share files between learners or re-present your constructed performance and interpretation to others located within the same classroom or across the Internet with other learners from different cultural backgrounds. This last act offers the potential to create a range of resources that are not bounded by the storage capacity of a prepackaged CD-ROM but are collected and shared from an ever growing unbounded Internet learning environment. StageStruck like many other technological innovations needs to go through a diffusion process to reach implementation. The on-line community is seen as an effective and cost effective way to realise professional development.

StageStruck Professional Development On-line Community

The StageStruck Community has been designed to support K-12 teachers in their classroom use of StageStruck. The free community offers access to mentors, training, projects, curriculum resources, lesson plans, or the chance to 'buddy-up' with an international school to swap design idea and projects. The site offers professional development, support and resources for teachers as well as activities and projects for students. Subjects such as script writing, set design, costume design, sound effects and stagecraft are explored in an interactive and fun way. Targeted at the busy teacher who wants to use StageStruck in his/her teaching but needs that 'kickstart' - or to extend the existing user who wants ideas for more sophisticated projects or have student works critiqued by experts in the performing arts field.

The site will grow and develop over time as teachers in the community contribute ideas, resources and develop their own projects. Participants in this interactive session will have the opportunity to discuss aspects of teaching in the performing arts with peers on-line in a number of countries. They will also be able to register their students in the writing and development of an episode of on-line serial to be started in February 2001 or propose and initiate a new International project.

The study will define the role that Internet technologies can play in the change process. Since traditional face to face professional development has been found to be very costly and less than effective in fostering and sustaining change, innovators are looking for new means to both improve the quality of teaching and empower teachers to shape the future of their own learning. One of these new means is Internet-supported communities of practice or networks. The time has never been better for a study of this nature, to show what is possible in an electronically and cognitively networked environment.

Detractors might complain that the technology is just not available or friendly enough yet for teachers to see it as a mainstream tool. This claim will very soon be easily refuted. The access to technology has grown rapidly. Australia is not alone in its efforts to offer schools high speed and effective bandwidth connections to the Internet. Most Australian state's school systems have agendas and priorities for the coming years that firmly position information and communication technologies near the top of the list.

The study's findings will be of significant specific interest to

- Educational multimedia product developers
- Curriculum developers
- Educational leaders
- Teacher training and development officers,

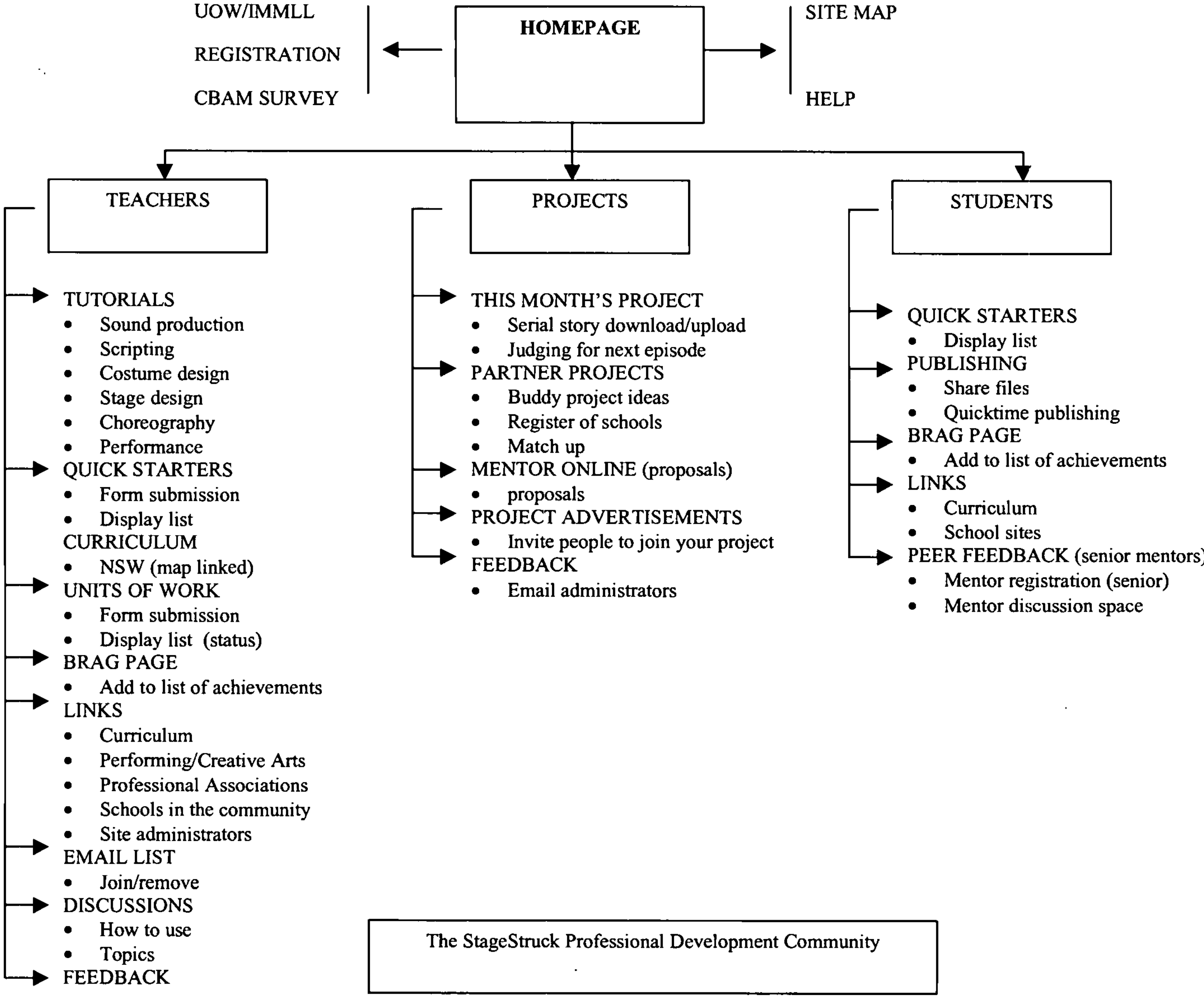
and indeed any educationalist considering the alternative to mainstream professional development.

Session Objectives: The session will involve demonstration and hands-on activity with the StageStruck CD-ROM and On-line Community. An accompanying paper is presented for this conference Professional Development On-line - Doing IT Pedagogically. The paper allows teachers to see the theoretical background to the CD-ROM and the web site. The poster session will allow teachers to further explore both media products and to order or purchase copies of the software.

Through this session participants will be able to:
1. Understand the constructivist nature of the StageStruck program design
2. Make explicit links from StageStruck to classroom activities and curriculum in the middle years of schooling and learning areas related to the performing arts (drama, dance, set design, costume design, stagecraft)
3. Explore hands-on the design and construction capability of StageStruck in a fun collaborative task
4. Join the on-line community to support the use of StageStruck and performing arts teaching
5. Contribute to an International discussion related to an aspect of school based performing arts.
6. Explore collaborative opportunities in International projects as part of the web site community

Proposed Participants: Teachers interested in aspects of the performing arts (dance, drama, stage design, script writing, and costume design) in elementary and secondary schools will find this a unique and valuable product and session. The session itself will be targeted to the middle years of schooling bridging student ages from 9 to 14 years, while the web site and CD-ROM for StageStruck are of value to a wider school education community. The product is a cross-platform development and will be equally valuable to users of MAC and Windows computer platforms.

Experience Level: Participants will require no computer specific experience. You are encouraged to attend the session in pairs to work together through a fun collaborative task.


UOW/IMMLL
REGISTRATION
CBAM SURVEY
HOMEPAGE
SITE MAP
HELP
TEACHERS
TUTORIALS
Sound production
Scripting
Costume design
Stage design
Choreography
Performance
QUICK STARTERS
Form submission
Display list
CURRICULUM
NSW (map linked)
UNITS OF WORK
Form submission
Display list (status)
BRAG PAGE
Add to list of achievements
LINKS
Curriculum
Performing/Creative Arts
Professional Associations
Schools in the community
Site administrators
EMAIL LIST
Join/remove
DISCUSSIONS
How to use
Topics
FEEDBACK
PROJECTS
THIS MONTH'S PROJECT
Serial story download/upload
Judging for next episode
PARTNER PROJECTS
Buddy project ideas
Register of schools
Match up
MENTOR ONLINE (proposals)
proposals
PROJECT ADVERTISEMENTS
Invite people to join your project
FEEDBACK
Email administrators
STUDENTS
QUICK STARTERS
Display list
PUBLISHING
Share files
Quicktime publishing
BRAG PAGE
Add to list of achievements
LINKS
Curriculum
School sites
PEER FEEDBACK (senior mentors)
Mentor registration (senior)
Mentor discussion space
The StageStruck Professional Development Community

Learner Self-efficacy, Attitude, and Utilization Patterns for an Electronic Textbook

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Abstract: The use of electronic textbooks is increasing. The spectacular growth of the electronic learning space that is accessible through the computer, CD-ROM, DVD, Internet and World Wide Web has impacted a traditional form of mediated instruction, the expository printed textbook. With the digitization of information has come an evolutionary societal change where electronic publishing increasingly supplements (and some would argue eventually supplants) the printed text. A pilot study of learner self-efficacy, attitudes, and access and utilization patterns are addressed using graduate students in instructional technology. This pilot study was initiated to discover areas that could impact an expanded study on factors influencing the use of electronic textbooks.

Introduction

Presentation of societal and cultural values and the evolution of instructional methods have focused on the printed textbook. McClintock (1992) has suggested that Western education has had 500 years of stability which can be attributed in large part to the printed textbook, "The reason for the underlying stability was rather simple: throughout it all, the character and limitations of printed textbooks remained substantially fixed, the keystone of the system." (McClintock, 1992, p.2). Chamblis and Calfee (1998) have noted the importance of printed textbooks in the United States. They identify textbooks as (a) providing 75-90% of instructional content and instructional activities, (b) filling a need where teachers lack comprehensive subject matter or curriculum design expertise, (c) serving as a surrogate for a national curriculum, and (d) serving both as subject matter authority and as an instructional program.

The paradigm of the "book" is changing. The spectacular growth of the electronic learning space that is accessible through the computer, CD-ROM, DVD, Internet and World Wide Web has impacted a traditional form of mediated instruction, the expository printed textbook. With the digitization of information has come an evolutionary societal change where electronic publishing increasingly supplements (and some would argue eventually supplants) the printed text. Electronic textbooks offer several advantages over expository textbooks. Some of these advantages may be derived from comparison with the economics of electronic journals (Odlyzdo, 1997). For example, from an author's perspective electronic textbooks provide advantages of scholar-controlled publishing, which implies editorial control of content and presentation. Electronic textbooks publication costs are negligible compared to print media, which makes them easier to revise, thereby improving the currency of the information presented. For the learner using an electronic textbook, advantages are not clearly apparent in the literature.

Pilot Study

In a pilot study nine graduate students in instructional technology were assigned readings in an electronic textbook (Misanchuk, et al, 2000). The electronic textbook met the four criteria suggested by Horney and Anderson-Inman (1999) for defining an electronic book: (1) electronic text must be presented to the reader visually; (2) software must incorporate a "metaphor of a book" to some significant degree; (3) software has an organizing theme or instructional focus; and (4) if other media incorporated in the electronic book, they are secondary to the text. The electronic textbook use in this study was delivered on CD-ROM. The electronic book is essentially linear allowing navigation from the current page to the "previous" or "next" page. Other navigational aids include a Table of Contents that was maintained to the left of the text. Some pages have sub-menus that allow links to sections providing more "elaboration" of the textual material. The hypertext nature of the textbook was familiar and not a problem for the pilot group. Graphics, some with animation, were used to explain specific concepts within the text.

Although all the students in the pilot study had considerable experience with electronic text, and with various forms of electronic text delivery, none had previously used an electronic textbook. At the beginning of the course students were given a questionnaire to measure self-efficacy beliefs with regard to access, utility, and navigation of an electronic textbook environment. The questionnaire was adapted from an Internet self-efficacy scale developed by Joo, Bong & Choi (2000). Studies have linked learners' attitudes and preconceptions toward media as a positive predictor of learning outcomes. (Al-Khakli, & Al-Jabri, 1998). As might be expected from our group of "expert users," graduate students in instructional technology, as a group their confidence was high with regard to their ability to access and navigate information in an electronic textbook format, even though they had no prior experience.

Students were given the opportunity to open-ended questions regarding what each user saw as advantages and disadvantages of the electronic textbook. One purpose of the open-ended questions was to help discover differences in user attitudes that could possibly serve as the basis for constructing evaluation instruments for an expanded study. The students were also asked to rank their perceived advantages and disadvantages as minor, major, or critical. By a ratio of 3-to-1 the students preferred a traditional printed textbook to the electronic textbook. The disadvantages most often cited a being major or critical were (1) text on the computer screen is harder to read (eye stress, slower reading, and requires scrolling), and (2) less text on each screen and hyperlinks interrupted the flow of the content. Although disadvantages were identified over advantages 2-to-1, the major advantage was that the electronic textbook's use of color, animation, and hyperlinks aided understanding of the text. (However, one student commented that the use of hypermedia was under utilized.)

This pilot study posed the following questions to the students in a focus group setting: At the conclusion of the course did the attitudes of students using an electronic textbook change with time and familiarity with the delivery system? What utilization patterns (printing hard copies, transferring electronic textbook material to word processing files, methods of note taking) did the students employ? Would you assign an electronic textbook for a class that you would teach in the future? What changes are needed for electronic textbooks? The results of the focus group are categorized (readability, content navigation, interface design, use of multimedia, etc.) and reported. Experiences with the electronic textbook and user attitudes were surprisingly uniform within the focus group.

References

Al-Khaldi, M.A., & Al-Jabri, I.M. (1998). The relationship of attitudes to computer utilization: New evidence from a developing nation. *Computers in Human Behavior, 14*, 23-42.

Chambliss, M.I. & Calfee, R.C. (1998). *Textbooks for learning*. Malden, MA: Blackwell Publishers.

Horney, M. & Anderson-Inman. (1999). Supported text in electronic reading environments. *Reading and Writing Quarterly*, *15*, 127-168.

Joo, Y., Bong, M. & Choi, H. (2000). Self-efficacy for self-regulated learning, academic self-efficacy, and Internet self-efficacy in Web-based instruction. *Educational Technology Research and Development, 48*(2), 5-17.

McClintock, R. (1992). *Power and pedagogy: Transforming education through information technology. Cumulative curriculum project publication #2*. [On-line]. New York: Institute for Learning Technologies, Columbia University. Available: http://www.ilt.columbia.edu/Publications/texts/mcclintock/pp/title.html.

Misanchuk, E., Schwier, R., & Boling, E. (2000). *Visual design for instructional multimedia*. Saskatoon, SK: M4 Multimedia.

Odlyzdo, A. (1997). The economics of electronic journals. [On-line]. *First Monday, 2*(8). Available: http://www.firstmonday.dk/.

Digital Video: What Should Teachers Know?

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Abstract: Texas State Board for Educator Certification has published new technology application standards for teachers who want to be certified, including teachers of technology. The standards require that teachers should know how to create digital video products for a variety of purposes and audiences and use them in multimedia applications. Other states may follow soon. This paper discusses the difference between traditional video and today's digital video, including streaming video; examine the current technology in digital video; provides a step-by-step guide on how to create digital video; provides teachers with practical suggestions of how to create digital video economically and effectively.

Introduction

In the year of 2000, Texas State Board for Educator Certification published a new set of standards for all schoolteachers in Texas, including teachers of technology – Technology Application Standards (TAS). TAS lists specific standards of digital video knowledge and skill requirements for teachers, especially teachers of video technology. TAS requires that teachers should know how to create digital video products for a variety of purposes and audiences and use them in multimedia applications and presentations (Technology, 2000). Prior to TAS, Texas had already had in place technology application standards called Technology Applications Texas Essential Knowledge and Skills (TEKS). TEKS is the standards for evaluating K-12 students' knowledge and skills in computer-based technology, including digital video. Now with the publication of TAS, the requirement for digital video for teachers has been raised to a new height. Other states may soon have the same requirements, like TAS, for teachers in public schools. Therefore, teachers around the country are facing a challenge for knowing how to create and use digital video technology.

Most public schools today receive certain amount of money from state and/or federal funding. The funds have largely been used in the building of computing infrastructure such as computer lab and computer network (Golden, 1997). However, the ultimate purpose of computing infrastructure is for computing applications. Without application the infrastructure would be a house without residents. Using multimedia has been one of the major applications (Slaughter, 1998). Some teachers and students are using digital camera to capture images and use them in their multimedia presentations and web publications. Nevertheless, digital video is still not a reality for most teachers due to the cost on computer hardware and software, the cost on digital video cameras, and the complicity of capturing and editing video, and the lack of knowledge on equipment involved in digital video creation and the knowledge and skills on how to create digital video. To meet the challenge, a good knowledge on digital video technology, equipment, computing hardware/software, and the skills of capturing and editing video will be a must. The purpose of this paper is to help teachers acquire a fundamental understanding and knowledge of digital video technology.

Why Digital Video?

Video has been around in our life for a few decades. The development of video technology came from the need of television industry to store, edit, and replay broadcasting content, allowing the industry to step ahead from the only "live" broadcasts (Lozano, 1997). Traditionally, individual images consisting analog signals are recorded onto magnetic tapes in sequence. Those individual images are called frames in video jargon. It is by projecting a certain number of frames on a screen, such as TV screen, that we can see motions similar to our real life. There are several standards developed by different countries as to how many frames can be projected per second (*fps*). Professionals call frames per second as frame rate. Video frame rate is between 24*fps* and 30*fps* depending on the standard adopted. Also different standards adopt different scan lines on the screen. For example, NTSC (National Television Standard Committee) system uses a frame rate of 30 *fps* (or, more precisely 29.97 fps) and 525 horizontal scan lines, whereas PAL (Phase Alternating Line) system has a frame rate of 25 *fps* with 625 lines at a frame. That is the reason why videotape from the United Kingdom, where PAL standard is used, may not be viewed here in the United States with a typical VCR/monitor that uses NTSC standard, unless a multi-system VCR or converter is used.

Editing traditional video is a knowledge demanding, time consuming, and high-cost job. Professionally trained technicians are normally needed to do the job. Due to the linear feature of analog video, dubbing and editing require several people and consume large amount of time. In addition, heavy and expensive equipment is needed to accomplish the task (Yao, Ouyang, & Wang, 2000).

Digital video on the other hand is quite different from analog video. It is more advantageous than analog video (Lozano, 1997, Slaughter, 1998, Vaughan, 1994, Villamil-Casanova & Mólina, 1997). Digital video is recorded in digital format if it is shot with a digital camcorder. In this sense, the video footage is universal, e.g., both Macintosh and PC computers can view and capture it. Unlike analog video, digital video equipment with DV terminal or connections lets you edit, copy and transfer data digitally, with virtually no generation loss in image and sound quality. The DV terminal is for both line-in and line-out, since a single DV cable can handle data in both directions. Dubbing with this terminal is much simpler than that in analog video. No heavy and expensive equipment is needed.

The superlative advantage of digital video is its non-linear editing feature. Analog video is recorded on videotape in a linear fashion, which means that there is the time span from the starting point of the video to the end point of the video. Assume that the video is an hour long and we want to view what is on the tape at the point of thirty minutes, the videotape has to be forwarded to the point of thirty minutes in order to view it. If the viewpoint wanted on the tape is five minutes back at the beginning of the tape and at present the video is an hour down into the tape, then the tape has to be rewound fifty-five minutes back to view that point. Let alone the difficulties and time involved to pin point the exact place on the tape, even though some of today's video editing systems are equipped with digital counters. Adding sound to video can be as difficult and time consuming as the video part of editing. However, digital non-linear video editing has forever changed the rule of the video world (Lozano, 1997). What is non-linear editing? After the video is digitized and transferred to a computer, it is stored on the computer's hard drive. When editing the video, the editor can find and access any point of the video without winding or rewinding the footage as analog video editing does. Much like word processing on a computer, one can find a time place or frame by simply clicking and/or dragging on the monitor control panel or the timeline to move to the point or frame where you want to be. The newly constructed video can be saved as a new file without destructing the original footage. In digital non-linear editing, trimming, cutting, pasting, adding, inserting, overwriting can never be easier compared with analog video editing. The same is true with sound to video. Almost unlimited video and sound tracks can be used to edit or mix video and sound. All these can be done on a single computer. That is what so-called non-linear editing.

Another advantage of digital video is that video can be compressed, which means that video file size, frames size, and quality can be manipulated. Since digital video file size tends to be very large and takes large amount of computer hard drive space, by reducing its size, one can store more video on the hard drive or on other storage devices. Nevertheless, the quality of the video will be reduced as the file is compressed. The more compression a video file has, the less quality it has. To solve the problem, smaller video frame size and/or lower frame rate are normally the choices.

As World Wide Web is gaining the momentum, digital video is also moved onto the Web. A problem with digital video on the Web is that it takes a long time to download the video file to the computer before it can be viewed if the file size is large. Thus streaming video technology was invented. What is streaming video? Streaming video refers to digital video files can be viewed as they are being downloaded from the Web. "Since viewers watch streaming video on the fly, they don't have to wait for long downloads" (Davis, 2000a). On the other hand, by compressing video, digital video can be streamed and put onto the Web faster and easier.

Current Digital Video Technology

Traditional digital video technology relies greatly on the conversion from analog video to digital video. A video footage is short using an analog video camera and recorded on videotape. A computer with a video capture board is needed to convert the analog video into digital video and store the captured video on computer hard drive. Of course, one can also capture video footage by connecting video camera directly to a computer that has a video capture board. That is obviously not practical for the cameraman since the computer has to go with the camera all the time. The quality of the digital video capture board determines much of the quality of the digital video footage captured. The CODEC software that comes with the video capture board is the other part that determines the quality of video captured. A digital video capture board can range from a few hundred dollars to several thousand dollars.

Like the advancement of other technologies, digital video technology has also made a leap jump in these few years. The most innovative is the digital video camera. The outlook of a digital video camera is no much different from an analog video camera. But digital video camera captures video in digital format and stores the video on digital videotape. In 1997, Sony Company introduced 3CCD technology, which uses 3 computer chips to calculate the three major colors, elevating digital video camera to a new high-quality level. A good digital video camera is normally equipped with steady shot image stabilizer, which eliminates shaky shots caused by unsteady camera move when long digital zoom is used. Digital video camera also captures sound in digital format. This feature enhances greatly the sound quality in digital video and makes video editing much easier. Some good quality digital video cameras use PCM technology, the same as used in CDs for a breathtaking dynamic range of 96 dB. Since video and audio signals are all recorded digitally, the captured video footage can be copied or edited multiple generations with no loss in quality. Many name brand digital video cameras provides 16:9 aspect ratio recording options, which means widescreen video can be recorded for widescreen movie and future compatibility with HDTV. Another very important feature of most digital video cameras today is that these cameras have built-in high-speed FireWire (IEEE 1394) interface. This interface allows for 2-way direct digital communication between either a digital video camera and a compatible computer or two digital video cameras. When connected to a compatible computer, the interface lets you perform economical, broadcast-quality, non-linear editing easily. When connected to another digital video camera, it lets you to produce duplicate copies of recordings without any loss in picture quality. Each copy is a perfect clone of the original. These advantages definitely overwhelm analog video.

Great improvement for digital video has also been witnessed in computer technology development. Computer is the essential tool in digital video editing. It is the advancement of computer power and capability that promotes the proliferation of digital video. A couple of years after Intel's Pentium chips came into the market, a computer chip technology called MMX was introduced. This technology greatly improved the computer's power to process multimedia, including digital video and sound. Later, MMX technology was integrated into Intel's Pentium II and the chips there after.

Data bus speed was increased from 66Mhz to 100Mhz in most of today's computers. Some have gone up to 133Mhz. 3D video accelerator becomes common for display with 8Mb or 16Mb of memory, or even higher. The most noticeable jump to the public is the computer's clock speed. Within about two years, it jumped from 200Mhz to 1Ghz and over, giving computer a much higher speed to process video. However, the most creative advancement from the point of digital video is the establishment of IEEE 1394 interface (also jargoned as FireWire and iLink) as the standard for digital video communication between digital video camera and the computer. FireWire interface allows transfer rate up to 400Mbps compared to 12Mbps of USB, which is another newly standardized interface for computer peripherals. Such companies as Sony, Compaq, and Dell have integrated this interface with their high-end computers. This advancement has truly made digital video editing available for end users and reduced video rendering time during editing.

Video editing software is getting better and easy-to-use, too. Some, such as MGI Software and Ulead, offer the basics of video editing capabilities. This type of software is called Beginners Editing Software, normally at a low cost. Others, like Trinity and Avid, offer much more editing capabilities, such as more powerful titler, more transitions, more video and sound tracks, more powerful sound editing and mixing capabilities, more after effects, more encoders, and the like. This kind of software usually requires high powerful computers and is adopted mostly by video editing professionals. In short, software availability, especially for beginners, provides a better opportunity for more people to be able to create and use digital video.

Smart Selection

"What hardware do I need?" "What software do I need?" These might be the foremost questions from teachers who want to start with digital video. The selection of hardware and software does play an important role for the beginners. Advanced digital video and editing systems not only cost more, but also tend to have higher learning curve. It would be smart for the beginners to start with a low-end system, including both hardware and software. This can reduce the cost on one hand and make it easier to get started on the other. To select a digital video system, teachers may find the following suggestions useful:

1). Digital video camera or you may call it digital video camcorder. Selecting a digital video camcorder to start with makes it much simpler than starting with capturing video through video capture board. As mentioned above, using a digital video camcorder eliminates the digitizing process. Then how to select digital video camcorder? One concept has to be cleared off first. Some digital camera can also record digital video. However, the digital video that a digital camera records is not the same as what a digital video camera does. What digital camera records is compressed video, usually in MPEG format. Whereas, what a digital video camcorder captures is full-motion uncompressed video. This is the kind of video that needs to be edited by using a digital video editing system. The cost for a digital video camcorder varies greatly as mentioned earlier. For the beginners, the choice is evident – low-end one. A few tips need to be kept in mind when selecting the digital video camcorder: *Video resolution*. Video resolution is measured in the number of horizontal lines. Higher number of horizontal lines contributes to higher video resolution. However, higher number of horizontal lines usually cost more. A number around 300 would be a fairly good low-end digital camcorder. *FireWire DV interface*. Look for this interface while selecting a digital camcorder today. It is a two-way input/output that carries digital audio, video, and control signals from the digital video camcorder to the computer or other compatible devices. A digital video camcorder without this interface may not be an updated product and probably not a good choice. *Image stabilizer*. An optical image stabilizer is better than a digital electronic image stabilizer. If two digital camcorders are at the same price, plus the same other features, choose the one that has an optical image stabilizer rather than the one with electronic image stabilizer. *Photo mode*. Photo mode equals to a digital camera in the digital video camcorder. It makes shooting images much convenient, e.g., without changing cameras. However, a digital video camcorder's photo mode cannot achieve the high image resolution quality of high-end digital cameras so far. *Analog line-in*. This input on a digital video camcorder will become very useful for those who will deal with analog video at the same time. *Built-in speaker*. This is a very important feature on a digital video camcorder. It allows you to listen to the sound of the video when playback video on the camcorder. Without it, the camcorder is certainly missing something and should not be a choice. *Color LCD viewfinder*. A beginner will find the color viewfinder on the digital video camcorder very helpful. There are many other features on a digital video camcorder that need to be pay attention to, but they are beyond the scope of this paper. Companies like Sony, Canon, Panasonic, JVC all have low-end digital video camcorders with prices within $1,500, such as Sony's DCR-TRV series, Canon's ZR-10, Elura 2, Optura, Ultura, Panasonic's PV-DV series. For teachers with some experience in digital video and want to move up to a higher quality level, Canon's GL1 and XL1, Sony's DCR-VX1000 and DCR-VX2000, Panasonic's AG-EZ30, etc. will be a better choice.

2). Computer hardware. The suggestion for teachers to select computer hardware is always go with the latest technology. This is because digital video requires higher computing power, which includes clock speed, bus speed, memory, and hard drive, than normal applications. The higher the computer power, the faster your capturing and editing work. On the low-end, minimum system requirement is: Processor, Pentium II, 300Mhz; system memory, 128Mb; hard drive size, 10Gb (SCSI drive recommended); external bus speed, 100Mhz; sound system, 16-bit sound card; interface, FireWire (IEEE 1394). If the computer does not have FireWire interface, FireWire interface card can be purchased and installed easily. However, most digital video editing system kit today comes with a video capture board that has integrated FireWire interface. Note that the system kit that comes with USB interface for video should not be your choice since it is much slower than FireWire interface.

3). Digital video editing system. Generally the following is the easy editing solutions for digital video editing: editing appliances, turnkey computer editors, and external capture devices (Davis, 2000b). Editing appliances, such as *Panasonic Digital Media Editor* and *Draco Avio ST*, are specially designed computer for video editing only. They cannot do anything else as a computer does. For teachers, though almost no hardware configuration and low in price, an editing appliance is still an extra cost if they already posses multimedia computers. Therefore, these appliances are not recommended. Turnkey computer editors refer to digital video editing kits. A turnkey computer editor, like *DVGear DV Warrior*, is actually a full-function video editing computer with everything you need, except digital video camcorder. If budget is not a problem, this is a good choice for teachers, especially for teachers who teach digital video. However, the price for turnkey computer editors varies greatly between easy ones and professionals. They may range from a couple of thousand dollars, such as *DVGear*, to over $40,000, like *Avid*, depending on the system configuration. Low price models in *DVGear*, *DVLine*, or *Sony* are recommended. External capture devices are devices that help capture video. They are inexpensive, but most of them are not for full-motion capturing, e.g., at 30 *fp*. Of course they are not recommended. There is another way to get digital video editing system and it is probably the most practical and economical for schoolteachers: Create-by-yourself. It is relatively less expensive if you already have a Pentium or higher speed computer. Create-by-yourself refers to buying a video capture board, choosing video-editing software, and installing them into your computer all by yourself. Sounds difficult? Not at all in practice. Just get a video capture board of your choice. Video capture boards can be purchased between $200 and $4,000 depending on names and brands, such as *Pinnacle Miro 30* at about $200 and *Truevision Targa 2000* around *$3000*. These boards normally come with intermediate level video editing software, such as *Adobe Premiere*. You may choose beginner level video editing software if you like, such as *MCI Software VideoWave III* and *Ulead VideoStudio 4.0* at about $100. At the price of about $800, *Pinnacle DV500* gives you almost all you need for video editing. The package includes a video capture board with FireWire interface, video editing software *Adobe Premiere 5.x*, software for making CD and DVD, and the appropriate interfaces for analog A/V inputs/outputs. Installation and configuration are fairly easy. To go by create-by-yourself, make sure that the video capture board you purchase has the interface to match your digital video camcorder; the board you purchase must be compatible with your computer's hardware (motherboard most of the time) and operating system. We recommend you try this method. Notice that Macintosh computers are not mentioned here simply because of the dominant PC majority user population.

Video Creation

For convenience, *Canon GL1* digital video camcorder, *Sony PCG-F490* laptop computer, and *Adobe Premiere 5.1 LE* non-linear editing software are selected to illustrate the necessary steps of how to capture video from digital video camcorder and edit it on a computer. Although other systems may be operated differently, the concepts will be universal and consistent.

Getting Started

First, shoot a piece of video using the digital video camcorder (To save space, how to shoot video with the digital video camcorder will not be illustrated here.) and make sure that the DV tape with the video is in the camcorder. Connect *GL1* to *Sony* computer via the FireWire interface on both the camcorder and the computer with a 4-4 pin FireWire cable. Turn the power switch of *GL1* to VCR and rewind the tape to the beginning. Turn on the computer. Go to Start. Under Programs, find and launch DVgate Motion under DVgate. After DVgate Motion program is launched, in MODE box on the program control panel, make sure that IMPORT - Auto is selected. REC DATE should show the current date and time. Other display boxes shall show zeros. On the left side of the program is the Monitor window. On the right is the IN/OUT List, where on display is the number of clips captured, capture in and out points, duration and file size of the video captured. On the GL1's display window, DVin should appear, indicating that the communication between the camcorder and computer is ready.

Capturing

The videotape playback on the camcorder can be controlled both on the camcorder and the DVgate program control panel on the computer. Using the control panel on the computer is recommended. Start the video playback by clicking the play button on the program's control panel. At this time, the Monitor window will display the video on the tape in the camcorder and the TIME CODE, IN, and DURATION boxes will display the relevant number. FAST, SLOW, and STEP FORWARD and FAST, SLOW, and STEP BACKWARD buttons can be used to find the exact point where the starting capture point is on the digital videotape in the camcorder. While observing the time codes and the images being played back on the video display area, click the MARK button when the target-starting image appears. This establishes the IN point and an image of this point is shown in the IN/OUT list. The time code display area shows the time code of the IN point and the elapsed time of the video playback from the IN point. Click the MARK button again when the target-ending image appears. This establishes the OUT point. The marked points can also be cancelled at anytime by using the CANCEL button on the control panel. When the marked in and out points are confirmed, click the CAPTURE button to capture the marked points one after another or click CAPTURE ALL to capture all the marked points. On the IN/OUT list, the in and out points, duration, and file size of the captured video will be displayed respectively. The captured videos are simultaneously stored in a pre-assigned folder in AVI files. The captured video can also be saved in a different directory. At this moment, video capturing is completed. It is ready to be pulled into an editor for editing.

Video Editing

Find and launch *Adobe Premiere 5.1 LE* non-linear digital video editor. Select project settings (This is typical in *Adobe Premiere.*). *Premiere* displays automatically the monitors, one for the Source video, the other the Target video; Project window; Timeline window (also called Construction window); and some other windows depending on user customization. The program is now ready to accept video. Use Import under File to find the folder where the video files are stored and import the video into the editing program. The imported videos are listed in the Project window. Click and drag a video into Source monitor window. Use the Frame Jogger to move forward or backward. Use the Mark In and Mark Out buttons to mark the video clip. After the marking, click and drag the marked video in the Source window onto the video 1A track on the Timeline. Sound of the video is also dragged to the sound track automatically. If sound is not wanted, deselect the sound icon button on the Source window. Then sound will not be brought onto the sound track but only the video. Once on the Timeline, all the editing features can be added, such as adding transaction, adding another track of video, superimposing, adding title, moving clips around, making the clip longer or shorter by just dragging it on the Timeline to the direction to be longer or shorter. Of course it cannot be dragged longer than its original. Almost unlimited video and audio tracks can be added in Premiere (up to 99 tracks). After the effect and process editing, the edited video must be saved in a directory before Premiere can view the edited video. After it is save, you can preview the edited video and edit it again at anywhere and anytime. When you want to view it again, Premiere renders the video and gets it ready for you to view. The saved edited view now becomes a Premiere project file. It now can be exported according to the editors desire and software encoders in other file formats, such as QuickTime movie, AVI file, Microsoft Video, etc. This is how video is edited.

Conclusion

Digital video technology is advancing fast along with the computing technology. The cost for digital video editing systems will be getting affordable. As the requirement for teachers to use digital video increases, digital video will become commonplace for teachers to integrate this technology into curriculum. With the right tools and knowledge in digital video, teachers will be able to meet the challenge of creating digital video for effective teaching and learning in the twenty-first century.

References

Davis, J. L. (2000a, Winter). A step-by-step guide: Encoding for the web. Videomaker, 49-54.

Davis, J. L. (2000b, Winter). Hot gear to make cool video. Videomaker, 9-25.

Golden, B. (1997, October). Does your technology deliver? *Techniques*, 16-19.

Lozano, J. (1997). *Multimedia: sound & video*. Indianapolis: QUE E&T Macmillan Computer Publishing.

Slaughter, S. (1998). *Easy digital video: The beginners guide to everything digital*. Grand Rapids, MI: Abacus.

Technology application standards. (2000). The State Board for Educator Certification, Texas. http://www.sbec.state.tx.us/certstand/certstand.htm

Vaughan, T. (1994). *Multimedia: making it work.* (2nd Ed.). Berkeley, CA: Osborne McGraw-Hill.

Villamil-Casanova, J., & Molina, L. (1997). *Multimedia: An introduction*. Indianapolis: QUE E&T Macmillan Computer Publishing.

A farewell to the traditional instructional media and technologies in the new millenium.

CHANGING INTERPERSONAL RELATIONSHIP BETWEEN TEACHERS AND STUDENTS USING TUTION

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Abstract

In this work we are proposed relocation of teacher's time during process of education. We have analyzed mutual student teacher relationship and proposed relocation of teacher's time as well as combination between tuition and classical teaching. The most common problem in relationship is insufficient experience or knowledge of teachers but as well learners (changing of learning paradigm form secondary school to higher education, or change in level from graduate studies till postgraduate studies). We have proposed different practical approaches and techniques for solving problems in teacher – learner relationship. Results have been obtained in both introspective form and testing form - student's evaluation of courses and marks.

1. Introduction

Mutual student - teacher relationship is key factor in learning process. Students' motivation is significant from that source. Many objective problems during learning process have been solved thanks to good relationship between teacher and students. Also some of the biggest problem during learning have been caused by bed relationship between students and teachers. And proposed relocation of teacher's time as well as combination between tuition and classical teaching. We are proposed different practical approaches and techniques for solving problems in teacher – learner relationship. The most important aspect is reaffirmation of tuition as the form of learning almost forgotten in higher education (mostly from the objective reasons). Results have been obtained in both introspective form and testing form - student's evaluation of courses and marks. Here proposed example is best for the first year – starting subject, because as it is stated later could solved additional problems caused by changing of learning paradigm. Of course it is applied on every type of learning.

2. Problems

It is not aim to accuse nor students or teachers but in real life every of us have been witness of mistakes on both sides. If we are excluded problems generated with purpose, we could roughly located motivation as a factor mostly dependent and vulnerable. From students perspective the most common problem in relationship is insufficient experience or knowledge of teachers. Both of those "unperfection" produced loosing of authority and credibility. From learners view the biggest problem is came from changing of learning paradigm form secondary school to higher education, or change in level from graduate studies till postgraduate studies. Several other problems have been monitored. Process of learning have became more pressured for teachers as asks from community raised. Another process is transformation of power channels and strength from teacher to students. Students have today much more rights what is one way positive process, but in other hands they have to take as well responsibilities, which by the line of low resistance they don't wish to accept. Also have been starting process of some kind of pressures from students toward teachers. Result should be satisfactory mark taken actually by the "force". Teachers have made negative reactions to whole group of students regarding that kind of respond. All together it leads to process (by the low of negative feedback) which results are negative for both sides. Resulting problems are: Students haven't confidence in teachers. Students think that teachers don't care for them. Students don't understand difference between secondary and higher education. The way for solution of this problem could be building new way of relationships, which has more confidence. But confidence we couldn't build by the low. Confidence is "wage" received in process. Teacher who couldn't deserve it with knowledge and skill need to put other assets to have it. Time is one of the resources available to everyone.

3. Proposal

Students needs from the start additional time, because they felt as loosed. In some educational system secondary school is pretty "liberal" and "learner oriented" so students work mostly with teachers help. When they come to university they are faced with completely different atmosphere, mostly without any personal contact with teachers. This proposal could solve some big problems. We are proposed teaching one or two subjects in the first term – semester in different way using combination of tuition and lecturing. It is obviously that teacher time for those subjects have to be almost duplicated because big portion of time should go on building new relationship between teacher and students.

As well proposed system should help in resolving problems caused by new environment and new conditions of living. This is another reason for positioning subject taught on tuition based in the first year of studding. This process is off course not easy, but if efforts come from both side results could be surprising. Ideas in this work have been tested in last four years, and are still in testing. Model which we suggest are modified from basic model, and what is from most interest one of the result is that different culture (but not very different) accepted teaching on completely different way. There for some of methods which were successful in some environment result as completely different in different environment. The big problem is also that different kind of students in way of personal predisposition (for example technical, media and art students) responds to teaching on completely different way. Students need starting week where they get information about process of learning, using literature Internet, distance base education and other types of education and communications whom they haven't been introduced before. Every university have this introduction but mostly on the wrong way, without results. Students are needed closer communication with teachers. In that sense logical solution is reestablishing institution of tutor. Also every subject should have at least some short interval of tuition [Vladan Zdravkovic. Reaffirmation of tuition in learning, Being Virtual, spring 2000]. It is clear that it is very complicated, especially for basic subject, where the number of student could be 500 per teacher, but it should be solved throe assistants or some other form of consultants. Teaching process should be more personalize. It's means that teaching process should more fit to students needs, abilities and wishes.

4. Solution

The main problem is relocation of teacher's time. As reintegration of tuition needs more teachers' time, where from time is came? Some topics actually haven't needed for human "on line" taught. These topic should be delivered by some form of education on demand: Web, Video, audiotape or as an assignment to read. Time have released by these approach could go to tuition. That concept has been introduced in 1998. First modification has been applied during winter semester 1999/2000, and second modification has been applied during the spring semester 2000. Third modification is still in progress and results will be presented on conference. Here we are presented solution for time saving. Students have been split in several groups (from 2 till 5) regarding their previous knowledge, and abilities to attending the technical level of lessons. On that way teacher were able to offer two kind of lecturing for two kind of students. The time for providing these idea coming from labs lessons where students receives freedom to work on their own (as well taking responsibilities for their own time and work). Also time have came from timing scheduled for theoretical lessons (because theoretical lessons have been performed on video base, giving chapters from book to reading (where they completely match subject) so teacher gave answers on questions during tuition).

5. Results

From the start results have been very unsatisfactory, but analyzing them conclusion were that several mistakes had been performed on start, which have been omitted later process. Understanding those mistakes, we have performed modification. After modification method have performed quite well and responds of students were over expectations. In full version of work is table with students' mark for subject and teacher.

6. Conclusion

Tuition has reestablished confidence and significant improved students' confidence toward teacher. It has helped in learning and solved many problems mostly couldn't be solved without using of tuition.

Solving educational problems during learning computer visualization applications and raising students' creativity

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Abstract

Learning visual based application has been one of the biggest problems for most of students. Both in art and technical education. One of the reasons is that education in computer visualization, especially in area of 3D modeling, 3D animation, computer-generated special effects and programming for multimedia and VR applications are not same as education for standard computer application. But any way teachers have been trying to implement standard educational techniques. The solution is in changing learning paradigm and tries in more flexible and differential approach. In this work we are presented combination of project based learning and teaching have been implemented in different proportion and sequence.

1. Introduction

Education in computer visualization, especially in area of 3D modeling, 3D animation, computer-generated special effects and programming for VR applications are not same as an education for standard computer application. Experience has been showed us that we should implement different strategies, methods, motivation approach and even change complete paradigm. Usually way of teaching should be abandoned, and project based approach with flexible, dependent on class dynamics and structure, teaching process should be implement in all steps of learning. In our case teaching has been combined with projected based approach where teacher showed on different types of applications mistakes and good solutions. This approach not even has been raised students knowledge and speed in acquiring knowledge but raised students' creativity [1].

2. Problems

Because of all differences between learning of visual application comparing with other computer related subjects educators should be careful and specially take care about following aspects:
Difference in way of adoption lecturing in those fields.
Importance of order of teaching and going step by step by subjects.
Group dynamic and structure have been more important comparing with "not visual related" subjects [2], [3].
Interdisciplinary and multidisciplinary of subjects especially connection with artistic problems and specialty, which this connection should bring in process of education for computer visualization. Also, learning animation programs carry problems. It is difficult and time consuming. Students could be unsuccessful and their self confidence will fooling down. Immersed in animation world, students could "forget" about primary task – learning other visual based subjects.

3. Methodology

In those research and presented work we have used some of not popular methodology, as dividing students, making range between them as more or less gifted for subject, but reality and experience show us that visual based applications are not kind of software which is immanent to every person. Beside that we have made this grouping on the way that student didn't realize that they are in different groups. If some of them had realized that, they didn't complain.

We have tried to implement different way of learning offering to students' different speed and type of learning. During our research terms have been changed, not all groups had have same tests, and not all results are processed. So the experiment should be treated as is still in progress and development and results as preliminary not as final. Any way now we are in phase that results could be useful so we are published work.

4. Project

We have made project in 3 phase. First two phases are finished. There is final last phase that should be finished and than results will be completely valid.

In the first phase we have tried to discover different ways of learning and approach to understanding visual based computer applications. We had tested students, before they have started education. It has given us base for almost absolute compression between control groups and different styles of teaching. Based on that we have monitored their success in learning visual based applications more efficient. Enrolment test had two parts. A psychology test based (mixture of intelligence, motivation and socialization aspects) and "subjective" test of creativity where students bring their "artistic" work, what have been upon their choice. Most have brought drawings, some stories or songs. We have correlated results on these tests and their educational background and their marks during education. During the first phase of research we have changed application for learning because we had found that some visual based applications allow faster learning results and stronger base for efficient learning then other correlated applications.

In the second phase we have gone deeply in problems of different way of teaching and learning. During that process we have tried different strategies in approaching to students and with different styles in learning. As in the previously phase we have used method of variation of teaching style of teachers. That method has been applied always on main teacher (teaching theoretical lessons). But instructors (lab assistants) approach for application programming has been a little bit different. Sometimes when we had been sure that instructor was able for transformation teaching style, we have used same person. But when we had thought that instructor wasn't able to change teaching style we have changed person, so we worked mostly with different types of instructors for learning application programs.

We have generally classified three types of approach to students. Criteria are mixed and complicated for explanation. We have also developed three different ways in presentation of theoretical topics. One way has been presented theoretical topics before practical, especially before learning application programming. Another has first used method of learning application programming without any theoretical introduction and then after finishing that learning working with theoretical lessons. Finally last method have been combination of that two in the way of positioning practical learning in the middle of learning process. The method where theoretical lessons had came at the end (after learning application program) has been rejected. We have tried with this approach several times, but with evidently refusing from the students. We also have appended learning of animation and modeling even to those who learned just multimedia programming, because we had believed that by this way students could improve their learning and understanding abilities [1].

Also there is a place to notify that we couldn't treat the results of experiment as absolute because for the main subject interactive multimedia – application program Macromedia Director, we have used results application – CD-ROM as criteria about successful fulfills of program. Some criteria in marking those kind of application could be absolute as number of mistakes in programming or consecutive of design or level of interactivity, but some are relative as quality of design [4].

5. Subject

The chosen subjects have been Computer Animation, Digital Postproduction and Interactive Multimedia. Although name Interactive Multimedia suggests learning multimedia based programming, it covers as well computer animation and modeling. Sometimes originally subject Interactive Multimedia already had included learning animation, modeling and editing (but on a very basic level), sometimes we ad these two areas in syllabus. Digital Postproduction have had also animation and modeling in syllabus. The reason is that we believed that learning modeling and animation could help in learning related topics in multimedia and that it raises student's creativity.
In process of learning as application programming learning we have used Adobe PhotoShop, Macromedia Director, NewTek LightWave, 3D MAX, formerly Kinetix now Discreet and Adobe Premier. We have used two countries and two educational systems for monitoring results. We have used Sweden and Yugoslavia. Also we have used groups of University students and students taught for company training. Total number of students have been more then sufficient for reliability of results (more then 400) but not all of them had been tested on same conditions, so we could compare smaller groups and building different correlation between different groups. The biggest problem have been impossibility for psychological and creative enrolment (pre-test) for all learners. Another problem has been caused by changing learning application.

6. Mission

In theoretical teaching most emphasis had been given to following topics: Interactivity, Multimedia, Production and basics rules about film making and visual aesthetics.
Main tasks what we had assigned to ourselves have been raising student's creativity, understanding problems in production of multimedia, animation and special effects, understanding purpose and ways for realization of interactivity Finally all that have been implemented to making students able for developing interactive multimedia application by themselves.
Monitoring of success of that process has not been so easy. How to monitor for example creativity of students? Even if such progress could be monitored, what will be defined as creativity? What is creativity for one person could be pattern and monotony for another. So it has been obviously that these task would be unmeasurable. One of ideas had been measuring this progress by introspection of students. We have abandoned it as completely not valuable method, but we had asked some of the students (selectable those for whom we suppose that could give honest and reliable answer), and those results we have assorted among "not valuable" results.
Students have made two kinds of assignment. One has been modeling assignment obligatory for all groups. First in NewTek LightWave (just in Yugoslavia), then 3D MAX (both Sweden and Yugoslavia). Another assignment has been deepened on group. For Interactive Multimedia it have been programming assignment in Macromedia Director. Programming assignment first have been made by one student, but later we change it on system two students one project, even it were cases where were 3 or 4 students on assignment (where the project was bigger). In Animation it have been advanced modeling or animation assignment depending of student's group. In postproduction it have been editing, digital composing and digital effect.
When we are compared results of students work we also compare other marks in their studding (where is possible) and that we also made using two criteria. In the first phase we also marked work in editing made in Adobe Premier, but we have realized that these mark had been mostly based on subject evaluation and on personal preferences. We had decided to abandon this program from those who were relevant for research. Any way students have received lecture in that program and worked in it, but it was out of evaluation for this research.
Regarding the modeling tasks we have tried with following system. Students' different ability had received different tasks of different difficulties. It have shown very good results, because by this way very good students produced excellent models and not so gifted students, succeed in producing sometimes pretty good models. It have been much better results from the previous attempts when we have made same way of assignment for all, and where the result were that in case when assignment were to difficult, not so small number of students just quitted from the work. In reverse case when we have given to easy assignment there were not extraordinary works.

7. Methodology for marking

One of the fundamentals have been building stable marking system, which could eliminate as much as it is possible subjective impressions. System of marking have been stable throe hole research, and we build marks from following parts:
Global impression of model has received maximum 10 points.
Model position on surrounding ground has received maximum2 points.
Economy of model (it means number of polygons used for building the model) received maximum2 points.
Lighting of model and established atmosphere of the scene have received maximum 5 points
Number of points in modeling assignments has been doubled if it was group for animation and triplicate for group for modeling. Points for multimedia presentations are followed:
Overall impression have brought maximum 30 points
Design have brought maximum 20 points
Navigation have brought maximum 10 points
Style have brought maximum 10 points
Incorporation of sound have brought maximum 7 points
Concept have brought maximum 5 points
Implementation of Idea have brought maximum 15 points
Implementation of topic have brought maximum 5 points
Story have brought maximum 10 points
Interactivity have brought maximum 10 points
Technical aspects (speed, mistakes...) have brought maximum 10 points
(Number of points has been 132 points, higher of 100 because it has been combined with modeling.
After finishing assignment all students have received replay on assignment and change their model, animation or application. That we have used because idea is that if students missed some essential aspects it is problem of teacher who hadn't transferred knowledge on correct way, from any reason. It could be student's absence from class or teacher mistake in education. But if the problem hasn't been fixed even after warning, these have been treated as student's mistake.

8. Results

Because we have got many correlation complete table of results is impossible for showing in work. Here we are presented table with comparison of three groups on the same University, and same subject - Interactive Multimedia. Groups have been worked in half-year delay and group one has worked with classical approach to Multimedia without active implementation of Modeling and completely without learning of animation. For group one teaching in modeling have been actually just learning about interface.

Average Marks:	Mark for program	Design	Overall Impression	Navigation
Group \max. points	132	20	30	10
Group 9	28	5	6	3
Group 13	64	12	18	4
Group 14	72	14	24	4

Table 1

Mission from the learning have been conducted in late two groups almost completely (criteria have been nominate as for the professional production. Significant difference in results has proved correctness of method.
Another interesting results have been notified in comparison groups who have worked with complete practical – project based approach (group 9), mixture of project based approach when the process has grouped in two blocs. First theoretical then practical (group 13), Mixture of theoretical and project in order theory – project 1 – theory – project 2 – theory – final project (group 14). This result is not so absolute valid as previously one because group 9 is from different country, and also global abilities of students and their pre knowledge before stating of course was different. Also it have been corporate training in difference from group 13 and 14 where it have been University education. Also training of group 9 have been much longer then training of groups 13 and 14 so we have provided two overall marks after first block of

work (about same amount of work as for the group 13 and 14 and final work (doubled time). Another different is early differentiation in-group 9 so learners have been divided in-groups as programmer designer and sound editor, what produced problem in their overall work.

Average Marks:	Mark for program	Design	Overall Impression	Navigation
Group \max. points	132	20	30	10
Group 9 first result	38	8	7	4
Group 9 final result	46	10	10	5
Group 13	64	12	18	4
Group 14	72	14	24	4

Table 2

9. Conclusion

Marks (objective criteria) and even more subjective criteria as a teacher filing about assignment shows all advantages of implemented approach in teaching. These project any way needs more time for testing, implementation of used techniques in teaching and comparison with others teacher's results (what is in progress). Any way there is no doubt that some of approaches should be implemented no meter of kind of educational organization or personal teachers approach, as is project based learning, different approach to different students, "quantityzation" of assignment and "personalization" aspect during teaching. Although project based learning is evidently more improved method of teaching [5], [6], it has to be implemented with careful and mixed with other methods.

10. Literature

[1] Zdravkovic Vladan, Vian Boris, Raising creativity and understanding of problems during learning computer visualization applications by using animation and visualization Interactive Multimedia, IWALT Proceedings, IEEE, 2000

[2] Boris Vian, Using of animation in learning process, Being Virtual, spring 2000

[3] Carling Eva and Olila Marc, SIGGRAPH proceedings, Siggrpah 1999

[4] Dal Van Ivo, Comparative advantages of project based education, Journal for new education NR. 3, 2000

[5] Journal of educational Multimedia and Hypermedia, AACE, Vol. 9 No. 3, 2000

[6] Journal of Interactive Learning Research, AACE, Vol. 11 No. 2, 2000

Designing Constructivist Teaching and Learning Environments For Visual Learning

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Abstract: This paper discusses the design of a graduate course in visual learning based on constructivist teaching principles. The conceptual framework is described, and guidelines and examples of each project are presented. Innovative strategies that contribute to a constructivist teaching and learning environment are discussed. Student and instructor comments are also shared.

The Importance of Visual Communication

Most living things depend on some form of visual communication every day. As human beings, our lives are intertwined with a rich array of visual information that is presented almost every waking moment. Beginning when we get up in the morning and often continuing into our dreams at night, we are continually being affected and influenced by the colors, images, and the media that bombards us. The world is becoming more and more visually oriented as the shear amount of information increases at an alarming rate, and we struggle to make sense it. We depend on visuals to help us understand concepts and procedures. Visuals can be very useful in solving problems. From Dr. Snow's maps plotting the location of cholera deaths in a central London neighborhood in 1853 to illustrations showing us how to connect cables to our computer, visuals often show us how to solve complex problems with very little support from text. Visuals are also tools of persuasion; printed and television advertisements influence people in making decisions. Spoken words such as poems or metaphors often create visual images in our minds. In spite of the overwhelming use and influence of visual information in all parts of our lives, educators are often not as knowledgeable about creating effective instructional visuals as text-based materials. More often they use verbal forms of communication to teach rather than visual presentation skills. Literacy skills for both teachers and students should include visual as well as verbal literacy. Visual literacy is "the ability to understand and use images, including the ability to think, learn, and express oneself in terms of images." (Braden, 1996)

Constructivist Teaching Environments

Designing effective teaching and learning environments is a complex and challenging task for educators. The course environment should facilitate students' ability to manipulate the content of the course to fit their specific learning needs and goals. Students should interact with the course information in order to develop proficiencies in both the theoretical framework that guides our understanding of how visuals can be used instructionally and specific technology skills in graphics software. A project-oriented approach seems to meet these goals since the guidelines for each project allow students to create products that are relevant to who they are as learners and reflect on the competencies they need to master.

Course Description

The Visual Representation of Information covers a wide variety of topics related to the effective use of representing information visually in instructional media and materials. The primary purpose of this course is to enhance students' ability to conceptualize, design and develop visually rich and appropriate materials that support and enhance active teaching and learning. Although the primary focus of this course is the effective use of graphics in interactive, computer-based instruction, the concepts can be applied to the design and development of materials for other courses, presentations, and instruction.

This course blends theoretical and research issues related to the use of graphics in instruction with production competencies. Students explore and evaluate the design and creation of visual information in a variety of technology-based learning environments. Another purpose of this course is to enable students to get in-depth, hands-on experience with a variety of graphic software programs. The general format of this course is a mixture of demonstration, discussion, and hands-on experiences, and the role of the instructor in this course is one of a facilitator rather that a source of all knowledge. In most tcchnology-rclatcd courscs, it is impossible to know everything; there is simply too much to know, and it is continuously changing.

Objectives for This Course

During this course, students participate in readings, discussions, and hands-on explorations of the following topics: creating appropriate visuals for instructional content and the intent of the instruction; understanding the role of visuals in facilitating learning and the relationship between learning theory and visual perception; knowledge of the research on visuals in instruction and the resulting instructional design principles; familiarity with the concepts of visual design and communication in computer-based instruction; and skills in creating paper and electronic documents such as storyboards, design documents, and flow charts that convey accurate descriptions of visuals to production units such as illustrators, artists, videographers, and photographers.

Through skills developed in five projects, students develop a personal understanding of design principles for computer-developed media, become able to apply design principles to situations involving the creation and evaluation of both static and animated graphics using technology, and develop a meaningful visual vocabulary that extends to other environments outside of this classroom. In addition, students learn to use creative brainstorming to develop instructional graphics to solve problems and communicate effectively. Finally, through authentic, challenging activities, students develop skills in Adobe Photoshop and ImageReady techniques.

Learner Profile

Typically students in this course are enrolled in the graduate instructional technology program, but few have experience in art or graphic design. At the beginning of the course, most students are interested primarily in the skills development, even calling the course, "the Photoshop course," but by the end of the semester, they realize that the development of visual literacy skills and the accompanying theoretical framework for design is more valuable.

One student stated it this way:

> *...the projects made me seek to absorb as much Photoshop as I could for each project. I want to have a good grade in the course, but I will be better served by the knowledge I have acquired from the course. I wanted to learn Photoshop two grades above "A". There was so much other needed knowledge gained in colors, metaphors and interface design, that the whole class was enriching for my use and career-to-come.*

Students have many responsibilities since the satisfaction and enjoyment of this course depends, for a large part, on the time and effort that each student dedicates to exploring the issues, learning different techniques, and playing with the tools. There is a great deal of time involved in learning graphic application software, and most of that learning occurs outside the regularly scheduled class. Students often spend as many as 9-12 hours each week working on the concepts and techniques discussed in class.

Course Projects

Project 1: Learning the Language of Art

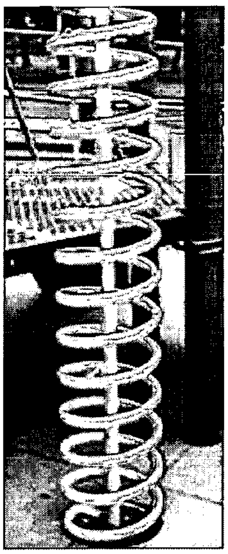

Figure 1: Illustration for the Concept of Line

In order to develop a common language for communicating about visuals and design, students research either an element of art or a principle of design and combine original graphics and descriptive text to create a reference for the Language of Art Resource in the course materials. Students demonstrate competencies in general graphic skills by scanning photographs, choosing correct file formats, appropriate selection areas, and appropriate size. Students also demonstrate general design skills by selecting appropriate type style and size, chunking text to improve readability, and creating appropriate balance between text, graphics and white space. Finally mastery of basic Photoshop skills are demonstrated by opening, resizing, and cropping images, adjusting brightness and contrast, and saving files. Creating a new word processing document, inserting graphics into the document and saving the file in HTML demonstrate Microsoft Word skills.

Students select and sign up for either an Element of Art or Principle of Design (for example: point, simplicity, shape, clarity, space, balance, light, harmony). They take at least 12 pictures with a regular camera that illustrates their concept. Digital cameras are not used because scanning is one of the objectives for this project. They have the pictures developed, then scan and enhance them in Adobe Photoshop by resizing, cropping and adjusting brightness and contrast. Students also research their topic by interviewing art educators, and reading information both online and print-based. Finally they find at least two examples of the element/principle illustrated in artwork in online museums.

The students write a summary about their topic in a word processing program, inserting the pictures in the appropriate places. They are required to have at least 3 bibliographic references and a short annotation describing the instance of the element/principle in a piece of artwork in an online museum with a hyperlink to the site. Finally the documents are saved in HTML format so they can be shared with others.

Project 2: Creating a 3 Dimensional Timeline

In the second project, students contribute to a timeline of computer history and construct a three dimensional "virtual exhibit." Each student chooses a period of time based on important events in computer history such as "The Enigma Machine (1935)" or "Blaise Pascal: Pascaline Calculator (1642)." Then they create an exhibit in an online computer history museum. Supporting information about the life and times of that era must also be represented. Timelines are appropriate topics for this project because they have long been used to represent temporal information in visual form.

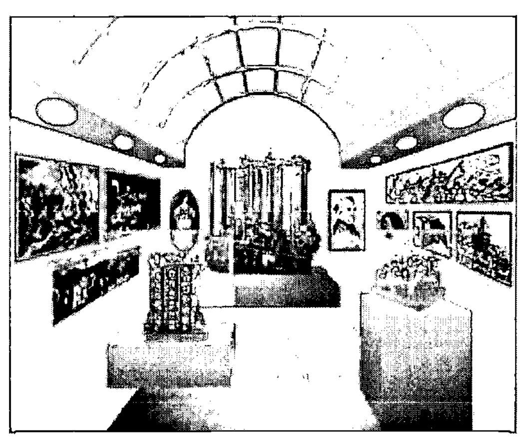

Figure 2: Example of Exhibit for Early Calculating Machines, Charles Babbage

Students demonstrate competencies in graphics skills such as understanding perspective and how to create an illusion of 3-dimension space, but they also must decide which images are needed in the space they create. Students research their era to find appropriate and meaningful historical and computer information. They must evaluate primarily textual information and then determine how it might best be presented visually. Students explore innovative approaches for displaying the visual information for the time period including techniques in color, light, and shadow. Finally students must obtain copyright permission to use any image not in the public domain or one they didn't create. The 3-dimensional room is placed on a Web page and the student submits information about the images, as well as links to relevant web sites that directly pertain to the computer history of that era.

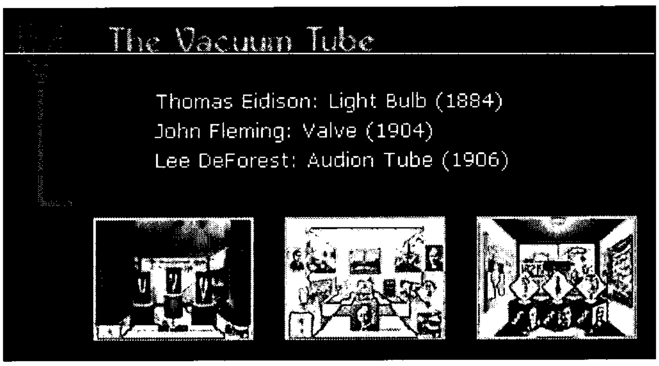

Figure 3: Part of the Menu for the Computer History Museum Showing Clickable Thumbnails for the Exhibits

As each class has contributed rooms to the Computer History Museum, it has continued to grow. Each room is shown on a menu page grouped with thumbnails of the rooms of each particular era. The thumbnail links to a Web page with a larger image and information about the era, important personalities, Web links, and information about the student who created the room.

Each room is very different since students have considerable freedom in selecting and placing objects and images. Usually the greatest limitation that students have to outcome is the lack of graphic software skills, since many students do not yet have the ability of reproduce what they see in their mind's eye.

Project Three: The Visual Representation of Statistical Data

For the third project, students design two visual representations of statistical educational data. Students create two graphs, one in normal form such as a bar graph, pie chart, or line graph, and the other using an innovative and less formal approach to portraying that same information. Both graphs reflect professionalism in design, but are radically different in both appearance and purpose.

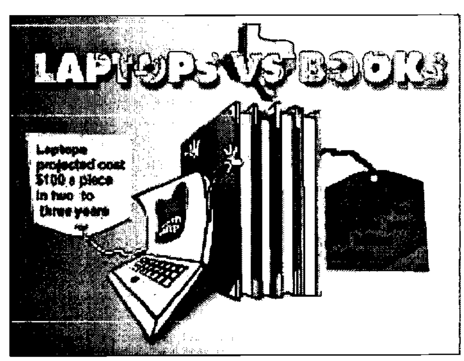

Figure 4: Example of an Informal Graph

Each graph should reflect a well-planned layout; have consistency in type, appropriate sizing, and a balance of graphics and information. Supporting information about the data - the original source - must also be included. Students design the first graph for a formal publication such as a journal or professional publication. The other graph is designed for a less formal situation such as a presentation at a conference, in which the visual must be more colorful, interesting and compelling.

Although constructing a graph seems simple, graphs are much more complex and powerful tools of persuasion than many other visuals because they contain data that carries with it the perception of research and fact. A good graph portrays correct information, gives the reader information at a glance, demonstrates simplicity of design, and uses color to create emphasis and understanding.

Project Four: Educational Animated GIF

In the fourth project, students construct an animated GIF that teaches an educational concept and demonstrates information in a purely visual manner. The image must show the represented data in a new, innovative and creative way. The animated GIF must be drawn be the student, but objects used in the animation may be from other sources such as scanned from a book or saved from the Web. The bibliographic source for the image, however, must be noted in full, and submitted with this project.

The most difficult part of this project is to narrow the topic down to a simple and straightforward subject that will easy to break into pieces or scenes in the process. Adobe ImageReady software is used to create the GIF, and build on the Photoshop skills already acquired in the previous projects.

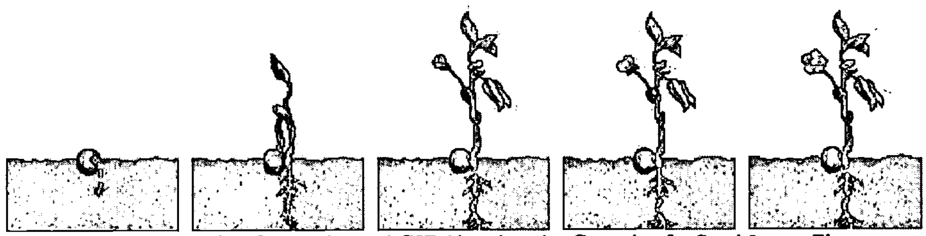

Figure 5: Example of an Animated GIF Showing the Growth of a Seed Into a Flower

Project Five: Interface Design

For the fifth and final project, students must design and build a consistent and meaningful interface for an educational computer-based program. All images and graphics used must be created, photographed, drawn, or scanned from natural objects; no clip art or scans may be used.

The components required for this project include a text-based design document that includes a design analysis, justification for the content and form of information representation, and identification of users. A flowchart that shows where screens fit into the total package must also be included. The visual elements include a collage that combines at least 5 images into a new representation, a tiled, seamless background, and navigational buttons that are consistent with the interface. Students develop five screens including a title screen, a menu screen, two content screens that branch from the menu, and a directions or help screen.

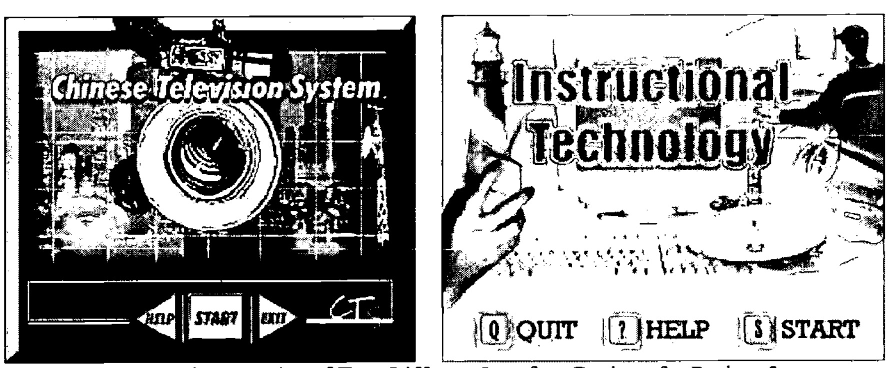

Figure 6: Examples of Two Different Interface Designs for Project 5

Many students note that this project is their favorite.

> *My favorite project was the final interface project. I liked it because I had to think in terms of an overall delivery system. It was challenging and the requirement that all of the graphics be our own forced me to be more creative.*

Issues

Copyright

Many students wrestle with the issues of copyright. Because Project 2 will be shared with the Web community, students must obtain copyright permission for every image they use in their museum exhibit that is not in the public domain or they did not create. This is a difficult and often time-consuming task, but most students note that the process is worthwhile.

One student noted:

> *I really appreciated participating in the process of obtaining permission. If nothing else, you get to see the turn around time required for producing pieces..."*

Making Informed Design Decisions

Because they are making judgments and decisions in new contexts and situations, students deliberate and worry about the selection of topics and then the selection of images, especially in Project 2, the Computer History exhibit, and Project 3, Graphing Statistical Data.

One student stated:

> *The hardest one is project 2, showroom. You have to rely on other people's permission and it is quite difficult to find exactly the things you want.*

Evaluation Matrixes

For each project, students collaboratively developed an evaluation matrix. Working in small groups, students develop guidelines for each aspect of the design and submit those for approval to the entire class. Categories for the Project 2 matrix included such headings are "Value of Specific Computer Information," "Creativity, Originality and Innovative Approaches to Displaying Information," and "Illusion of Depth and Space." After completing each project, students first evaluate their own projects before submitting both the project and their evaluation. Students did not enjoy spending the time to construct the matrix for each project, but most felt the experience was worthwhile.

A student stated:

> *It (Constructing the matrixes) was the most difficult part of this course for me and I hated it. But when I look back at it now, I find that effort very useful because the effort of constructing matrixes taught me a lot of things about each subject matter and guided me through my projects.*

Portfolios

Students are also required to develop a portfolio of their projects. The portfolio includes each project and any supporting materials, such as an artist's statement. The portfolio has been useful for job interviews, referencing materials used in class, and documenting progress in the course.

Although the course is challenging, the rewards for both instructor and students are great. In addition to acquiring software skills, students noted growth in other areas, noting, "when you create something with your own materials, or you depend on your own thoughts and materials you feel more confident" and "I enjoyed the freedom of not being 'locked in' to a particular idea; to scrap one idea for another and devote the time necessary to finish it on time."

References

Braden, R. (1996). Visual Literacy. In D. Jonnassen (Ed.) Handbook of research for educational communications and technology. New York: Simon and Schuster.

PRESERVICE TEACHER EDUCATION

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This year's submissions in the area of Pre-service Teacher Education fell into three broad themes: Integration, Collaboration and Information Literacy. By far the largest of these categories was *Integration*, a theme that carried over from years past, and continued to be of major importance. This theme included papers reporting on pre-service teachers learning and using technology in education classes to enhance their own learning and modeling inclusion of technology in their own practice, as well as papers reporting on faculty and colleges' inclusion of technology when teaching courses. The area of *Collaboration* included papers reporting on pre-service teachers work with in-service teachers, and university personnel collaboration with in-service teachers, community colleges, other universities, govemment agencies and/or local schools. We introduce *Information Literacy* this year as a new category of papers that concem efforts to facilitate students' use of technology to gather, manipulate and evaluate information. Subtopics in this area included the development of technology skills aligned with the National Educational Technology Standards (NETS), development of cognitive skills, and employment of technology applications to facilitate learning.

Integration:

Several areas came together under the umbrella of Integration. Kilbane (University of Massachusetts, USA) & Gartland (University of Virginia, USA), Schepise (University of Central Florida, USA), and Zembal-Saul & Gimbert (Pennsylvania State University, USA) discussed theories and practice for pre-service teachers learning about and using technology in college of education methods courses as a tool to enhance student learning. Hartle (University of Central Florida, USA), Wilson (Langston University/ Tulsa, USA) and Swain, Foti, & Dawson (University of Florida) outlined developmental changes in teacher education programs where an increasing emphasis was placed on the inclusion of technology instruction in educational methods and foundations courses. Ferguson (University of Northem Colorado, USA) focused specifically on the role of the inclusion of technology in anchored instruction. While Mize, Purkiss, Burleson, Gibbons, & Mann (West Texas A & M University, USA) called for the seamless integration of technology in pre-service teacher instruction, Keating & Evans (Boston College, USA) stated, in direct opposition, that technology should not be seamless, but explicit.

Runyon & Rose (Robert Morris College, USA), Rose & Runyon (Robert Morris College, USA), Rose & Winterfeldt (University of Wisconsin Oshkosh), Molebash (University of Virginia, USA), Ramirez & Bemard (University of Texas-Pan American, USA), Grable (NC State University, US), Keely & Sjoerdsma (Calvin College, USA), Rubio & Sedersten (Albion College, USA), Duran (University of Michigan-Dearbom, USA), Bober and Dodge (San Diego State University), and Brown and MacKinnon (Acadia University, Canada) all stressed modeling the use of technology to enhance pre-service teachers' learning. Each provided for the integration of the technology in their practice for the enhancement of student learning. Gibbons & Burleson (West Texas A & M University, US) and Cook (Notre Dame, USA) provided a rationale for the inclusion of technology in education courses as models to be emulated by students. Hutchinson, Sherron, Lynch, Mary & Mary (University of Central Florida, USA), Chen & Cmajdalka (University of Houston-Downtown, USA), Chatterton & Willan (Sheffield Hallam University, England), Casey (St. Bonaventure University, USA), Baker (St. Vincent), Anderson (Shippensburg University of Pennsylvania, USA), Almeida (Universidade do Minho, Portugal), Alibrandi, White, & Hagevik (North

Carolina State University, USA), Dickey & Dickey (Eastern Kentucky University, USA), Calandra & Fitzpatrick (University of South Florida, USA), Amber (National University, USA), Chatel (St. Joseph College, USA) and Norwood (North Carolina State University, USA) reported situations where modeling has been implemented by embedding the technology in methods instruction, each for specific areas of the curriculum. The inclusion of specific technology applications was of interest to those wishing to broaden the use of technology in instruction. Gao (Purdue, USA); Anguita, Osuna, Martinez & Dimitriadis (Universidad de Valladolid, Spain); Henry & Crawford (University of Houston-Clearlake, USA); Baker (University of Missouri, USA); Luca (University of Massachusetts Lowell, USA), Flake (Florida State University), Albion (University of Southern Queensland, Australia), Johnson, Ertmer, & Lane (Purdue University, USA), Wentworth & Monroe (Brigham Young University, USA) and NEWT.com all outlined the use of specific inclusion examples. In this same vein, Bynum & Considine (Indian River Community College, USA) discussed the use of distance learning to model technology integration in teacher education. Kaplan (University of Central Florida, USA) examined the strengths and weaknesses of instructional technology in a discussion of the cognitive and affective aspects of online learning.

Barrclay-McLaughlin & Nonis (University of Tennessee, USA) and Ragan (University of Wisconsin-Greenbay) called for the integration of technology not only in university classroom environments, but also in the practice teaching environment with the placement of interns in technology rich schools.

One paper in this Collaboration category, White & Sprague (George Mason University, USA), bridged the areas of integration and collaboration with a report on the elimination of a single educational technology course and the inclusion of technology skills instruction in all college of education foundation courses using collaboration between technology faculty and foundations area faculty.

Collaboration

Collaboration is an area that continued to be of importance in pre-service teacher education. Golden & Erb (Mariatta College, USA), Dutt-Doner (University of Southern Maine, USA) & Powers (Indiana State University, USA), Kerr (Brock University, Canada) & Slepkov (district School Board of Niagara, Canada), and Myhre (Western Washington University, USA) reported on projects where collaboration occurred between pre-service teachers and active classroom teachers. Technologies used included video and e-mail to enhance communication among all participants.

Another area of collaboration involved interaction of the university or college with community colleges, other universities, government agencies and local schools and community groups. Coe & Land (Midwestern State University, USA) described a collaborative effort between the university and in-service teachers in the community. Projects of both Begeron, Wenhart, Hopper, & Barrett (Arizona State University East College, USA) and Sheinkopf (Florida Solar Energy Center, USA) & Krupp (Brevard Community College, USA) involved collaborations of upper level schools of education with community colleges. Sheinkopf & Krupp, Hoffman (Eastern Michigan University, USA), Roempler (Eisenhower National Clearinghouse, USA), Mardis (Merit Netork, US), Wiley & Recker (Utah State University, USA), and Banks & Traxler (St. Mary's College, USA) all described collaborative efforts especially designed for the enhancement of science instruction by providing added background instruction or information for teachers. Verkler (University of Central Florida, USA) described a collaborative project that involved language students in the US collaborating with students in France and Spain using technology as the communication tool, thus providing not only a model for collaboration, but also for technology integration.

Information Literacy

Information literacy is a broad topic that embodied cognitive skills, the instruction in and use of applications for learning, technology skills and assessment of educational technology. Templeton, Warner & Frank (Westfield College, USA) provided an in-depth look at information literacy and the need for inclusion in all areas of pre-service education. Zhang (Washburn University, USA), and Jensen & Fowler (University of Nebraska-Lincoln, USA) examined technology language, "cyberjive," as an indicator of technology efficacy while Downs, Repman, Carlson, & Clark (Georgia Southern University, USA), and Hokanson (University of Minnesota) examined the background of entering pre-service teachers to ascertain skill needs. Two other presenters focusing on teacher technology training were Egan (Minnesota State at Moorhead, USA), who examined rural teacher technology skills, and Morton & Bollulo (Laval university, Canada), who presented the CAMITE model for technology training. Sanders (Winthrop University, USA) & Sanders (Lander University, USA) addressed the issues of information evaluation and cultural/racial diversity in resources.

Two PT3 Grant status reports were included in the category of cognitive skills. Pittman (University of Cincinnati, USA) reported on using technology to improve cognitive skills while Hoskisson, Thompson, Bass, & Holcomb (Valley City University, USA) reported on the use of technology and learning communities to enhance cognitive skills. Also in the area of enhancing cognitive skills, O'Rourke (Carlow College, USA) and dos Anjos, de Morales, Paas, & Barcia (Universidade Federal de Santa Catarina, Brazil) provided descriptions of the cognitive skills that distance learning requires and offered ideas for facilitating the development of these skills. Williamson (Brown University, USA) presented an argument for the use of technology at higher levels of Bloom's taxonomy than currently seen in most instruction where technology is employed merely as a tool. Inquiry learning and culture clash were the focus of two more presentations (Morgan [Bemidji State University, USA] & Bender-Fayette [Horace May Elementary, USA] and McClelland [Kent State University, USA]) where cognitive skills received particular emphasis. Dils & Ayre (King's College, USA) applied digital video in a constructivist environment for pre-service instruction, thus modeling the integrated use of technology in the classroom; Bennett (Navajo Education Technology Consortium, USA) presented another digital video project designed to assist pre-service teachers in the development of skills necessary to use this tool in the classroom; and Austin (Black Hills State University, USA) tendered a model for the use of Palm Pilot PDAs for faculty supervising intern teachers.

Focus on NETS and development of pre-service teacher technology skills were integral themes in Deek & Kimmel (New Jersey Institute of Technology, USA), Madison & Hutchinson (University of Wisconsin-Stevens Point, USA), Wiencke (State University of West Georgia, USA), Melczarek (Troy State University Dothan, USA), Young (Indiana University South Bend, USA), Gregory & DeTure (Rollins College, USA), Ku, Hopper, & Igoe (Arizona State University, USA), McCoy (University of Alaska Anchorage, USA), and Jones (University of Sunderland, United Kingdom). In these presentations, differing emphases were placed on NETS skills with varied program ideas for development of learning opportunities to enhance these skills.

Assessment and evaluation of technology instruction provide valuable insight into what works. Lou & MacGregor (Louisiana State University, USA) examined the use of WebQuest in instruction in terms of its capacity to provide guidance for learning, as well as enhancement of motivation when employed in a cooperative learning environment. Other assessment-focused presentations included Seed (Northern Kentucky University, USA) and Schnorr, Burnell, Robertson & Cope (California State University, San Bernardino, USA), where Seed examined the theoretical concerns of technology implementation in a university college of education and Schnorr et al. looked at the transfer of technology instruction to actual practice. Faculty attitudes provided the focus for Szware (UNIP, Brazil), while in-service teacher concerns and the need for a concerns-based training model drove theory presented of Rakes & Casey (University of Louisiana at Monroe, USA). Finally, Connell (NTU, Australia) examined the role of Instructional Technology as it may be altering teaching techniques and philosophies to such an extent that it must impact on pre-service training.

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Beyond the Status Quo in Preparing Tomorrow's Teachers

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Abstract: This paper presents a case for rethinking the existing paradigm of the personal computer in educational technology. In particular it examines the nature of failure, the evolution of technology, and the general lack of acceptance of educational technology in today's classrooms. The paper asks the question what is the role of teacher educators in the development of new technology implementation paradigm, and provides a rationale for a more critical analysis of existing educational technologies.

Introduction

In his book the Evolution of Useful Things, Henry Petroski suggests that failure is the fundamental principle by which products arrive at their form and function. When a product fails to meet expectations it either evolves or becomes extinct. Laptop computers offer an example of Petroski's notion of failure driven product evolution. Early portable computers were heavy, cumbersome and limited in power. These properties failed to meet the expectations of mobile users. The failures led to lighter, smaller and more powerful laptop designs. Does Petroski's product evolution hypothesis generalize to other areas of technology such as educational technology? Are the products and processes of educational technology evolving? The relatively rapid obsolescence of school computer labs suggests that the answer is yes. Product failure has played an important role in the evolution of educational technologies. However, if form follows failure as Petroski suggests, does twenty years of technology evolution and the resulting lack of acceptance of educational technology by the majority of classroom teachers constitute a deeper form of failure?

A view of "normal" science may prove useful in understanding deeper forms of failure. Kuhn (1970) noted that much of the knowledge in scientific fields involves puzzle solving - elucidating anomalies to fit an existing paradigm. When the solutions no longer fit the paradigm, they generate a crisis. The existing paradigm no longer explains the phenomena adequately and the potential for a shift to a new paradigm increases.

Is there a view of "normal" in educational technology? What is the accepted paradigm in educational technology? Since the field encompasses numerous technologies, proposed here for the sake of simplicity is a "normal" view that focuses on one common educational technology - the personal computer (PC), in particular the application of the PC and its software as the common paradigm for the classroom implementation of technology. The benefit of this viewpoint is that it provides both a recognizable paradigm with identifiable methods and an opportunity to revisit Petroski's notion of failure and evolution.

Twenty years of technological advancements have supported the paradigm of personal computers as the primary tool for the integration of technology into classroom teaching. Each new version of PC is faster, more powerful, and in many cases less expensive than its predecessor. Still, despite PC advancements, many teachers cannot justify the time and effort required to integrate PC technology into their teaching. and the cost of accessibility is still beyond the grasp of many schools(Dias, 1999).

If a historian traces advances in educational technology backward for the past twenty years, she is likely to find puzzle solving incremental changes akin to those offered by Kuhn's "normal" science. Incremental changes are evolutionary. They gauge progress. They clarify methods and importantly in the case of educational technology they proved instrumental in introducing technology into classroom instruction. Clearly, history shows that problems/failures have been overcome. Early personal computers were slow, the solution was to make them faster. Second generation PC's lacked adequate the memory to run complex software. Their descendants gained memory. When teachers and their students needed improved access, PC labs were institutionalized. When teachers suggested that the PC's were too difficult to use, professional development was provided. In these and other instances immediate problems were identified, addressed and solved. All of these advancements fixed problems encountered with educational technology but none solved a key problem evident in the PC paradigm. Even with access to advanced equipment teachers seldom integrate PC's into their teaching.

Is it possible that educational technology evolution efforts have been misplaced? Probably not. The PC paradigm in education followed a path analogous to the one encountered by business users. Only now are standards for educational use entering the mainstream. Even with an absence of educational failures, the PC was destined to evolve as a function of business and economic forces. Nevertheless, the educational community has not asked, "Does the PC as an implementation paradigm fit the work environment and goals of teachers and students?" If the answer to this question is yes then educational technologists simply need to identify failure points, correct them and watch technology evolve. If, however, the paradigm does not fit the goals and environment of the intended audience then no amount of failure, puzzle solving, or evolution will correct it.

Is there evidence to suggest that the PC paradigm is flawed? Seminal research suggests that a wide cross section of middle school teachers do not perceive existing educational technologies as supportive of their classroom teaching (Abate & Jin ,2000). The results are preliminary but revealing. It has been documented elsewhere that lacking a job-imposed requirement, individuals are not likely to use tools that they perceive to make their work more difficult (Ehn, 1993). As failures of technology become more prominent and the public begins to question the efficacy of educational technology (Stoll, 1995) it becomes increasingly important for teacher educators to consider alternative educational technology paradigms.

What is the role of teacher educators in the development of a new technology implementation paradigm? In most professions the design of tools takes into account the work context of the user (Kuhn, 1996). In the field of educational technology few reports discuss the design of the technological tools available in typical classrooms. This is understandable. Most educators are not designers of educational technologies. However, in other fields, medical equipment for example, medical personnel work closely with designers to produce technologies consistent with their work environment. In the design of office furniture, ergonomic experts work with office staff to provide solutions unique to office workers needs. Even in recreation, biomechanics experts work with athletes to design foot apparel for specific sports. The precedent for collaborative design exists should teacher educators choose to assume the role of learning technology designers. One approach is for teacher educators to join forces with classroom teachers to take a more active role in the design of classroom technological tools. The alternative is to continue the present course, a course where existing technologies are adapted for the classroom, and the learning environment is adapted to meet the requirements of the tools.

References

Abate, R. J. & Jin, S. (1999) Teachers and technological tools in the middle school. Technology and Teacher Education Annual 9, 215-220.

Dias, L. B., (1999) Integrating Technology some - things you should know. Learning and Leading with Technology, 27, (3) 10-13.

Ehn, P. (1993) Scandinavian design: on participation and skill. In D. Schuler, and A. Namioka, Participatory Design (pp 41-76) Hillsdale, New Jersey: Lawrence Erlbaum Associates.

Kuhn, S. (1996) Design for people at work. In T. Winograd Bringing Design to Software (pp. 273-289) New York: ACM Press.

Kuhn, T. (1970) The Structure of Scientific Revolutions, Chicago: The University of Chicago Press.

Stoll, C. (1995). Silicon snake oil: second thoughts on the information highway, New York : Doubleday.

Talking with computer-using teachers: Insights for pre-service teachers

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Abstract: Access to models of appropriate practice is an important aspect of pre-service teacher preparation. Multimedia materials can be used to supplement uneven field experience. The project on which this paper is based included materials prepared by and interviews with ICT-using teachers. Analysis of the interview transcripts and trials with the CD-ROM confirms that the interviews are likely to be effective in presenting pre-service teachers with appropriate messages about the use of ICTs in teaching.

The development of teachers' capacity to work effectively with information and communications technologies (ICTs) in their classes is influenced by many factors. Clearly access to, and personal skills in the use of, appropriate hardware and software are important. Another important influence is access to appropriate examples of teachers who work with ICTs.

The importance of modeling for professional development of pre-service teachers in respect of computer use has been argued in previous studies (Albion 1996; Becker 1994; Downes 1993; Sherwood 1993). For students in teacher education programs, the logical context for encountering these teachers is field experience. However, pre-service teachers have reported seeing little use of ICTs during their field experience (Albion 1996). Hence, various researchers (e.g. Albion & Gibson 1998; Chambers & Stacey 1999) have proposed the use of interactive multimedia to present accessible and appropriate models of teaching including the use of ICTs.

Previous papers have described aspects of the design (Albion & Gibson 1998) and development (Albion 1999) of the *Integrating Information Technology into Teaching* CD-ROM (Gibson & Albion 1999), which presents a set of problem-based scenarios related to planning for the use of ICTs in primary school classrooms. An important goal in the development of these materials was to provide pre-service teachers with access to appropriate models for the integration of ICTs into their curriculum planning by having a small group of teachers provide sample responses to the tasks embedded in the materials. As part of creating a context within which the examples might be better appreciated, video of interviews conducted with these teachers was also included in the materials. In an evaluation of an early prototype of the materials a majority of participants nominated the video interviews as their favorite element (Albion & Gibson 1998). Hence the content of the interviews was analyzed to determine what messages might be conveyed to users of the materials. This paper reports on some results of that analysis and some responses of participants in trials of the completed materials.

The Computer-Using Teachers

Seven teachers (4 female and 3 male) cooperated in the development of the multimedia materials. The author invited four teachers after they had presented aspects of their work with computers at a local professional development activity. When their schools were approached for permission to film, one of the principals suggested two additional teachers from his school. Finally a recent graduate who was known to be commencing an Internet project with a class was invited to participate.

Their teaching experience ranged from beginning teacher to as many as 20 years. The class levels being taught at the time of the interviews varied from Years 1 to Year 7 and the arrangements for computer access varied from laboratories to one or more computers in the classroom. For the purposes of the materials, the teachers were identified by pseudonyms and these are used in the following brief biographical notes.

Carla was a secondary teacher who was working part-time as a specialist computing teacher with children in Years 3 to 7. She took groups of children for weekly classes in a ten-seat computer laboratory and had some responsibility for assisting other teachers to develop skills and adapt curriculum to integrate computers. **Julie**

was commencing her first teaching appointment and had arranged for her Year 4 class to participate in an Internet Travel Buddy project with a class in New York State. She had access to a single computer in her classroom. **Karen** was an experienced teacher who had been using the Internet with her class for several years. Her Year 6 class shared a mini-laboratory of five computers with the class in the room next door. **Ken** had more than 16 years teaching experience and was active in his local computer using teachers group. He had a single computer in his Year 4 classroom. **Matt** had 15 years teaching experience and a strong local reputation for innovative uses of computers in his teaching. He had two computers in his Year 7 classroom. **Neil** had twenty years of teaching experience but was a relative newcomer to using computers in his teaching. His Year 4 class in one end of a double teaching space shared five computers with the other class in the space. **Robyn** had been teaching for 4 years and was studying a masters degree majoring in educational computing. She regularly took her Years 1 and 2 class to a 15-seat computer laboratory, which she managed for the school.

There is no suggestion that these teachers are necessarily typical of computer-using teachers, nor that they are a representative or random sample. They were invited to participate in the project because they were known to use computers or were suggested by a peer or principal. They present a sufficiently varied group to avoid any suggestion that there is a preferred stereotype of the computer-using teacher. The interviews were conducted in the teachers' classrooms using a common schedule of questions (Table 1) with supplementary questions or prompts used to clarify meaning where necessary. The teachers' responses were videotaped and later transcribed. The digitized video and transcripts were included in the multimedia materials.

Table 1: Schedule of interview questions

1	How did you learn to use computers in your teaching?
2	What made you chose to use technology in your class to supplement traditional approaches?
3	What type of factors do you have to consider when planning for technology use in your classroom?
4	What classroom management factors must be considered with the addition of computers to your classroom?
5	Where do you go to get support, ideas for technology use?
6	How does the integration of technology into your classroom assist in achieving the objectives you set for your students? Have the objectives you use changed in any way?
7	What differences have you noticed in outcomes for your students following the integration of technology?
8	What impact has the use of technology had upon your own approach to teaching?
9	What implications do you see for your classroom as a result of connecting to the Internet?

Emerging Themes

Analysis of the responses was undertaken manually using a constant comparative method. Although the responses were directed to the questions, common themes were identified across responses to different questions. Six major themes, each with several sub-themes, emerged (Table 2).

Table 2: Major categories emerging from interview analysis

Category	Description
Purpose	Statements which offer explanations of the decision to use computers in teaching
Development	Statements about training and support for computer use
Method	Statements that comment on practical aspects of working with computers in classrooms
Impact	Statements about the ways in which using computers has affected the teacher or children
Issues	Statements about problems or challenges associated with using computers for teaching
Internet	Statements which offer a view of the Internet and its significance for education

Purpose

Although all seven teachers were dealing with children who were at least 4 to 5 years from entering the workforce, all but one made statements which related the importance of computers in education to future employment. Almost half of the statements about purpose related to future employment or study. Julie suggested that the skills she would teach her nine-year olds were "*the same skills that they'll learn when they're in high school, when they want to write reports for university, or in the work force.*" Karen thought that her twelve-year olds "*could use some of the things they have done, for instance, if they were looking for a job*", although she added that looking for a job was unlikely at their age.

Five of the teachers appeared to regard technological advance as inevitable but ascribed no particular educational value. Neil said, "*Technology is a thing of the future. Kids need to have a basic idea of computers because they're going to be what everybody's going to be using in the future.*" Ken chose to use ICT because "*it's available and, if we don't we're certainly behind the eight ball and it's just the way of the future.*"

Even when they referred to the educational potential of computers it was often undefined as in Carla's suggestion that computers provide "*such wide scope for the children*" or Julie's choosing to use technology "*because it was something different*". Only Matt was able to articulate the value of ICTs as "*a way of enhancing the curriculum*" and supporting other aspects of his work with his class. Nevertheless, as is evident in the statements coded under other themes, these teachers were strongly committed to a variety of educational applications of computers.

Development

Issues associated with learning how to use computers in teaching or obtaining support for their use loomed large in the minds of the teachers. More statements were coded under the theme denoted by *development* than in any other, indicating the importance these teachers accorded to ongoing learning. That theme also had the greatest number of identified sub-themes, suggesting an openness to a variety of sources of learning.

The most mentioned source of professional development was a variety of activities that the analysis grouped into a sub-theme labeled as *networking*. Ken said, "*I talk to other people. I steal ideas from other people and they steal ideas from me*", although he was probably using "steal" in a metaphorical sense. Robyn spoke of building a network of friends, locally and through the Internet, for mutual support and commented that the "*increased interaction with other teachers is very beneficial*".

A second major source of development was tagged as *experience*. Julie referred to her learning to use computers as a "*learn as you go sort of thing*" and Ken spoke of how he "*played around with them on Christmas holiday*" and of "*trial and error*". Karen "*just kept using it and teaching* (her)*self and using it with the children, and learning with them which was very good.*"

Children are often described as developing confidence with ICTs more quickly than adults. Julie and Ken noted this and Julie referred to teachers "*not wanting to try to use the computer in their classroom because they just don't think they have the knowledge.*" In Karen's class "*there were quite a few very good computer children and they taught* (her) *what* (she) *needed to know.*" Robyn was open to learning with or from children:

> *Don't expect to know everything. Or to always be the person who knows the most. There will always be children in the class who know more than you. Use them. Make them a part of the team. They'll love showing their skills off and you'll love learning from them. You build a really good relationship.*

Method

Key ideas grouped within this theme included teaching *with* rather than *about* computers, integrating ICTs into the curriculum, and managing the complexities of matching among children, computers and curriculum. Despite the challenges, these teachers managed to maintain a focus on the educational value of the activities rather than on using ICTs for their own sake or as a "filler" when students completed other activities.

Matt said, "*I don't think it's appropriate that you build your curriculum around technology, but that the technology fits in with the curriculum.*" He described how he had equipment "*set up in the classroom in such a way that* (he could) *monitor what the kids are doing.*" Robyn described her management strategy as being

> *to always have open ended projects so that children; the brighter ones, the faster ones can always just do that little bit extra on their work. You don't ever want to have the children finish and that's it. Or go too far ahead of the rest of the class. So it's best to have open-ended projects and they can work on it.*

Impact

The most commonly cited *impact* of ICTs was enhanced motivation of teachers and children. Ken described his reaction after he had purchased a home computer: "*I kept coming to school and saying 'Look what I can do, look what I can do, look what I can do!'*" His enthusiasm spilled over to his class, resulting in "*a lot of keen kids who enjoy being on the computer in non-school time and doing school tasks in the school time.*" Julie found that her Internet project impacted motivation in her class:

> *Andrew yesterday was writing this report and he didn't want to do it and I said this has to go to the class in New York and his face lit up and he was saying "Oh, it has to be my best hand writing and my best spelling" and then he had his best handwriting and everything and he was so proud of it then because it was going to someone else and he had a real audience.*

Ken found that his new skills increased his efficiency so that where he "*used to spend a lot of weekends making charts*", he could "*go to the computer at home, whip up a very professional chart, blow it up to A3 and it's done.*" Robyn found that the computer allowed her to "*get to children that normally won't click onto the idea.*" Both Robyn and Karen noted improvements in the quality of work done by children.

Another frequently mentioned *impact* was professional growth. Matt described how using ICTs had allowed him to "*learn a lot of bits and pieces about teaching*". Robyn spoke of moving away from "*chalk and talk*" but the major impact for her was enhanced professional interaction:

> *I feel like I've enjoyed meeting and getting to know many more teachers than I probably, ordinarily, would have because teachers who are interested in technology tend to talk about it more. They get excited about what they're doing and they start asking things like "Have you tried this?" ... So there's a lot more interaction, a lot more talking and teachers tend to build up a network of friends around the area.*

Issues

Very few of the statements coded for the *issues* theme related to technical aspects of computer use. The most frequently mentioned issues were concerned with the acquisition and management of physical resources and time. Matt cited placement of computers as a key issue and Julie described some factors she had considered in deciding where to place her computer in the classroom.

Managing access when there were many more children than computers was typically resolved through the careful allocation of time using timetables or rotation of groups. Robyn and Neil both referred to using parent volunteers to facilitate their own time with children. As a beginning teacher, Julie was struggling with the balance between group and whole class activities:

> *I'm finding it hard at the moment when to decide when its OK for them to be on the computer and not being in the lesson and when they have to be in the lesson. Like sometimes I might send them over and a few seconds later I realize that they needed to hear that.*

Internet

Most of the statements about the *Internet* referred to it primarily as a means of communication. However, the object of that communication was often access to information. Julie had explicitly described the Internet to her class as a community in which they were participating. Robyn compared the Internet to a

> *global village. The children get to know other children around the world through e-mail or through live chats. And it doesn't become a case of "us and them" any more. They relate to these children and understand that they're just children like themselves.*

Carla viewed the Internet more as a source of information and suggested that, as a result, "*encyclopedias are now out of date.*" Matt referred to both communication with children elsewhere and to the capacity of the Internet to provide his class with a "*taste of the world*" although the existence of "*good and bad points*" required him to "*manage the bad points a little bit.*"

User Response

The multimedia materials were tested in use with a group of 22 pre-service teachers studying an elective subject related to the application of ICTs to teaching. As in the earlier study with the prototype (Albion & Gibson 1998), a majority of users (15 of 22) identified the video interviews as their favorite element of the materials. Data gathered using journals kept by users revealed that some users had spent a large proportion of their time with the materials (mean = 6 h) reviewing the video materials.

Several of the users indicated that the materials had exposed them to ways of thinking like a teacher about computer use. One pre-service teacher commented on the access to experiences that had not been available during time spent in schools. Other comments recorded changed ways of thinking about computer use away from seeing it as applicable only in mathematics classes, as a weekly skill lesson or as a filler activity when students had "spare time". These users reported changing their views to see the potential of computers as being capable of almost constant use across a variety of curriculum activities.

Participants in the study valued the insights offered by different teachers. One student noted the inclusion of "*alternate responses to the same questions – different doesn't mean wrong.*" Another wrote in a journal about the first scenario, "*The interview with Julie was great – helpful to have an actual insight on the use of technology.*" In an interview at the end of the trial a student commented on how the video interviews had given him "*a bit of enthusiasm, a bit of excitement to see computing technology can be used in a real and practical way.*"

Discussion

Taken as a whole, the ideas expressed by the teachers in their interviews were consistent with the research about computer using teachers. Studies of exemplary computer-using teachers have found that they tend to de-emphasize teacher-centered activity in their classrooms in favor of more student-centered approaches consistent with constructivist theories of education (Becker 1994; Hadley & Sheingold 1993; Honey & Moeller 1990; Sandholtz, Ringstaff, & Dwyer 1994; Sherwood 1993). Teachers' use of computers and the Internet have been found to be related to their learning from or with students, orchestrating multiple simultaneous activities in class, assigning long and complex projects and giving students greater choice in tasks and resources (Dexter, Anderson, & Becker 1999).

The teachers in this study appear to have moved beyond a view of "teaching as telling" and to have accepted that one of their roles as teachers is to model the processes of lifelong learning. This is evident in their commitment to professional development and their willingness to learn from the children in their classes. There was an emphasis on teaching *with*, rather than *about,* ICTs. Ken spoke about how the use of computers had increased the enthusiasm of children for their work. Julie, Matt, Neil and Robyn spoke about the integration of ICTs to support the curriculum rather than as either an addendum or a central focus and described student-centered activities involving multiple simultaneous activities in the classroom. Matt set up equipment so that he could monitor the work of multiple groups. Robyn advised the use of open-ended projects to enable children to extend an activity.

The pre-service teachers who participated in the trial found the video of the interviews engaging because of the clear connection to the reality of classroom teaching. They were able to recall ideas from the videos and to articulate developments in their thinking about computers as a result of working with the materials. The interviews included in the CD-ROM appear to be an effective means of providing pre-service teachers with appropriate messages about the use of ICTs in teaching.

References

Albion, P. R. (1996). Student-Teachers' Use of Computers During Teaching Practice in Primary Classrooms. *Asia-Pacific Journal of Teacher Education*, 24 (1), 63-73.

Albion, P. R. (1999). PBL + IMM = PBL^2: Problem-Based Learning and Multimedia Development. In J. D. Price, J. Willis, D. A. Willis, M. Jost, & S. Boger-Mehall (Eds.), *Technology and Teacher Education Annual 1999,* Association for the Advancement of Computing in Education, Charlottesville, VA. 1022-1028.

Albion, P. R., & Gibson, I. W. (1998). Designing Problem-Based Learning Multimedia for Teacher Education. In S. McNeil, J. D. Price, S. Boger-Mehall, B. Robin, & J. Willis (Eds.), *Technology and Teacher Education Annual 1998,* Association for the Advancement of Computing in Education, Charlottesville, VA. 1240-1244.

Becker, H. J. (1994). How Exemplary Computer-Using Teachers Differ from Other Teachers: Implications for Realizing the Potential of Computers in Schools. *Journal of Research on Computing in Education*, 26 (3), 291-321.

Chambers, D. P., & Stacey, K. (1999). Using Technology Effectively in the K-6 Classroom: Professional Development for Teachers. In J. D. Price, J. Willis, D. A. Willis, M. Jost, & S. Boger-Mehall (Eds.), *Technology and Teacher Education Annual 1999,* Association for the Advancement of Computing in Education, Charlottesville, VA. 1046-1051.

Dexter, S. L., Anderson, R. E., & Becker, H. J. (1999). Teachers' Views of Computers as Catalysts for Changes in Their Teaching Practice. *Journal of Research on Computing in Education*, 31 (3), 221-239.

Downes, T. (1993). Student-Teachers' Experiences in Using Computers During Teaching Practice. *Journal of Computer Assisted Learning*, 9 (1), 17-33.

Gibson, I., & Albion, P. (1999). *Integrating Information Technology into Teaching* [Multimedia CD-ROM]. Toowoomba, Australia: University of Southern Queensland.

Hadley, M., & Sheingold, K. (1993). Commonalities and Distinctive Patterns in Teachers' Integration of Computers. *American Journal of Education*, 101 (May 1993), 261-315.

Honey, M., & Moeller, B. (1990). *Teachers' Beliefs and Technology Integration: Different Values, Different Understandings.* (Technical Report 6): Center For Technology in Education.

Sandholtz, J. H., Ringstaff, C., & Dwyer, D. C. (1994). *Student Engagement Revisited: Views from Technology-Rich Clasrooms.* (ACOT Research Report 12): Apple Computer Inc.

Sherwood, C. (1993). Australian Experiences with the Effective Classroom Integration of Information Technology: Implications for Teacher Education. *Journal of Information Technology for Teacher Education*, 2 (2), 167-179.

GIS (Geographic Information Systems) in Teacher Education

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Abstract: This paper introduces Geographic Information Systems (GIS) technology as a useful addition to other technologies being introduced in K-12 classrooms in the context of an experimental teacher education course. In the iterative course design, graduate students (classroom teachers) provided email feedback and input to inform instruction. An in-service teacher and two graduate student teaching assistants were part of the instructional team, as was a middel school student. Students in the process of learning GIS mastered many other related technological applications. From a wide range of backgrounds entering the course, all students were able to design original GIS projects, importing data from a variety of sources for integration with existing map projections. The projects relate to Social Studies and Science curriculum frameworks, and lesson plans accompany the map products. Qualitative data from email, quizzes and evaluations is presented along with student products and preliminary findings. The course runs again in Spring 2001.

Introduction

Geographic Information Systems (GIS) are used in virtually all industries and government agencies that require spatial planning and/or problem-solving. Emergency 911, TV weather reporting, satellite imagery and communications using GPS (Global Positioning Systems), transportation and distribution routing, infrastructure and community planning all require spatial analysis and design flexibility. GIS combines data from data-based information with coordinates in a spatial layout or map. When the data are coordinated with a geo-coded field to locations in the digital map, the data can be instantly located in the spatial layout. Once located spatially, the data can be analyzed in different ways depending upon what other data is related to it. For example, if data from a town water distribution system can be geocoded using street addresses, the fire hydrants all across town can be made to app4ear instantly on a computer screen in a GIS. Now, to analyze the locations of hydrants needing routine inspection, a field can be created in the database to record the inspection and conditions of the hydrant. Those in need of repair can now be shown on a map in a contrasting color to indicate where workers will route their repair work for the coming month.

How and why would GIS be used in schools? Why introduce a teacher education course in GIS? Once introduced, what kinds of problems will teachers find intriguing enough to answer using a GIS project? How will teachers learn and teach with GIS? These are the questions that guided the course and our inquiries with student participants.

Theoretical perspectives on GIS in Education

As billions of dollars are spent to infuse technology into US classrooms, the values of particular technologies will become more apparent. Because GIS is ubiquitous in industry and government, students with these skills are in high demand (Alibrandi, 1998). Beyond employability, the rationale for GIS in schools is potentially more transformative. GIS analysis represents an opportunity for students and schools to provide real research-based service to their communities. Attendant with this potential is also an important responsibility to apply the technology ethically and responsibly. This implies an ability to take a critical perspective on the technology, on the nature of representation and its attendant biases, and to be able to describe those limitations and biases while presenting information in a GIS format. We have written about the need to ground virtual applications in actual experience, to apply a critical perspective on the technology in order to ethically apply the technology to community problems.

Based on Pickles' (1995) Ground Truth; Social Implications of Geographic Information Systems, several students selected projects in which they analyzed race and ethnicity data from the Bureau of the Census. One advanced student developed a voter precinct problem that became more relevant in light of the 2000 presidential election. By framing the learning of GIS in a critical perspective, the students (pre- and in-service teachers) became interested in addressing social issues using GIS.

Notes from the Field

Data for this preliminary case study derive from emails sent by students. Students taking the course for graduate credit were asked to reflect upon their learning processes through weekly questions posed on an email list that was an important means of communication for the class. Students shared their thoughts with us as instructors, and also often did so with their peers. As mastery improved over the semester, students used email to announce newfound resources or strategies to one another. This became an important source that informed course design. In GIS departments, the new landscapes of distributed cognition and expertise is common. We responded to student mastery by including it in the instructional design. As students discovered new ways to overcome problems, we asked them to share these strategies with the class. In this way, we modeled teaching with technology in a more democratic, collective and co-constructive environment. We experienced the discomfort of having to problem-solve on the fly with students; we couldn't always provide the answers to their problems, but we respected all who found solutions and immediately incorporated their learning to be shared with the whole group.

This model of teaching is not familiar to students and at times the cognitive dissonance over not always having an answer created frustration and productivity gaps. The gaps were places in which other students' strategies and findings could be inserted into this highly experiential and problem-based approach. As students hared their projects, problems and solutions, unanticipated dynamics and new levels of technical expertise were achieved that surpassed the instructors' expectations and in some areas, our abilities. This also is an artifact of teaching with technology that becomes useful when incorporated into the instructional design.

Preliminary Findings and new directions for research

As we review the gaps, we see opportunities for designing to address them. Where simple repetition is needed to routinize procedural operations of GIS software and its many related applications such as hotlinks, graphing, integrating data from various sources such as the Internet, GPS, video and still imagery, we see opportunities for process and product design. Identifying gaps will be important in the upcoming iteration of the course, collaborative group problems will move to the foreground, emphasizing actual experience will become a more grounded starting point, and a continuing inquiry into the learning processes of teachers as students will continue to iinform our design and research. Finally, as we build upon the projects of our students, a bank of GIS projects for teachers will become available to other teachers through web-served versions of GIS porjects. Once established, teacher access to GIS projects on a website in a limited version can to serve other teachers and communities to begin to manipulate GIS and see its potential for integration into existing curricula as well as to demonstrate applied GIS.

References

Alibrandi, M. (1998). GIS as a Tool in Interdisciplinary Environmental Studies: Student, Teacher, and Community Perspectives. *Meridian* (electronic journal): http://www2.ncsu.edu/unity/lockers/project/meridian/jun98/feat2-3/feat2-3.html

Pickles, J. (1995). *Ground Truth: Social Implications of Geographic Information Systems.* New York, NY:Guilford.

Digital Cameras in Education

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Abstract: Intended for convenience, digital cameras are an inexpensive learning technology schools may easily benefit from. Once captured, digital photographs are already in a universal format that makes them exceedingly uncomplicated to distribute and use with PC or MAC computers. There versatile usage makes including visual images in word processing documents, e-mail, class projects or on web sites effortless. Digital camera technology brings about a totally new innovative and motivational approach to teaching and learning.

Designed for quick and easy operation, digital cameras are one of the most inexpensive learning technology purchases a school can make . Though only a few years old it is already finding wide acceptance in many areas where images are needed to enhance projects. (See Figure 1).

Figure 1. Student projects

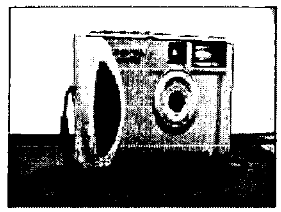
Digital cameras and traditional cameras are very much alike in many respects. The biggest difference is the way images are captured. With traditional films, they are captured on silver-based film. With digital cameras, they are captured on solid state devices called image sensors.

Once captured, digital photographs are already in a universal JPEG format that makes them exceedingly easy to distribute and use with PC or MAC computers. For example, you can insert digital photographs into multimedia projects, word processing documents, send them by e-mail to colleagues, or post them on a Web site, just to mention a few ways. With many cameras you can immediately see your images on a small LCD screen on the back of the camera, or you can connect the camera to a TV and show them much like a slide show.

Editing is simplified because once transferred, the images can be manipulated, digitally edited on-line, and then copied back to a variety of other software programs. Not only is it easy, there is no loss of image quality comparable to scanned photos. Once on the computer, you can also easily add audio, change the texture, change the size or add frames. Images in digital form may also can be pieced together and pasted into other images. These composite images can be routine or funny. In fact, composting is done so often on television and in print advertisement that we're growing used to it. Digital is the universal format.

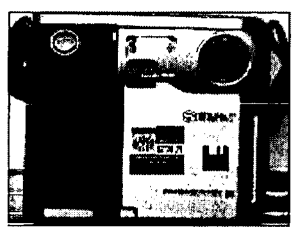
A convenient feature of digital cameras is that images are ready to post as soon as they are taken. The images don't have to be first processed and then scanned, as film has to be. This saves both time and money. Since most screens display only low-resolution images, the low-resolution of some cameras is no drawback. In fact, higher resolution images would be too big to post on most Web sites and would have to be reduced anyway.

Figure 2 **Earthlink DISCPRO Digital Still Camera**



The Arc soft photo base software available with this camera automates image transfer with a personal computer. It automatically starts image uploading whenever you connect the camera to your computer using a special USB cable. Uploaded images are stored in folders named according to the dates images are recorded. Images can be viewed on your computer using a standard Web browser, either as a group or individually.

Figure 3 **Sony Mavica Digital Still Camera**



The Sony Mavica Digital Still Camera (See Figure 3) stores picture images on a standard 3.5" HD floppy disk, therefore, no extra software is necessary. Each floppy disk holds approximately 40-50 pictures depending on the complexity of the picture image. The Sony camera has a playback menu option to view or delete any or all photo images without removing the disk from the camera. The floppy disk can be removed at any time and reinserted back into the camera without any problem. When the disk is full or you're finished with the desired pictures remove disk from camera and insert it into a computer. All picture images are stored by number of the order in which pictures were taken. Pictures can be viewed by opening each folder and used in a variety of ways. When finished with the picture images on the disks they may be deleted and the disk may be reused.

Point and shoot cameras as in the Earthlink DISCPRO, are generally small and inexpensive (at least in relative terms). They are fully automatic and usually don't provide a lot of overrides that give you creative control - that's why they are called "point and shoots." At the low end of this category are cameras with lower resolution whose images are limited to about 4 x 6 inches or so. Despite this small size, the images are ideal for Web pages and e-mail attachments

Positioned between the inexpensive point and shoot cameras and the very expensive professional cameras discussed next is a family of cameras based somewhat on the 35mm SLR model but designed exclusively for digital photography. This is the Sony Mavica camera. It is sometimes called a presume camera. It has 2-megapixels or more. Generally, the higher resolution is combined with more advanced features such as through-the-lens (TTL) focusing, various exposure modes, and manual overrides of otherwise automatic controls such as focus and white balance. This is one of the fastest growing categories because these cameras appeal to serious amateur photographers and professionals who want creative control of their camera settings and prints up to about 8 x 10 in size.

The following projects used digital photos taken with either the Earthlink or the Sony digital still cameras.

Projects

Project 1: This is a web site for a preservice graduate education class at National University in Los Angeles, California called CLD 605 The Diverse Classroom. On the web site there is a power point presentation or media gallery, which have a collection of images. There are writing assignments and class discussions designed around the images.

Project 2: Open House Fall 2000: This is a video developed for an open house presentation for students and their parents. Video consists of a collection of digital camera photographs of students engaged in class activities throughout the school year. The original work was developed on power point and then transferred to video.

Project 3: After school computer class: Students at Shandin Hills Middle School in San Bernardino, California completed this collection of presentations. Presentations will consist of student power point and digital camera projects.

Project 4: Gifted Students art project: Web site illustrating the art projects from a fifth grade class at Belvedere Elementary School in Los Angeles, California.

Digital cameras have many uses in the schools. Here are just a few of the most common uses in the average school.

1) school newspaper / newsletter -
2) year book -
3) open house / staff training presentations -
4) student projects / reports -
5) individual teacher and / or school web sites -
6) school dances / activities / sports -
7) field trips / class parties –

Additional Web Sites References

For more information, explore the following web sites:

Aquino, G. New Digital Cameras Deliver Mega Shots. [Online] Available http://www2.pcworld.com/top400/article/0,1361,10686,00.html, June 1999.

Keizer, G. Shooting Stars. [Online] Available http://computershopper.zdnet.com/texis/cs/ddoframe.html?rg=r129&u=www.zdnet.com/computershopper/edit/cshopper/content/9805/297263.html, May 1998.

PC Computing How To Buy a Digital Camera
http://computershopper.zdnet.com/texis/cs/ddoframe.html?u=www.zdnet.com/computershopper/edit/howtobuy/C0000024/

Peach, J, 2000. Making Best Use of Multimedia, the internet and Video to enhance you instruction. Bellevue, WA. Bureau of Education.
http://www.peachboys.com

Photography in the Digital Era
http://www.photocourse.com/00/00-01.htm

Tools of the Trade:
Integrating Technology in Research & Methods Courses for Preservice Teachers

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Abstract: This paper examines and describes one approach of integrating technology into research and methodology courses for teacher education. Each course is complimented with a web site that serves as a virtual office and learning resource center. The instructor used the resources at Blackboard.com to build the framework for each site. They were designed upon the premise that it is acceptable to not under go a total systematic change in delivery but a hybrid where technology supports the learning environment is preferable. The courses have produced students that are competent and knowledgeable about the subject matter and technology, its use and instruction integration.

The true power and potential of computer based technologies lies not in the machine itself but in the prudent and appropriate use of software applications to gather, process and communicate information. Teachers; integration of these tools into the educational experience of students, including those with special needs, is crucial to preparing them for lives of personal, academic, and professional growth and achievement.

California Commission on Teacher Credentialing 1999.

It is this philosophy all teacher credential programs in California have been required to address in their approach of the implementation of new computer standards. With a multitude of skill levels & technology limitations, increasing how we implement technology in teacher education programs may first seem monumental. This paper explores one approach toward this task

The three classes discussed in this paper are; Research in Education, Foundations of Education and Cross Cultural and Multicultural Teaching Methods. They are established in a teacher credential program where students are completing a credential or working toward a master's degree in education.

There are several common denominators found in each group of students that enter the program. Each campus where the classes are held has a computer lab and all students automatically receive an email account upon enrollment. The students come to the program with a variety of skills in technology. The courses are taught in the standard face-to-face tradition where students are expected to attend each class meeting to receive general information and to have round table topic discussions. It is an accelerated pace with each class meeting twice a week for one month. Lastly, upon the first class meeting the students are introduced to the technology tools available to them in that particular class. When presenting class projects / presentations students are strongly encouraged to utilize technology in creative ways.

Each course is complimented with a web site that serves as a virtual office and learning resource center. The instructor used the resources at Blackboard.com to build the framework for each site. Courses on Blackboard.com have a unified appearance beginning with the same page layout starting each course. The first page of each course greets the user with icons on one section of the page that lead to various pages of documents, communication tools and video capabilities. The course sites make use of access to information on the Internet, synchronous and asynchronous communication. There are several other free, user-friendly resources educators may use to develop web sites. They all have similar features and are geared to accommodate a variety of skill levels. Blackboard.com was selected because of the ease for the novice computer literate student to utilize the supplemental information without having to surf the web. Everything is available at the student's fingertip.

Guiding Philosophy

The integration of technology is not an all or nothing approach. It is acceptable to not under go a total systematic change in delivery but a hybrid where technology supports the learning environment is preferable and comfortable to utilize appropriately (Bothel &. Enfinger,1999).

Knowledge is acquired through involvement with content instead of imitation or repetition. This allows for the horizontal transfer of skills, from the university classroom to the K-12 classroom. As content and technology share the goal of competence, technology should be taught in context, not in isolated tasks. It is important for the teacher education faculty to model the technology with proper usage. If we do not model effective uses than we are inhibiting the development of our students repertoire of teaching skills.

Key Features of Course Web Sites

Research Methods: The communication tool where students and teachers send documents is essential. The research classes are taught in a one-month format where much of the class time is based on individual meetings with the students. By using the web site, students may send the instructor drafts to review or submit at any time. This allows for the instructor to have more time with the students to discuss their drafts. The site also allows for external links where the instructor may post links to web sites which host quality research. Not only does this give students suggestions of where to begin their own research but it provides a bases for them to use in evaluating quality information found on the Internet.

Cross Cultural and Multicultural Teaching Methods: Discussion of the required reading is continued well beyond the classroom. Students are required to respond to questions about the material in the threaded discussion feature of the web site. Threaded discussions are a common feature of online classes with asynchronous communication. The participants have the opportunity to process or reflect on material before responding. This assignment can be extended where groups of students are responsible for summarizing and synthesizing the threaded discussion each week and distributing the results through email. Each course site has a quiz and test feature that may be incorporated in the class. This course uses this feature as a test your knowledge exercise. The non-graded quizzes on material are used to help students grasp major concepts presented in the course.

Foundations of Education: This is often the first class in the program. The classes are comprised of new students balancing classes and full time employment. Students in this course have appreciated the synchronous communication tools that allow for them to work on group projects outside of classes. The students agree on a meeting time online in the course web site meeting area. For their convenience, they may be at any computer, i.e. home, school, or library and proceed to discuss their work. This class also features a media gallery with the case study assignments. Student may view a collection of pictures presented in a slide show. This collection of images gives the students a visual stimulus that is more favorable for visual learners.

Each of the courses described in this paper was designed with the desire to provide students with deeper learning, better use of time, and the possibility of additional cycles of observations and analysis of content materials. The courses have produced students that are competent and knowledgeable about the subject matter and technology, it's use and instruction integration.

References

Bailey, Gerald D. 1997. What Technology Leaders Need to Know, Learning and Leading with Technology, 25 (1), September, 57-62

Bothel,R. Enfinger, J. (1999, September).You Don't Have To Go the Whole Distance. T.H.E. Journal Online.

Butler, K. (1987). Learning and teaching style in theory and practice. Columbia. CT. The Learner'sDimension.

Sheingold, K. & Hadley, M. (1990). Accomplished Teachers: Integrating Computers into Classroom Practice. New York: Center for Technology in Education, Bank Street College of Education.

CECI: A Computer-Assisted Co-educational and Transdisciplinary Experience

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Abstract: This paper describes a CSCL application named CECI (*Co-Edición de Cuentos en Inglés*. Co-Edition of Tales in English), which assists would-be teachers in the development of multimedia educational resources aimed at learning the English language. These resources are used by students with a basic or elementary level and are accessed through a computer net. Those would-be teachers write a children's tale and then add a methodology and collaborative activities that describe the prospective use of that tale in the classroom.

Introduction

One of the biggest challenges that is actually taking place in educational practice is teaching skills for the use and exploitation of Information and Communication Technology (ICT) to would-be teachers. However, despite all these efforts, we can still appreciate the would-be teachers lack of initiative to promote the development of new technology for the classroom. From our point of view, apart from the lack of technological skills, there are also other aspects that affect this situation, namely the absence of a methodology that enables the creation of teaching materials and the difficulty entailed by the interdisciplinary teacher-technological developer relationship. This has led us to reflect on the need to treat teaching problems from the perspective of the skills but without forgetting the rest of the aspects listed above.

On the other hand, we can also observe the recent and increasingly usual emergence of applications oriented to the use of the technology through which students both interact and learn; this is known as CSCL (*Computer Supported Collaborative Learning*). There are applications that have been developed to learn different types of skills: scientific, social, reading-writing and teaching skills to name but a few. Among these technological applications, we can find some which are oriented towards language learning –especially English– but their main focus is learning how to use the language rather than how to teach it. These aspects are treated in a new CSCL application called CECI, which is based on the asynchronous authoring of documents by means of the Internet. To be more precise, the student is placed in a learning situation in which he/she has to create tales in English in a collaborative way; these tales are then represented as teaching material that will be used in the classroom; this aspect is fulfilled by means of technological tools and computer networks that enable the publishing side (Alario & Anguita, 1998)

The CECI Application

Taking into account the CECI goals, we can easily appreciate that the teaching-learning process covers features from different disciplines and this makes it even more complex. Not only do we expect to create an application for *"the edition of material"*, but we also want it to allow the student to practice and work with the English language, to have a methodology assisting him/her and to produce materials that are adequate to be used with future learners of the language. In order to develop the application, a work group including teachers belonging to two different areas was created; on the one hand, Foreign Languages and New Technologies teachers, both subjects being taught in the Faculty of Education at the University of Valladolid; on the other hand, Telecommunication Engineers from the School of Telecommunication at the same university, took the role of technology developers. The group used the methodology called DELFOS (A Description of teleEducational Layer Framework Oriented to learning Situation) (Osuna, 2000). This framework provides a series of attributes the enable the analysis of the requirements needed to create a collaborative learning scenario. It also requires that both teachers and application developers play an active role in a transdisciplinary working environment in which dialogue and commitment are crucial for the development of the applications.

After an in-depth collaborative analysis, we decided to form groups of would-be teachers; they should jointly create multimedia materials that would be used to teach English to primary school students. Besides creating the material, this would-be teachers had to propose a methodology for its subsequent use in the classroom. This is how we decided to develop an application that enabled the asynchronous edition of the material: each student edits the document individually and then it is published in an Internet server so that another student from the same group can edit it again. Fig. 1 shows the interface developed for the application. We can see that there is an editor that includes general HTML editing operations such as headings and bolds, and also especial operations in order to publish (send to the server), collaborate (add comments, suggestions) and visualize (see "preliminary views" as you go along). Moreover, the application also includes an interaction analysis tool that enables the reconstruction of the tale taking as a basis the different identified events, as if we were in front of video sequences. The teacher and the student can add commentaries about the process and, at the same time, they can get information about any of the versions, know how is their group and subgroup acting, see what is the role of the teacher and check general information about the editing process. Lastly, the application presents an evaluation instrument that continually evaluates each of the new versions.

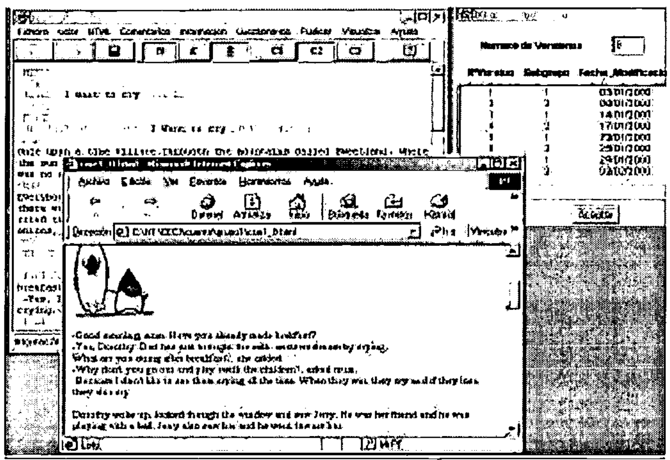

Fig. 1 Interface of CECI

CECI was used by would-be teachers during a whole academic year. Our aim by using this application was not focusing on technological architecture, but observing the progressive application acceptance process by would-be teachers and measuring how this process is related to technology and uses technology at the same time. In order to measure this, we have used the methodology proposed by DELFOS which is supported a set of ethnographic instruments such as interviews, questionnaires, classroom observation, etc.

Conclusions

The development of activities based on transdisciplinary orientation techniques is a valid strategy to ensure the educational process; this is especially so when we are dealing with technology learning because it enables a constant dialogue between the problems in both disciplines. Joining two different subjects in the same project helped the would-be teacher in two aspects: visualizing a problem from a twofold perspective and using technology adequately to solve educational aspects.

We should highlight that the students developed their technological skills progressively and as they went along and the need to use them emerged. Besides, they stopped viewing technology as a hardware and software set and started to see it as a potential tool to be used during classroom activities in the future. This situation made their former lack of initiative to develop new educational technology decrease.

References

Alario, A., & Anguita, R. (1998). The would-be teacher face the new technology. In *Proceedings of International Congress of Media*. Segovia, Spain: Escuela Universitaria de Educación.

Osuna, C. (2000) DELFOS*: A Telematic and Educational Framework based on Layer oriented to Learning Situations*. PhD Dissertation. Valladolid, Spain: Universidad de Valladolid.

Integrating Technology into Courses for Pre-Service Teachers

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Abstract: Collaborations of college faculty, pre-service teachers, and in-service teachers proved to be a successful combination in developing expertise in using technology in K-16 classrooms. Pre-service and in-service teachers developed units, lesson plans, and other activities that were implemented in the in-service teachers' classrooms. The students were able to see their work applied in real life situations. The college faculty employed the skills they learned through the collaborations to integrate the teaching of specifically designed technology skills in the pedagogy courses and content area courses that pre-service teachers must take from their first semester through student teaching. In this way, students apply learned skills immediately, and as the skills become progressively more advanced, pre-service teachers build on past activities and successes.

Introduction

Using technology has become a way of life for many children in today's K-12 schools. It is the youngsters who know better than their parents or teachers how to program a VCR, manipulate all the controls on a Play Station, and find really "cool" graphics on the Internet. These same children are entertained in a fast-paced simulated world that comes to them via the television set, the movie screen, and the computer monitor. In a classroom devoid of high tech approaches and applications, students become disinterested bystanders on the road to relevant education.

With the majority of K-12 teachers and college faculty nearing retirement age, they obviously did not grow up with computer technology and thus are, in some cases, intimidated by the seeming intricacies and complexities of the URLs and hypertext. Most can understand the advantages of using computer technology in their classrooms; they just don't have the means, or sometimes the patience, to learn how most effectively to employ this wizard technology.

What about today's college students who are the pre-service teachers preparing to enter the workforce as K-12 teachers? Their level of expertise might fall between that of the K-12 students and their teachers. The college students have Play Stations at home, use e-mail to keep in touch with all their friends attending other colleges, shop via eBay, and word process all of their college essays and research papers. Where they lack expertise is in the use of appropriate computer technology to create, deliver, and assess meaningful, relevant lessons in their content areas.

Link-to-Learn Program

To address the appropriate use of technology in the K-16 classrooms, Saint Vincent College in Latrobe, Pennsylvania sponsored a "Teaching and Learning with Technology" workshop that spanned two summers (1999 and 2000) and one school year (1999-2000). This program was funded by the Pennsylvania Governor's Link-to-Learn Initiative, designed to bring technology to the pre-service and in-service teachers of Pennsylvania.

Saint Vincent College is a four-year liberal arts college with an enrollment of approximately 1100 students; 15% of them are enrolled in the teacher certification program. All students at Saint Vincent College, including those in a teacher certification program, must major in a content area. Students must also include a very heavy concentration of core curriculum classes into their academic programs. The requirements of the major and the core leave students with little time to take the required courses needed for certification. Therefore, it becomes necessary to incorporate important pedagogical and technological skills into all Education courses and into many of the content area and core courses, as well.

In order to include rigorous instruction in using appropriate technology for teaching and learning, the Education Department and six content area departments with teacher certification programs (biology, English, history, mathematics, physics, and psychology) adapted courses already being offered in the departments to be "technology designated" courses, all of which incorporated specific skills, competencies, and products in using technology for classroom instruction. Within these courses, pre-service teachers develop skills to incorporate technology successfully into their model lessons, units, demonstrations, lab experiments, and other learning activities.

The vehicle for developing the "technology designated" courses was the Saint Vincent Link-to-Learn workshop "Teaching and Learning with Technology." The workshop brought together teams of participants--one college faculty member, one pre-service teacher, and one K-12 teacher on each team. The teams collaborated in curriculum development and lesson planning based on educational objectives, state and national standards, the International Society for Technology in Education (ISTE) standards, and technology resources as they apply across the K-12 grade levels and the undergraduate college curriculum.

Participants

- 18 college faculty in chemistry, education, English, history, physics, mathematics, and psychology
- 18 pre-service teachers (college students) enrolled in elementary, early childhood or secondary (biology, chemistry, English, and mathematics, physics, and social studies) teacher certification programs
- 18 teachers from three area school districts

Because most of the in-service teachers served as cooperating teachers for the pre-service teachers, the collaborative lesson plans and other learning activities were implemented in the teachers' classrooms, with both the in-service and pre-service teachers having an integral part.

Goals

The Link-to-Learn Program sought to make people into educators who could use technology to enhance and improve instruction; thus the program concentrated on the following goals:

- Emphasize *teaching* with technology, not *about* technology.
- Provide adequate technical support for all participants to reduce frustration and burn out.
- Promote relationships among pre-service and in-service teachers and college faculty so that they can develop authentic curriculum materials that incorporate appropriate technology.
- Incorporate both technology standards and approved and emerging national and state academic standards.
- Design new course syllabi or lesson plans--or revise existing ones--to reflect academic and technology standards.

Equipment

All participants had access to state-of-the art equipment. Acquisition of necessary hardware and software was supported by funds from the Link-to-Learn Initiative. All participants received IBM laptop computers. The college faculty and K-12 teachers retain use of their laptops until they leave their place of employment or until the laptop needs to be replaced. The college students keep their laptops through the end of their student teaching internship.

All workshop sessions were held in the new Saint Vincent College Instructional Technology Resource Center, which is equipped with the following:

- Three "smart classrooms" each equipped with a Softboard, LCD projection device, document camera, laser disk, DVD, and videocassette
- Multimedia laboratory with computer workstations, scanners, digitizers, plotters, printers, and audio-video resources
- Academic Lounge which contains collaborative networking access pods with ports for laptop access by as many as 16 students and faculty

The classrooms in the Education Department were upgraded through the addition of three desktop computers, an ink-jet printer, a scanner, a document camera, and an LCD projector with a laptop computer per classroom. All classrooms have Internet connections. Students use this equipment during classes in simulations and in micro teaching demonstrations. When the rooms are not being used for class, students can use rooms as small computer labs.

Topics covered during the workshops included:

- Locating, reviewing, evaluating, and using software
- Trouble shooting problems
- Using imaging devices (scanner, digital cameras)
- Using productivity tools for word processing, database management, and spreadsheet applications
- Making multimedia presentations
- Using telecommunications to access information and enhance personal and professional productivity
- Demonstrating knowledge of equity, ethics, legal, and human issues concerning use of computer and technology
- Identifying computer and related technology resources for facilitating lifelong learning and emerging roles of the learner and the educator

By the end of the summer workshops, the K-12 teachers and the pre-service teachers had created products that they can use in the classrooms and had developed technology skills that enable them to incorporate appropriate technology into their teaching. See the Link-to-Learn Home Page to view the projects: http://facweb.stvincent.edu.L2L/projects.html.

The college faculty, likewise, developed expertise in using technology as part of their instructional repertoire. Their new goal was to teach the students in their classes how to use specific technology applications and how to incorporate them into lesson plans, learning activities, demonstrations, and labs. Fourteen courses became "technology designated," and specific skills and competencies were assigned to each course.

Below are courses or groups of courses taught at the college. Following each course is a list of competencies that students develop through instruction in the course or courses. Material in parenthesis refers to ISTE Foundation Standards (ISTE, 2000).

Foundations of Education (required of all certification candidates):

- Demonstrate knowledge of equity, ethics, legal and human issues concerning use of computer and technology. (1.2.6)
- Use productivity tools for word processing; submit all work in word-processed format. (1.2.1)
- Establish e-mail accounts; learn features including send, reply, forward; create contact lists, set up group lists, send attachments; maintain contact with course instructor and submit and receive assignments via e-mail.
- Describe current instructional principles, research, and appropriate assessment practices as related to the use of computers and technology resources in the curriculum. (1.3.3)
- Research and compose a paper on the use of technology resources to facilitate lifelong learning. (1.2.7)

- ❖ Develop a home page that will include resume, philosophy of education, service activities, work with students, annotated bibliography of interesting books and articles, list of educationally valuable web sites.
- ❖ This web page will be expanded throughout all subsequent courses.

Observation and Interaction Laboratory (required of all certification candidates):

(Students will use resources available at field placement sites and at the college in preparing these activities.)

- ❖ Develop a list of television, videotape, videodisc, and CD-ROM resources suitable to pre-service teacher's grade level and content area.
- ❖ Use digital camcra and inscrt picturcs into course work. (1.1.4)
- ❖ Develop scenarios of using classroom computers or computer labs for student learning.
- ❖ Use record-keeping software for creating gradebooks/rosters/progress reports for parents. (1.2.4)
- ❖ Add to homepage: photos of field experiences, lists and scenarios developed, sample gradebook page or roster.

Strategies and Techniques of Instruction (required of all certification candidates):

- ❖ Operate multimedia computer systems with related peripheral devices to successfully install and use a variety of software packages. (1.1.1)
- ❖ Use terminology related to computer and technology appropriately in written and oral communications. (1.1.2)
- ❖ Locate, review, evaluate, and select instructional software appropriate to pre-service teacher's grade level and content area. (1.3.1)
- ❖ Prepare a lesson that includes a selected software program suitable to pre-service teacher's grade level and content area; install and demonstrate software. (1.3.3)
- ❖ Use video camera to tape a classmate teaching a lesson. Review one's own videotaped lesson for self-evaluation.
- ❖ Add to home page: evaluations of instructional software, lesson plan with software application, video clip of tcaching dcmonstration.

Education Psychology (required of all certification candidates):

- ❖ Perform Internet functions of search, retrieve, copy to file, and evaluate. Research a topic including use of original sources, artifacts, and reports to be used in lesson or unit plan. (1.2.3)
- ❖ Use software and other diagnostic tools to assess different learning styles among children. (1.3.3)
- ❖ Add to home page: research paper prepared with sources from the Internet as well as more traditional sources.

Education and Psychology of the Exceptional Student (required of all certification candidates):

- ❖ Demonstrate awareness of resources for adaptive/assistive devices for students with special needs. (1.2.5)
- ❖ Describe use of adaptive technologies such as text-to-speech, special keyboards, Braille printers, touch screens, closed caption, digitizers, large screens. (1.2.5)
- ❖ Use technology to adapt lesson plans for special needs students, incorporating strategies such as simulations, peer tutoring, dialog journal, and use of problem-solving videos.
- ❖ Add to web site essay on the use of assistive technologies, adapted lesson plan.

Child and Adolescent Development (required of all certification candidates):

- ❖ Develop an annotated listing of URLs that are useful resources for understanding child and adolescent psychology.

- ❖ Add this list to home page.

Secondary Reading Instruction (required of all secondary education certificate candidates)
Children's Literature (required of all elementary education certification candidates)

- ❖ Use multimedia and other forms of technology to develop alternative activities for special needs students, ESL students, and culturally, racially, or ethnically diverse students. (1.1.1)

All Content Specific Methods Classes

- ❖ Evaluate software packages for their appropriateness in pre-service teacher's content area and grade level. (1.3.1)
- ❖ Develop an annotated listing of URLs appropriate to pre-service teacher's grade level and content area.
- ❖ Use appropriate resources for classroom instruction including databases, CD encyclopedia, atlases, dictionaries, spreadsheets, and Internet. (1.3.1)
- ❖ Use imaging devices such as scanners, digital cameras, and/or video cameras with computer systems and software in development of lesson plans or units. (1.1.4)
- ❖ Create multi-media presentations using a combination of computer, projection device, document camera, overheard projector, VCR, videodisc, CD-ROM. (1.1.1, 1.1.4)
- ❖ Add to home page: software evaluation, annotated list of URLs, multi media lesson plan(s) that feature the above-mentioned resources, imaging devices, and equipment.

English (secondary) Reading and Language Arts (elementary)

- ❖ Use e-mail to communicate with children in local schools for tutoring and mentoring on reading and writing projects. (1.3.3)
- ❖ Use multimedia to create interactive learning environments in which technology can be used to show the relationships between literature and other subject areas such as music and art. (1.1.1)
- ❖ Develop criteria for evaluating Internet resources for accuracy, logic, use of propaganda, author's purpose, and tone. (1.3.1)
- ❖ Research effective oral reading presentations on laser disks, videodisc, CD-ROMs, or other electronic sources for use in developing listening skills and vocabulary. (1.3.3)
- ❖ Use computerized literature databases such as ERIC.
- ❖ Add to home page: criteria for evaluating Internet resources, lesson plan show integration of reading with other subjects, citations of useful auditory resources, a bibliography taken from ERIC or another literature database.

Mathematics

- ❖ Create electronic spreadsheet activities. (1.2.1)
- ❖ Use geometry supposition software to demonstrate electronic conjecturing and proof. (1.2.1)
- ❖ Use graphing software to visualize and print algebraic and trigonometric relations and functions. (1.2.1)
- ❖ Use materials generation software to customize worksheets/posters/banners for the classroom. (1.2.1)
- ❖ Establish math tutorial program with a middle or high school student through e-mail correspondence.
- ❖ Add to home page: a sample spreadsheet activity, samples showing use of geometry supposition, graphing and generation software packages.

Social Studies/Geography

- ❖ Develop criteria for evaluating Internet resources for accuracy, logic, use of propaganda, author's purpose, and tone. (1.3.1)

- Use computers to support problem solving, data collection, and information management. (1.2.4)
- Use computer software for site-location analyses, diffusion modeling, and simulation.
- Use spreadsheets to present results of regional geographic studies. (1.2.1)
- Produce data banks for regional study projects. (1.2.4)
- Produce CD-ROM programs of flora and fauna of bioregions.

Science

- Use computers to support problem solving, data collection, and information management. (1.2.4)
- Use appropriate content-specific technology tools such as probe warc, midi dcviccs, graphing calculators, data plotters, video microscopes. (1.2.4)
- Use data acquisition and analysis software to design and build spreadsheets. (1.2.1)
- Use simulation software, computer-aided laboratory devices, and data reduction software to develop and test hypotheses regarding various physical phenomena. (1.2.4)
- Use instruments and systems such as CBLs for automated data collection/develop lesson plans that utilize this technology.
- Use analytical probes connected to graphing calculators to collect a variety of data.
- Analyze the data through calculator-based mathematical analysis or graphing. (1.2.4)
- Establish math tutorial program with a middle or high school student through e-mail correspondence.
- Add to home page: criteria for evaluating Internet sites, evidence of using laboratory equipment and software specified above.

Pre-Student Teaching Seminar

- Use computers to communicate information to parents, students, colleagues, teachers, and professors. (1.2.3)
- Prepare a lesson that teaches your students how to create a technology-based project.
- Produce informational pieces such as brochures, newsletter, flyers, sign, school newspaper, and letters using dcsktop publishing software or resources. (1.2.1)
- Use "grade book" or other record keeping software to record and track student progress. (1.2.1)
- Add to home page examples of electronic correspondence with parents or teachers, an instructional technology lesson, your brochure or flyer.

Conclusion

By the time the students are ready for their 15-week student teaching internship, they will have had experience in creating a number of units, lessons, activities, demonstrations, and labs that incorporate appropriate technology applications. They gain these skills and competencies through observing them being used in an instructional setting and then through applying them within the classroom to create materials required as part of the course.

Integrating technology into already existing courses for pre-service teachers was done out of necessity. The Education Department did not wish to add another course to the students' already heavy academic loads. With the success we have seen with this approach, we recommend the integrated approach even for schools that have the "luxury" of being able to add one or more instructional technology courses. The key, of course, is to make sure faculty are well trained in the use of technology before undertaking a department-wide integration endeavor.

References

ISTE Standards Projects: NCATE. 2000. <http://www.iste.org/standards/ncate/basic.html>

Eureka Science Academy: A 2-Year Progress Report on Technology Integration in Reading and Science

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Abstract: The Eureka Science Academy is in year 2 of a 3-year grant. This is a report on the Academy and 2 groups of preservice teachers that have taught in the program and how they integrated reading, writing, science, and technology in the project. Team leaders and interns spent one week in training prior to the arrival of the Eureka students. Their training, provided by the program directors, consisted of team building activities, writing team mission statements, developing effective literacy strategies, performing science activities, and reviewing books and computer software. Time was also spent reflecting on the focus of the Academy - meeting the needs of students through an integrated program of reading, writing, science, and technology.

Introduction

In August of 1998, with the aid of a Lilly Planning Grant, discussions with area teachers and principals from both public and parochial schools were initiated. While the needs of students experiencing substantial academic difficulty are addressed through special services and those high-achieving students typically have access to special classes, children of average achievement (40th-60th percentile in various standardized tests) often have few programs directed to their needs. These are the students who can gain the most from more encouragement and additional preparation, becoming enthusiastic and successful learners.

A 3-year Lilly Grant enabled the development of the Saint Mary's College/Students/Teachers/Parents Science Project, hereafter identified as CoSTEP. CoSTEP is a comprehensive science education outreach composed of three key activities which bring together students from South Bend area schools grades 4-12, their teachers, their parents, and Saint Mary's College faculty to encourage active inquiry-based science that engages the hands and minds of all participants. The project sought to help students, teachers, and parents achieve success in teaching and learning science; to increase the use of technology of students; and to nurture habits of discipline, scientific inquiry, critical thinking and communication that will help students succeed in school. An ancillary goal was the increased preparation of the Saint Mary's College elementary education majors prior to their student teaching

Students attending the Eureka Science Academy, one part of the CoSTEP project, were given intensive instruction in reading and writing, exploring environmental science, and technology. Essential to the program were twenty interns: Saint Mary's College elementary education majors who completed their junior year of studies including courses in developmental and corrective reading, the science and language arts methods courses, a technology course, and at least 70 hours of field study in area schools. Each intern was responsible for developing and carrying out the daily lessons with three or more students and for keeping records on the students' progress. The interaction between the students and the interns gave the intern an opportunity to expand her teaching repertoire. A weeklong training program before the start of the Academy completed the intern's preparation for this important role

According to Woodrow (1998) Technology-enhanced instruction (TEI) is not a new heady concept. It is just another step on the learning highway that permits disciplined organized, meaningful pursuit of understanding- whatever the subject. TEI is a pedagogical device, which does not smother creativity; it empowers access and choices to vast realms of information, an access that enriches thought, and thus, creativity, a peculiar form of imagination. Somehow trainers of teachers must communicate this message substantively throughout the educational community; they must become leaders in the implementation of technology-enhanced instruction. Technology is not a master. It is a product of the most essential forms of human creativity. A cycle has been completed from stone to silicone, the toolmakers continue to extend their reach, to improve their grasp.

Five of the interns were chosen as team leaders. The team leaders worked with four interns each and were responsible for team activities. Interns facilitated the program in a 3:1 or 4:1 student: intern ratio. This ratio was a key element of the Eureka Academy because it provided for individualized instruction, dialogue between the intern and students, and immediate feedback during discussions

During the first year, fifty-three students from grades 4-6 representing four public and three Catholic schools, arrived at Saint Mary's College to begin their Eureka Science Academy experience. During the second year 56 students from grades 4-6 representing 4 public and 6 private schools began their Eureka Science experience. The overall science theme was the environment, and all the reading, writing, technology, and science activities revolved around this central theme.

The Program

Planning for the first Eureka Science Academy summer session began in January 1999. A brochure and an application form were designed and local schools were contacted about the program. Classroom teachers identified students according to the criteria specified for the Eureka Science Academy. Parents interested in having their children participate in the Academy, submitted application materials and were notified of their status in a timely manner. Simultaneously, the application process for team leader and intern positions began. Once selected, the team leaders began their initial training with the program directors.

Team leaders and interns spent one week in training prior to the arrival of the Eureka students. Their training, provided by the program directors, consisted of team building activities, writing team mission statements, developing effective literacy strategies, performing science activities, and reviewing books and computer software. Time was also spent reflecting on the focus of the Academy - meeting the needs of students through an integrated program of reading, writing, science, and technology.

Woodrow (1998) reports if public education is to continue serving learner needs, then teachers must be trained in the use and application of available technology. Except in very special circumstances, little is achieved by loading up a school with technology and saying, "Get to it." Be it rather fast, technological application still must evolve to suit known learning needs in the classroom. Playing on the Internet does not constitute advanced technological application to learning needs: the curriculum is still the curriculum; methods of learning, together with the grammar of disciplines and the understanding of the principles of the relationships among parts, must be learned. First however, a generation of preservice (and inservice) teachers must learn to understand and be completely comfortable with computer/multimedia technology as essential learning tools.

At the end of the preparation week for the preservice teachers, a parent orientation evening was held. During this event, the Eureka students were introduced to their team leaders and interns and were given an opportunity to get acquainted with their team members. All Academy students had their photographs taken and displayed on their team boards. They also received T-shirts and hats with the Eureka Science Academy logo on them. The evening ended as families toured the campus, giving everyone the opportunity to visit classrooms, the computer lab, library, and dining hall. The goal was to make everyone comfortable on the very first day.

Environmental science was chosen as the central theme of the Academy because it brings together chemistry, physics, and biology. Each of the three weeks had a specific focus - the living environment (Indiana plants and animals), the physical environment (air, water, energy, and matter), and the interactions that occur between the living and the physical environments (food chains, weather, water cycle). Reading, writing, technology, and science activities all revolved around this central theme. Favorite science activities included dissecting owl pellets, germinating seeds, using microscopes, and working with the weather station. The use of software such as Tom Snyder Science Court CDs with accompanying hands on science kits - *Water Cycle, Soil, Living Things,* and *Seasons* were used to strengthen the students' process skills.

One intern wrote in the Academy daily diary "We then went into the Regina MAC lab and did the Owl Pellet CD-ROM on the presentation stand to allow the kids to better understand how the lab they were to take part in would work. They thought the presentation board/computer was really neat. We then talked about the lab a bit and told the children what they could and could not do."

As the focus of each week was planned, related literature was identified and writing experiences were designed. Each day a story was read aloud and discussed. According to Anderson *et al* (1985), reading aloud to children is the single most important activity for developing a sense of story structure, promoting vocabulary growth, and teaching higher level thinking skills which are ultimately reflected in the student's writing. Tompkins (2001) points out that when teachers read aloud, they model what good readers do and how good reader's use reading strategies. An example of a picture storybook read during the study of the living environment was *Two Bad Ants* written by Chris Van Allsburg. The story presents life - adventures, dangers, decisions, values - from the ants' perspectives. Discussion of this book has focused on making choices, related consequences, and discovering what is truly important, as well as seeing the world from the ants' perspectives. Writing response choices included writing a poem from one of the ant's point of view, observing ants or other insects and writing their version of the story, and researching information about ants on the Web. Because the Academy was able to acquire many books, including multiple copies of paperback chapter books, students were also able to work in small literature response groups, read a common book as a team, and take books home for independent reading. Some favorites have included *Poppy, Stone Fox, Song of the Trees*. A word processing program AppleWorks was used to help students sharpen their writing and presentation skills.

A typical day at the Eureka Science Academy began with the 8:30 arrival of students, mostly on buses. Following breakfast, students and their team leaders/interns went to their classrooms for literature, writing, and science experiences. Teams often began with editing a sentence or paragraph related to the environment. Grammar, capitalization, punctuation, and spelling were emphasized. At least one read aloud was included each day - either a picture storybook or a chapter book - followed by discussion and a response activity along with vocabulary additions to the word wall. Another intern wrote "After the flower activity, our group worked on a project for The Well. Our project was to write a script about a scene in the book and then act it out in front of the camera. At first my group did not want to do this, but then they got into the idea. We then finished our script and went back into the classroom to regroup as a team to go to lunch."

A science activity would often be the focus of a morning or afternoon or sometimes the entire day. Using a microscope to view commercially prepared slides as well as self-prepared slides, dissecting owl pellets, and building seed germinators were extensive projects, while checking and graphing the weather was an ongoing activity that involved a short period of time each day. An intern wrote, "When lunch was over, all of us returned to the classroom for two activities. One of the activities was to make paper. The other activity was for the students to identify a leaf, find a picture of the tree that it came from, and write a paragraph about the tree with just the Internet. Our group went about doing these activities by having two of the leaders work with one group of students on making paper and the other leader working with the other two groups in the computer lab. I feel that this worked well because the papermaking was very time consuming."

Students also had the opportunity to go to the computer lab to search the Internet or use other aspects of the technology available. A intern reported in the daily diary, "They (the students) all logged on and I guided them to www.yahoo.com. I had them search for web sites on their favorite animal. Then I taught them how to copy their picture onto an AppleWorks document in order to save paper. They then gathered some Internet information so they can make a poster with the pictures and information they gathered." Each student compiled a portfolio. Photographs with accompanying written commentary were included for projects too large to fit into a portfolio. Photographic entries were included of field excursions as well. Some days the students took photographs and cataloged them or digitized them and saved them to their personal file on the college server. Another intern commented "Right after breakfast, we split the team into two groups. We took those who were finished choosing articles for their portfolios to the computer lab, and those who needed more time choosing stayed in the classroom. In the computer lab, I showed the students how to write a table of contents using the Harvard outlining system. I decided to use the presentation station to show then how to make the table of contents since there was so many of them and only one of me (plus Jenny). So while I demonstrated on the overhead, Jenny went around helping and answering questions. This system seemed to work pretty well. The kids did really well and all of their tables looked unique and nice. Meanwhile, back in the classroom, the rest of the kids worked diligently at putting their portfolios together. Some kids opted to hand write and decorate their tables of contents. After the students were finished in the computer lab, they joined those in the classroom ad put their finishing touches on their portfolios. I must say, they all worked very hard and their final products were something they can be proud of!" Another intern wrote "All day the kids were bugging us to let them go on the computers. So I sent them to do a Best Weather webquest but apparently they recently took it off. I luckily had some back-up web quests for them. I altered the quest a little to fit out needs. One group was the Tornado Team; the other was the Hurricane Team. They had to search the web to find what materials could best withstand the effects of a Tornado or Hurricane. Then they were to draw a picture of a structure that would withstand the disaster using the information they found. The groups had a fun time doing this project."

Team leaders and interns facilitated the learning experiences as they encouraged, supported, and taught the young Academy students. Buses arrived in time for a 3:00 p.m. dismissal each day. One intern reflected "After lunch we had time to study the water. The hay infusion has been a self-directed project. Except for telling the students what I need to see for their final product, I have given no guidance to the group. They have done very well organizing themselves and making decisions. The rest of the day was spent writing poems and spending time in the computer lab."

Field trips, both on and off campus, enhanced the study of the environment. An off-campus field trip to a nature or environmental center was planned for each week of the summer session. Team leaders and interns prepared students for the trips by reading about and discussing various aspects of the trip as well as reviewing the activities that would be done at the site. One intern delineated her group's activities "My small group is reading Tracker. We discussed some of what they have read so far. Then we went to the computer lab. They checked their e-mail. (They enjoy it but there must be a time limit). I had my students research leaves and then go to www.pbs.org/Kratts. They worked on a "Mad Lib" type activity and will go in their portfolios. They enjoyed the web site- it was a good one! They also went to Fernwood's website to get ready for Friday's field trip." Each venue provided students with the opportunity to listen to docents present information and explore the environs with their guidance. As students participated in field trips, they wrote observations, gathered specific information, and drew and photographed the environment. On-campus field trips included the Saint Mary's nature trails and a tour of the Science Hall. When students were asked what they noticed about the teaching space in the Saint Mary's College Science Hall compared with their schools, they noted that nearly every room was a laboratory. Professors facilitating the tour explained that most of the science learning at Saint Mary's takes place in the laboratory. Hands on excursions both on and off campus provided the students with exciting experiences that extended their understanding of science concepts.

A family open house was held during the last week of the summer session. Although many parents work outside the home and their attendance at an afternoon event was questionable, an opportunity to view the products of their children's success seemed important. Every child but two had parents in attendance. The students enjoyed being able to present their science and literature projects as well as their portfolios to their parents and siblings. An intern reported "Since the kids wanted to show their skits and commercials to their parents, we brought in a TV and VCR and let the kids view their creations until the parents arrived. Then the parents came and the kids got busy showing their parents what they had done. We had set-up the seed germinators; owl pellets, microscopes, bread mold, and hay infusions at various places in the room so parents could see. We showed the skits to the parents once most of them got there. The kids also showed their newly acquired computer skills to their parents in the lab. We got so many thank-yous from the parents, and we thanked the parents for letting us have their kids. Everyone was gone by 3:00pm and I felt it was a successful day."

While surveys and questionnaires have not yet been statistically evaluated a technology proficiency survey for this year's intern indicated eighty percent of the interns and team leaders know word processing well and twenty percent felt they could not do without word processing. Half of the interns and team leaders know presentation software well or so well they could not do without it. All of the interns and team leaders know e-mail well or so well they could not do without it. They indicated the same about the Internet. Ninety percent of the interns and team leaders know how to use CD-ROM's well. Fifty percent of the interns and team leaders know subject specific software well.

A parent's e-mail to the program director said, "I had reservations about sending my child to an academic day camp during the summer months. I thought this was going to burn her out before school started. I was so wrong! My daughter is so excited when she comes home. She talks constantly about the camp activities and can't wait for tomorrow. [The student intern] has ignited a fire. My daughter wants to be an SMC girl like her. Thank you for providing my daughter with a good role model." On the parent survey sent home at the conclusion of the three-week Academy, one parent wrote, "We have never seen [our daughter] more positive about a learning experience. So far her enthusiasm is being carried over into school. She wants to do science homework first. Thank you all!" Others mentioned how wonderful it was to see their children reading and writing over the summer because of their time at Eureka.

During a parent open house, a father was overheard telling his daughter that sure, she could attend Saint Mary's for college even though they had never thought about it before, and that it just might be a good place for her. Whether the child had thought about attending college prior to her experiences at Saint Mary's we can not say. The positive signal here is that the time spent on campus during the Academy stirred a desire in this child to ask her father about going to college at a place that she felt comfortable.

Most Eureka students will begin their school year with a greater interest in science and enhanced reading, writing, and technology skills. The hope is that the progress made during the Academy will not only continue into the school year but will make a difference throughout the academic lives of the Eureka students

References

Anderson, R. C., E. H. Herbert, J. Scott, and J. Wilkinson. (1985). Becoming a Nation of Readers. Washington, DC: The National Institute of Education

Tompkins, G. E. (2001). Literacy for the 21st Century. Upper Saddle River, New Jersey: Merrill-Prentice Hall.

Woodrow, J. E., (1998). Technology-Enhanced Instruction: A perspective from experience, Journal of Technology and Teacher Education 6(1), 3-9

Preservice Teachers' Experiences in a Technology-Rich Urban K-5 School Setting

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Abstract: This presentation will describe preservice teachers' experiences during their internship year in an elementary magnet technology school. This program is part of a grant designed to better prepare preservice teachers to work in urban settings.

Introduction

This study is part of a larger research project designed to investigate the effectiveness of training and support for pre-service teachers and the extent to which various technology tools and applications are used in their assigned schools and classrooms. It is our expectation that this insight will improve teacher preparation at the University of Tennessee and reduce the growing exit of educators leaving urban settings. The current study is based on a series of focus groups that examine the perceptions of a group of students enrolled in a five-year teacher preparation program in the College of Education.

Participating interns have chosen to serve one year in the Knoxville urban school setting working full time under the tutelage of a mentor teacher. Even though interns do not receive an income, their experience is a part of the training towards a Master's credential. The primary assignment for interns participating in this study is an urban public school (K-5) with a concentration in science, mathematics, and technology. This school, located in one of the poorest areas in the city, reflects many of the academic challenges known to urban education. Nonetheless, it is uniquely rich in technology resources with state-of-the-art equipment due to a variety of special funding sources.

Two focus groups were conducted over two consecutive weeks with 15 students for approximately 90 minutes. Through our conversations with the interns, we were able to gain a sense of their perspectives about teaching, technology, and the integration of both areas in a technology-rich school environment. In addition, we were able to increase our understanding of their perceptions of their mentor teachers' uses of technology in the classroom. Future studies in this project will include interviews with the mentor teachers, administration, and parents to gain their own perspectives. The ultimate goal is to understand the broader context of the roles, relationships, and support needed to maximize learning opportunities for students and teachers to succeed in a changing, tcchnological world.

Teacher Preparation

Technology can be a powerful tool to help teachers in all aspects of their jobs, however many new teachers report being unable to use technology in their classrooms (OTA, 1995). With the increased attention to the level of technology in schools, certain obstacles preventing the effective use of these resources must be addressed. Of these, providing teachers with adequate preparation in the use of technology in their teaching is a major concern.

Teaching isolated skills is not as effective as grounding it within a context of relevance to preservice teachers. Typically, the response to preparing teachers to use technology has resulted in "add-on" courses that teach technical skills and topics in isolation from the rest of the teacher education program. Even if students use technology within their methods classes, many comment that they do not use technology during their student teaching experience because of a lack of adequate resources in the school.

Though interns were required to take an introductory computer course prior to their internship, findings from the focus groups revealed the following insights with respect to their technology experiences:

- Student knowledge and background experiences reflected a range of skill and comfort levels creating the need for differentiated instruction to build on existing skills and knowledge
- Comfort levels with software were varied and dependent on the frequency with which the software was used
- Computer preparation experiences within the College of Education did not provide consistent content or requirements, and sometimes led to repetition of topics and concepts
- Classroom management issues related to teaching and teaching with technology in a K-12 classroom were not adequately emphasized
- Course experiences prepared some students to use technology as a personal productivity tool but not necessarily as a teaching tool for instruction
- Software selection and use did not always reflect developmentally appropriate practices
- Students did not grasp underlying principles and concepts that would give them the flexibility to transfer their knowledge to different computer programs (e.g. Excel vs. AppleWorks spreadsheet)

Instructional and Professional Technology Use

Preservice teachers observed different trends in the use of technology in the classroom. Among these, interns reported that teachers used technology as a whole class presentation tool, as a center for small group activities, as a remediation activity, and as a drill-and-practice application for practicing basic skills. There seems to be a relationship between mentor teacher's use, or support of technology use in the classroom, that impacts the degree to which interns themselves support or use technology. Technology resources differ within the school depending on the source of funding attached to different programs operating within the school. For example, some teachers submitted applications and received funding through the State to become a 21st Century classroom. The focus group findings revealed the following trends:

- Mentor teachers use of technology varied – classroom applications may not be consistent
- Mentors use (or non-use) of technology had an impact on interns use of technology in both positive and negative ways
- Interns with more experienced technology-using teachers felt more comfortable taking the initiative to explore the use of technology in the classroom. Teachers who used the technology often modeled various teaching strategies, applications and integrated uses of technology
- Greater coordination could contribute to more effective collaboration between teachers and the support and technical staff

Conclusion

We have learned through the voices of interns that school and classrooms contexts are complex. Funding resource streams differ. For example, in a given school, classroom resources may vary depending on the funding source. Emerging findings from interns' reports suggest that teachers' values, beliefs, and attitudes differ and may be associated with such factors as age, training, and experience. Student needs vary, particularly in this context where poverty and equity issues often emerge. It is a context where technology can be used to ease some of the challenges on the teacher, especially when technology is integrated and not introduced in isolation. The leadership and excitement of being at a magnet school has set a positive tone and generated a lot of discussion and buy-in about the possibilities and expectations of a more coordinated and integrated practice.

Unique Collaborations in Teacher Education Programs

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Abstract: The critical need for teachers coupled with the need for quality teacher preparation has led to a unique collaboration of a public school district, community college and the education department of a university. This collaboration has developed a teacher certification program that targets the non-traditional student with a strong emphasis in technology integration, authentic projects and quality fieldwork experiences.

The CCACC Initiative

In the past few years, a critical teacher shortage of has developed in the United States. The U.S. Department of Education predicts that the nation will need more than a million new teachers by 2010. (Kantrowitz and Wingert, 2000) In Arizona, the state which provides the context for this unique partnership, the media reports a demand for 27,000 new teachers throughout the next 10 years, a rate of growth currently ranking third in the nation. These new positions are intended to keep pace with the additional 200,000 students that will be relocating to Arizona over the next decade, and do not include additional positions to be vacated through attrition and retirements.

Coupled with a high demand for certified teachers is a renewed public scrutiny regarding teacher preparation. Concerns with current practices include a disconnect between universities and schools, limited field experiences, and weak links between education units and liberal arts departments (Burstein, Kretschmer, Smith, & Gudoski, 1999).

Although the needs are readily identified across the teacher education literature, few systemic or substantive changes have been made beyond superficial modifications to existing programs. This may be due in part to administrative or social barriers, including structures within higher education that support isolation, independence, and competition (Miller & Stayton, 1999).

Faculty members who want to improve the quality of teacher preparation often do so out of their own hide, without the support of the institutional environment.

The prevailing thought in current education reform focuses on collaboration and the potential for change to occur as individuals work in cooperative ways. As noted by Miller and Stayton (1999), "collaboration and innovation in teacher education are essential ingredients for preparing teachers for increasingly diverse and challenging school populations" (p. 290). Despite their potential, however, collaborative enterprises are also fraught with challenges. Often noted in the literature is the clash of cultures between schools and universities, resulting from a lack of shared vision or sense of larger issues through which the two cultures can be brought together. Superficial relationships between teachers and university-based faculty can also limit program impact (Bullough et al., 1999).

Three partners -- a university education program, a public school system, and a community college have developed a successful collaborative that is attempting to meet the dual demands of teacher shortages and quality preparation. The "Chandler Unified School District, Chandler-Gilbert Community College, Arizona State University East Certification Collaborative" (CCACC) was developed at the request of the Chandler (Arizona) School District, which is anticipating that its population of 20,000 pupils will double by 2012. The district requested a "grow your own" program that would allow its current instructional aides and paraprofessionals to earn credits towards certification while continuing their employment in the district. The community college would offer lower division courses, leading directly to admission at the university for a two-year teacher preparation block that would fulfill the requirements for a Bachelor's degree.

The CCACC initiative has the potential of addressing the current teacher shortage crisis while reforming teacher preparation through rigorous standards, innovative teaching, and intensive field experiences. Miller and Stayton (1999) purport that "creating professional communities designed for innovation is a complex social challenge, one that will require the actors to act with courage, integrity, and a willingness to create the structures we need for real reform" (pp. 301-302).

The CCACC partnership includes several distinctive features, including a focus on district and state standards in the development of a joint university/community college curriculum. The standards identified and aligned with each course serve as the framework for performance-based measures to trace the success of teacher candidates. For example, as students participate in intensive field experiences, their performances are mapped through observational rubrics and individualized professional portfolios. Quality is also enhanced through an emphasis on technology, and its effective adaptation to classroom instruction.

In addressing demands placed on the profession to accelerate the certification process, the CCACC collaborative optimizes conditions for current district employees to participate in the program. Courses are offered entirely on-site, and are primarily taught by the district's master teachers who consistently model best practices and standards integration in their own classrooms. The program also revolves around the district's calendar, facilitating the participation of employees while providing concrete experiences based around a complete school year. Critical to the collaborative nature of the initiative is the Site Coordinator, a university adjunct professor assigned to the district to assist in developing syllabi, advising, supervising, and mentoring the master teachers. These unique programmatic features, offered in the context of a university/district/community college collaborative, will provide the venue for the session's interactive exchange.

"Grow Your Own" Certification

The Chandler Unified School District, in the Phoenix, AZ metro area, serves a diversified population of over 21,000 students in grades PreK-12. Due to a booming city population and open enrollment laws, Chandler Unified is one of the fastest-growing districts in the state. The district has opened 8 schools in the last 10 years and now consists of 17 elementary schools, three junior highs and two high schools. In the next 15 years, the district will build a new high school (scheduled for 2004), a new junior high (scheduled for 2003) and at least 10 elementary schools. Additionally, in the last 5 years, the district has hired over 700 teachers. This number is half of the current 1200 certified staff members. In the last 3 years the district has hired 220 plus teachers per year.

As the school district reviewed the number of teachers retiring, the pool of new teaching candidates, and the number of prospective teaching positions, it was decided that a proactive stance needed to be taken. The district decided it was time to "grow our own." They were determined to find quality individuals who were interested in entering the teaching profession. Many of these individuals are the employee pool of support staff. With the partnership of Chandler Gilbert Community College and Arizona State University -EAST campus, the district has been able to offer a program.

Students who have completed their required courses at Chandler Gilbert or elsewhere will take their methods courses in the Chandler district and participate in valuable learning experiences with master Chandler teachers. Additionally, this program is available to students with a degree in another area, wishing to pursue a post baccalaureate degree. Opportunities for participants to work for Chandler Schools as an instructional paraprofessional are available for those participants interested.

The Role of the Community College

It is approximated that at least 40% of prospective teachers meet at least a portion of their general studies requirements at two-year institutions (Haver & Watson, 1997), and that community colleges enroll 43% of all U.S. undergraduates (Anglin, Mooradian, & Hamilton, 1993). These institutions are therefore, prime venues for recruiting prospective teachers and, in particular, present a virtually untapped resource pool for minority teachers.

The role of the community college is to provide general education classes at times that are convenient for the working student or full time student. In addition, advisors meet individually with each student to develop a program of study. When cohorts are large enough, classes can be offered on site at the school district. Students can choose education classes as well as general education classes that meet the requirements of the first two years of college, and they can attend either full time or part time. Upon completion of the community college courses, they can transfer to the university program or one of the on-site collaborations as a junior.

The community college education program at the Williams Campus is geared for full-time students, many of who are already admitted to the university through the Partnership in Baccalaureate Education program (http://www.east.asu.edu/programs/pbacc/index.html). A 4-semester block of classes has been developed. Learning communities and a structured set of courses have been planned.

During the first semester, students are involved in a learning community which includes First Year English, Introduction to Education, and the Internet. This 7-9 credit hour block of classes is taught for 4-hours, twice a week. The three courses are fully integrated so the papers that the students will write for English 101 will be based on topics discussed in the Introduction to Education course. The Internet class will include development of computer literacy skills, research skills and web page design skills.

During the second semester, the learning community courses will be the second semester of First Year English, Contemporary Multicultural Film and Literature, and presentation graphics (PowerPoint). The Contemporary Multicultural Film and Literature will help students meet a humanities requirement, cultural diversity awareness, or a literacy requirement while serving as the theme around which students will write their research papers for the English composition course. Eventually, students will be sharing their research through the use of PowerPoint presentations, skills which will be developed in the presentation graphics computer course. Students will be asked to research, write and present around the theme of "Teaching and Learning in a Multicultural Classroom."

During the third semester, a 3-credit computer course will be linked with Children's Literature and Math. The students will learn more about computer terms and concepts using word processing, database, and presentation graphics to do various assignments with the children's literature class. They will use spreadsheets within the math class.

While the fourth semester is still in the planning stages, the students will be completing foundation courses in their major and certification requirements.

The students will proceed through the four semesters by taking some general education courses and some courses in education, specific to their major. In each semester they are completing important core requirements, gaining exposure to life as a teacher, and developing technology skills. A very important element of the program is that during each semester, the students will be involved in service learning experiences that include direct interface with school-aged children. They will serve teachers and children in a variety of K-8 school settings: working with children living in a nearby transitional housing program which provides shelter for formerly homeless families; serve at a branch of the Boys and Girls Club; and work at a YMCA early childhood program.

The faculty at the community college and the university are working in a collaborative manner to establish common goals for the students with items such as portfolios and course expectations.

Teacher Preparation Curriculum

The Elementary Education Program at ASU East is an extension from the program of the main campus at Arizona State University. ASU has entered into a partnership with the city of Mesa and the Chandler-Gilbert Community College to utilize the former U.S. Air Force Base -- Williams Field. The program began 2 1/2 years ago with 14 students.

In the course of development, the ASUE program began to no longer "mimic" the ASU Main program. Fieldwork became a more integral aspect of the ASU East program required each semester of the education program. Methods classes were taught at partnership elementary schools in the area. As the program began to grow, it became more obvious that major revisions were necessary in the curriculum.

Collaboration of the faculty lead to the development of a curriculum with a strong literacy base. The literacy methods courses follow the timeline of child development beginning with "Emerging Literacy". In each semester, there is an integrated learning experience, which emphasizes the application of the content of the methods courses, classroom management and portfolio development. The study of technology has been strengthened from a 1 credit course to 3 credit course with more emphasis on the integration of technology into instruction. The faculty has collaborated to develop cross-curricular assignments requiring the authentic use of content and technology in field experience. The faculty has also made a commitment to "model" the integration of technology into their instruction with the use of an Internet portal, multimedia presentations, and other forms of assistive technology.

Technology Integration

A 1997 report by the President's Committee of Advisors on Science and Technology stated that preservice teachers are not getting the training that they need to integrated technology into instruction. Preservice teachers do not routinely use technology in field experiences and do not work with mentor teachers who can demonstrate and advise on technology integration. (Moursund and Bielefeldt, 1999).

The Education Program for ASU East is fortunate to be based at the site for the university's computer and technology program. Classrooms on the campus are equipped with instructor stations (computer, VCR, projector) and the instructional support is very strong. With this support, it is a natural progression to integrate technology use into the education classes.

As part of a PT3 grant, the education faculty worked with classroom teachers to incorporate technology based projects in methods classes. These projects utilized skills developed during the required technology course and periodic workshops. At the expiration of the grant, the faculty made a commitment to continue with a strong technology integration model. Faculty has collaborated to develop assignments that are cross-curricular. The use of Internet resources is required in the research for these assignments and all work must be "word-processed" or produced using technology -- for example, video and digital cameras. The faculty also is endeavoring to model the use of technology in their own instruction. All instructors are required to provide instructional support through the use of the university Internet portal software. Students have 24/7 access to syllabus and other course documents, posted grades and discussion group. All notices and announcements are posted on the department's "community" site and are sent to the students via e-mail.

The administrators of the public school recognize the need for teachers to receive a solid foundation in technology training. In a recent survey, a vast majority of principals indicated that they would give more consideration to hiring a teacher with demonstrated technology training. (Heng-yu and Hopper, 2000). ASU East offers students the opportunity to earn a technology credential through additional coursework, workshops and an applied project.

It is a natural progression to continue the strong technology integration model of ASU East to the CCACC program. Chandler is home for the Intel Corporation and the company has strong ties with the school district. Intel and the CUSD are in the process of developing "the classroom of the future" where teachers will be trained in the latest educational applications -- including the use of PDA's as a teacher and student learning tool. The preservice teachers enrolled in CCACC will have the opportunity to train in the “classroom of the future” and develop projects to use in their fieldwork.

Field Experience

One of the strengths of the education program at ASU East has been the required field experience. Preservice teachers complete 6 hours weekly each semester working with a mentor teacher. To coordinate with the child development focus of the literacy curriculum, the fieldwork assignments are coordinated with that particular semester's study -- i.e. during Emerging Literacy, preservice teachers are assigned to K-2 classrooms as interns. Assignments in methods classes are developed to utilize the fieldwork.

To accommodate the non-traditional students of the CCACC program (working adults), modifications have been made in the fieldwork requirement. Fieldwork is still a strong component and valuable asset of the teacher education program. The number of required hours has been reduced while the district administration has screened and trained mentor teachers to make sure that the fieldwork hours are all "quality" hours. Those students who are employed as paraprofessionals in the district will use their work experience as fulfillment of the fieldwork credit. This may require "visiting" other classrooms in order to complete an assignment. Those students who work as substitutes in the district can count their substitute experiences for half of the fieldwork hours. Other students have made arrangements with employers for flexible hours to free time for fieldwork. The school district has also asked for interns to work in "Saturday" school -- a remedial study program.

Conclusion

The collaboration for providing training for future teacher is continuous and reciprocal. Each party has approached the discussion with the goal of providing the best possible scenario for training teachers. Although, we have not endeavored to "reinvent the wheel", we have made an effort to look at pedagogy with new eyes and not be caught in the trap of how it has always been done. There is much give and take, but never a compromise on quality of the program. The discussions will continue throughout the program as we analyze what works.

Anglin, L. W., Mooradian, P., & Hamilton, A. (1993). A missing rung of the teacher education ladder: Community colleges. Action in Teacher Education, 15, 8-13.

Bullough, Jr., R. V., Birrell, J. R., Young, J., Clark, D. C., Erickson, L., Earle, R. S., Campbell, J. F., Hansen, L., & Egan, M. W. (1999). Paradise unrealized: Teacher educators and the costs and benefits of school/university partnerships. Journal of Teacher Education, 50, 381-390.

Burstein, N., Kretschmer, D., Smith, C., Gudoski, P. (1999). Redesigning teacher education as a shared responsibility of schools and universities. *Journal of Teacher Education*, 50, 106-118.

Darling-Hammond, L. (1994). Who will speak for the children? How 'Teach for America' hurts urban schools and students. *Phi Delta Kappan*, 76, 21-34.

Haver, W. E., & Watson, R. F. (1997). A not so new challenge for community colleges: Teacher education. *Community College Journal*, 68(2), 32-34.

Heng-Yu Ku, Hopper, Lee and Igoe, Ann. (2001) Perceptions of Preservice Teachers' Technology Competency Skills in Arizona. Society for Information Technology and Teacher Education. Orlando, FL.

Imig, D. G. (1997). Professionalization or dispersal: A case study of American teacher education. *Peabody Journal of Education*, 72, 25-34.

Kantrowitz, Barbara and Wingert, Pat. Teachers Wanted. *Newsweek* Vol. CXXXVI, No. 14. October 6, 2000.

Moursund, D. & Bielefieldt, T. (1999). Will new teachers be prepared to teach in a digital age? A national survey on information technology in teacher education. Santa Monica, CA.

Technology and Pedagogy: The Evolution of A Curriculum

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Abstract

Acadia University was the first laptop university in Canada. Being first has had its challenges. This paper discusses how between 1996 and 2000 a School of Education has adapted to the new technologies and made efforts to incorporate them pedagogically in their two-year after-degree teacher education program. Data gathered from review of equipment and facility inventories, demographic and curriculum documents, and surveys of students and faculty regarding background computer knowledge, attitudes, skill development, application, and innovations have formed the basis for this analysis. An examination of the first four years since initial implementation of laptop technology infusion into the teacher education program demonstrates an interesting evolution of curriculum and its impact on education students and faculty. The conference presentation graphically illustrates various survey results, and raises discussion questions about the technology/pedagogy/curriculum linkages.

Technology and Pedagogy: The Evolution of A Curriculum

Introduction

In 1996 Acadia University embarked on an IBM-sponsored laptop project, the first of its kind in Canada. By the fall of 2000, full implementation of this initiative, coined the Acadia Advantage, put Pentium laptop computers in the hands of some 3420 full-time students and 357 full- and part-time faculty. A complete rewiring of the campus has allowed for virtually unlimited network and internet access. The campus-wide project has had profound implications for the School of Education teacher education programs. Computer technology was an immediate concern, and remains so, as Education faculty seek to develop, to use, and to model the use of, pedagogically appropriate classroom strategies. This paper follows the evolution of curriculum between 1996 and 2000 as technology has taken a more prominent role in our teacher education programs.

The Setting: Acadia University

Founded in 1838 and one of the oldest universities in North America, Acadia University is located on a 250 acre campus in a rural farming community. The student population of approximately 3420 is attracted from over 30 countries around the world. The university offers 200 degree combinations, primarily undergraduate degrees, although a limited number of Master degree programs are available in most faculties. Research funding from Canadian granting agencies alone reaches approximately ½ million dollars annually. Class sizes vary of course, but average teacher:student ratio of 1:15.

Acadia University is recognized as an educational institution worthy of considerable praise. In each of the past three years, Maclean's magazine conducted a national survey and ranked Acadia as the "best overall", "most innovative", and "highest quality" primarily undergraduate university in Canada. In 1999, the Acadia Advantage initiative was inducted into the Smithsonian Institute.

All teacher education programs in Nova Scotia are legislated as two-year pre-service professional education following a first degree (arts, science, etc.). Acadia University School of Education takes in approximately 130 students each year for a total enrolment of 260. School of Education faculty includes 18 full-time and 7 part-time professors.

The Process

For this study, data gathered from a review of equipment and facility inventories, demographic and curriculum documents, and surveys of students and faculty regarding background computer knowledge, attitudes, skill development, application, and innovations have formed the basis for this analysis. The purpose of examining the first five years of initial implementation of laptop technology infusion into the teacher education program, was to describe the pedagogical and curriculum changes that became necessary as students and faculty grew into their new roles as teachers/learners in a fully-wired and technologically-enhanced learning environment at Acadia University.

Technology Infrastructure

For the campus: Acadia University campus has 5200 data connections spread over dormitories, student meeting areas, classrooms and teaching laboratories. Laptop computers are leased by students as part of their $5000.00 tuition fee. The same model laptop computers are provided for each faculty member.

Computers Used by Students and Faculty 1996-2001

96/97	97/98	98/99	99/00	00/01
365ED	365XD	380ED	380/385	A20M
100 MHz	133 MHz	166 MHz	166/366	500 MHz
412 MB	1.2 GB	2.1 GB	2.1/4.8	6 GB
12 MB	24 MB	48 MB	48/64 GB	128 GB

For the School of Education: Acadia University School of Education has 286 network connections and 10 wired classrooms. Equipment available includes digital projectors, opaque projectors/overheads, sound systems, VCRs, analog/digital video production, digital cameras, and scanners in teaching labs plus one in each faculty office.

Technology Support

AITT: Acadia Institute for Teaching and Technology (AITT), or more commonly known as the Sandbox, provides support for instructional design and teaching innovations for faculty. AITT has a full-time staff of eight, including one seconded member of faculty, and a part-time staff of up to 20 students. Typically to access support, a faculty member starts with an idea of how technology might improve the manner in which a particular course component

Technology Support

	Full-Time Staff	Part-Time Staff	Support For Whom?	Example
AITT: Acadia Institute for Teaching and Technology (8) (22)	1 director 1 manager 3 academic computing specialists 1 project coordinator 1 multimedia producer 1 seconded faculty	1 instructional designer 1 webmaster 1 digital audio specialist 1 programmer 15- 20 students	Primarily for faculty; student occasional use	Curric. development and tech. problem-solving
ACME: Acadia Courseware Management Environment (4)	3 academic computing specialists 1 programmer		Faculty prepare it for each course; students access it during course	Faculty place all course materials and assignments on ACME; registered students access
USC: User Support Centre (13) (11)	1 manager 3 senior technicians 6 senior help-desk consultants 1 software consultant 1 trainer 1 IT support & training coordinator	11 (student) help-desk consultants	All faculty and students	Problems with computers, network access, classroom equipment, etc.
CSS: Computing Services Support (16)	1 director 2 managers 1 sr. network analysts 3 system analysts 1 junior systems operator 2 unix ops/admin 3 programmers 3 technicians		System support campus wide	Problems with basic system and network

could be taught, and then works with AITT staff to develop the necessary technical design and application.

ACME: Acadia Courseware Management Environment is an on-line framework for each instructor to post contact information, course outline, course text information and materials, course notes, questions, on-line discussion groups, and tests. Staff includes 1 programmer and 3 academic computing specialists.

USC: User Support Centre has 13 full-time and 11 part-time staff. This service is used extensively by students and faculty particularly early in the academic year. For example, between August 16th and September 28th, 1999 (43 days), USC responded to 9446 calls for support.

CSS: Computing Services provides system support with a total of 16 full-time staff including 1 director, 2 managers (network services; information systems), 1 senior network analyst, 3 system analysts, 1 junior systems operator, 2 unix operator/systems administrators, 3 programmer analysts, and 3 technicians.

Evolution of Curriculum in Teacher Education Programs

1995: The School of Education computer lab was equipped with 10 IBM clones 386/486 attached to a campus computer network and a single network printer for students to access. Five Macintosh computers in a LAN were equipped with such specialized inclusive education peripherals as Touch Window, Intellikeys, Braillers, etc. Three Macintosh computers were connected to the campus network. Fifteen students enrolled in each of two sections of an elective introductory computer applications course. The curriculum was comprised of 80% skills and 20% applications. Each student's background was assessed and an appropriate skill development stream implemented.

1996: The computer lab remained the same. Introduction to Computers in Education became a required course for all B.Ed. students; four sections with 25-30 students in each. Computers were shared by three students. The curriculum again was comprised of 80% skills and 20% applications. Group tutorials addressing general areas of growth were required.

1997: AA Initiative (Acadia Advantage) sponsored by IBM began. A new small classroom with 25 network drops was provided for the now required Introduction to Computers in Education course. Network support for Macintosh was no longer available and therefore could only run Mac's in LAN or stand-alone. The curriculum was comprised of 70% skills and 30% applications. File management and email became obsolete areas of the curriculum. Workshops at beginning of the semester were introduced to ensure that all students had a beginning base of computer skills to bring to the course. Some exposure of students to the Macintosh platform was maintained.

1998: Large classrooms became available with 60 network drops. Class sizes increased to 30-35 students. Some exposure to Macintosh platform was maintained. The curriculum was comprised of 60% skills and 40% applications. Students' backgrounds in all areas seemed to have improved to an extent that much less time was spent in skill areas: word-processing, spreadsheets, databases, internet use and file management. Student attitude about computers had changed significantly in a positive direction. A new elective course in Computer Multimedia was offered in response to student demand for more applications. Although this was not a required course, two sections had to be capped at 15 students each, based on resources available.

1999-2000: Large classrooms became fully equipped with data projectors and opaque projectors, VCRs and sound systems. The curriculum continued to be comprised of 60% skills and 40% applications. However, students now had a much more positive attitude and seemed to need much less ongoing support. Professors increasingly used more technology in their teaching. Students were exposed to a wide variety of applications in the context of other subject areas. Students became very adept at using the technology in the presentation of their own work in their on-campus classes, and in their teaching for those fortunate enough to have an internship in a technology supported school.

Student Background Survey

	Experience		
Application	None	Some	**Extensive**
Word Processing	1	2	3
Spreadsheets	1	2	3
Databases	1	2	3
File Management (directory structures)	1	2	3
Internet searches	1	2	3
Webpage design	1	2	3
FTP	1	2	3
Listservs	1	2	3
Newsgroups	1	2	3
Email & attachments	1	2	3
Desktop Publishing (graphics)	1	2	3
Powerpoint	1	2	3
Qbasic programming	1	2	3
Probes for math and science	1	2	3
	Maximum	Score =	42

Survey Results

Year	**Average Total Score (n = 110-130)**
1996	21
1997	22
1998	28
1999	34
2000	t b a

Summary:
An examination of the first five years since initial implementation of laptop technology infusion into the teacher education program demonstrated an interesting evolution of curriculum and its impact on education students and faculty. The influence of the technology on pedagogy and on curriculum might have at first seemed linear, but it became increasingly clear that technology, pedagogy, and curriculum are inextricably linked in a continuous ascending growth spiral. A change in any one element, created new opportunities for change in one or the other of the remaining two elements, which then precipitated a change in the third, and so on. New curriculum developments can stimulate a drive to create a new application of the technology. A new way of thinking about the pedagogy can stimulate a new aspect of curriculum development and a new application of technology.

Understanding the strength and importance of such linkages has significant relevance for teacher education programs. The increasing speed with which new developments in technology occur will likely provide ongoing challenges for teacher educators. If our efforts are successful in helping pre-service teachers understand and exploit these vital linkages between pedagogy, curriculum, and technology, then we might expect the diversity of young learners in today's classrooms to readily engage in learning activities created by teachers that address their various learning styles and capture their interest.

Multiple-Delivery Systems—A New Approach to Education Courses

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Abstract: Multiple-delivery Systems: A New Approach to Education Courses at Indian River Community College (IRCC) addresses the needs of non-traditional pre-service education students through multi-media Internet-based courses in education. These courses are learner-centered and combine the synchronous format required to develop social interaction skills with the asynchronous access to information and to assignments. The course addresses multiple learning styles and promotes active student learning, while facilitating student success by providing web-based college support services online. An example, "Introduction to Education," features instructional lesson summaries and lectures using streaming video and graphics, graphic support materials, e-mail, chat rooms, message boards, and multi-media technology to address auditory, visual, and kinesthetic learning styles. A description of the web-based course and an introduction to the student support services available to students is presented. Also, this paper presents the rationale for the course components along with a description of the additional courses engendered by this prototype.

How do you develop an on-line course that uses state-of-the-art technology to address student learning styles and that uses a virtual campus to meet Southern Association of Colleges and Schools (SACS) criteria? Distance Learning challenges faculty to capture the atmosphere of a traditional classroom and to communicate that atmosphere in an asynchronous manner. An additional challenge arises when the course serves the dual purpose of providing prospective teachers with a pre-requisite knowledge base for entry into a teacher education program and of showcasing the skills that characterize effective teaching.

All too often Internet classes are little more than high tech correspondence courses that offer communication only in a half-duplex mode. In other words, the instructor poses a set of exercises and of assignments. At a later time the student completes the work and sends it to the instructor only to be forced to wait again for results. This delay yields a sporadic stimulus-response system that is mutually unsettling. The impersonality of the experience invariably results in high attrition rates.

These negatives, however, can be reversed so that the Internet experience can be rewarding both to the instructor and to the student. McArthur and Lewis point out that "information technologies can improve the efficiency of learning and teaching" (1998). The Internet-based "Introduction to Education" course from Indian River Community College (IRCC) features multi-media streaming, video, and Internet resources to promote efficient learning. Moreover, as Frayer and West (1997) suggest, students are more actively engaged in the learning process, practice more, and receive useful feedback when learning styles are matched to the learner. This course uses state-of-the-art technology to address auditory, visual, and kinesthetic learning styles, while providing synchronous and asynchronous active student learning, educational resources, and extensive support services. "Introduction to Education" uses Internet-based instructional lesson summaries and lectures, streaming video and graphics, graphic support materials, e-mail, chat rooms, and message boards to create a successful learning experience. The student is able to see and hear the instructor and take part in class discussions. Students learn various teaching methods as they engage in the activities thus improving their personal teaching skills (Collins, Brown & Newman, 1989). There is less isolation for the student, and a feeling of camaraderie frequently develops among fellow students. The intimidation of communicating that might exist in a classroom setting disappears, and the frequency and intimacy of communication among students and between students and instructor increase (Chickering & Ehrmann, 1997).

As this course was conceived and designed, the student's needs took priority. Among the design principles are those enumerated by Kozma and Johnston (1991): using multiple modalities to engage students in drills, simulations, critical thinking, collaboration, scholarship, and construction of knowledge. Subject matter, concepts, and skills were presented using various modalities and in varied format. A student who needs to utilize a visual method of learning receives visual reinforcement. The student who needs to apply a more tactile approach is accommodated as well. The clarity of the streaming audio and video replicates the classroom situation to the extent that students have reported that "it was like having the instructor in the living room." Insofar as that was the case, the design was successful. The successful completion rate for this class is among the highest for the college, whether Internet, Interactive Television, Telecourse, or the traditional classroom.

During the development phase, the quality of the streaming media was a major focus. The course must be delivered so that the quality remains consistent whether the student has a state-of-the-art computer setup or a rather marginal one with a less than 56K modem. An initial welcoming video serves to introduce the instructor to the class. Using Real Media, the quality of the video is excellent and free from the distracting jerkiness of some web-based video. Lectures for each chapter in the course text were written by the instructor and recorded in the Distance Learning studio. The recordings were carefully edited to remove extended pauses, incomprehensible phrasing, and extraneous noise. Using Sound Forge, the finished product, 9 lectures in all, was loaded into RealMedia and matched with a set of PowerPoint slides that highlighted key points in the lectures. These slides may be printed for study purposes.

The separate yet integrative components of this course include a set of video tapes provided by the textbook publisher. These videos are keyed to individual chapters in the text. Each is remarkable in that it generates fervent discussion among students. These discussions take place on the message board and in the chat room. With the instructor as facilitator, these discussions allow a personal level of involvement for everyone.

Written assignments for this course include reflections on journal articles as well as in-depth research on various cultures. Assignments are e-mailed to the instructor who grades them online and resends them to the student. Immediate feedback is crucial in distance learning. The rapid turnaround of assignments offers the distance learning student immediate reinforcement.

Student progress in the course is measured by a series of online tests. There are two testing formats available for each test, either multiple choice or essay. The student chooses the format preferred. The test is available to students during a specified number of days. Students are allowed only one attempt and receive their score upon finishing the test. A time limit is imposed for each test. The final examination is proctored and must be taken at a campus site.

The last piece of the process is the support provided by the college itself. The IRCC web site replicates campus support services through a virtual campus. Students can read the IRCC Catalog, can obtain financial aid information and applications, can check up-to-date class offerings, can register, can buy textbooks and supplies, can access educational support materials and resources, and can use library resources on-line.

The course is mounted on the Internet using Web-CT. This relatively user-friendly course presentation software offers the flexibility required for the various course components. IRCC faculty interested in developing courses for the Internet receive intensive training in the use of Web-CT and the Distance Learning technical staff are available at all times to assist, to offer advice, and to provide video and sound editing. Successful creation of these materials depends on the communication between the educational faculty and the distance learning support team. Through teamwork, technical knowledge and course content are fused to design and to develop a successful distance learning course offering. Realizing that any such endeavor will always be a work in progress, adjustments, refinements, and additional resources can be added as needed. In a sense, then, the course does not become stale. Just as the classroom can become rigid and tiresome, any web course must receive regular and critical evaluation. Student evaluations, peer review, and experiential data supply the information used to update the course.

The success of this education course, both from the instructor and the student perspective, has given rise to the development of similar courses in Mathematics, Earth Science, and Ecology. Taking full advantage of new technology, virtual field trips, real-time interactive and asynchronous classroom visits, and web-based resources all become the delivery method and the substance of the student's learning experience, transcending the limits of a typical virtual classroom.

References

Chickcring, A. W. & Ehrmann S. C.(1997) Implementing the seven principles: Technology as lever. Retrieved November 27, 2000on the World Wide Web: http://www.aahe.org/technology/chrmann.htm

Collins, A., Brown, J.S. & Newman, S. (1989) Cognitive apprenticeship: Teaching the craft of reading, writing, and mathematics, in L.B.Resnick (Ed.), Knowing, learning and instruction: Essays in honor of Robert Glaser. Hillsdale,NJ: Erlbaum.

Frayer, D. A., & West, L. B.(1997) Creating a new world of learning possibilities through instructional technology. Retrieved on the World Wide Web on November 25, 2000: http://horizon.unc.edu/projects/monograph/CD/Instructional_Technology/Frayer.asp

Kozma, R. B. & Johnston, J. (1991). The technological revolution comes to the classroom. Change, 23 (1),10-23.

McArthur, D., & Lewis, M. (1998) Learning and instruction delivery. *Untangling the Web: Applications of the Internet and other information technologies to higher learning*. Retrieved on the World Wide Web on November 21, 2000: http://www.rand.org/publications/MR/MR975/

A Holocaust Web Site: Effects on Pre-service Teachers' Factual Knowledge and Attitudes Toward Traditionally Marginalized Groups

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Abstract: The Holocaust remains one of the most effective and extensively documented subjects for an examination of basic humanitarian issues. Knowledge is the key to an intelligent understanding of such a tragic passage in human history, the key to a wisdom that will never let it happen again. To address the need for quality, accessible information about the Holocaust, the Florida Center for Instructional Technology developed an extensive website titled *The Teacher's Guide to the Holocaust.* This study was designed to investigate the effectiveness of the website. Specifically, data were collected via pre and posttest measures to determine if access to *The Teacher's Guide to the Holocaust* significantly impacted the knowledge level or attitudes of pre-service teachers.

Introduction

In response to a bill passed by the Florida Legislature in 1994 (Florida Statute 233.061 requiring public school instruction of the history of the Holocaust), graduate students and staff at a major Florida university created a web-based instructional program for Holocaust education. This award-winning site, *The Teacher's Guide to the Holocaust*, is now an amalgam of over 6,000 files in a variety of media ranging from virtual reality tours, videos, survivor testimonies, and photos, to thought provoking teacher-resource and student-activity sections (http://fcit.coedu.usf.edu/holocaust). The site is meant to be a resource for certified and pre-service teachers, many of whom have had little or no training for teaching such sensitive material.

The instructional goal of the website is to provide a single starting point for Holocaust education with relevant background information and links to instructional resources. The content of *The Teacher's Guide to the Holocaust* is presented from three perspectives: Timeline, People, and The Arts. An introduction to the *Teacher's Guide* reads: "Holocaust study is a very sensitive subject, and the appropriateness of material is dependent upon individuals. All materials should be reviewed before use in class." In designing the site, it was hoped that, through the study of the Holocaust, students and teachers alike would be able to develop an understanding of the ramifications of prejudice and racism, and help to ensure that an event such as the Holocaust will not happen again (Barron, 1998).

The purpose of this study was to investigate whether or not pre-service teachers' factual knowledge and attitudes toward traditionally marginalized groups would be significantly changed through interaction with the *Teacher's Guide to the Holocaust* website. Second, the study was meant to examine the state of pre-service teachers' knowledge on the Holocaust. Third, any correlation between subjects' knowledge and attitudes was analyzed.

The Study

Participants in the study were pre-service teachers enrolled in an undergraduate course – EME 2040: *Introduction to Computers in Education.* All students enrolled during the spring semester, 2000, were invited to participate. Of 143 participants who began the study, 115 completed both the pretest and posttest.

Two types of instruments were developed for this research: an objective test of Holocaust factual knowledge and two scales to assess attitudes toward diversity and perceptions of traditionally marginalized groups.

On the day of the pretest, each student received a packet containing a knowledge test, one version of the attitude instrument, a lesson plan assignment sheet, and a CD containing a website. Students were encouraged to answer the questions as honestly as possible. Following administration of the instruments, graduate assistants for the class collected the test forms.

Students were required to develop a lesson plan based on the CD included in their packets. Students assigned to the experimental group were required to complete an assignment using *The Teacher's Guide to the Holocaust* website, while students in the control group developed a lesson plan based on the 4^{th} *Grade FCAT website*. These assignments were designed so that the student needed to review and investigate the particular resource they were assigned. The Holocaust activity incorporated a question that built upon a section of the guide titled *Timeline* and required the student to read and synthesize material from each of the sections. The students were given one week to complete the assignment. Posttest data were collected during the class session in which the assignments were turned in.

Results

Data were analyzed using both analysis of variance and correlational methods. Group difference in changes from pretest to posttest on knowledge and attitude scores were assessed using analysis of covariance. In addition, two factor ANOVAs, (treatment condition by occasion of testing) were used to examine changes in perceptual bias toward specific marginalized groups, and correlations between knowledge and attitude scores were evaluated. Finally, individual item difficulty indices were used to guide a content analysis of participants' performance on the knowledge test.

The results indicate that exposure to the *Teacher's Guide to the Holocaust* did not have a significant impact on either the factual knowledge or the attitudes of the subjects. The findings suggest that the limited amount of engagement required of the subjects (they had to write a lesson plan related to the material) was not sufficient to impact a change in either knowledge or attitudes. Perhaps a more thorough, directive approach to the material would be more beneficial.

References

Barron, A. E. (1998). Developing a large-scale instructional programme on the Web. Educational Media International, 35(3), 192-196.

Borrowman, S. (1999). Critical surfing: holocaust denial and credibility on the web. College Teaching, 47(2), 44-47.

Brown, M., & Davies, I. (1998). The Holocaust and education for citizenship: The teaching of history, religion, and human rights in England. Educational Review, 50(1), 75-83.

Carrington, B., & Short, G. (1997). Holocaust education, anti-racism, and citizenship. Educational Review, 49(3), 271-282.

Holt-Reynolds, D. (1999). Good readers, good teachers? Subject matter expertise as a challenge in learning to teach. Harvard Educational Review, 69(1), 29-50.

Howard, T. C., & Denning del Rosario, C. (2000). Talking race in teacher education: The need for racial dialogue in teacher education programs. Action in Teacher Education, 21(4), 127-37.

Kudva, P. (1999). Relevance of a knowledge base for a teacher as a professional. India. (ERIC Document Reproduction Service No. Ed 429 932).

Landesman, B. (1998). Holocaust denial and the Internet. Reference Librarian, (61), 287-99.

Putnam, R., & Borko, H. (2000). What do new views of knowledge and thinking have to say about research on teacher learning? Educational researcher, 29(1), 4.

Sternberg, R. J., & Horvath, J. A. (1995). A prototype view of expert teaching. Educational Researcher, 24(6), 9-17.

Taylor, P. A. (1999). Multicultural Education Issues: Perceived Levels of Knowledge of Preservice Teachers and Teacher Educators. Indiana. (ERIC Document Reproduction Service No. Ed 436502).

Teaching Guidelines, Teaching about the Holocaust: A Resource Book for Educators. Washington D.C.: United States Holocaust Memorial Museum.

Creating Collegial Networks

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Abstract: This paper examines how web-based educational environments were used to foster collegial conversations in three case studies conducted in the Graduate School of Education at Portland State University. The cases describe instructors' and graduate students' experiences with interactive, online discussions. Two cases center on interactions in cohorts (groups) of preservice teachers, while the third case highlights the course-based exchanges of inservice and preservice teachers. Reactions to online interactions are analyzed. Several important considerations are shared about how to cultivate peer collaboration and encounter success when teaching and learning with web-based environments.

Introduction

Teacher educators know that discussion is vital to learning. Now, teacher educators are exploring whether telecommunications can broaden the discussion by taking it beyond the walls of the classroom. This paper describes the instructors' and graduate students' involvement with interactive web-based learning environments, examines their reactions to this type of interaction, and provides suggestions for implementation.

Given today's busy lifestyles, electronic discussions seem an efficient way to nurture such interactions without concern for geographical boundaries or time constraints (Johnson, 1997). Use of web-based educational environments may extend learning and teaching beyond our classrooms through electronic dialoguing (Norton & Johnson, 1997). An online dialogue helps to enhance our students' conceptual understandings of issues related to preservice and inservice teacher education.

Background

Web-based educational environments are rapidly establishing a presence on university and college campuses. These user-friendly resources allow instructors to create a unique online learning forum for their students. Today, most web-based educational programs require minimal expertise on the part of the student or instructor. Teacher educators are discovering that web-based tools such as e-mail and listservs facilitate communication among instructors and students (Van Gorp, 1998). Using web-based resources is a straightforward way to supplement course content and to increase communication among students and instructors.

Instructors use the controlled environment feature of web-based technology to promote discussion and collaboration. Since user IDs and passwords limit access to the web-based environment, online conversations remain cohort-wide as opposed to worldwide. As students connect with one another in this safe and limited space, their unique personalities and feelings are revealed (Wepner & Mobley, 1998). Similarly, this forum creates a safe learning environment for students to display their work among a smaller, known audience. Features that cultivate collegial interactions include electronic bulletin board tools for communication and cohort forums; course and calendar tools for posting assignments and important dates; and student project pages for sharing ideas and displaying products. These options allow instructors to create a purposeful and learner-centered network. Web-based educational environments are more than sites to access information; they create a place for interactive communication and the construction of knowledge (Van Gorp, 1998). These online environments have the potential to facilitate learning processes as well as peer collaboration throughout the teacher preparation and continuing education programs. Importantly, students and instructors are afforded with continual opportunities for interaction and reflection across both university and field settings.

Implementation

The following three cases reveal how instructors implemented web-based environments with their graduate students. The first case explores the interactions of preservice teachers in a graduate teacher education program. The next case examines the growth of preservice teachers in the special education program. In the final case, the collegial dialogue among inservice and preservice educators evolves.

Case Study: Beginning the Conversation

Yearlong access to the bulletin board and specific features of the web-based system was established for three successive field-based cohorts (groups) in Graduate Teacher Education Program (GTEP) at Portland State University. GTEP is an intensive, one-year teacher preparation program comprised of academic work and field experiences that leads to licensure. GTEP students complete the program requirements in cohorts. During the past three years, the field-based cohorts have had 28-29 members. Though students in these field-based cohorts took course work together, their student teaching placements were spread across several school districts. As a result, students were afforded the opportunity to use on an online environment to maintain a professional conversation with members of their cohort. The web-based environment provided a means for students to stay connected across the academic year and began to shape a collegial network. Beginning in the fall term, students were introduced to the electronic bulletin board in the *Classroom Instruction and Technology* course. During the winter term, students routinely used the bulletin board feature to support the academic and field components of the teacher preparation program. When engaged in full-time student teaching in the spring, students were able to continue and deepen their collegial discussions. Students' encounters with the web-based environment expanded each year as the instructor drew upon prior experience from the previous cohort's interactions. Through this online forum, expectations were communicated effectively, information was exchanged efficiently, and meaningful dialogue flowed effortlessly.

Communication among students and instructors improved with the inclusion of an electronic bulletin board. More positive and productive interactions emerged. After sharing learning objectives, one student provided this supportive feedback, "Your objective was clear and precise. I understood exactly what you wanted the students to do. You not only stated what you want students to be able to do, but also what and how they were going to accomplish the objective." Students responded to posted topics and posed questions about their field experiences. When prompted to report effective teaching behaviors that they had observed, an aspiring science teacher posted, "My teacher, through modeling and thinking aloud, helps the students learn how to organize the given information and develop a "plan of attack" to solve the problem." A foreign language student teacher initiated a dialogue about modeling. "Modeling is a constant in the foreign language classroom. There seems to be much controversy about error correction in the classroom. Should the student be corrected on the spot when he/she mispronounces or uses the wrong word?" Other students sought feedback on their performance. "I just want to make sure that I have completed all of the required assignments that have been posted and that I am on track." Students and instructors alike used the bulletin board to convey personal sentiments. Midway through the program, one student offered his thoughts to the cohort, which generated a flurry of heartfelt responses.

> I know that I have not shared with all of you what an honor it is to be associated with this cohort. Throughout the three months that we have been together, I have witnessed genuine

caring and concern for the members of our group. It bodes well for the teaching profession that tomorrow's teachers exhibit this nurturing behavior, as it was often mentioned in our discussions of effective teachers. I thank all of you for continuing to make this one of the most memorable experiences of my life.

One instructor expressed her genuine and positive regard in this way: "I really appreciate your demeanor and sensitivity when you interact with us" and "Thank you for the contribution you have made to our cohort". Overall, students communicated more frequently and openly, were more cognizant of course and program expectations, and reflected openly on their teaching experiences.

Case Study: Preparing Preservice Teachers To Be Online Teacher Collaborators

Being "connected" with colleagues is of vital importance for special education teachers as they learn their craft. Due to the nature of their jobs, they are often physically isolated from other special educators who can potentially offer valuable support and mentorship. It is with this in mind that Portland State University's Special Educator Program began to integrate electronic discussion into preservice experiences. Across the span of an academic school year, a cohort of full-time graduate students learned how to participate in online discussions within the context of coursework and field experiences. This case study describes how graduate students preparing to be special education teachers learned to use electronic discussion methods as a means to maintain professional connections.

The first stage of the study required students to participate in asynchronous electronic discussion available through a online course environment designed for the Collaboration 1 course offered during fall term. Students learned the technical aspects of online discussion by: a) participating in practice sessions that explicitly modeled the skills of composing new messages and replying to received messages; b) being mentored by other students in the cohort and; c) using web-based tutorials. For many students, this was the first time they had participated in web-based discussion outside of traditional e-mail applications. A weekly routine was established where students purposefully participated in electronic discussions as they reflected upon the assigned course readings and web links. The goals for this term were for students to get comfortable with using web-based technology, to learn to actively troubleshoot unexpected technical problems and to begin to connect with others by participating in threaded discussions. These expectations were surpassed as students successfully posted a total of 165 messages with 68% of those messages connected to short threaded discussions (most commonly consisting of 2-3 messages each). It became clear that students were learning to interact purposefully online as they exchanged opinions and ideas.

During the second term, the same group of students participated in electronic discussions as a requirement for the Collaboration 2 course. Students were expected to build upon the accomplishments of the previous term by increasing their interactivity and deepening the conversational nature of discussion forum activities. The total number of messages posted across the term (n = 328) increased substantially from the previous term suggesting that students were becoming more adept at using the electronic bulletin board. In addition, an evolution in the quality of the discussions began to occur as threaded discussions became driven by "hot topics" with more students asserting their perspectives. There were still threaded discussions with 2-3 messages but now, deeper electronic conversation threads with 7-10 messages were regularly occurring. In an effort to generalize online discussion skills outside of the course discussion board, students were also required to subscribe to a listserv or discussion group of their choice.

During the final term of the program, students actively contributed to the electronic discussion board as they immersed themselves into a full-time student teaching experience. The culmination of their online discussion experience created a rich dialogue among student teachers and university faculty inspired by the on-going epiphanies and quandaries of each student teacher. Student teachers began to expand their electronic conversations into the reality of day-to-day teaching responsibilities. In the process of reviewing hundreds of messages posted during the 10-week student teaching period, six recurring themes emerged from the discussion threads including: 1) requesting help; 2) sharing common experiences; 3) expressing opinions; 4) broadcasting useful information; 5) sharing ideas for innovation and; 6) offering support to others. In one instance, a student teacher that felt empowered by her online experience created a listserv for student teachers and first year special educators. Overall, the explicit teaching and guided practice of electronic discussion skills prior to student teaching transformed the discussion group from being "technologically inexperienced" to a cohort of savvy collaborators.

Case Study: Transitioning from "Chat" to a Professional Dialogue

For the past three years, students have had the opportunity to take an elective course titled *Applications of the World Wide Web for Teaching and Learning* in PSU's Graduate School of Education. Over the years, the course format has evolved into a flexible format approach that combines face-to-face and online class sessions. About 20-25 students have enrolled in this 10-week course each year. Although a majority of the students have been inservice teachers, undergraduates and preservice teachers have participated in the course each year (approximately 30%). Because the content of the course focused on web-based learning, it also seemed appropriate to have the course serve as a model of web-based teaching.

During the first year, students met face-to-face each week for the first three weeks of the course. Class activities included locating and evaluating web resources and learning to use the email, bulletin board, and chat tools included in the online course environment. The fourth week of the course was held online, to test the bulletin board sharing and email assignments with chat discussion format to see how it would work. While the email and bulletin board discussions were successful, the chat sessions were not. Due to equipment or access challenges, almost 50% of the students failed to access one of the chat sessions. Those who did access the chat session found the challenge of typing messages and tracking the conversation awkward. During the next face-to-face session, students brainstormed and established criteria for improving the chat session format: 1) sessions were scheduled for various days and times to allow access and keep the number of participants to about 4-6 students; 2) students who did not have adequate access at home or work were encouraged to use campus labs; 3) during the chat sessions, students included the name of the person they were responding to when appropriate (chat etiquette). Three online sessions that applied these formatting changes followed, with better use of the chat function.

The course was redesigned for the second year with three of the ten class sessions held on campus: the first, mid-term, and final class sessions. This allowed time to learn how to use the course tools, begin to create a community, and set expectations for weekly online sessions. During the online weeks students were expected to: 1) send email to the instructor sharing progress on course assignments; 2) participate in bulletin board discussions of readings focused on issues such as equity, ethics, copyright, and child safety; 3) participate in a chat session discussing the work they were doing for course assignments. By applying the lessons learned from the previous years chat session's attendance improved, and conversations were more coherent. Yet, the quality of the discussions was still primarily chat (e.g., How are you? What movies have you seen lately? Were your kids out of control today?). While this did help us maintain a feeling of community, any significant dialog related to course issues was minimal, and most sessions lasted only 15-20 minutes.

Changes to this course during the third year focused on the need to initiate and sustain a more professional dialog during chat sessions. Course readings, bulletin board postings, and chat assignments were modified to establish the students themselves as both teachers and learners. Each session focused on an issue of the week, with students taking turns being the expert or sharing their experiences with a given issue. The resulting discussions were rich in content and quality, and frequently lasted longer than the scheduled thirty minutes. By centering each week around a specific subject with students as experts during chat and bulletin board discussions, and observing appropriate chat etiquette, chat sessions have evolved from simple conversations to professional discussions centered around issues related to web-based teaching and learning. As a result, this course now serves as both a useful learning experience, and an appropriate model of web-based learning.

Discussion

Teaching with web-based technology requires planning, implementation, and revision. Several important lessons were gleaned from teaching with web-based environments. 1) Start small and expand its use routinely. Instructors need to introduce their students to a limited number of features of the web-based system before adding additional components. 2) Create scenarios that foster student success with technology. Initial instruction that guides students to access and respond to messages on an electronic bulletin board works well in face-to-face sessions. 3) Engage students with meaningful work that naturally draws upon technology resources. Electronic discussions need to center on authentic, educational issues that resonate with students. 4) Ensure equity of access to technology resources. Instructors need to become knowledgeable about what resources are available to students and actively support their access to those resources. 5) Find ways to incorporate technology seamlessly into both the academic and field components of preservice programs. 6) Model technology's use for students, and problem-solve technology problems as quickly as possible.

Instructors need to focus students' attention on learning to use the available technology in order stay connected to their developing collegial network. 7) Reflect upon the experiences and outcomes of using web-based resources when planning its continuation.

Finally, student response rates and evaluative comments attest to the positive impact of their web-based interactions. Online environments appeal to a range of audiences as evidenced by numerous university courses and multiple student groups tapping web-based systems. Overall, web-based educational environments provide a forum for discussion among colleagues and expand the opportunities for learning.

References

Johnson, D. (1997). Extending the educational community: Using electronic dialoguing to connect theory and practice in preservice teacher education. *Journal of Technology and Teacher Education,* 5, (2-3), 163-170.

Norton, P. & Sprague, D. (1997). On-line collaborative lesson planning: An experiment in teacher education. *Journal of Technology and Teacher Education,* 5, (2-3), 149-162.

Van Gorp, M. J. (1998). Computer-mediated communication in preservice teacher education: Surveying research, identifying problems, and considering needs. *Journal of Computing in Teacher Education,* 14 (2), 8-14.

Wepner, S. B. & Mobley, M. M. (1998). Reaping new harvests: Collaboration and communication through field experiences. *Action in Teacher Education*, 20, (3), 50-61.

Technology and Teacher Preparation: A Case Study

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Abstract: Over the past several years, I have attempted to raise both the computer knowledge level and the computer comfort level of preservice teachers by: 1) integrating technology into my own teaching, 2) using technology to foster preservice teacher inquiry and high level thinking, and 3) using technology to encourage preservice teachers to become educational leaders. This report describes several of the activities such as threaded discussion, publication of lesson plans on the Internet, access to lesson plans and further readings, and use of e-mail based class discussion and their impact on preservice teachers' perceptions of the role, use and purpose of technology in the classroom. Analysis of preservice teacher feedback following courses that require the use of technology in many different learning activities demonstrates that although undergraduate preservice teachers enter the program with slightly more developed computer skills than graduate preservice teachers, it is the graduate preservice teachers who are able to articulate how technology might be integrated into their own teaching.

Keywords: Integration of technology, Technology and teacher preparation, Technological literacy

Introduction

Like many teacher preparation faculty across the nation, I have decided not only to *talk the talk but to walk the walk* with respect to technology by transforming my literacy courses so that preservice teachers experience information technologies in support of learning and teaching (Queitzsch, 1997; Zellner, Denton & Zellner, 1999; Gipe & Lamare, 1997; Rossiter & Bagdon, 1999). Multiple national and state reports such as *Transforming Learning: Technology Integration Across the Teacher Education Curriculum* (1999), *Resources for 21st Century Teachers* (1999), and *Technology Competencies for Connecticut Educators* (1997) and research (Vagle, 1995; Queitzsch, 1997) state that in order for preservice teachers to become comfortable and capable with information technology, teacher preparation faculty must model innovative teaching that is facilitated and mediated by information technologies. In keeping with these recommendations, I have redesigned my literacy courses to make use of the Internet and other digital resources. I regularly use technology in my teaching and students are required to use a variety of technological tools in order to complete and submit assignments (Powers, 1998; Vagle, 1995; Northrup & Little, 1996).

Transformation of Courses and Teaching

Educational use of technology has been integrated into all of my undergraduate and graduate preservice teacher education literacy development courses. All courses can be accessed at the following address: URL: http://www.sje.edu. All course syllabi are on the Internet with direct links to scholarly and consistently available web sites for literacy information, research data, lesson plans, assessment information, national issues in teaching and assessing English Language Arts (Rossiter & Bagdon, 1999). In addition, research (Gipe & Lamare, 1997; Vagel, 1995)) has shown that use of e-mail, e-journals and the Internet have been found effective instructional tools; therefore, all online syllabi contain links to all assignment, evaluation rubrics, required method of submission of assignments including email and the process for accessing course threaded discussions or e-journals.

Data Gathering: Preservice Teacher Technology Skills Self-Assessment

At the beginning of each semester, students complete a technology skills self-assessment which requires them to appraise their knowledge and expertise in the use of the Internet and email as having extensive experience, moderate experience or needing help. In addition, students were asked to respond to the following open-ended prompt:
When I (you) think of the role, use, and purpose of technology (the Internet and email) in the classroom, I think (I am concerned) that..

At the end of the semester, students are asked to discuss how the class affected their knowledge and expertisc of educational technology, the role, use, and purpose of technology (the Internet and email) in our class, use of email to submit and receive assignments and updates from the professor and the use of Internet for further readings, the threaded discussion, accessing and submitting lesson plans. In addition, students are asked to respond to the same open-ended prompt as at the beginning of the semester:
When I (you) think of the role, use, and purpose of technology (the Internet and email) in the classroom, I think (I am concerned) that..

Data Analysis

Preservice Teacher Technology Skills and Attitudes, Beginning of Semester
The results for one semester in **Table 1** show that for the most part approximately 88% of graduate and approximately 91 % of undergraduate students rate themselves as having extensive or moderate experience with computers. My students have computers at home. Some have several email accounts and can design web pages, use email to communicate socially with colleagues and friends, use the internet to complete class assignments, gather news information, look up personally relevant sites such as a child's school web page, order books, research topics of interest to family and friends, and use support group networks. (Cuban, 1999)

	Extensive Experience	Moderate Experience	Need HELP!!
Undergraduate (n = 24)	56%	35%	9%
Graduate (n = 25)	58.5%	29%	12.5%

Table 1: Preservice Teacher Technology Skills Self-Assessment of Knowledge and Expertise with Respect to the Internet and Email, Beginning of Semester

This project, also, involves the analysis of unstructured data including response to an open-ended statement about the innovation (integration of technology into courses) in order to develop an analysis or understanding of the feedback from students at the beginning of the semester and at the end of the semester. The structure for the data analysis is the Concerns-Based Adoption Model (CBAM): A Model for Change in Individuals **(Table 2).**

Typical Expressions of Concern about an Innovation	
Stage of Concern	**Expression of Concern**
6. Refocusing	I have some ideas about the technology that would work even better.
5. Collaboration	How can I connect what I am doing to what other teachers are doing?
4. Consequence	How is my use affecting the children? How can I change it to have more impact?
3. Management	I seem to be spending all my time getting materials and myself ready.
2. Personal	How will using technology affect me?
1. Informational	I would like to know more about its use in the classroom.
0. Awareness	I am not concerned about it. I have no computer and don't want or need one!

Table 2: Adapted from *Taking Charge of Change* by Shirley M. Hord, William L. Rutherford, Leslie Huling-Austin, and Gene E. Hall, 1987. Published by the Association for Supervision and Curriculum Development.

Although my students are relatively proficient and successful technology users, the data analysis using the Concerns-Based Adoption Model (CBAM): A Model for Change in Individuals shows that at the beginning of the semester both undergraduate and graduate students are most concerned with the consequences or negative impact of technology on students and with how the use of technology in the classroom will affect them personally **(Table 3).** Many students are concerned that technology will be misused by adults preying on children, make children too dependent on it, or that children will not have sufficient access to technological training, or be hurt in many other ways such as, *"I am concerned students will rely on the Internet a great deal during research - rejecting books and articles."*

"I think they need to be closely supervised by their teacher or some other adult because there are a lot of thing on the Internet that they shouldn't be looking at."

"The Internet is a wonderful aid and (but it) does not replace imagination, creativity and time spent working hard for the student."

"I am concerned that children spend too much time at home on the Internet using it for a social tool."

"I see a danger using computer time as a reward of lack of as punishment because it doesn't give kids the right motivation for learning."

With respect to the personal concerns as indicated in **Table 3**, at the beginning of the semester undergraduate and graduate preservice teachers are concerned with how educational technology will impact them directly rather than just its impact on students. Many undergraduate and graduate preservice teachers said, *I am concerned that*

"My fear and limited knowledge about the Internet is my greatest fear about becoming a teacher. It is something that I really need to work on. I don't know enough about the Internet to properly assist the students "

"I am a bit concerned that computers at some point will replace teaches and I think the human contact is just as important."

In addition, graduate students expressed management concerns such as

"I am concerned about sifting through all that is out there to find information that is appropriate to the lessons I'll be teaching."

"There is so much out there and it is so time consuming."

Finally, neither undergraduate nor graduate students seemed to posses much information about the application of educational technology to their own future teaching. Although graduate students did speculate about possible uses of email and the Internet as indicated by the following statements,

"Email can be used effectively in the classroom when students need to do research, and to connect them with other classrooms an over the world and of emailing pen pals in other states, cities, etc "

"Hyperstudio and downloading of worthwhile links from the Internet can be used effectively in any classroom to extend and enrich specific units of study at a very low cost."

"Using the Internet for research for the older students and to go along with themes in the classroom for elementary students."

Stages of Concern	% of Undergraduate Students **Beginning** of Semester	% of Undergraduate Students **End** of Semester	% of Graduate Students **Beginning** of Semester	% of Graduate Students **End** of Semester
Refocusing	0	0	0	0
Collaboration	0	0	5	0
Consequences				
• Negative	48	17	42	0
• Positive	4	9	0	24
• Social	8	22	0	24

Management	0	4	12	18
Personal	33	30	21	45
Informational	4	4	4	0
Awareness	0	0	4	0
Anticipated Uses				
Specific Applications	4	8	21	91
General Applications	12	22	12	27

Table 3: Preservice Teacher Perceptions of Role, Use and Purpose of Technology at Beginning & End of Semester

Data Analysis: Preservice Teacher Technology Skills and Attitudes, End of Semester

Focus on Instructional Use of Technology

Although I am always grateful that course evaluations are done at the end of the semester not at the beginning, **Table 4** shows that student feedback with respect to the use of technology in my literacy classes is extremely positive. Students say,

"I think the technology is certainly enhancing the learning. This is good in that it is making the class aware of the information to which we have access. Technology is affecting our learning in a positive way."

"Technology aspects are refreshing. Many of my profs hate e-mail, are afraid of attachments, and so on. I feel that technology has extended the classroom to my home and increased my educational opportunities. I love it."

" Technology is having a tremendously beneficial effect. At first I was uncomfortable using the computer, but now I am at ease. I find it enjoyable and relaxing. I also think it's really cool to be able to post ideas on the discussion forums and respond to others ideas. I wish more professors wo7ld use the email and Internet to make their course materials and themselves more accessible to students."

"The technology certainly enhances the learning process and I am forced to stretch to learn...to become computer literate. this can only make me a better teacher."

It is interesting to note that almost half of the graduate students who tend to be older than undergraduate students refer to the use of technology in terms of enjoyment and discuss a delight in learning something new. I would speculate that this might be due to the fact that the undergraduate students have been surrounded by the technology and view it in very ordinary terms. Whereas, the more mature graduate students may still be able to recall typing papers on a typewriter and are appreciative of the wonders of a simple word processor. And, although some graduate students stated that the use of email unnecessarily complicated assignments and caused stress, over 60% of them appreciated its timesaving and efficient nature and the immediacy of communication with peers and the professor.

Comments on Use of Email	Undergraduate Students	Graduate Students
Convenience • Efficient or Timesaving • Enjoyable	61%	63% 44%
Frustrating • Stress & worry - Initially difficult • Complicated the assignment	9%	29% 25%
Requested more immediate feedback from professor	18%	0%
Appreciative of new learning experience	0%	44%
No comment	22%	0%

Table 4: Use of email to submit and receive assignments and receive updates from professor

Submitting lesson plans for publication on the World Wide Web proved to be the most exciting technological innovation for graduate students.

"Well, I did it successfully and was published! I guess that just about says it all for the impact!"

"Lots of satisfaction knowing I'll see it posted. When grandma surfs the web in Michigan, she'll see it!"

"It was fun to have my lesson plan accepted by ERIC. I can't wait to see it posted."

"Creating a lesson plan with the thought of submitting helped to motivate me. I could see adapting this as a motivating technique for my students."

On the other hand, the attitude of undergraduate students toward this activity may be summarized in the words of the following student,

"I think it was unnecessary. I think it should be an option for you if you want to do it but you shouldn't have to do it."

However, a few students find that the integration of technology is having a negative impact on their learning and would prefer a stand-alone computer course to this instructional method. For example,

"I feel it is inhibiting my learning. Some of the things we uncover are interesting and informative but after a while it just becomes time consuming and monotonous."

"Sometimes I feel a little bit overwhelmed with the amount of time I spend on the Internet."

Conclusion: Focus on Implications for Future Application of Education Technology by Preservice Teachers

At the end of the semester, some my students demonstrated some dramatic changes as shown in **Table 3**. Although educational *consequences* and *personal* concerns are still the main concerns about the role, use and purpose of technology, these concerns are of a different nature. The concerns about perceived possible negative effects of the technology diminish greatly for both graduate and undergraduate preservice teachers. What does emerge in terms of education consequences are concerns about the impact of limited access to computers for some segments of our populations. These preservice teachers are giving voice to their social consciences as evidenced in the following words,

"I'm afraid many of the urban schools will be robbed of the possibilities and activities offered."

"How do I level the playing field for those students who have no access to computers or no desire to become computer literate?"

And, graduate students' *personal* concerns increase greatly in that they are concerned about being able to keep up with the rapid pace of technological innovation. As one student stated,

"I assume that by the time I am teaching (2 years) technology will continue to advance at an alarming rate."

Finally, as indicated in **Table 3**, graduate students seem to be able to articulate many specific ways that they foresee being able to use technology in their future classrooms. For example,

"Most definitely I will implement an email system in my classroom or an informal communication similar to it. I plan to include the Internet in some long-term projects that include research. I bought the print shop and will create motivational banners and certificates. I want to create a website with my class. I think that would give them a sense of pride and foster a cooperative community."

"I have already begun to collect educational software to be used for grades 1-3 which is where I hope to teach. I plan on providing TECHNOLOGY TIME for my students each day. I will allow 2-3 students to work on a computer and explore the wonders of technology. I'd also love to have students begin to learn proper ways to type. I'd like to offer a typing tutor program to 2nd and 3rd graders."

"I will use technology in my classroom through computer software such as Bailey's Bookhouse."

Unfortunately, this was not the case with undergraduate students who did not seem to make this intellectual leap. Undergraduate students tended to view educational technology in very general terms such as,

"Email and the Internet are very good tools for learning and gaining current information."

"It is good to have as an addition to traditional ways of research and teaching."

It would seem that undergraduate students need a somewhat different preservice experience with technology before they can speculate on how they might be able to apply it to their own teaching in the future. This experience has provided a direction for future research and has great implications for my efforts to use the integration of technology into my teaching as a vehicle for developing educational technology skills of future teachers.

References

Cuban, L. (1999). Thc Technology Puzzle. *Education Week on the Web.* Retrieved September 15, 2000 from the World Wide Web: http://www.edweek.org/ew/vol-18/43cuban.h18

Gipe, J.P. & Lamare, J.A. (1997). Preservice Teachers Integrating Technology Into a Corrective Reading Course. *College of Education University of Houston.* Retrieved December 7, 1999 from the World Wide Web: http://www.coe.uh.edu/insite/elec_pub/HTML1997/rl_gipe.htm

Hord,S., Rutherford, W.L., Huling-Austin,L. & Gene E. Hall. (1987). *Taking Charge of Change.* Association for Supervision and Curriculum Development.

National Standards for Technology in Teacher Preparation. (1998). *International Society for Technology in Education.* Retrieved December 7, 1999 from the World Wide Web: http://www.iste.org/Resources/Projects/TechStandards/index.html

Northrup, P.T. & Little, W. (1996). Establishing Instructional Technology Benchmarks for Teacher Preparation Programs. *Journal of Teacher Education.* 47(3), 213-223.

Powers, S. (1998). Developing a Need for the NCATE/ISTE Standards for Pre-Service Teachers. *College of Education University of Houston.* Retrieved December 7, 1999 from the World Wide Web: http://www.coe.uh.edu/insite/elec_pub/HTML1998/pt_powe.htm

Queitzsch, M. (1997). The Northwest Regional Profile: Integration of Technology in Preservice Teacher Education Programs. *Northwest Educational Technology Consortium.* Retrieved November 22, 2000 from the World Wide Web: http://www.netc.org/preservice/challenge.html

Resources for 21st Century Teachers. (1999). *International Society for Technology in Education.* Rctrieved September 15, 2000 from the World Wide Web: http://www.iste.org/Resources/Projects/21Century/index.html

Rossiter, D. & Bagdon, K. (1999). Embedding the Acquisition of Technological Literacy: A Case Study. *Educational Technology Journal.* 2(4). Retrieved December 7, 1999 from the World Wide Web: http://ifets.ieee.org/periodical/vol_4_99/rossiter.html

Technology Competencies for Connecticut Educators (1997). *Area Cooperative Educational Services.* Retrieved September 15, 2000 from the World Wide Web: http://www.aces.k12.ct.us/www/pdsi/techcomp.html

Transforming Learning: Technology Integration Across the Teacher Education Curriculum. (1999). *National Council for Accreditation of Teacher Education.* Retrieved September 15, 2000 from the World Wide Web: http://www.ncate.org/accred/projects/tech/ci8.htm

Vagle, R. (1995). Technology Instruction for Preservice Teachers: An Examination of Exemplary Programs. *College of Education University of Houston.* Retrieved December 7, 1999 from the World Wide Web: http://www.coe.uh.edu/insite/elec_pub/html1995/087.htm

Zellner, R. D., Denton, J. & Zellner, L. Integrating Technology with Practice: A Technology-enhanced, Field-based Teacher Preparation Program. *National Information Infrastructure.* Retrieved December 7, 1999 from the World Wide Web: http://bob.nap.edu/readingroom/books/whitepapers/ch-63.html

Co-operative Teaching and Learning in Information Technology and Modern Foreign Languages

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Abstract: This paper examines three years' experience of collaborative teaching and learning of ICT on a PGCE course leading to qualified Teacher Status.
Groups of students intending to teach ICT as their subject specialism have worked with groups training to teach Modern Foreign Languages to develop MFL teaching and learning materials that make effective use of ICT. They have then worked together in local secondary schools, using the materials to teach pupils from across the secondary age range (11 – 19).
This paper examines how these experiences change the attitudes to ICT of Modern Foreign Language students and how it affects their subsequent use of ICT to deliver MFL teaching and learning in the secondary school classroom.

Introduction

At Sheffield Hallam University we are in the third year of a project in which a group of student teachers with ICT as their specialist subject, work with the Modern Foreign Languages (MFL) group to support their ICT development. This includes the development of suitable teaching materials within the university and visits to local secondary schools to support the MFL students' use of ICT in teaching French, German and Spanish. The initial results, reported during the first year (Chatterton, J & Willan, C, 1998), were very encouraging and the project is very much "on-going". The work has been developed and extended in each of the last two years and this paper discusses the student experiences to date and their changing perceptions of the possible role of ICT in their teaching.

In 1998 (DfEE 1998) it became compulsory for all students in initial teacher training to achieve a range of competences in using ICT, both to support teaching and learning in their specialist subject area and for their own professional development. In September 2000, a new National Curriculum for England and Wales (DfEE, 2000) came into force that made it compulsory for all pupils to be "given opportunities to apply and develop their ICT capability through the use of ICT tools to support their learning in all subjects". The modern foreign languages document goes on to say that:

"Pupils should be given opportunities to support their work by being taught to:

(a) find things out from a variety of sources, selecting and synthesising the information to meet their needs and developing an ability to question its accuracy, bias and plausibility
(b) develop their ideas using ICT tools to amend and refine their work and enhance its quality and accuracy
(c) exchange and share information, both directly and through electronic media

(d) review, modify and evaluate their work, reflecting critically on its quality, as it progresses. "

All those involved in initial teacher training must ask, how are we to ensure that our trainees develop their own skills and the necessary professional judgement to know how, when and where to make effective use of ICT in their teaching?

ICT and Modern Foreign Languages

It is important that ICT is used genuinely to support and develop MFL skills and is not merely a token gesture. Many examples of the latter have been seen where, for instance, pupils spend 30 minutes drawing a picture, then use only a few words or a single sentence of French to describe it. Pachler and Field say that it is important "... for the MFL student teacher to ensure that pupils using information obtained particularly via CD-ROM and/or the internet have actually understood the material and developed and/or consolidated linguistic skills, knowledge and understanding in the process of using this technology." (Pachler, N. & Field, K. 1997)

In fact, there are many opportunities for pupils to make good use of ICT in supporting their learning of MFL. A non-exhaustive list of examples might include:

- The World Wide Web provides easy access to a range of authentic original sources (though there are issues about which sites are appropriate and usable at different levels).
- E-mail allows pupils to have direct and authentic contact with native speakers, allowing both the development of language skills and increasing cultural knowledge and awareness.
- Multimedia packages provide great help in catering for differentiation needs.
- Text manipulation packages help pupils to develop reading skills by text prediction and to develop memory skills through having to fill in gaps in a text having viewed the complete version for a time etc.
- Word-processing allows pupils of all abilities to redraft written work with relative ease (without going through the "red pen stage"!) and to produce a well presented finished article.

Cajkler and Addelman, however, make the point that "... many teachers may be wary of the computer and lack the skills and confidence to make full use of it in their teaching." (Cajkler and Addelman, 2000)

A recent report of an inquiry by the prestigious Nuffield Foundation deals at some length with the issue of technology and the importance of its role in language learning, making a number of recommendations for enhancing its use in a variety of ways. It says that "ICT has immense potential to enhance language learning ... it moves the focus from teaching to learning ..." However, it goes on to say that "The full potential of ICT has yet to be realised in languages. Levels of use of ICT in language learning vary dramatically from sector to sector and from one institution to another." and that "In schools there is evidence that logistical problems still make it difficult to provide levels of pupil access needed for success." (The Nuffield Foundation, 2000)

It is in this context of *compulsion* from the government, *resistance* from some teachers and *insufficient facilities* in schools that our students have to demonstrate their ability to use ICT in all aspects of their professional development.

Development of the Project

The co-operative teaching and learning project is now in its third year. In the first year of the project we took a decision to concentrate on information handling skills. This had a number of advantages for both groups of students:

- information handling skills are easily applied to real-life and rôle play situations
- they can play a valuable part in encouraging target language use in MFL teaching and learning;
- the teaching of information handling skills forms a central part of the ICT school curriculum

- the MFL students were almost universally lacking in experience of using ICT to deal with information
- ICT-based information handling skills are currently under used in schools.

The sessions were entirely based within the university and it was left to the students to make use of the skills within their school placements.

In the second year of the project, the scope was widened to include using word-processing, art packages and html to prepare good quality teaching materials, including a small web-site. While students reported relatively high levels of WP skills on entry to the course, their view of what a word processor could do was limited: it became apparent that they had not considered the use of such things as call-outs, text boxes, flowing text around graphics etc. Work by the ICT studcnts helped the MFL students to gain experience with such techniques within the target language. The MFL students, supported in the classroom by the ICT students, then used the materials to teach a number of sessions in a local secondary school. This year, the scope of the university-based sessions is effectively the same, but the school-based sessions will be extended to include a much larger group of pupils.

The Shared Sessions

It was clearly important, for both groups of students, that they developed the skills and attitudes that would enable them to match the government's requirements for the award of Qualified Teacher Status. The IT students were asked to plan and deliver the sessions, to create any necessary materials and to evaluate the effectiveness of the teaching and learning. In doing so, the sessions would meet very many of the standards laid down in DfEE circular 4/98, although this might be regarded as fortuitous as the original sessions were actually planned before we had sight of the document.

From an ICT viewpoint, the sessions covered a wide range of topics from basic computer skills, through text and image manipulation to data-base and web-site creation and manipulation. However, these were presented in a format that focussed on the types of activities normally found in a modern languages classroom – creating worksheets and games, setting up rôle play activities, searching for and organising information sources in the targct languages etc. This sort of activity matches closely the expectations that schools have of ICT teachers: they not only teach the pupils, but also have a part to play, formally or informally, in developing the ICT capabilities of their colleagues in other departments.

For the linguists, the sessions would tackle directly their weaknesses in ICT, as revealed in the IT skills assessment done at entry to the course. The sessions would also give them some insight into how a relatively low level of ICT expertise could be used prepare good resources and to provide a good teaching and learning experience. They would also enable the students to practise their new ICT skills in the classroom, while being supported by ICT specialists.

Two example databases have been jointly developed by the students: in the first year students created a very simple "Hotel Room Booking" database; last year the new students created their own version of this and then went on to create a tourist "Campsite" database with links to on-line, commercial databases. These were intended for use as a stimulus for pupil rôle play activities across a wide age-range. For example, within the classroom one pupil would have a cue card / rôle play card telling him/her to request, from a tourist office, a campsite with various specified facilities. The other pupil would use the database to find a campsite appropriate to the needs of the "customer". The national curriculum document states, in programme of study (PoS) part 1 that: "Pupils should be given opportunities to take part in activities in the target language that, where appropriate, combine two or more of the four language skills...." The rôle play activity fulfils the need in that both pupils are using speaking and listening skills within the context of a two way conversation and the "tourist office employee" is also using reading skills as s/he searches the database. The "Hotel Room" database would, of course, operate in much the same way, although with different vocabulary. With older children, the on-line elements allows them to interrogate live databases for details of campsites and to add the information to their own database, perhaps targeting the language for younger pupils to use. Thus they meet all four aspect of the language curriculum – listening, speaking, reading and writing – as well as many of the ICT aspects.

Gains — Skills and Attitudes

At the start of the one-year, postgraduate training course all students are asked to complete a self-assessment sheet in ICT: this is repeated towards the end of the year. The returns have been examined to look for changes in perceptions of ICT skills by the MFL students and to compare the MFL students with those from other groups who had not had input from the IT student group. It was decided to compare the MFL group with the English student group, as both tended to have non-technical backgrounds and, on entry, similar knowledge/attitudes to IT.

Over the three years, the initial assessment of ICT skills has shown no significant difference ($\rho \sim 0.5$) between the PGCE English and MFL and the course planning documents showed a similar level of expected ICT input, except for the joint IT/MFL sessions. Comparisons of the figures on the exit assessment with those at entry has shown that, while both groups gained in ICT skills, the *improvement* has been much more significant for the MFL group ($\rho < 0.0001$) than for the English group ($\rho \sim 0.025$). A direct comparison of the two groups at exit showed also that the MFL group's perceptions of their own ICT skills was significantly higher than the English group's ($\rho = 0.024$).

In the second year of the programme, the ICT and MFL groups worked together in language classrooms in a local school, with a number of different year-groups (grades). These sessions produced a marked enthusiasm from the pupils, apparent gains in language practice and a very positive attitude by the teaching staff involved. Indeed, the school staff retained the materials for their own use and they have been keen to be involved in further sessions. Methods of teaching which support or encourage pupil participation are important and, again, the effect has been noted elsewhere. "Many teenagers, particularly boys, who may be reluctant to engage in classroom interaction and are not inspired by conventional language teaching materials, have a keen interest in computers as well as excellent screen and keyboard skills." (The Nuffield Foundation, 2000) The ICT and MFL students, too, were very positive about university and school-based sessions, both in terms of "enjoyment" and in perceived gains.

Exit figures for this year's students are not yet available, of course, but initial survey data shows considerable positive feedback from the early sessions. After some 30 days in school, of which half was actual whole class teaching time, the Modern Foreign Languages students were asked to complete a questionnaire relating to their experiences, attitudes and use of ICT in a teaching context. Replies were received from 20 out of 22 students.

Considerably more than half reported that they were using computers frequently to make worksheets and flashcards for their teaching and all of the others were making at least occasional use in this context. Many also made overhead transparencies, language games or used ICT to present language in other ways.
In terms of 'monitoring, assessing and recording', one of the required competences, the pattern was rather more patchy. Few had, as yet, taken on ICT use for this purpose, although two were making frequent use in other administrative contexts.

About half of the trainees had used ICT with pupils to meet teaching and learning objectives, mostly on only one or two occasions thus far, though one student was working every week in the ICT Lab with a MFL group. Pupils had been involved in such activities as:

- designing birthday cards, using the internet to search for information;
- presenting statistics gathered from a class survey conducted in the foreign language;
- word-processing a description previously done for homework;
- playing language games found on a an internet site;
- writing coursework assignments;
- creating a database from a survey of class pastimes;
- moving text boxes (in text matching exercises); and
- writing the class timetable in the foreign language.

All trainees, with one exception, intended to use ICT with classes as they continued through their placement but some expressed their uncertainty about how possible it would be in view of logistical difficulties – in particular access to computers. This fits with observation in a number of other contexts, such as quoted from the Nuffield report (ibid.) or by Cajkler & Addelman "Many schools are unable to offer full access to the computer to language teachers." (Cajkler and Addelman, 2000)

Some two thirds of the trainees said they had continued to develop their personal ICT skills during their time in school. This was done variously by independent practice, by working with the school IT co-ordinator, by working with their mentor or by working with other students. Two students had bought their own computers to further enhance their skills. More than half of the trainees reported that their skills had been considerably enhanced and/or they had learnt new skills in the joint sessions at the University while all the others except two felt that their skills had been extended to some extent. Of the two others, one reported that s/he already had very high level skills and the other felt s/he was "treading water". About two thirds of the students felt more confident and/or more enthusiastic because of the sessions and, of those who felt that this was not so, it was because their enthusiasm and/or confidence was already at a high level.

The Modern Foreign Languages departments in which the trainees were placed showed a wide range of involvement in the use of ICT to achieve learning and teaching objectives in MFL. The departments were almost exactly evenly split between those using ICT frequently, those making occasional use of ICT and those never doing so. Some students felt that they had themselves contributed to developing their department's ICT use. Current evidence for this is rather thin, as, at the time of writing, this year's trainees have only completed a short period of time in their schools. However, examples of contributions to the work of the departments that has already been done includes:

- providing print-outs of materials from German websites for departmental use;
- sharing ideas with the new Head of Department in the school; and
- storing copies of electronically created worksheets on the school's computer for other department members to use.

Conclusion

The students' immediate, enthusiastic response to the sessions initially encouraged us to continue to develop and extend the work. However, it is not just enthusiasm: a number of measures have all indicated that the students make good progress in their ICT skills and confidence and that they are able to demonstrate this new confidence in the stressful setting of their first teaching placement. Comparisons with other, apparently similar, students show to good effect the benefits of co-operative teaching and learning. In what might be seen as a constructivist setting, students are able to build on their existing skills in an open and supportive environment and to transfer these gains successfully to a variety of settings.

It remains relatively unusual for training sessions to be so universally well received by the different groups involved – our students, teachers in school and the school pupils themselves. This is due, in no small part, to the level of co-operation and mutual support achieved within the students groups themselves. It is also noteworthy that, for the first two years of the project, a relatively small time commitment within the university has produced a clearly demonstrable effect on students' attitudes and skills several months and a long teaching placement later.

The use of ICT is now effectively a requirement in teaching and, in many schools, the ratio of pupils to computers is in single figures. As computers in the classroom, and at home, become increasingly the norm, motivational effects due to the novelty of using a computer will fall away. It will be interesting to see, then, how the upward trend in our students' skills and attitudes to the use of ICT in their own classrooms continues this year, particularly as the three populations involved become ever more used to having computers around.

Bibliography

Cajkler, W. & Addelman, R	2000	The Practice of Foreign Language Teaching, 2nd Edition David Fulton Publishers, London
Chatterton, J & Willan, C.	1998	Teaching IT, Learning MFL Proceedings of the 1998 ITTE Conference, "Moving Forward", University of Amsterdam
DfEE	1998	Circular 4/98, Annexe A. Standards for the Award of Qualified Teacher Status DfEE London
DfEE	2000	The National Curriculum DfEE, QCA London
DfEE	2000	Modern Foreign Languages in the National Curriculum DfEE, QCA London
DfEE	1998	Teaching: High Status, High Standards *Requirements for Courses of Initial Teacher Training* DfEE London
Pachler, N. & Field, K.	1997	Learning to Teach Modern Foreign Languages in the Secondary School: a companion to school experience Routledge London and New York
The Nuffield Foundation	2000	Languages the Next Generation: the Final Report and Recommendations of the Nuffield Languages Inquiry Distributed by Thc English Company (UK) Ltd.

Analyzing Bilingual Education Preservice Teachers' Learning Outcomes in a Computer Literacy Course: From the Technological Perspective and the Pedagogical Content Perspective

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Abstract This paper presents findings of a study designed to analyze student performance from two unique perspectives: the technological perspective and the pedagogical content perspective. The student population consisted of three separate cohort groups enrolled in a computer literacy course (CS 1105) and a bilingual instructional reading course (READ 3303) concurrently. Students were enrolled in the courses during the fall 1999, spring 2000, or summer 2000 semesters. All students were preservice teachers in the bilingual education program at the University of Houston-Downtown's Department of Urban Education. During the semester enrolled, the students were required to complete several major assignments integrating technological content knowledge with pedagogical content knowledge. Assignments included the creation of an instructional lesson plan, a World Wide Web search for information to be used instructionally, and the production of a graphic organizer to present educational information. For each assignment, students were to show their mastery of the technological tool while also showing competence in a pedagogical content area. All student assignments were evaluated by both the technology professor and the bilingual reading professor. This study collected information on the similarities and differences between the grades received and comments noted by the two professors, each from a different perspective.

Introduction

The mission of the Department of Urban Education is to prepare future teachers for the urban classroom who will enhance the chances of academic success for at-risk children and adolescents in inner-city schools. Its teacher education program is a state approved Center for Professional Development and Technology. The center trains new elementary, secondary, and bilingual teachers and also provides staff development and technology support for public schools.

During the school year 1999-2000, there were approximately 432 students in total who registered in the three successive Blocks of professional development courses (91 in secondary education, 101 in bilingual education, and 239 in elementary education). To help them gain the knowledge and experiences needed to be a teacher of at-risk students, the department requires undergraduate and post baccalaureate students who have been admitted to the teacher education program and who do not currently teach on a permit in a public school classroom to successfully complete three interdisciplinary blocks in urban public schools in the Houston area. Following the model developed by Haberman (1991), the UHD-CPDT enables projective urban teachers to participate during their junior and senior years in a 27 semester-hour field-based professional development sequence in the format of blocks. The district-wide demographic line graph (see Figure 1) indicates that in the year 2000, students of Hispanic origin (approximately 120,000 students) make up over 50 percent of the student population in Houston Independent School District. This is a district that is currently a UHD partner for which UHD graduates will most likely serve. African

American students (approximately 70,000) are second, followed by Anglo students (approximately 23,000) and students categorized as Other (approximately 5,000) (http://www.houstonisd.org/ab/images2/enroeth.gif).

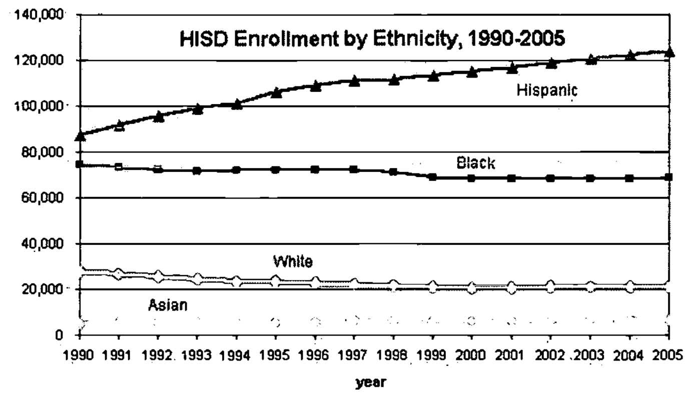

Figure 1: HISD District-wide demographic line graph

The 1990-98 Migration Scenario (see Figure 2) provided by Texas State Data Center at Texas A&M University shows rates consistent with 1990-98 patterns of total net migration and the 1980-90 patterns of ethnic distribution of migrants. This scenario predicts larger rates of Hispanic and Other population growth and smaller rates of Anglo and African American population growth in the Houston area as well as for the state of Texas as a whole. Under this assumption, the growth of students of Hispanic origin will continue to be strong in the next few decades (http://txsdc.tamu.edu/cgi-bin/prjctn2000.cgi).

Population 1990 and Projected Population 1995-2030 by Race/Ethnicity and Migration Scenario for Houston PMSA

YEAR	TOTAL	ANGLO	BLACK	HISPANIC	OTHER
1990	3,322,025	1,884,557	601,230	709,370	126,868
1995	3,675,520	1,976,963	655,288	874,517	168,752
2000	4,034,540	2,043,922	712,505	1,058,235	219,878
2005	4,413,919	2,094,732	773,324	1,263,269	282,594
2010	4,834,437	2,139,100	840,208	1,495,698	359,431
2015	5,314,616	2,182,731	917,161	1,763,701	451,023
2020	5,851,150	2,219,596	1,003,430	2,069,917	558,207
2025	6,433,557	2,241,093	1,097,746	2,413,005	681,713
2030	7,063,986	2,247,118	1,201,164	2,793,719	821,985

Source: Texas State Data Center

Figure 2: The projected population 1996-2030 in Houston area

Bilingual education teachers are in one of the critical shortage areas in Houston. The Bilingual Education program at UHD has recently been awarded a 5-year grant by the Department of Education in the amount of $ 3.1 million to prepare new teachers and current teachers to better serve Limited English Proficient students. The new grant from DOE and the Gordon & Mary Cain Future Teacher Scholarship are expected to attract more applicants to the program in Bilingual Education. It is the department's urgent need to lay out the infrastructure to better support the incoming pre-service teachers. The improvement of prerequisite courses for the teacher education program and pedagogy and methodology courses are under discussion.

In order to provide its students with experience in using technology to enhance instruction and professional development in Bilingual Education classrooms, the department is blueprinting its way to integrate the educational computing component into its existing interdisciplinary block structure.

Since its conception in 1995, the department has a technology component combined with its "block" structure. The technology training is a one-hour credit course, which is held in the on-campus computer lab. The course CS1105 is described by Chen in "The Way to Go: Integrating Instructional Technology Initiatives into a Teacher Education Program." As described in the syllabus for the course, the five technology sessions are integrated into the first block for the pre-service teachers at the Department of Urban Education (http://www.dt.uh.edu/degree/urbaned/home1.htm). The course is offered in the format of five workshops of three hours each, which are spread throughout the whole semester. This paper presents findings of a study designed to analyze student performance from two unique perspectives: the technological perspective and the pedagogical content perspective.

General course framework for CS1105

The titles and brief descriptions of the five workshops (3 hours each) currently offered have been discussed by Bhattacharjee and Chen (2000) and are briefly summarized as follows:

Workshop I: E-mail & Internet Discussion
The instructor begins with an introduction to the use of different professional teachers' forums over the WWW by showing pre-service teachers how to follow the threads, respond to interesting topics, and start their own subjects. The instructor also assists students in creating accounts with a web-based e-mail program such as Hotmail and Yahoo. The instructor then demonstrates the ways to check in-coming mail, compose out-going mail, send documents as attachments, forward and respond to mail, set up distribution lists to send to multiple recipients, set up automatic signature files, and organize read e-mails into different folders.

Workshop II: WWW & Web Search
The instructor begins by showcasing the CS1105 class web site created just for them (http://www.dt.uh.edu/~chen/cs1105.html). The web site consists of different applications and examples of WWW uses in K-12 classrooms. Examples might include a demonstration for the bilingual education groups which emphasize Mexican culture and Spanish language arts. Students also learn how to download texts and graphics from the Internet while sharpening their web search and web research skills at the same time.

Workshop III: Desktop Publishing & Graphic Organizers
The instructor guides the students with the creation of a simple flyer and a newsletter while allowing them the flexibility of applying clip art, word art, colors, and content to enhance their ownership of the product. After this, the instructor explains the different looks and uses of graphic organizers and demonstrates the creation of a thematic unit with the fundamental building blocks of graphic organizers such as text, circles, lines, and colors.

Workshop IV PowerPoint Presentation

The instructor leads the students in creating two simple slides with headings, text, graphics, and charts by following an activity guide. The workshop ends with the showing of the more advanced functions of PowerPoint such as animation, sound, and transitions.

Workshop V: Software Evaluations

The software evaluation session starts with software demonstrations including *Story Book Weaver, Body Works, Amazon Trails, Just Grandma and Me, and Encarta.* Students are then informed about various criteria used in software evaluation. The workshop concludes with the students filling out software evaluation rubrics so that they will become comfortable judging educational software.

Analysis of observations

During the semester enrolled, the students were required to complete several major assignments integrating technological content knowledge with pedagogical content knowledge. Assignments included the creation of an instructional lesson plan, a World Wide Web search for information to be used instructionally, and the production of a graphic organizer to present educational information. For each assignment, students were to show their mastery of the technological tool while also showing competence in a pedagogical content area. All student assignments were evaluated by both the technology professor and the bilingual reading professor. The following analysis study collected information on the similarities and differences between the grades received and comments noted by the two professors, each from a different perspective.

The following observations are based on student population that consisted of three separate cohort groups enrolled in a computer literacy course (CS 1105) and a bilingual instructional reading course (READ 3303) concurrently. Students were enrolled in the courses during the fall 1999, spring 2000, or summer 2000 semesters. All students were preservice teachers in the bilingual education program at the University of Houston-Downtown's Department of Urban Education.

From the Technological Perspective

When delivering the workshops, the technology instructor has tried to customize the activities to meet the special needs of Bilingual Education preservice teachers. For example, during Workshop II: WWW & Web Search, more culture and language related sites were demonstrated and discussed. Online resources such as Investigating Mexico (http://www.infinet.com/~baugust/mexico.html) and lesson plan archives just for Bilingual Education teachers are introduced. During Workshop V: Software Evaluations, the technology instructor demonstrated both the applications of the English version and the Spanish version of *Just Grandma and Me* by the Living Book, conducting student collaborative writing in Spanish with *Story Book Weaver* by MECC, and reviewing other tutorial/drill/practice for language learning with a critical mind to detect cultural or gender bias.

From the homework, the technology instructor can detect the different angles or perspectives taken by preservice teachers in regular Elementary Education preservice teachers and Bilingual Education preservice teachers. Teachers today face a challenge in ensuring students are given the opportunity to master basic skills. The preservice teachers are aware of the fact that some of the students in Bilingual Education classrooms do not have parent to read with them, either because the parent are too busy or do not have the reading skills. For example, in lesson plans intended to incorporate the *Exploring Yellowstone* CD-ROM by MECC in early childhood classrooms, regular Elementary Education preservice teachers more commonly emphasize on the knowledge parts while Bilingual Education preservice teachers have one more mission in mind, which is to enrich their students' vocabulary. Lesson Plan One (see Appendix A) and Lesson Plan Two (see Appendix B) are two original lesson plans designed by two Bilingual Education preservice teachers.

The technology instructor observed that reading/writing is by far the most popular subject when it came to picking content, whether the homework is for newsletter, lesson plans, PowerPoint, or graphic organizer. The author of Lesson Plan One sounds adept and comfortable with the content and therefore the quality of the technology integration is excellent. However, for the rare ones that take science or math as the subject, the technology instructor can perceive that the preservice teachers are trying out a new field and are inept in doing so.

Take Lesson Plan One for example, the preservice teacher is focused, and can write an effective lesson plan with a clear goal in mind. However, the author of Lesson Plan Two has used many words but is still ineffective in grasping on a certain aspect of science. The instructor senses the need to find a balance among the subjects and better prepare the preservice teachers for the science/math subjects for them to feel more comfortable.

The technology instructor has also observed that the software mentioned in students' work are the cartoon/game type of software that are most commonly found in the market such as *Blue's ABC Time Activities, First Grade Reader Rabbit Program, Colorful Letters* and *Numbers, Dally Doo, you can too!!!Alphabet. The Jump Start* program series seems to be the software that has most frequently been incorporated into the lesson plans turned in by many students. Having noticed students' limited selection, the instructor feels the need to broaden students' knowledge of the different types of educational software including simulation, problem-solving, etc. There is also a need for the instructor to familiarize the students with the publishers of educational software, the various educational software catalogues where they can purchase specialized software through the mail, and the online software.

The instructor reminded the preservice teachers that although Spanish software is hard to find even in such a ethnically diversified city such as Houston, many educational titles can be "repurposed" to fit the needs of bilingual students. A piece of software currently available in the market can be repurposed and turned into useful instructional material for bilingual classrooms.

The technology instructor has noticed that the Bilingual Education preservice cohort group tend to have a good rapport with each other and are excellent collaborative learners in comparison with the regular Elementary Education and Secondary Education cohort groups. I have observed that they helped each other and learned from each other more often then the other cohorts.

The technology instructor is very pleased with the quality of work turned in by the preservice teachers. When compared with the work turned in by regular Elementary Education and Secondary Education preservice teachers, it does not represent any less of quality at all. During classroom instruction, the technology instructor can feel the preservice teachers' eagerness to learn. This eagerness to use technology is carried on to Block II and Block III as the technology instructor hears all the time of other instructors' comments on how well their students can use technology. It is hoped that the same attitude can be carried on to their future classrooms.

From the Pedagogical Content Perspective

When delivering instruction for the READ 3303 course, a focus is placed on how to deliver reading and content instruction to school-aged learners in an effective and meaningful manner. Bilingual pre-service teachers must be trained and knowledgeable in all of the same areas as a mainstream teacher. In addition, the bilingual pre-service teacher must also have special training and a higher emphasis on educating special populations including culturally diverse and linguistically diverse student populations. As the bilingual students vary widely in their educational backgrounds, it is important to present instruction using a variety of methods that take learning styles into consideration. This includes making allowances for visual learners, audio learners, and tactile/ kinesthetic learners.

One way to approach instruction in this manner is to make use of instructional technology. By incorporating graphic organizers into instructional presentations, pre-service teachers are better able to visually represent content knowledge to their students. Also, by being familiar with what is available through the web and how to do web searches on specific teaching methods, the pre-service teachers are able to take advantage of instructional activities designed for audial and tactile/kinesthetic learners. There is a wealth of information as well as activities already developed and available on the web for use with language minority students with various learning styles and other educational needs. Being able to access this information has been very beneficial to the pre-service teachers when developing lesson plans in reading and in the content areas. Also, being able to communicate electronically with peers, other professionals, and professional organizations has enabled the students to tap into an additional wealth of human resources and share/compare ideas with others for the purpose of enhancing the instruction that children receive in the classroom. For these reasons, participation in the instructional technology workshops has been invaluable to the students and has also improved their performance in the reading content course.

An observation from the pedagogical point of view is that when the students in the reading content classes are given an assignment to research information related to reading and bilingual education or bilingual populations, they seem to feel comfortable with the task from the beginning and have confidence in their own skills to use the internet web resources. Also, when students need assistance in developing additional ideas or activities related to a certain lesson plan, they are quick to consult their peers, other professionals, and professional organizations for ideas. They make these consultations using their e-mail skills and Internet search skills.

Another observation is that the students tend to use their newly acquired technological skills with rigor. Although the quality of work in the content area demonstrated by the students is high, it is also clear that overall, students tend to spend more time on the technological aspect of the assignment than the content itself. Students have stated numerous times that they enjoy using the technology so much, that they will spend extra hours developing the technological aspect of the assignment, sometimes to the point of overshadowing the actual reading content. This attitude of enthusiasm toward the use of technology is welcomed by the reading content professor, because as mentioned before, the quality of work in the content area is still very high. Also, these students are in their first semester of the blocks. As they move into the second and third semesters, they will be much more adept in using the technology for instructional purposes. The reading content professor hopes this enthusiasm for integration of technology continues in future semesters and into the field as well.

Conclusion

The efforts of the technology instructor and the pedagogical content instructor in conducting the analysis of the Bilingual Education preservice teachers' learning outcomes in a computer literacy course is part of the planned infrastructure to better support the in coming pre-service teachers. With nearly 10 % of children ages 5-17 nationwide speaking Spanish at home, and as many as 22 % in California and Texas, teachers today face a challenge in ensuring students are given the opportunity to master basic skills. Technology is a great tool in helping the students in Bilingual Education classroom facing the challenge. I noticed that computer is one of the topics that are in urgent need of support for this special population. There are lots of expectations regarding the use of computers in bilingual education. Proper use of computer can help bilingual students to retain their cultural heritage, to fit into the new community, and to become more productive citizens.

Reference

Bhattacharjee, M. & Chen, L. I. (2000). Preparing Pre Service Teachers to Use Technology to Teach the Content Areas in Elementary Schools. In J. Price, J. W. Willis, & D. Willis (Eds.), (pp. 120-25). *Technology and Teacher Education Manual -- 2000.* Charlottesville, VA: Association for the Advancement of Computing in Education.

Chen, "Irene" Linlin. (1999). The way to go: Integrating instructional technology initiatives into a teacher education program. In J. Price, J. W. Willis, & D. Willis (Eds.), (pp. 18-21). *Technology and Teacher Education Manual -- 1999.* Charlottesville, VA: Association for the Advancement of Computing in Education.

Haberman, M. (1991). The pedagogy of poverty versus good teaching. *Phi Delta Kappan, 73*, 290-94.

Appendix A

Lesson Plan One

Title: Virtual trip to the Yellow Stone National Park

Subject: Reading and writing: Students expand vocabulary through reading, writing and listening

Grade Levels: 4th. Grade bilingual

Learning Outcomes: Bilingual students get an exposure to a variety of wild animals and their Habitat. New vocabulary will be learned in an effective and enjoyable fashion.

Instructional Materials: CD- Yellow Stone Park, Projector, and computer with windows 3.1 Minimum.

Prerequisite Skills: Basic knowledge of mouse function (i.e.) left button once for select Twice to select.

Pre-computer Activities: Teacher presents poster board with animal drawings with the definition Or explanation of the same. Teacher directs attention of students to the advantages we have with technology by demonstrating the versatility and effectiveness of the software by projecting to the screen a colorful photo of a wild animal and its habitat. Teacher models for students how by clicking different animal name on the menu a new wild animal and its own characteristics can be appreciated on the screen. Teacher repeats this step with 2 or 3 animal to be sure students understand what the software provides.

Activities and Procedures: Teacher divides class into small groups of 2 to 3 students. Each group selects 2 to 3 animals, which as a group will investigate using the software. They will discuss some characteristics of each animal (i.e.) color, size, food they eat, weather, habitat peculiarities etc. etc. As a group they pick 2 characteristic of each animal and write one page about their findings.

Extension Possibilities: Teacher plans a field trip to the local zoo with the objective that the students Will analyze animals with some a particular characteristic feature to analyze and report back to the teacher.

Closure: Teacher highlights the advantages of technology. Teacher explains that Without having to travel to far places and risking their lives they were able to visit and explore exotic wild lands and animals.

Evaluation: Students are graded on the content and depth of their work.

Resources/References: Animal encyclopedia, http://frog.simplenet.com

Appendix B

Lesson Plan Two

Lesson plan Two

Grade Level: 2nd grade bilingual

Purpose: The second grade students will be able to use the Encarta software to do research for their science project.

Objective: The second grade students will use information found in the Encarta software to do research on their science project.

Focus:
- Ask students what other ways they can conduct research other than using encyclopedias, textbooks, journals, newspapers, etc.
- Have them come up with ideas as to how a computer can help them do research.

Guided Practice:
- As a class we will find information on the planets.
- As a class we will discuss the information we found.

Independent Practice:
- Students will each find valuable information for their science project using the Encarta software.
- Students will print information they need for their project.

Tech Ambassadors: The Next Generation of Professional Development

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Abstract: This presentation will focus on the results of an ongoing pilot study that involves training both pre-service and in-service teachers, as well as K-12 students, in the integration of technology in the classroom. Through the institution of the "TechAmbassador" program, students in our undergraduate education program team up with in-service teachers and use a problem solving approach to provide technology enriched lessons in these teachers' classrooms. Through observation of and active listening to the needs of current teachers, these pre-service teachers brainstorm lesson ideas with their college classmates, research appropriate technology solutions, practice delivery, and finally model the utilization of technology in the P-12 classroom under college faculty supervision. The project exemplifies a constructivist approach to learning that uses real-world problems, project-based curricula, and an active learning environment.

Background:

In a January 1999, a report by the Department. of Education entitled, Teacher Quality: A Report on the Preparation and Qualifications of Public School Teachers, indicates that "few teachers (20%) report feeling well prepared to integrate educational technology into classroom instruction." Further, A National Survey on Information Technology in Teacher Education, a Milliken Exchange on Education Technology report which commissioned ISTE to survey schools, colleges and departments of education in the U.S. states, "Most institutions report that IT is available in the K-12 classrooms where student teachers get their field experience; however, most student teachers do not routinely use technology during field experience and do not work under master teachers and supervisors who can advise them on IT use." It further concludes that, "the most important finding of the survey is that formal stand-alone IT coursework does not correlate well with scores on items dealing with technology skills and the ability to integrate IT into teaching." Recommendations include:

- "Student teachers need more opportunities to apply IT during field experiences under qualified supervision"
- "In order to provide models for change, researchers, professional societies, and education agencies should-on an ongoing basis-identify, study and disseminate examples of effective technology integration that reflect the current needs in both teacher education and K-12 schools." (Moursund, 1998)

Another survey conducted by AACTE in found that "Too few students are expected to use computers, televisions, and VCRs to share information in their campus classroom settings." (American Association of Colleges for Teacher Education, 1997) Supporting that finding, a 1997 NCATE task force on technology in teacher education report found that "teachers-in-training are provided instruction in 'computer literacy' and are shown examples of computer software, but they rarely are required to apply technology in their courses..."(National Council for Accreditation of Teacher Education, 1997)

Rationale:

As a fully experienced technology teacher, I want to begin by emphasizing that teaching with technology requires more effort and is fraught with more problems than using chalk, an overhead projector, or a book.

Technology does not always work on request, is rich with glitches that can result from the system, the software, as well as from teachers' or students' lack of experience. A teacher must be willing to give up the tried-and-tested methods he/she currently uses to enter into a somewhat intimidating, somewhat frustrating "unknown" world that utilizes technology. Without experience or trouble-shooting skills, it is easy to get overwhelmed and give up. It is also difficult for many teachers to relinquish "control" when a student is more technologically proficient. Whether we agree or not, we can not overlook these realities. Teachers need more preparation time and more assistance. We cannot just expect results without a commitment to help them develop these new strategies and skills. While many school programs offer staff development programs outside the classroom, this program suggests doing it "live" so that everyone participates and collaborates and the setting is "real." The pre-service teachers' lack of classroom experience is compensated by the current teachers' classroom control and the current teachers' lack of technology skills is supplanted hy the student teachers' knowledge, and both of them arc supported by technologically proficient college faculty. It's win-win for everyone.

A Response to the Need:

The TechAmbassador Program was developed in response to a twofold need: to train undergraduate pre-service teachers in the classroom use of technology, and to integrate technology into the P-12 classrooms where further education/assistance may be necessary. These needs were authenticated through direct observation and experience. As a member of the full-time faculty in the School of Education at *New York Institute of Technology,* I have the gratifying experience of training teachers in the use of technology in the classroom and supervising pre-service teachers in the Student Teaching semester. This allows me entrance into various classrooms in and out of the NYC school system. In addition, I am able to draw on my varied computer experience in the corporate world as well as that in the education system.

Firstly, what I have discovered throughout my experiences is this: In-service teachers often have neither the adequate time nor the resources to implement new programs in their classrooms. They are severely limited by the restrictions of curriculum, the pressures of testing, the lack of technology skills and the lack of planning time, in addition to minimal choices in hardware/software. Many are trained in technology outside the classroom or in graduate settings where assignments are theoretical or specific to particular software products rather than based on needs. These teachers need assistance in a way that supports their efforts by bringing training and resources to them *in the classroom.*

Secondarily, through questioning and observation, I have come to believe that that while pre-service teachers are taught the practice of teaching, they do not adequately *practice their teaching*. This practice, whether classroom or field-based, even within the scope of one educational sequence, is often not only limited but lacking in organization for a rounded experience. Several factors contribute to this, namely: lack of overall planning, varied faculty supervision, cooperating-teacher flexibility and placement issues. Additionally, these same pre-service students, while they may personally use technology, rarely practice its use in the P-12 community. Lessons presented, even in the student teaching experience, tend to follow the pattern of the cooperating teacher, which often only promotes the under-utilization of technology in the classroom. The need for pre-service teacher technology training is now being stressed by the new ISTE standards for pre-service teachers and most states carry that requirement. Several studies (as cited above) have uncovered this under-utilization of technology at the pre-service level. In fact, parenthetically, *any* teaching experience in P-12 classrooms is often limited. "Art Levine, president of Teachers College at Columbia University, would like to see a greater emphasis on clinical training with apprentices and mentors, similar to the kind of experience new doctors get." (Kantrowitz and Wingert, 2000). Why not, then, work technology into teaching at the grass roots level, so that new teachers endeavor to teach as they are taught at the pre-service level--with technology.

All students (P-12, undergraduate, and graduate) need to be prepared to meet the demands of the 21st century as well as the present. Many national mandates and initiatives support the notion that more technology is needed in schools, but *even if technology resources were unlimited,* the methods of utilization would still be severely lacking. This initiative focuses on a method of training pre-service and in-service teachers, as well as P-12 students, in the utilization of technology both as resource and as tool.

The Methodology:

The TechAmbassador Program trains the undergraduate students in our education program who are aspiring to become teachers in the proper utilization of technology in the classroom, and sends them into the classroom of current teachers as "ambassadors." These students **model** the integration of technology under college faculty supervision, in various classrooms thereby reaching and teaching current teachers *and* their students. The program provides many benefits and fulfills the following objectives:

- Each pre-service teacher will be trained in the integration of technology and the curricular requirements.
- Each in-service (current) teacher would collaborate with pre-service teachers to determine which units of study would best utilize the strengths of technology and then host this guest student teacher to demonstrate, model and deliver unit plans that utilize this technology.
- Each pre-service teacher will develop or do research to find specific units that effect technology integration into targeted classrooms.
- Each pre-service teacher will develop plans for implementation in a target classroom.
- Each student teacher will practice delivery of the developed or adapted units in a supportive college setting.
- Each pre-service teacher will model appropriate technology usage for current teachers so that the learning curve is reduced.
- Each pre-service teacher will deliver 2 units under the supervision of the classroom teachers and NYIT faculty
- Each pre-service teacher will provide turn-key, tested, technology enriched lesson plans for future utilization by current teachers.
- Each in-service teacher would receive assistance and learn how to effectively integrate technology into the curriculum.
- Students in the classroom will become more proficient in using technology as a resource and a tool to meet curricular goals.
- Students in the classroom would experience collegial, cooperative collaboration as a means of achieving goals. Teachers would model what they preach.

These objectives can be measured by the degree to which pre-service teachers meet the goals of the college course, by the degree to which technology is utilized in the target classrooms, and by the increased competence of pre-service teachers, classroom teachers and P-12 students. As the study progresses, all planned units and the journals describing their implementation will be assembled in a book, available in print and online. Surveys of computer integration are distributed to current teachers, the results of which will also be documented. As the study continues, each pre-service teacher will assemble a portfolio to be reviewed by school district administrators for evaluation for potential employment, as an authentic assessment.

The ISTE NETS Standards addressed:

II Planning and Designing Learning Environments and Experiences: Pre-service teachers collaborate with in-service teachers to enrich established curriculum content with technological tools.
III Teaching, Learning and the Curriculum: In-service teachers implement curriculum plans infused with the technology through collaboration with and hosting of TechAmbassadors who deliver technology enriched lessons to K-12 students in their classroom.
V Productivity and Professional Practice: Pre-service teachers practice and model technology integration in real K-12 classroom settings, thereby enhancing both their and their collaborating in-service teacher's professional development.

The TechAmbassador Project:

The TechAmbassador Project is a pilot study to test a new method of addressing the needs of in-service, pre-service and P-12 students. The study can easily be replicated in a college-level education course. The course in which this pilot project was launched is entitled "Curriculum Articulation through Multi-Media" which carries a Field Experience requirement of 20 hours. The students in this class were elementary education students with the exception of one Occupational Education major (Culinary Arts). On the first day of class, the project was introduced, indicating that this study was a fresh approach for completing their field placement hours. During this time, students, as TechAmbassadors, would each be required to collaborate with a partner teacher to help infuse technology into his/her classroom curriculum. All students were eager to be part of this innovation, but at the same time, apprehensive. For example, one wrote, "I feel it will be a great experience...", while another said, "I feel it is a great program so long as the co-operating teacher has a little knowledge at how to use technology."

I immediately contacted four schools to request placement for my "TechAmbassadors". In one case, I revived a contact, a District Director of Technology, who I had met at a conference; for others, I contacted 2 principals who had each hosted one of my student teachers at their respective schools. Finally, I made a new contact for the Culinary Arts student. In each case, the project was well received; however, the Culinary Arts teacher felt he was "helping my student out", while the others voiced more enthusiastic responses, such as "This is a dream come true!" and "Can I have more?" Placement was a lot easier than expected. In each case, my ambassador and I met with the partnering teacher, who had been invited by the principal contact, to introduce the project. I must stress that partnering teachers were not selected based on technology competency. In fact, the opposite was closer to the truth. I reviewed the course syllabus with each teacher, showing that at least two lessons would be targeted for integration: one mid-semester, one at the end of the term. Additionally, I explained that pre-service TechAmbassadors would be keeping a journal, practicing lessons in the college setting and preparing a research paper. Subsequently, each ambassador filled out a survey and delivered a survey to his/her partnering teacher so that I could ascertain each participant's level of computer literacy.

For most part, cooperating teachers were anxious for technology integration and looked to the pre-service teachers immediately. We established the guideline that the TechAmbassador would complete at least four period-long observations prior to the delivery of the first lesson. The observations were for orientation purposes in that the TechAmbassador needed to learn the classroom routines, observe the strategies used, observe those students who could use special attention, test the technology, determine the content into which technology could be integrated, etc. TechAmbassadors would then reflect on observations in a journal, prepare to write an observation paper as well as their "research" paper (which basically chronicled their quest for information on their anticipated lessons), and of course, design their turn-key lesson plans which would integrate technology into existing curricula. It should be noted that these lesson plans are four page documents; half of which is targeted to in-service teacher preparation, the other half to student learning.

Each week in class, I facilitated discussions on the weeks' observations, with each TechAmbassador taking turns at center stage. Anticipated lessons were discussed and practiced in class, while issues of integrated curriculum, classroom management, thematic units were introduced as part of the coursework discussions. As the need for software was uncovered, I, as the instructor, would work with the student either alone or with all students as a group to demonstrate the software that could be used. Often times, students would show each other what they learned independently. During one lesson, we hosted a representative from PASCO who demonstrated computer-connected tools for scientific recording of variables such as temperature, distance/depth, heart rate, etc. At the end of this session, I arranged for a "donation" of a specific software product. (One ambassador was extremely interested in using it in his P-12 classroom.)

The course structure, thus followed a quasi-constructivist approach, in that while certain guidelines and discussions were established by the syllabus, the majority of class time was used to uncover real-world classroom problems and learn about possible technology solutions.

In each partnership between the in-service teacher and the ambassador, relationships developed; some surprisingly quickly and well-connected. In most cases, students were asked to teach even prior to the first scheduled "observed" lesson, which naturally occurred in or about the 7th week of the semester. Fears were soon allayed. Remembering that these ambassadors are undergraduates, there was indeed a certain amount of questions about expectations, grading policies, hours in class, but for the most part, they "assumed the roles". One particular student was extremely frightened about presenting to a fifth grade class, until one day, she came to my class, wearing a great big smile, saying, "I taught two lessons today!" Apparently, the partnering teacher trusted her enough to have her teach a Math and an English lesson. Having observed the class, and establishing rapport with the teacher, she was able to do it with little difficulty. The students begged her to stay and do more! Was she changed by the experience? Incredibly so! When I observed her official "technology" lesson, the students remained completely engaged, she assumed control, and the teacher exclaimed, "They behaved better for you than they do for me!" Personal satisfaction! In addition, as an outsider, I observed that while the TechAmbassador introduced the lesson, the teacher busied herself with her own work. But when the technology was introduced, the teacher stopped, sat, and watched attentively. Incidental professional development! I highlight this case simply because it demonstrates an incredible (r)evolution.

Initially, this ambassador was scheduled to work with the computer teacher for a social studies lesson, but since he really did not need assistance, he suggested a newer teacher as an alternative. This "ncw" tcacher was a veteran teacher of 19 years, but this was her first year at this school and she had not yet acclimated to the school's policies and procedures. She accepted this ambassador so reluctantly that it was 3 weeks into the semester before the ambassador could negotiate a time to observe at a convenient timc for the teacher. This teacher happened to have considerable computer background at her previous position but did not seem to see the connection between engaging students with technology and classroom control. In her survey, she wrote that she could incorporate technology (NEC) into somc lessons but "I have to gain control of the class first." Simply stated, this was a major victory for the TechAmbassador.

Other partner teachers had previous training in particular software programs. All responded that they wanted more technology training. One teacher had only seen PowerPoint *modeled* in her college career, and although she uses word processing and the Internet at home, she has never used these in her teaching. She uses *Acelerated Reader* (a self paced tutorial) with her class once a day and visits the librarian occasionally for a computer lesson. Another teacher became so frustrated with needing technology "repairs" that she rarely used the computers in her room. Our ambassador noted that merely "rebooting" the machine fixed the problem she was describing. This in-service teacher had a remarkably quiet, industrious third grade class who worked conscientiously and listened attentively. The Ambassador and I both noted how well behaved the class was. This teacher knew *KidPix*, *The Amazing Writing Machine* and *Encarta* in addition to being able to use the Internet. Her philosophy of "teaching the students a new software program and nothing else" seemed to work for the Tech Ambassador as well. This ambassador spent a session just teaching *KidPix* and then was able to teach Limerick composition, leaving children to use the *KidPix* program on their own after a brief refresher. Previous to this lesson, the teacher had attempted to use "The Amazing Writing Machine" with her class, only to find that the Techie at the school erased the student work when called in for a repair. The teacher was understandably frustrated once again, especially since she is so accustomed to calm and control. The Ambassador, in addressing this problem, elected to use *KidPix* for its "better" features, after comparing both programs for the Limerick task at hand. An example of critical thinking about a "real world problem" and other well run lesson!

One science teacher was trained in *Gizmos and Gadgets, Millie's Math House, Sammy's Science House, Science Court, Magic School Bus* but did not have a working computer in the classroom. Therefore that Ambassador partnered with the Social Studies/Computer teacher who was willing to let us use "his" lab so long as we integrated Social Studies. The resulting lesson relied on Internet Research to search for volcanoes in Central and South America, the focus of the Social Studies lessons. We had to use our imaginations!

Another teacher had only used television and video as technology tools. This was the class targeted by the student who wanted to use the PASCO equipment. The student wrote in his journal, "It is evident to me that he uses little or no (computer) technology when he teaches." This TechAmbassador was faced with multiple problems. First, the PASCO tool arrived later than expected. When the ambassador tried to install the software associated with it, he tried that process on at least four separate computers, before he called PASCO to find out that the PC version only works with the Windows 98 Operating System. At the eleventh hour, he arranged to "borrow" a laptop from the principal of another school in the district to use for the lesson. Would an in-service teacher have the time to pursue this?—would he take the time, especially since his oceanography unit has been working just fine for several years? Unlikely. Another victory for TechAmbassadors!

Thus, the TechAmbassadors were placed in a variety of grades with students of varied abilities and personalities. Each partnering teacher had a curriculum plan he/she was using for the time we spent there, so it became our responsibility to work within that framework. With the exception of the Culinary Arts student, none of the students had taught with technology to P-12 students prior to this experience, even though many had personally used technology and had other field based experiences.

Examples of lessons at mid-term were:

Using Tom Snyder's program, "Choices, Choices: On the Playground" for a developmentally delayed first grade class learning about cultural diversity. This program takes students through a class thinking exercise on how to treat a new student who is "different".

Using PASCO's EchoSounder to determine the formations and depth of an ocean floor for a unit on Oceanography that the teacher admittedly used for several years.

Using KidPix to create illustrated limericks by 3rd graders learning about styles of poetry.

Using Inspiration to develop a concept map about the Solar System and individual planets that would later become the basis for a writing assignment for 2nd graders.

Using the Internet to shop for holiday gifts for a hypothetical family to develop predictions and collaborative thinking in a cooperative learning group setting.

Using spreadsheet formulas to adjust a recipe for more or less servings with high school culinary arts students in a vocational training program.

Using an Ambassador-created Internet Hotlist to do research on volcanoes to prepare for a subsequent PowerPoint presentation with a fifth grade Science class.

The study is ongoing, therefore, at the time of this writing, only midterm reports are complete. For these mid-term observed lessons, as the faculty member in charge of my ambassador, I took the liberty of co-teaching when warranted. I believe that as a professor, it is my job to facilitate teaching and learning, to coach, to allow students to achieve success by guiding them toward a challenging goal. A self-reflection rubric assessment is factored into the mid-term grades. At times, the in-service teachers also participated in the group learning activities. While this may not be the goal of an education program that trains teachers to be independent teachers, it *was* the goal of the TechAmbassador program to build bridges from Higher Education to P-12 using the next generation of teachers as facilitators. In contrast, end-term lessons will be delivered as independently as possible to achieve success. Results and sample lesson plans will be posted at http://iris.nyit.edu/~jclement/techambassadors.html

In conclusion, the TechAmbassador pilot study is an initiative that brings together in-service and pre-service teachers with the goal of integrating technology into the P-12 curriculum through observation, active listening, collaboration, modeling and reflection. Presenting at the AACE conference will provide much needed feedback to improve the format for yet another "generation" of TechAmbassadors.

References:

National Center for Education Statistics (1999). *Teacher Quality: A Report on the Preparation and Qualifications of Public School Teachers*. Washington D.C.: U.S. Department of Education.

Moursund, D., (1998) *Will New Teachers be Prepared to Teach in a Digital Age?* Santa Monica, California: Milliken Exchange on Education Technology.

Persichitte, K.A., Tharp, D.D., & Caffarella, E.P. (1997). *The Use of Technology by Schools, Colleges, and Departments of Education 1996*. Washington, D.C.: American Association of Colleges for Teacher Education.

National Council for Accreditation of Teacher Education, Task Force on Technology and Teacher Education. (1997). *Technology and the New Professional Teacher: Preparing for the 21st Century classroom*. Washington D.C.: Author. (Also available online at http://www.ncate.org/accred/projects/tech/tech-21.htm.)

Kantrowitz, B. & Wingert, P. (2000, October 2). Teachers Wanted *Newsweek*, .37-47.

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IT in the classroom and its implications for pre-service teacher education.

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Abstract: I completed six months in a classroom as part of my Doctoral research and I attempted to use IT as a teaching tool with a class of year 1/2/3 children. As a lecturer within the pre-service teacher education course at NTU I left the classroom in 1986 when computer technology was just entering our classrooms as a new teaching tool. In the pre-service course I have been involved in working with students in a competency based IT unit without knowing how IT can work as a tool in our classrooms. This paper attempts to explore my practical experiences and the implications for pre-service teacher education.

IT in the classroom – my knowledge of IT in theory.

In my return to the classroom I was interested in exploring the role that computers could play in the teaching and learning experience. I recognised that the use of IT would require a 'mind shift' and a challenge to explore new models of teaching and learning.

> Unless educators are willing to reconceptualise curriculum and instruction (and perhaps the organisation and process of schooling itself), they will probably need to be quite patient in expecting transformation to occur through the use of computers and other tools.(Mojkowski,1990, p14.)

Computers as word processors, as a means of presenting knowledge and understanding through a variety of software programs, and as a source of information(through the internet and CD Roms) means that the teacher is confronted with a totally different teaching tool. A rethinking of the teacher's role in the classroom is part of this whole 'mind shift'. Rather than passively listening to the teacher, students are encouraged to discuss and learn ideas from themselves and for themselves through technology. This requires teachers to become participants in the learning and to create collaborative learning situations for both the teacher and student. Mojkowski(1990) refers to the need for teachers to tackle the pedagogical issues of education in the light of these new technologies. He argues that teachers, administrators and researchers have not addressed these three major questions,

1. How should existing curriculum and pedagogy be redesigned to accommodate and maximise the use of the technology?
2. What are the most appropriate ways to bring technology into the curriculum?
3. How can computers and other new technological tools be used as catalysts to revitalise existing curriculum and instruction within and across subject areas?

Dede(1997) would argue that these 'mind shifts' also require a total rethink of current 'chalk and talk ' practices as well as the pedagogical issues that relate to teaching and learning and how technology can enhance the learning environment. Dede(1997) continues to state that teachers will need to reconsider their own teaching strategies, their role in the classroom, the contributions students make to their own learning, the authenticity of the curriculum and their evaluation of student work. Teachers will also need to participate in and recognise the value of collaborative learning.

Zimmerman(1998) argues that schools need to use technology for at least three major reasons,

- As a catalyst for the larger education reform effort of restructuring the way students learn and teachers teach
- Good tools give talented and caring teachers and administrators the power to create successful learning environments
- Students who do not have technology skills will be unable to compete in the economy of the future

(Zimmerman,1998,p115)

Technology in the classroom can allow for more flexible, collaborative and self - directed learning experiences for the learner. Technology can,

- provide other entry points for a learning experience,
- provide opportunities for parents to become more involved in the educational process from home and work via the internet and
- allow for more involvement with the wider community again via the internet and CD Roms.

Warlick(1999) would argue that technology can provide extensive experiences in collaboration. Limited classroom computers requires that students often have to work in teams to access information from web sites or CD Roms. As they access the information in groups, they discuss the relevance of information, how to record the information and they make decisions about who does what. In a multi-age classroom more able readers can assist those less able. Students with more advanced computer skills can assist others. Using email facilities means that interaction is occurring with others as well as collaboration as the children compose responses to email messages. Technology can support and enhance student learning, thinking and problem solving in many ways and teachers need time and training to explore how this can be done. Too often attempts have been made to train teachers in technology skills, when what is needed is time for teachers to think creatively about using technology to enhance what teachers already do – provide for meaningful learning experiences for every child.(McKenzie,2000) This emphasis on meaningful learning experiences is fundamental to the learning process and it is important to realise that technology can enhance the experience not take it over.

IT offers the teacher another tool to assist in the preparation and planning of meaningful experiences for all children. It can provide many opportunities for students to explore and present knowledge in a variety of as it provides unique opportunities for

- collaboration
- a child-centred approach to a learning experience
- a flexible learning experience, and
- motivation.

And so I entered my classroom with my research and understanding of IT. I saw the role of technology as a new tool that would allow for more flexible learning to occur as well as more collaborative and self - directed learning experiences for the learner. I used technology to provide another entry point for a learning experience and to allow for more involvement with the wider community by accessing and communicating with them through the world wide web. The reality of the classroom provides the teacher with opportunities to explore these new ideas.

I had four MacIntosh computers that were connected to the internet and to the school's server. All computers had CD Rom access as well as Microsoft word, excel and powerpoint software. I had a small bubblejet printer that worked occasionally. I had a number of personal educational CD Roms as well as access to some school CD Roms from the library. While I often prepared learning experiences that allowed for student direction, I was often frustrated by the equipment. The computers would freeze, access to the internet was often slow, the sound would not work, and/or too many children were around the computers. When the computers worked the learning experience was successful. However I often found the effort involved in planning activities very time consuming.

Activities that I planned for included,

- Activities for reading, maths and or spelling where the children rotate in groups.
- Sending and receiving emails.
- Using as a drawing tool.
- For information gathering through CD Roms and the internet.
- Morning activities – learning games.

From my own reflection during my teaching and research it was evident that some collaborative and self-directed learning did occur when the children worked together during computer activities. Some children continued to pursue research on their computers at home, others were keen to bring in CD Roms with relevant information while others produced further powerpoint generated booklets at home. The children also recognised that they could communicate with their parents, teachers and pen pals from interstate through emails and some children sent emails to the classroom from home during the weekend, or when they were sick. Internet searches, which allowed children the opportunity to access information from the wider community was difficult at times because of the old computers and irregular internet connections. Lack of teacher expertise in utilising the computers and inadequate technical assistance and equipment made it difficult to utilise the technology fully.

However the children did progress ; by the end of nineteen weeks all children were able to write up their own stories to send as an email to parents(the initial task in Week 3 took one week, our final newsletter in Week 19 took one hour!) and three children were trained in how to access a CD Rom through the school server, indicating improvement in the use of technology within the classroom.

Implications for pre-service teacher education.

The unit offered at a first year level for our pre-service teachers is a compulsory unit. However the IT component is only six week in length, with a weekly three hour tutorial. Students can access the six topics on-line and either attend or not attend tutorials. The topics include,

- Cut, paste and graphics.
- Emails with attachments.
- Searching the internet and CD Roms.
- Powerpoint and prolight.
- Hyperstudio.
- Databases and spread sheets.

These topics were chosen three years ago after consultation with the Education Department IT personnel.

When I returned from the classroom this unit was the first I taught and I found I was able to give students direct experiences of IT use in all of the above topics. This skills based unit enables students to utilise the open-ended activities on-line, in their own time and to their level of understanding and competence. The students final portfolio is a sample of all these topics around the theme of 'ME', which provides the students with a useful resource for when they enter schools for practicums. This approach to IT is reflected in the use of specialist IT labs and teachers in Primary Schools and I experienced the value of these labs alongside classroom use where follow up activities related to the topic and curriculum area can be pursued.

I now have considerable more confidence in talking about IT in the classroom having had the experience and having tried out what I am talking about. I have also been invited by colleagues to talk about IT in other subject areas and I feel that this will probably be the greatest implication from my experience in the classroom.
It is imperative to re-look at our approach to teacher education and to explore a more integrated approach, similar to the way we encourage our students to work in the classrooms. IT can provide a tool for this integration as reading is integral to the internet and/or CD Rom research required in all subject areas, maths activities through spreadsheets and databases as well as tables and statistics. As the lecturer in Arts Education I can use IT to explore drawing and design techniques, visit an art gallery through the web or a CD Rom and create soundscapes through specialised music programs. Teachers recognise that teaching and learning is always about change and IT is but another tool to add to our growing list of skills, knowledge and understandings. Our classrooms in primary schools and Universities have the opportunity to be exciting places of change and discovery as we work with IT in our teaching and learning.

References.

Dede, C. (1997). *Rethinking, how to invest in technology, p12 - 16.* Educational Leadership, November 1997 ASCD, Virginia.

McKenzie, J.(2000). *How Teachers Learn Technology Best.* FNO Press, USA.

McKenzie, J. (2000). *Beyond Technology. Questioning, research and the Information Literate School.* FNO Press, USA.

Mojkowski, C. (1990). *Developing Technology Applications for Transforming Curriculum and Instruction, p13-22,* Technology in Today's Schools, edited by Cynthia Warger, ASCD, Virginia.

Warlick, D. (1999). *Raw materials for the Mind. Teaching and Learning in Information and technology Rich Schools.* The Landmark Project. USA.

Zimmerman, I. (1998). *Professional development for the Use of technology in Schools: It takes a Network to Connect a Village..!* p115. Beyond Technology.... Learning With the Wired Curriculum. Zimmerman, I and Hayes,M(Eds) MASCD, Massachusetts.

A Planning Model for Integrating Technology and Educational Methodologies in the Pre-service Teacher Education Program

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Integration of technology into the classroom has been promoted, written about, encouraged, and in some cases mandated for the last 25 years. Standards have been developed by the National Council for Accreditation of Teacher Education (NCATE) and the International Society for Technology in Education (ISTE) to address educational reform at both higher education teacher education programs and PreK-12 learning environments for the inclusion of technology into the learning process. At the university level, constructivist teaching methodologies have been introduced in pre-service teacher foundations and method classes, and technology literacy classes have been added to the pre-service teacher education requirements. Yet findings indicate that teachers who integrate technology into their K-12 teaching on a regular basis are in the minority (OTA, 1995). As Lortie (1975) documented twenty-five years ago, "teachers teach as they were taught". Traditionally, teachers teach by lecture and incorporate technology as an "add-on" or isolated entity from the total learning process. Recent research has identified that attitudinal issues, such as teacher beliefs (Ertmer, Addison, Land, Ross & Woods, 1999, pp.54-72) have hindered the goal of integrating technology and curricular goals in a more enhanced student-centered learning environment. Teachers must re-examine how they plan and deliver learning objectives and need a procedure on how to alter their own teaching practices to include new educational methodology paradigms that use technology as a tool in a restructured learning environment.

Development of the Planning Model

As an education department faculty member of Notre Dame College of Ohio, I am the coordinator of the technology endorsement certificate program. One of the biggest challenges I face has been to help teachers and pre-service teachers identify a process they can use when planning for integration of technology in the curriculum. After spending several weeks introducing the students to the technical aspects of technology (what is a computer system? what is a network?) and educational methodology paradigms (constructivism, directed teaching), the students needed "something" to link educational theory with the creation of a student-centered learning environment that included multi-sensory stimuli and tools; allowed for multiple paths for learning; fostered student collaboration, inquiry-based learning, and critical thinking; and provided students with authentic, real world learning experiences. That "something" was a planning instrument to help them rethink the total lesson in terms of learning objectives, classroom activities, educational methodology, assessment rubric and technology effectiveness.

The Planning Model

In development of a planning model to encompass methodology, standards, technology and learning environment, I looked at 3 stages in the planning for learning process: (1) Knowledge Acquisition and Research (2) Knowledge Organization and Analysis and (3) Information Presentation and Assessment. Learning objectives begin in Stage 1 with students acquiring knowledge in some manner - through lecture, books, interviews, surveys, Internet, etc. The knowledge acquired is then organized in Stage 2 in some fashion for analysis. Organizational components can include reports, spreadsheets, databases, etc. After analysis a synthesis of new knowledge is then presented and evaluated in Stage 3. The presentation/assessment vehicle might be a test, oral presentation, document, web site, slide show, newsletter, etc. In each of the 3 stages of the model, lists of example components were developed with accompanying attributes. These component attributes included: learning objective, type of methodology, and NETS Connecting Curriculum and Technology standard with accompanying performance indicator.

Application of the Planning Model

The Modeling Instruction with Modern Information and Communication Technologies (MIMIC) Project involves a consortium of 5 colleges in the Cleveland Area colleges, including Notre Dame College of Ohio, which provide pre-service teacher education program. MIMIC , funded by a US DOE Preparing Tomorrow's Teachers to use Technology

(PT3) grant, targets three populations that supply teaching models for pre-service teachers: (1) Higher education faculty who deliver methods and foundations instruction; (2) K-12 teachers who supervise field experiences; and (3) Higher education Arts and Sciences faculty. Drawing on the National Educational Technology Standards (NETS) for teacher education developed by the International Society for Technology in Education and in-service professional development efforts generated by Ohio SchoolNet, the MIMIC Project has been designed to implement a context-based and content-specific approach for modeling the integration of technology for pre-service teachers. As coordinator for the MIMIC project at Notre Dame College of Ohio, a small Midwest Catholic liberal arts college, I serve as the mentor of university faculty and cooperating teachers of field experience for pre-service teachers, to support and train them in modeling technology to pre-service teachers.

In my role as mentor, teachers had to re-examine their way of teaching in terms of identifying that curriculum goals, technology integration standards and educational methodologies need to be a unified concept. Each MIMIC Project teacher designed and implemented 3 lessons that modeled technology to pre-service teachers. The planning model ensured that participating teachers would be exposed to a consistent, effective process when planning and revising their lessons. While each teacher selected their topic and grade level, their choices of components were linked to specific methodologies, standards, and technology components that were unique to their specific learning environment. The model provided a consistent framework to plan not only "what", but also "how". As mentor, the model helped me identify skills that the MIMIC Project teacher needed at each stage of the process. I could design training/support activities that would meet the needs of individual teachers - these needs included not only technology skills, but also classroom management and alternative assessment skills. After implementation of the lesson, the teacher and mentor could evaluate whether different component choices would have been more effective in unifying methodology and standards. Reflection and evaluation within a framework allow the teacher to "tweak" their succeeding lesson designs to create more effective results while developing confidence.

Benefits of the Model

The benefit of a planning model for the integration of technology and educational methodology paradigms that is linked to a body of standards is that it provides a consistent, step-by-step procedure for a teacher to re-examine what and how they are teaching. The students in my classes provided the following feedback after using the planning model: (1) gave teachers a starting point for lesson planning (2) allowed them to customize - plug-in individual components (content area, grade level, student procedures, assessment methods, teacher delivery style) (3) identified the choices they can make in each stage of the lesson planning process in terms of methodology, standards and technology (4) identified the skills needed as components choices were made and (5) helped them become independent planners.

The cooperating teachers and university faculty that were exposed to the model reiterated the benefits listed above and also added the following: (6) the incremental nature of model increased their confidence that they could effectively add a component that not only fit with their learning goals, but used a technological tool and (7) they could easily structure their existing learning goals into the model framework

Conclusion

The model provided a flexible framework for both pre-service, cooperating and university teachers as pre-service teachers relied on the model for comprehensive planning and existing teachers used the model to unify what they currently were doing integrating curriculum standards and technology initiatives. The components and attributes provide dynamic entities that are added to and modified as technology, standards and methodologies change. As more data is gathered through the MIMIC Project and classroom teaching experience, the model will be updated to enhance its use as a planning instrument

References

Ertmer, P. A., Addison, P., Land, M., Ross, E. & Woods, D. (1999). Examining teachers' beliefs about the role of technology in the elementary classroom. Journal of Research on Computing in Education, 32(1), 54-72.

Lortie, D.C. (1975). *The hand of history.* In D.C. Lortie, Schoolteacher (pp.1-24). Chicago, The University of Chicago Press.

Office of Technology Assessment. (1995). *Teachers and technology: Making the connection* (OTA-HER-616). Washington: D.C. U.S. Government Printing Office.

CURRICULUM MODELS FOR COMPUTING AND INFORMATION TECHNOLOGY: ARE WE KEEPING UP WITH THE CHANGES?

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Abstract:
Recent efforts in the development of national and state curriculum standards focus mostly on the content taught in each discipline and are meant to define the skills and knowledge of the discipline to be acquired by every student. For this to happen, school curricula must be aligned with these standards. In order for the students to gain these skills and knowledge, teachers must acquire a body of knowledge that encompasses what is defined by content standards plus the pedagogical skills that will allow teachers to guide their students in the acquisition of the discipline's skills and knowledge. This paper focuses on the current state of teacher preparation programs and the requirements needed to teach computing and information technology.

INTRODUCTION

The United States continues to lack an agreed upon and well disseminated national curriculum standards in computing and information technology from which to build a foundation on in our schools. This is so even though professional organizations have called for infusing computing education at the pre-college level (Tucker, 1996 & 2000; Stephenson, 1997; Deek & Kimmel, 1998 & 1999). The Nation at Risk Report issued by The National Commission on Excellence in Education (NCEE, 1983) recommended "that the state and local high school graduation requirements be strengthened and that, at a minimum, all students seeking a diploma be required to lay the foundations in the Five New Basics by taking the following curriculum during their first four years of high school; (a) 4 years of English; (b) 3 years of mathematics; (c) 3 years of science; (d) 3 years of social studies; and (e) one-half year of computer science. According to the Association for Computing machinery (ACM) Model High School Computer Science Curriculum (ACM, 1985a), "The need for computer science education is similar to the need for education in the natural sciences. The proposed ACM curriculum takes the form of a recommended comprehensive one-year computing course for secondary schools. It identifies the essential computing concepts that every high school student should understand. The intention is that this course be similar in its scope, depth, breadth, and methodology to typical high school science courses. It should serve all students in the same way that introductory biology, chemistry, and physics courses do. The International Society for Technology in Education (ISTE) has also suggested recommendations for curriculum and teacher preparation (ISTE, 1992, 1997 and 2000). The guidelines developed by ISTE distinguish between computer science as a discipline and educational technology as a tool. As for pre-service programs that prepare teachers to teach computing and information technology, such college programs are still very limited and teacher certification mechanisms for computer science education are still a long way from being implemented in most states where computing and information technology teachers still come from the ranks of other disciplines. Deek and Kimmel, 1998 and 1999 have addressed curriculum and standards issues and presented a teacher-formulated model that is currently being implemented in the State of New Jersey. This paper focuses on the issues of teacher preparation programs and the requirements needed to teach computing and information technology, giving these models and recommendations for computer science education at the pre-college level.

MODELS OF TEACHER PREPARATION PROGRAMS IN COMPUTING AND INFORMATION TECHNOLOGY

Recently, there have been increased efforts in the development of national and state content standards. The curriculum standards, both nationally and by every state, focus mostly on the content taught in each discipline and are meant to define the skills and knowledge of the discipline to be acquired by every student. For this to happen, school curricula must be aligned with these standards. In order for the students to gain the skills and knowledge, teachers must acquire a body of knowledge that encompasses what is defined by content standards plus the pedagogical skills that will allow teachers to guide their students in the acquisition of the discipline's skills and knowledge. It is understood that there must be a match between the skills and knowledge defined for the students and the acquired skills and knowledge of the teachers. At the same time, it is recognized that teachers must have a greater depth of knowledge than required in the curriculum they are teaching. Deciding what subject matters, and in what depth, is a substantial challenge for educators. For educators in computer science education the situation is exacerbated, since the discipline at the pre-college level is still ill defined, and the distinction needs to be made between pre-service programs that prepare teachers to teach computing and information technology and those that prepare teachers to use computers as an instructional tool in other disciplines.

Deek and Kimmel (1999) have reviewed the current status of secondary school computer science education in the State of New Jersey and discussed curriculum guidelines formulated by classroom teachers. This effort was intended to serve as the stepping stone towards establishing and promoting computer science as a recognized discipline in New Jersey's secondary schools. Computer science is a widely acknowledged discipline in the post-secondary education community and as a profession in our society (Tucker, 1996; Deek and Kimmel, 1998), but the same has not happed at the pre-college level yet.

The lack of recognition of computer science as a high school discipline by state departments of education may be reflected in:

- the exclusion of the discipline of computer science in the implementation of content standards;
- limited, and not well-defined in the few instances where they exist, teacher certification mechanisms for computer science; and
- limited college teacher-preparation programs for secondary school computer science.

As a result, virtually all pre-college computing teachers are certified in other disciplines. For example, the lack of teacher preparation programs in New Jersey has led to teachers of computing and information technology with certifications in diverse areas including mathematics (60% of those teaching Computer Science courses), science, business, and English (Deek and Kimmel, 1999). This situation is common to many states, and as seen in this paper, still encouraged by many states.

As previously stated, the curriculum, certification standards, and well-trained classroom teachers are essential steps towards a recognized subject area. There have been two directions taken in the development of guidelines for the preparation of teachers of computing and information technology: a recommended curriculum of courses and the identification of core competencies needed to teach computing courses. Both approaches have been part of recommendations by national organizations, and both approaches have been adopted within different states. Information and data on teacher certification requirements and teacher preparation programs were obtained from a search of the web sites for state departments of education (CCSSO, 2000). Further information was sought for those states that indicated either certification or endorsement requirements for teaching computing courses in the high schools. This was accomplished by either contacting the departments of education directly and/or contacting (and/or accessing the web site of) universities with teacher education programs in those states. The later strategy assumed that the adoption of criteria for the teaching of a discipline by a state department of education would lead to programs of study offered by schools of education at universities in that state. Finally, if a university is offering a program for prospective teachers of computing and information technology, the authors have assumed that they are authorized (or at least acknowledged) by their state to offer such a program, and that such a state does provide a certification or endorsement for teaching in the field. In conducting the search, certifications and programs in educational technology were identified and eliminated from further consideration. The authors recognize that this type of search is neither comprehensive nor necessarily complete. Hence, the results may not be totally representative of the situation across the country. However, the authors believe that the results of the study provide snapshots of the current status of teacher education in computing and information technology, and serve to define future directions.

The first major document to focus on the preparation of teachers of computer science was released by an ACM/IEEE taskforce, which was concerned with secondary school curriculum and teacher certification in computer science (ACM, 1985a & ACM, 1985b). The Task Force made recommendations regarding computer science in the secondary schools and the preparation of high school computer science teachers. While the taskforce recognized at that time that many teachers are expected to continue to come from within the in-service ranks, with little training in computer science, they called on colleges and universities to begin the preparation to offer pre-service teacher certification. In recognition that the current cohort of teachers would have to be the primary source of instructors in computer science until college and universities would be able to implement teacher preparation programs, another ACM Taskforce defined a program of study for retraining of teachers (Poirot, Taylor and Norris, 1988).

Chen (1989) reported on the use of the Delphi approach to develop guidelines for establishing a model curriculum for secondary school computer science teachers. The study sought to establish consensus guidelines for the key courses for a computer science teacher certification program.

An examination of degree requirements, for different disciplines, in different states (Blank and Langesen, 1999) shows a range of 18 to 45 credits required for teaching science and mathematics in the secondary schools. It seemed that programs below 30 credits referred to a minor in the subject, and that a minimum of 30 credits would constitute a major. In fact, eight states required majors in the field without specifying the number of credits, while one state specified a "competency-based program" without stating the number of credits. None of these states' requirements listed computer science as a discipline, an indication that the recognition of computer science as a high school discipline is still not widely accepted. This listing indicates that the recommendations of the ACM/IEEE Taskforce and the Delphi approach would be consistent with a minor in computer science.

A combination of Web search and personal communications indicated that eight states delineated certification standards, indicating some fundamental training for teachers of computing and information technology in the secondary schools. Thirty-one states listed some kind of an endorsement, of which four states show both certification standards and endorsements. Of the 31 states, 10 of the endorsements appear to have an instructional technology/computer applications focus. The results of this search indicate that many states still do not require a computer science degree or a computer science certification. The nature and requirements for the endorsement are quite varied. On the one hand, two states require a specific number of semester hours (18 hours in North Carolina and 12 hours in Louisiana), while on the other hand, the computer science endorsement science requirement for six states is placed in business education. (Note that the certification requirement for computer science for Rhode Island and Oklahoma lies within business education.) One state required knowledge of programming, while another required competency in both programming and data structures. Seven states label the endorsement as instructional technology/computer applications, or computer education. Others provided no specific information on the endorsement. In this search, it was necessary to distinguish between requirements and standards that prepared teachers to teach the subject of computing and information technology versus those that prepared teachers in the use of instructional technology in the classroom. In some states, these situations appear to be interchangeable. It was decided to disregard any listing that appeared to focus on the application of technology in the classrooms rather than on the teaching of computing as a discipline. Below, we provide some specific examples.

Reports have described teacher preparation initiatives in states such as Delaware (Taylor and Norris, 1988) and Texas, Missouri and Florida (Thomas, et.al., 1993). Of those four states, we find that Delaware shows both certification standards and an endorsement in computer science. Florida lists certification requirements through the

University of Florida, while Texas provides an endorsement in computer science. Missouri appears be using the ISTE recommendations in their pre-service program only for the use of instructional technology in the classroom. The certification requirements of Florida and Delaware are discussed next.

Variations in certification requirements are evident for the eight states identified in the study. As indicated earlier, certification requirements in Rhode Island and Oklahoma fall under business education. The description of certification on the Oklahoma Department of Education web page is particularly interesting here. They provide a listing of courses to be taught in Oklahoma high schools (grades 9-12), which include Advanced Programming, Computer Programming I & II, AP Computer Science, and Introduction to Computers. For each course the exact same credentials are listed as follows:
"Computer science – a credential in business education, mathematics, or science with at least six semesters hours in computer training, *or* any valid secondary or elementary-secondary certificate and 12 college hours in compute training."

Certification in Florida is further developed. They provide several options to meet specialization requirements for certification in computer science for grades K-12 as follows:
(a) An undergraduate or graduate major in computer science or computer science education which includes credit in computer applications and computer programming, or
(b) An undergraduate degree with thirty (30) semester hours in computer science or computer science education to include:
    1. three (3) semester hours in computer literacy,
    2. six (6) semester hours in survey of computer applications,
    3. twelve (12) semester hours in computer programming (including six credits in Pascal and data structures).

These requirements show that computer programming is the most prominent subject of computing. This is consistent with the arguable idea that programming is the only important subject in teaching computing and information technology at pre-college level. However, these requirements provide a starting point for addressing the discipline of computing and information technology as it should be taught at the high school level. This model also implies that a K-12 certification covers the needs of all student populations, elementary, middle and high school grades.

Three states come closest to the concept of a curriculum requirement for certification of teachers of computer science, Delaware, Maryland, and Michigan. They are also reflected in the programs offered by universities in these states. Each of them requires, as a minimum, 18–24 credit hours of courses in computer science, closely paralleling the recommendations of the ACM Taskforce. Delaware and Maryland appear to be the closest to the recommendations of the ACM Taskforce. Delaware requires either a major in computer science or a teacher education major with an 18-credit concentration in computer science. Maryland requires a 24-credit program in computer science. Both the 18 and 24 credit hour programs would constitute a minor. The Delaware requirement includes 12 hours of required courses and 6 credits of electives. The Michigan requirements are reflected in the teacher preparation programs of the University of Michigan and Michigan State University. They include courses in programming (as reflected in the first Introductory Computer Science Course), Assembly Language, and Data Structures, and 1-2 elective courses (a variation between the two Michigan universities.

Several states do appear to require some kind of computing and information technology content for an endorsement, although that might be as little as some competency in structured programming and a basic understanding of data structures (e.g., Utah). As stated earlier, North Carolina and Louisiana require 18 hours and 12 hours, respectively, for an endorsement. Louisiana actually has a "12-hour rule", which permits a teacher with 12 credit hours in computer science to teach two classes a day in the subject. Kansas lists a set of competencies as standards that teachers must meet to receive an endorsement. The competencies include problem solving in a logical manner with a computer, computer systems, high-level programming language, development of program design.

CONCLUSIONS

State boards of education across the country are recommending a diversity of ways of gaining computer skills (having a computer science degree, taking classes or completing training program) for teachers. However, there is need to have teachers develop a common level of knowledge about the subject. In particular, teachers should be competent in problem solving/programming, data structure, operating systems, and software applications, including the Internet. Other skills would also be required in order to teach advanced courses. Courses in these subjects would provide teachers with the ability to infuse information technology into the classroom. Unfortunately, it appears that most current computer science endorsements cover a small part of the discipline.

This baseline study appears to indicate very slow progress towards the establishment of teacher certification standards and teacher preparation programs in computing and information technology for high school teachers. Only a handful of states have requirements that could be aligned with the national standards recommended by ACM or ISTE. Not much progress has been made in the decade and a half since the issuance of ACM curriculum recommendations. Perhaps the fact that certification standards and approval of programs are usually covered by regulations or administrative code that must pass through a complex and somctimes bureaucratic process before adoptions can take place is partly to blame. But collaboration among professional organizations in education and computing, colleges and universities, state education departments and teachers can help move this issue forward. There remains another obstacle to overcome and this is the shortage in computing professionals that is facing industry and the difficulties that colleges and universities are dealing with when recruiting computer scientist is now common to K-12 schools.

REFERENCES

ACM Task Force on Curriculum for Secondary School Computer Science (1985a). Computer science for secondary schools: Course content. *Communications of the ACM, 28 (3)*, pp. 270-274.

ACM Task Force on Teacher Certification in Computer Science (1985b). Proposed curriculum for programs leading to teacher certification in computer science. *Communications of the ACM, 28 (3)*, pp. 275-279.

Blank, R.K. and Langesen, D. (1999). *State Indicators of Science and Mathematics Education.* Washington, D.C.: Council of Chief State School Officers. P. 57.

Chen, J.W. (1989). Toward an ideal competency-based computer science teacher certification program: The Delphi approach. *ACM SIGCSE Bulletin, 21 (1)*, pp. 257-261.

Council of Chief State School Officers (CCSSO). *Links to State Education Agencies* [online]. Available: http://www.ccsso.org/seamenu.html [2000, January 15].

Deek, F.P and H. Kimmel, (Eds.), (1998). *Computer Science Education in the Secondary Schools: Curriculum Guidelines, Content and Professional Development.* Proceedings of the 1995, 1996 and 1997 Conferences. Newark, NJ: New Jersey Institute of Technology.

Deek, F.P., H. Kimmel, and J.A. McHugh (1998). Pedagogical changes in the delivery of the first course in computer science: problem solving then programming", *Journal of Engineering Education, 87 (3)*, pp. 313-320.

Deek, F.P. (1999). The software process: A parallel approach through problem solving and program development. *Journal of Computer Science Education. Vol. 9, (1)*, pp. 43-70.

Deek, F.P and H. Kimmel (1999). Status of Computer Science Education in the Secondary Schools: One State's Perspective, *Journal of Computer Science Education, vol. 9, no. 2*, pp. 89-113.

International Society for Technology in Education (ISTE) Accreditation Committee (1992). *Proposed NCATE Curriculum Guidelines for the Specialty Area of Educational Computing and Technology: Proposal to NCATE.* Eugene, OR: ISTE.

International Society for Technology in Education (ISTE) Accreditation and Standards Committee (1997). *National Standards for Technology in Teacher Preparation*, Eugene, OR: ISTE.

International Society for Technology in Education (ISTE) (2000). *National Educational Technology Standards*, Eugene, OR: ISTE.

National Commission on Excellence in Education (NCEE) (1983). *A Nation at Risk: The Imperative for Educational Reform*. Washington, DC: US Government Printing Office.

Piorot, J.L., Taylor, H.G., and Norris, C.A., (1988). A Framework for Developing Pre-College Science Retraining Programs. *ACM SIGCSE Bulletin, 20 (3)*, pp. 23-31.

Stephenson, C. (1997). Revitalizing High School Computer Science: Finding Common Ground? *NECC'97 Proceedings*. Seattle, WA: National Education Computing Conference.

Taylor, H.G., and Norris, C.A. (1988). Retraining Pre-College Teachers: A Survey of State Computing Coordinators. *ACM SIGCSE Bulletin, 20 (1)*, pp. 215-218.

Tucker, A. (1996). Strategic directions in computer science education, *ACM Computing Surveys 28 (4)*, pp. 836-845.

Tucker, A. (2000). Computer science core concepts for a K-12 curriculum, *Computer Science and Information Technology Symposium 2000* [online]. Available: http://www.iste.org/ProfDev/Events/Body.html#COMP_SCI [2000, August 1].

Economics, Information Literacy, and Teacher Education

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Abstract: When preparing future educators to teach the concepts and principles of economics to prek-12 students, it is recommended that not only should these educators be provided with experiences in economic theory but also with skills in the area of information literacy. A brief explanation and several examples are given on how and why content area study, information literacy, and teacher preparation can be orchestrated.

Introduction

There are three perspectives to observe when preparing teachers to instruct in the area of economics education. One perspective is that of content development. Teachers must know basic principles and applications of economics. The other perspective is that teachers must have the knowledge of student skills needed to learn information and to make real life applications. And a third perspective is that teachers must have the skills needed to use the best and most modern pedagogy in order to meet the needs of students. Modern pedagogy includes the use of technology.

A teacher education program must recognize all three perspectives. Educators must not only acquire content knowledge, they must also understand the skills needed by preK-12 students to learn and apply that knowledge. Educators must also acquire, understand, and use technology to be able to instruct effectively and efficiently in the 21st century classroom. Therefore, a model teacher education program should include the study of content, the study of student skill acquisition, and the use of technology for learning.

As part of the national standards movement in education, individual states created state-based curricula that provide educators with goals and/or standards in the area of economics education. For example, Kentucky=s Curriculum Framework (Kentucky Department of Education, 1995) maintains that students should understand economic principles and be able to make economic decisions that have consequences in daily living. Kentucky educators refer to this expectation when developing curriculum plans and assessment goals. When studying economics education, preservice and inservice educators often make reference to the academic expectations as defined by their state department of education.

The importance of information literacy is demonstrated by the National Educational Technology Standards (NETS) Project. The NETS Project (Thomas and Knezek, 1999) has attempted to draw a national consensus on the role of technology in schools. After studying the impact of technology on the education of students, members of the NETS Project proposed a set of standards to guide educational leaders to recognize and address the conditions for effective use of technology to support preK-12 education. The educational technology standards for students include six broad categories: basic operations and concepts; social, ethical, and human issues; technology productivity tools; technology communications tools; technology research tools; and technology problem-solving and decision making tools. Students are to use these technology skill areas in an integrated manner with content learning. Content Aknowing@ should include application in the context of learning, living, and working in authentic situations.

The significance of technology in teacher education was demonstrated in the release of the NCATE (National Council for Accreditation of Teacher Education) Task Force on Technology and Teacher Education=s report, ATechnology and the New Professional Teacher: Preparing for the 21st Century Classroom,@ (NCATE, 1997). This report explains new understandings, approaches, roles, forms, and attitudes in programs based upon the need to include the implementation of technology in teacher education programs. Information based upon this report is being used as standards for the NCATE accreditation review process. Teacher education programs seeking accreditation from this agency must study and apply these standards.

When observing the NETS Project standards report and the NCATE technology report information and standards, the importance of implementing the use of technology for student learning is clearly apparent. When preparing educators to learn and teach economic principles, the use of technology applications during the process of content acquisition is a logical and necessary process. Therefore, when studying the content area of economics at Eastern Kentucky University, students are required to use technological applications during the learning process. The following information will explain: (A) teacher education and the study of economics at Eastern Kentucky University, (B) basic economics principles recommended by the Kentucky Department of Education in its curriculum framework and core concepts for assessment, and (C) examples of classroom applications of information literacy skills required of students during the study of the content arca of economics.

Economic Study and Teacher Education at Eastern Kentucky University

Eastern Kentucky University is a regional, comprehensive institution located in the southeastern part of the state. The student population is approximately 14,000. Economics education courses and workshops are offered at the undergraduate and graduate levels through the Economics Department in the College of Arts and Sciences. Students take economics courses in fulfillment of program requirements in: general education, an economics major, an economics minor, teacher certification emphasis, and graduate subject matter study. Undergraduate teacher education students attend courses and workshops in the area of economics with other majors. There is a specific graduate workshop available for inservice teachers.

Basic Economic Principles for Teacher Education

Educators in Kentucky have recognized the need for students to study economic principles. Kentucky=s Curriculum Framework specifies an academic expectation which declares that students should understand economic principles and be able to make economic decisions that have consequences in daily living (Kentucky Department of Education, 1995). The importance of the study of economic principles such as the study of production, distribution, and consumption of goods and services is confirmed in the Core Concepts for Social Studies Assessment (Core Content for Social Studies Assessment - Version 3.0, 2000). These assessment goals recommend that students need to understand how economic decisions affect them, others, and the nation as a whole. Students at the elementary, middle, and high school levels are assessed on their ability to address topics such as making informed choices, comparing revenues to costs, analyzing resources, examining opportunities, and performing other economic applications. The area of economics is presented in four broad content statements or assertions as follows:

(A) The basic economic problem confronting individuals and societies is the scarcity or imbalance between unlimited wants and limited resources available for satisfying those wants.
(B) To deal with the problem of scarcity, people and societies create economic systems and institutions.
(C) Markets are institutional arrangements that enable buyers and sellers to exchange goods and services.
(D) All societies deal with questions about production, distribution, and consumption.

When studying economic principles these assessment areas are incorporated into lesson development plans. Educators are to help students learn, understand, and apply these concepts.

Classroom Applications of Information Literacy Skills

Economics is a theoretical science. Consequently, economic theory plays a critical role in studying the results of economic events. Students are required to apply theory to predict the outcomes of economic events. In order to evaluate theory, students must compare theoretical predictions with the actual results of those events. Understanding the implications that flow from such a comparison represents a crititcal achievement in analytical thinking. In order to successfully proceed in these developmental exercises, a student must learn and apply skills in the acquisition and use of economic data. Such study develops a student=s thinking processes associated with comprehending, applying, synthesizing, predicting, analyzing, and evaluating.

The economic decisions that students study involve the application of information literacy skills by society. In making economic decisions, an individual must acquire information, process the information by abstraction, apply economic theory to produce a set of expected outcomes, express the outcomes as a functional understanding, make decisions based on their understanding, and after the fact, evaluate the usefulness of the theory based the actual outcome of the decision.

The modern educational environment has many electronic resources that are used in connection with the acquisition and processing of economic data. The use of computers, networks, and software are high technologies that assist the student in finding, analyzing, and applying economic data sets. These technologies require the skills needed to read and interpret as well as analyze and evaluate, thereby making use of information from print, visual, audio, or electronic sources. Such skills are the essence of information literacy (Rafferty, 1998). In turn, the skills of information literacy provide students with the abilities to produce forms, charts, graphs, maps, and other visual displays of data. These skills are of particular importance in a world where one may need to find or present data in non-print formats. Students need skills with information technologies not just to analyze and evaluate data, but also to acquire the data initially and again later to present the product of their work.

The following are some examples of how the application of information literacy is used to study economic principles:

Students make use of library resources and CD based information sources to compile a profile of the time period in which an economic event occurred.

Students format a word processing document to display the profile as a 'timeline' event that they are studying.

Students make use of library resources, CD based information sources, and internet access to institutional and governmental data bases to assemble a sct of cconomic data that would measure the occurrence of the event they are studying and economic data that would measure the impact of the event.

Students organize their economic data in a spreadsheet format. They apply their skills at presenting the information in this format and their skills at transforming the data into the visual format of a graph that shows an economic measure over the time period of their event.

Students predict what the appearance of the graph would be if it were to comply with the theory that they have studied in their economics course. They apply their analytical skills to examining the consistency of the graph with the theory=s predictions. Students apply their evaluative skills in explaining the interpretation of the evidence and the resulting implications regarding the theory that they have applied in the exercise.

These exercises utilize and develop information literacy skills as well as makes use of information from print, visual, and electronic sources. Economic concepts are learned by using authentic data. Also, students have the opportunity to apply their learning to real life situations.

Conclusion

The acquisition of economic principles is an important aspect of preparing educators to teach economics. When this acquisition process is infused with the use of information technology, students are able to understand the content being studied as well as the use of information technology in the procedure. Theory states that students will teach as they have been taught. Studying economics orchestrated with the use of information technology is a modern and effective method of preparing educators for authentic classroom experiences.

References

Core Content for Social Studies Assessment - Version 3.0. (2000, August 18). Frankfort, KY: Kentucky Department of Education. Retrieved August 18, 2000 from the World Wide Web: www.kde.state.ky.su/oapd/curricu/corecontent/social_studies_cc_3.asp

Kentucky Department of Education. (1995). *Transformations: Kentucky=s Curriculum Framework (Vol.I).* Frankfort, KY: Kentucky Department of Education.

National Council for Accreditation of Teacher Education. (1997). *Technology and the New Professional Teacher: Preparing for the 21st Century Classroom.* Washington, D.C.: National Council for Accreditation of Teacher Education.

Rafferty, C.D. (1998). Literacy in the information age. *Educational Leadership,* 57 (2), 22-25.

Thomas, L. G. & Knezek, D. G. (1999). National Educational Technology Standards. *Educational Leadership,* 56 (5), 27.

Constructivist Use of Technology: Encouraging Preservice Teachers to Construct an Understanding of their Leadership Role in Promoting Reading Outside the Classroom

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ABSTRACT: In order to facilitate preservice teachers' understanding of the importance of reading aloud to children and of their role as educators of parents and community members, a project utilizing the constructivist use of technology was undertaken. Preservice students were presented with research concerning the correlation between the amount of reading done at home and reading achievement in school (Anderson, Hiebert, Scott, and Wilkinson, 1985). These preservice students were then asked to formulate their own understanding of how they could educate parents about their role in the educational process. The students then converted their ideas into a digital video public service announcement to be run on the local media. This paper/presentation will share how this project was undertaken and will model the use of the digital technology.

Constructivist learning principles—supported by the writings and theories of Dewey (1982), Piaget (1972), and von Glasersfeld (1995)—give teacher educators a way to facilitate learning through experience and reflection. When using this approach, educators do not rely solely on the direct transfer of knowledge from the teacher to the student (as is done with teacher-centered approaches). More wisely, they take into account that "learners do not passively absorb knowledge, but rather construct it from their own experiences." Accordingly, teacher educators who use constructivist approaches act as coaches who provide students with appropriate learning experiences that lead to learning. These teacher educators also act as knowledgeable guides who can empower students to reflect on those experiences as they relate to thc goals of education.

Constructivist principles can also be used to facilitate preservice teachers' developing role as teacher leaders. According to Odell (1997), teacher leaders are "considered first and foremost to be instructional leaders who are open to continuous systemic change for school improvement" (p. 122). Fullan (1993) has identified teachers as moral change agents. In order to reconceptualize preservice teacher curriculums that would support this role development, Grossman and Richert (1996) emphasize the need to foster certain commitments within the curriculum. These would include commitments towards a) ongoing learning, b) openness to other points of view, c) working through areas of conflict with other school and community members, and d) risk-taking. To develop these commitments, preservice teachers would investigate a real world problem and work with school personnel and/or community members to solve it.

One avenue would be to provide multimedia forays into the world outside the classroom. Just such a foray was recently provided to introductory education students. After having students conduct a review of the literature concerning the positive effects of parents reading to their children (Anderson, Hiebert, Scott, and Wilkinson, 1985), they were then provided with a desktop computer with digital video editing software (iMovie) and a digital video camera. After being taught to use the equipment, the students then used this technology to write, produce, and act in a public service announcement encouraging parents to fulfill this crucial educational role. This student-produced video was to be run on a local cable television station.

Overall, this project was intended to provide an opportunity for preservice teachers to work together to promote parents' reading to their children. Reflective discussions with students suggested that they were motivated to solve this real world problem. They attempted to fulfill this change-agent role by researching the literature, using technology, and collaborating with one another in order to encourage positive educational practices in the community.

References

Anderson, R.C., Hiebert, E.H., Scott, J.A., & Wilkinson, I.A.G. (1985). *Becoming a nation of readers: The report of the commission on reading.* Washington, D.C.: National Institute of Education.

Dewey, J. (1916). *Democracy and education.* New York, New York: Macmillan.

Dewey, J. (1982). *How we think.* (Originally published in 1910.). Lexington, MA: Heath.

Fullan, M. (1993). *Change forces: Probing the depths of educational reform.* Bristol, PA: Falmer.

Grossman, P.L. & Richert, A.E. (1996). Building capacity and commitment for leadership in preservice teacher education. *Journal of School Leadership, 6, 202-210.*

Odell, S.J. (1997). Preparing teachers for teacher leadership. Action in Teacher Education, 19(3). 12—124.

Piaget, Jean (1972). *To understand is to invent.* New York, New York: The Viking Press, Inc.

von Glasersfeld, E. (1995). A constuctivist approach to teaching. In L.Steffe & J. Gale (Eds.), *Constructivism in education* (pp. 3-16). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

TECHNOLOGICAL CAPACITATION OF DISTANCE EDUCATION TEACHERS

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Abstract: This article reviews current literature on the technical know-how of teachers working with Distance Education (DE) and presents an argument for the importance of teacher training. Based on research being conducted at the Distance Education Laboratory (LED) of the Federal University of Santa Catarina (UFSC), in Brazil, the authors show that there is a shortage of teachers with knowledge of educational technology and the background needed to work as distance educators.

Introduction

The principal objective of this paper is to highlight the necessity for technically capacitating teachers working with distance education, and to present a theoretical and practical approach for this challenge. Preparing distance education teachers for technology use is necessary in order to generate effective communication with students and fully exploit the teaching/learning experience. Teachers should be encouraged to embrace and incorporate information and communication technologies to the extent possible, perceiving them as tools for augmenting the potential of the educational process. Teachers who avoid technology or see it as a threat become increasingly alienated in the context of the information society and sense a continuing loss of control in their professional paths.

Recent research conducted at the University of California shows that 67% of professors perceive they are under constant pressure to keep themselves up to date in relation to emerging technologies and 62% feel that their teaching positions are threatened. According to the researchers, this preoccupation could be preventing professors from using new technologies. The study shows that only 35% of professors actually use the internet for research, and only 38% use computer technology to prepare presentations for the classroom. These statistics are dismal in the light of the rapid expansion of distance education and the benefits offered by the ever-increasing array of Educational Technologies.

Research in process at the Distance Education Laboratory of the Federal University of Santa Catarina indicates that the more than 75% of distance education professors do not have the technical knowledge necessary for conducting distance courses. The authors are in the process of examining the difficulties that our teachers, and others around the world, have in learning about educational technology in order to establish effective solutions.

The resistance of many teachers to the use of technology in the classroom and in their pedagogical approach is well recognized. This phenomenon has been ameliorated by events and programs for technological capacitation which demystify the image of machines, present strategies and options for professors to choose their own methodological solutions, and which " condition (professors) to be adaptive to various tasks and to constantly seek self improvement" (Preti, 1996, p.16).

Hawkins (1995), describing the errors committed in the process of introducing computers in North-American schools, comments that the greatest mistake was not having initially put the technology in the hands of the teachers, and leaving them to think about how they would like to proceed and adopt these technologies in the context of reform. Hawkins advises that much investment is necessary for helping teachers to think in different and new ways about their profession.

Willis (1994) considers teacher training to be the primordial factor for the success and continuation of any distance education program, because of the big challenges distance educators face. They must recreate their course, adopting the role of "content facilitator" acquiring confidence and efficiency while using technology as the principal communications means with the students. It also involves learning to teach effectively without the visual control provided by direct "eye-to-eye" contact, and developing an understanding and appreciation of the lifestyle and profile of distance education students

According to Mason (1998) in order for distance teaching and learning to improve on existing levels and dominions, it is necessary to include interaction in the process, have teachers play the role of "guide" and understand how to take advantage of the benefits that computer technologies allow. As professors increasingly become familiar with operating computers and with integrating multimedia into curriculum related activities, they will be able to participate more actively in the implementation process of educational technology. The ongoing development of user-friendly machines and softwares is facilitating this journey.

According to Barcia et al., (1998) it is necessary to create interdisciplinary teams in order to diminish the distance between education and informatics, so that teachers maintain confidence and decision-making powers. They should have adequate tools for the selection, indication and presentation of academic content. Educational technology's real value is evidenced when teachers discover its optimal use in the classroom. The authors hope that at the end of the technological capacitation process, teachers will be able to devise their own strategies for the best use of the computer according to their particular didactic content and teaching style. It is also important for them to recognize the necessity of using technology in distance education to provide the students with simultaneous and constructive feedback.

Conclusion

Due to a lack of information and an adequate framework for dealing with technology, many teachers have rejected using educational technology, in part from fear that it would eventually replace them in the classroom. Today the benefits of educational technology and its possibilities for enriching educational content and delivery are becoming increasingly evident and teachers are coming to understand the importance of learning how to incorporate it in their classrooms. In this context, it is important for teachers to understand that any incorporation of education technology should be integrated within a wider educational context requiring different pedagogical strategies, and its incorporation in no way diminishes the importance of the teaching profession.

The principal objective of technological capacitation is to prepare professors for better serving the information society, where technology plays such an important role in all activities and professional areas, and which has generated a great demand to learn how to adapt and manage knowledge and information. The process of technological capacitation of teachers for distance education is challenging in relation to social aspects because it requires a change in attitude and teaching methodology. However, with teacher training programs and support, professors more easily come to understand how to adjust their teaching methodologies in order to better help students construct knowledge at a distance. They can also be encouraged and supported during the dificult process of learning to manage the differences, which unquestionably exist, in communication flows mediated by technology.

References

Barcia, R.; Vianney, J. *Pós-graduação a distância: a construção de um modelo Brasileiro.* Brasília, Ed. 1998.

Eastmond, N. *Distance education-strategies and tools*. Englewood Cliffs, New Jersey, 1994.

Fischer, J.; Tafner, M. A. *A utilização do computador no processo ensino-aprendizagem*. Tradução: S.C., 1996.

Gentili, P. *Pedagogia da exclusão: crítica ao neoliberalismo em educação*. RJ, Vozes, 1992.

Gomes, R. C. *A utilização de novas tecnologias numa concepção de educação histórico-social.* (monografia) S.C., 1997.

Hawkins, Jan. O uso das novas tecnologias na educação. Revista TB, Rio de Janeiro, 120: 57/70, jan.-mar. 1995.

Johnson, W.L., Shaw, E.; Ganeshan, R. *Pedagogical Agents on the Web* . ITS'98. August, 1998.

Marin, A. J. *Educação Continuada: Introdução a uma análise de termos e concepções*. Campinas, Papirus, 1995.

Mason, R. *Models of Online Courses*. V. 2, October, 1998.

Moore, M. G. ,Kearsley, G. *Distance education: a systems view*. Belmont, USA, 1996.

Preti, O. *Educação a distância: uma prática educativa mediadora e mediatizada*. Cuiabá: NEAD/IE – UFMT, 1996.

Pretto, N. L. *Uma escola sem/com futuro: educação e multimídia*. Papirus, S.P., 1984.

Schank, R.; Cleary, C. *Engines for educacion*. The institute for the Learning Sciencies Northwestern University. New Jersey, 1995.

Stoner, G. *A conceptual framework for the integration of learning technology*. Report for the learning technology issemination initiative. Institute for computer based learning. Edinburgh, 1996.

Valente, J. A. *Formação de profissionais na área de informática em educação*. Cap.7 , S.P., 1988.

Willis, B. *Enhancing Faculty Effectiveness in Distance Education*. In Willis, B. (Ed . Englewood Cliffs, NJ: Educational Technology Publications, pp. 277-290, 1994.

Technology Integration into Preservice Teacher Preparation: Recommendations for Practice

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Abstract: The purpose of this paper is to provide recommendations for practice to integrate information technology into teacher preparation programs. The author describes a model for technology integration into teacher preparation programs. This model is based on what he has learned in his recent studies and his beliefs about the things that teacher preparation institutions must do in order to increase the level of technology integration in their own programs. Based on the integration model discussed, the author provides specific recommendations for practice.

As the United States enters the 21st century, teacher preparation programs across the nation are assessing their capacity to adequately prepare new teachers to embrace the use of information technology in the education of young people who will live in a global, information-based society. While investigating the status quo, recent studies have produced somewhat disheartening data. Relatively few teachers (20 pecent) report feeling prepared enough to integrate technology into classroom instruction (NCATE, 1999 January). In general, teacher preparation programs do not provide preservice teachers with the kinds of experience necessary to prepare them to use information technology effectively in their future practice (Duran, 2000; Moursund and Bielefeldt, 1999).

The purpose of this paper is to provide recommendations for practice to integrate information technology into teacher preparation programs. In this paper, the author describes a model for technology integration into teacher preparation programs. This model is based on what he has learned in his recent studies and his beliefs about the things that teacher preparation institutions must do in order to increase the level of technology integration in their own programs. Based on the integration model discussed, the author provides specific recommendations for practice.

Integration Model

In general, in order to increase the technology proficiency of new teachers in K-12 classrooms, teacher preparation institutions should increase the level of technology integration in their own programs. To provide a model for technology integration into preservice teacher preparation, the researcher recommends three program components for reaching better preparation of preservice teachers in the use of information technology in the teaching and learning process.

a) A core course in educational computing prior to methods courses.

b) Education faculty who model uses of information technology in their methods and curriculum courses and require their students to do so in the design of their integrated units and field experience.

c) Student teaching experiences with supervising teachers whose students use information technology in their classrooms.

The first component of this model addresses a required educational computing course prior to methods courses. An educational computing course plays a critical role in introducing preservice teachers to fundamental information technology components and skills. It particularly provides preservice teachers with the opportunity to become confident and proficient with information technology tools. Recently, more than 91 percent of higher education institutions require an educational computing course for some or all their preservice teachers as a core component of their technology preparation programs (Vagle, 1995).

The second component of this model addresses faculty use of information technology in their practice. Education faculty need to serve as role models using information technology to facilitate instruction in their curricular areas, allowing students to observe the use of technology in particular disciplines. Faculty use of and attitudes towards information technology in the college classroom will strongly influence the implementation of technology by preservice teachers in their future practice. In methods courses, students should also learn specific software that experts in their fields use as tools of the trade. In these methods courses, students can be more specific in their analysis of technology integration as it relates to particular tenets of a discipline. However, this component appears to be lacking in preservice teacher preparation programs (Duran, 2000; Moursund & Bielefeldt 1999; Persichitte et al. 1997; Wetzel, 1993; Willis & Mehlinger 1996).

The third component of this model addresses integrating information technology into the field component of teacher preparation programs, particularly into the student teaching experience. It is important to place preservice teachers in classrooms where information technology use is modeled appropriately. Work in the field is a "salient way" to help preservice teachers experience deep learning of how to effectively use information technology in instruction and how to manage actual classroom learning activities within a technology-enriched environment. However, this component also appears to be lacking in preservice teacher preparation programs (Duran, 2000; Moursund & Bielefeldt 1999).

Specific Recommendations for Practice

Based on the integration model discussed above, the author specifically recommends followings:

1. Preservice teacher preparation programs should be engaged in technology planning that focuses on not only facilities but on the integration of information technology into the entire undergraduate curriculum.

2. Most preservice teacher education programs currently require an educational computing course for their education major students. The researcher recommends that the teacher preparation institutions should continue to require this course to its preservice cadre prior to teaching methods courses.

3. Education faculty must be encouraged to model and integrate technology in their courses. Even though a computer on a faculty member's desk is a step, providing professional development in technology usage is crucial. The researcher recommends continues effort for ongoing quality faculty development combined with adequate resources (especially in university classrooms) and support from the administration.

4. Student teachers need more opportunities to observe/apply information technology during field experiences under qualified supervision. This requires a partnership between the teacher preparation institutions and cooperating schools. The researcher recommends that working with school districts, the teacher preparation institutions must plan and provide ongoing professional development opportunities for cooperating teachers and place its student teachers in classrooms where they observe/apply effective use of information technology.

5. The researcher strongly recommends consistency between what preservice teachers learn in their educational computing coursc (theory) and what they observe in their methods and curriculum courses or in K-12 classrooms (practice).

6. Teacher preparation is a university-wide and community-wide responsibility. Thus, the researcher strongly recommends a collaborative effort of the teacher preparation institutions and other units within a university that contribute to the preparation of teachers.

References

Duran, M. (2000). *Examination of technology integration into an elementary teacher education program: One university's experience*. Unpublished doctoral dissertation, Ohio University, Athens, OH.

National Center for Educational Statistics (1999 January). *Teacher quality: A report on the preparation and qualifications of public school teachers*. Washington, DC: U.S. Government Printing Office.

Moursund, D. G., & Bielefeldt, T. (1999). *Will new teachers be prepared to teach in a digital age? A national survey on information technology in teacher education.* Eugene, OR: International Society for Technology in Education.

Persichitte, K. A., Caffarella, & E. P. Tharp, D. D. (1997). Technology in teacher preparation: A qualitative research study. *Journal of Technology and Teacher Education,* 7(3), 219-233.

Vagle, R. (1995). Technology instruction for preservice teachers: An examination of exemplary programs. In D. A. Willis, B. Robin, & J. Willis (Eds.), *Technology and teacher education annual, 1995 (pp. 230-237).* Charlottesville, VA: Association for the Advancement of Computing in Education.

Wetzel, K. (1993). Teacher educators' uses of computers in teaching. *Journal of Technology and Teacher Education*, 1(4), 335-352.

Willis, J. W., & Mehlinger, H. D. (1996). Information technology and teacher education. In J. Sikula, T. J. Butter, & E. Guyton, (Eds.), *Handbook of research on teacher education* (pp. 978-1029). New York, NY: Macmillan.

Standards Based Reflection: The Virtual Teacher Project

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Abstract: In Indiana, the current dilemma facing teacher education programs is how to best teach about and assess students on the standards adopted by the Indiana Professional Standards Board (IPSB), and in particular, the dispositional component found in those standards. The Virtual Teacher Project combined over 32 inservice teachers representing 30 different schools, 170 preservice teachers representing six teacher preparation programs and 8 teacher educators representing 4 universities in an electronic discussion group that focused on connecting standards adopted by the IPSB and INTASC.

Background

Imagine a professional development school and teacher education program where the teachers play an integral part in the preparation of future teachers. Each teacher has the opportunity to impact the learning and preparation of hundreds of future teachers and each pre-service teacher has the opportunity to interact with dozens of veteran teachers. Teacher education students can ask teachers burning questions related to current issues and practices in education. Teachers in turn have the opportunity to reflect upon their professional practice. This type of K-16 learning community was developed in the Virtual Teacher Project.

In 1997, The National Council for the Accreditation of Teacher Educators (NCATE) issued a report entitled *Technology and the New Professional Teacher: Preparing for the 21st Century Classroom.* This report describes the need for teachers to be able to understand the impact of technology on society, the need for teachers to adopt new roles which allow them to use technology to become more reflective and critical consumers, and the need for teachers to participate in activities that are delivered via informational technologies. This transformation to technology-rich teacher education classrooms is new, but the importance of using technology as a vehicle for delivery of information is apparent. Teacher education programs are then actively seeking means by which they can integrate technology in a meaningful way into their programs.

Reflection is another element that teacher education programs are working to include. Thoughtful reflection is a difficult process that must be developed and nurtured (King & Kitchener 1994). Donald Schön (1987) identifies the important role that reflection plays in professional development and growth. Reflection that leads to critical analysis of performance can be fostered through the creation of multiple opportunities for students to examine different points of view reflectively. Reflection is tied to dispositions in that teachers (in-service and pre-service alike) must want to act upon their reflections to change behavior (Kottkamp 1990).

Finally, a growing set of teaching standards looks not only at performances, but also considers the disposition of the teacher and teacher candidate. While some research supports the notion that dispositions are stable traits (Haberman 1993), a number of theories contrast this notion and suggest that group climate, social influence and social networking can impact attitudes and behavior, and in turn, possibly dispositions (Salancik & Pfeffer 1978). It is therefore a possibility that the dispositions outlined in the various standards are dispositions that could be "taught" to students.

The Virtual Teacher Project:

The goals of utilizing a virtual community of learners were to: 1) increase the understanding of in-service and preservice teachers as it relates to the teaching standards developed by the Indiana Professional Standards Board and the Principles of the Interstate New Teacher Assessment and Support Consortium (INTASC); 2) to provide a forum were teachers could publicly reflect upon their professional practice as it relates to the standards and learn from the reflection of others; 3) to give pre-service teachers access to teachers (who do not assess their performance) to learn about professional practice and related dispositions; and 4) provide a vehicle by which teacher educators could integrate information technology into classroom practice. The project has a two-year span. During this time, preservice teachers, inservice teachers, and teacher educators posted over 4000 messages related to these content standards.

During the first year of the project, three different electronic discussion groups for preservice teachers were developed. The groups were devoted to the EAG standards (Early Adolescent Generalist), the AYA standards (Adolescent Young Adult), or the INTASC principles. Thirty-two select teachers from across the state were recruited to participate. After an introductory workshop focused on learning more about the standards and effectively communicating on an electronic discussion group, the thirty-two teachers were assigned to one of the three groups. The three online groups began discussion in January. The first three weeks of the discussions were slow and limited due to the lag time of the start of college classes and getting students online. By the second week in February, the online discussions were moving along well. Teachers and students discoursed about how to involve parents, classroom discipline, innovative instructional strategies, assessment of students, and the very real issues of school safety raised by the shootings at Columbine. Following feedback from the first year, a team of approximately five teachers covered each of four electronic discussion groups that related to four IPSB developmental standards (Early Childhood, Middle Childhood, EAG, and AYA).

Over a third of the participating students actually participated by sending and responding to messages. The other students remained in the status of "lurking." However passive, lurking does not prevent students from learning and gaining an understanding of teacher dispositions and reflections. In the second year of the project the discussion list provided opportunities to help students, even the passive lurkers, to draw more direct connections to the standards. Adding online teacher education faculty facilitators to draw clear connections to the standards and the discussion in the second year relieved some burden from the teachers and provide more clarity for the students.

Summary

The Virtual Teacher Project illustrated the impact that electronic discussion groups can have on pre-service teachers. It was learned that students often contacted teachers directly to continue discussion. The teachers themselves felt it was in important component in their professional development and the future teaching profession. Finally, it provides a vehicle to accomplish the multiple tasks of technology integration, teacher modeling, reflection, and disposition instruction.

References

King, P.M. & Kitchener, K.S. (1994). *Developing Reflective Judgement: Understanding and Promoting Intellectual Growth and Critical Thinking in Adolescents and Adults*. San Francisco: Jossey-Bass.

Schön, D.A. (1987). *Educating the Reflective Practitioner*. San Francisco: Jossey-Bass.

Kottkamp, R.J. (1990). Means for facilitating reflection. *Education and Urban Society, 22*(2), 182-203.

Haberman, M. (1993). Predicting the success of urban teachers (the Milwaukee trials). *Action in Teacher Education, 15*(3), 1-7.

Salancik, G.R. & Pfeffer, J. (1977). An examination of need-satisfaction models of job attitudes. *Administrative Science Quarterly, 22*, 427-456.

Infusing Technology into Preservice Teacher Education

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I. PROPOSED PLAN AND SERVICES TO BE PROVIDED

Grant Goals/Objectives

The Oswego County Goals 2000 Consortium proposes to implement an extensive preservice teacher education model to improve preservice teacher preparation in instructional technology and the New York State Learning Standards. Building upon the 1999--2000 Goals 2000 Preservice Grant, the overall goals and objectives of the 2000-2001 Preservice Proposal are to:

- Continue to revise education courses (Curricular Foundations of Education, Elementary and Secondary Math Methods, Elementary Science Methods, ELA Methods, School in Urban Society, Secondary Reading in the Content Area, General Elementary Methods, Elementary Reading Methods, Technology Methods, Graduate Special Education Course On-line, and Special Education Methods) to better prepare preservice teachers to integrate technology in their teaching and to assist students in reaching/exceeding all New York State Standards, in particular ELA, MST, and CDOS;
- Continue an integrated MST course at Hannibal High School that serves as a model of MST integration for preservice teachers, and continue to provide numerous opportunities for preservice teachers to observe and interact (through well established video-conferencing system, e-mail, websites, on-site visits, etc.) with exemplary classroom teachers and their students as they integrate technology and reach the Standards;
- Extend the project at Hannibal High School to include an Earth Science course, where a science teacher and a special education teacher collaborate to teach the curriculum (according to NYS Standards) to both regular and special education students using a multimedia approach;
- Continue to provide numerous opportunities for preservice teachers to experience a variety of technologies in the instruction of their education courses, including the use of videoconferencing;
- Continue the urban education link between JH56 Corlears Junior High School in Manhattan and Curricular Foundations of Education and Elementary Math Foundations courses using "NetMeeting" videoconferencing technology; and expand to include a librarian, a Spanish teacher, and an urban education and foreign language methods course at JH56, a high needs district;
- Continue the urban education link between Bellevue Elementary School in Syracuse and a Special Education Methods course using current technologies; additionally, extend the collaboration of our Special Education Program to Sandy Creek Elementary (a high needs school), and add another special educator from our program to the project, who will be mentored by an experienced project participant;
- Expand support for Oswego County's two Professional Development Schools and support 12 regular and special education teachers at these two PDS schools;
- Provide all teams on-going training in technology, technology integration, NYS Standards infusion, and School-to-Work Connections;
- Continue and strengthen the mentoring program in which technologically experienced faculty mentor new participants in their efforts to integrate Standards-based, technology-infused activities into their instruction; and
- Present information concerning this project to colleagues at national and international forums in an effort to share timely information regarding the infusing of new technologies into the curriculum for preservice teachers and K-12 students.

1. Grant Activities and the Use of Modern Technologies

A Technology Needs Assessment administered to education faculty revealed that most faculty see a lack of time and knowledge of technology as the primary reasons for not integrating technology into their instruction. However, during the summer of 1999, the faculty members who received release time for participating in the grant attended all of the technology training sessions. This project's mandatory summer training included presentations, mentoring for new participants; consultant conducted sessions on Frontpage and Photodraw software, and team sharing and work time. The 1999 proposal involved more faculty members, more classroom teachers, and more diverse sites experimenting with a variety of technologies such that the impact on our preservice program and on school improvement was greater and more systemic. For the 2000-2001 proposal, we aim to continue building on the projects completed last year, while extending the project to a greater number of interested college (from 11 to 19) and K-12 (from 15 to 33) faculty in an effort to positively impact an even greater number of preservice teachers and K-12 students. Technology infusion activities will include multimedia presentations, desktop videoconferencing, interactive large group videoconferencing, and the development of two on-line graduate courses (action research and special education).

The Consortium proposes the following activities to be implemented during the grant period (September 1, 2000 – August 30, 2001):

September—December 2000

- Finalize and order equipment for new participants and model classrooms. Each new model classroom will be equipped with 4 computers, 1 laptop computer, 1 color ink jet printer, 1 digital camera, 1 LCD projector, any necessary equipment to connect with existing networks, and various educational software.
- Install equipment in respective classrooms.
- Administer pre-survey for faculty and teacher participants.
- Maintain weekly open labs (staffed) for all participants to continue technology training in teams.
- Plan mentoring activities where each new participant is paired with an experienced participant (college and K-12 levels) to orient new participants.
- Plan and implement a two-day fall inservice/work session for college faculty/K-12 teacher teams. Update participants regarding videoconferencing technologies, pair/share team plans, review assessment procedures, and highlight model technological infusions that focus on student achievement (NYS Standards).
- Co-Directors and experienced faculty participants will present at a countywide conference.
- Participate in a variety of countywide technology infusion offerings to further support the professional development of technology teams.
- Set up a Goals 2000 listserve to enable all participants to have a forum for discussing technology infusion, delivering updates, etc.
- Implement revised education courses as well as activities that integrate technology and the Standards in both the preservice courses and public school classrooms.
- Education faculty and classroom teachers observe and consult with technology collaborators.
- Preservice teachers observe classrooms through videoconferencing system.
- Gather qualitative data through observation of implementation and focus groups.
- Administer post-survey to preservice teachers.

January-June 2000

- Implement revised education courses as well as activities that integrate technology and the Standards in both the preservice courses and the public school classroom.
- Education faculty and classroom teachers observe and consult with technology collaborators.
- Preservice teachers observe classrooms through video conferencing system.
- Gather qualitative data through observation of implementation and focus groups.
- Administer post-survey to participating faculty, teachers, and classroom students.
- Complete data collection and analyze data.
- Begin planning for a 3-day summer workshop and weekly labs for teams.
- Maintain weekly open labs (staffed) for all participants to continue technology training in teams.

July/August 2001

Plan and implement a 3-day workshop and weekly labs for teams. The workshop will continue the technology integration model, including presentations by participants on "The Rewards of Technology Infusion"; review technology and Standards training for all teams; provide up-to-date information on School-to-work and CDOS standards; provide time to set goals for 2001-2002 implementation; participants will revise courses, create technology integration activities and performance assessments aligned with Standards that are ready for implementation, and share/plan parent involvement activities related to technology infusion in the schools. Learning activities will be coordinated between preservice teachers and public school children as much as possible. College faculty and K-12 teacher teams will plan for future collaborations.

2. Business and Industry in Technology Partnerships

Since 1994, the Oswego State University's School of Education continues to participate in a Teacher Education Partnership with Microsoft. This partnership allows the School of Education to serve as a training site for Microsoft software and thus provides access and use of Microsoft products (e.g., Microsoft Office, Picture It! Greetings Workshop, Encarta, Encarta Africana, Encarta Reference Suite, Creative Writer, Bookshelf, Visual Basic). During years one and two of the Goals 2000 Grant, our participating K-12 schools also received copies of Microsoft software. Such extensive software access, valued at $20,000, allows minimal expenditure on other computer software.

The Consortium also works closely with the Targeted Instructional Staff Development Grant group which supports Oswego County's Professional Development Schools and involves business and industry in developing technology partnerships. In addition, the Co-Directors of Project SMART, a program that helps elementary and middle school teachers to develop hands-on interdisciplinary math and science units in collaboration with local businesses and industries, are participants in this grant. "Kids at Work," a component of Project SMART, is a validated NYS State Sharing Success Program, and is the key CDOS training component in Goals 2000.

3. Shared Decision Making Committees

Representatives from the Shared Decision Making Committees at Oswego State University's School of Education and the participating school districts of Hannibal, Oswego, Pulaski, and Altmar-Parish-Williamstown, Fulton, Corlears Jr. HS, Syracuse, and Sandy Creek participated in the development of this proposed program to ensure that their collaboration in the grant activities would further their school improvement. In addition, the PDS management team at Lanigan Elementary in Fulton and Parish Elementary helped shape the proposal and recruited 12 participants. All education improvement plans call for the acquisition of technology, the integration of technology in the curriculum, and the training of teachers.

4. Higher Education Involvement

This collaborative project involves several Oswego State University constituents: 18 education faculty, two arts and science faculty, and over 1000 preservice teachers enrolled in ten different courses. The Curriculum and Instruction Department Chairperson is a new participant for the 2000--2001 school year. Additionally, the Dean of the School of Education, the Provost, and President of SUNY Oswego endorse this project.

5. Local Educational Agencies

Oswego County has maintained a tradition in collaborative efforts in teacher education. The Oswego County Goals 2000 Consortium consists of 20 elementary, 9 middle, and 9 senior high schools in Oswego County's nine public school districts: Altmar-Parish-Williamstown (APW), Central Square, Fulton, Hannibal, Mexico, Oswego, Phoenix, Pulaski, and Sandy Creek. Collaborating institutions include: the Oswego County Board of Cooperative Educational Services (Oswego BOCES), Oswego County Teacher's Center (OTC), the Special Education Training and Resource Center (SETRC), the State University of New York at Oswego (SUNY Oswego), and the Oswego County Workforce Preparation Partnership.

Oswego City Schools will also provide some of the technology training for the grant participants as well as outstanding teachers who are experienced in technology integration will serve as technology collaborators. Oswego City Schools have implemented extensive technology plans during the last five years—plans that include not only the acquisition of equipment but also an arduous staff development plan. The 2000--2001 proposal plans to utilize Oswego's technology expertise in providing training and support to participating faculty and classroom teachers.

6. Supporting High Need Populations and Low-Performing Schools

Schools chose to participate in the Consortium on the basis of a combination of need, interest, and ability. Pursuant to a consensus of Oswego County Superintendents, the Oswego BOCES invited component school districts to designate a liaison to assist in the development of a Consortium proposal; Oswego State University also accepted this invitation.

Oswego County is a predominantly rural county of approximately 1,000 square mile located around the southeast corner of Lake Ontario. About two-fifths of its 121,771 (1990 Census) people live in the cities of Fulton and Oswego. The remainder lives in suburban or rural communities. Oswego County has very high percentages of adults with less than a high school education (23.8%) and of children living in poverty (17.4%). With several major plant closings/layoffs in recent years, Oswego County's unemployment rate is consistently high, nearly twice the New York State average.

Eight of Oswego County's nine school districts rank among the state's least wealthy school districts, five of which are Fulton, Hannibal, Pulaski, Altmar-Parish-Williamstown, and Sandy Creek School Districts. Bellevue Elementary in Syracuse and JH56 in NYC are also high needs schools. The proposed initiative will be implemented in: Hannibal High School, Kenney Elementary (Hannibal), Lanigan Elementary (Fulton), Lura M. Sharp Elementary (Pulaski), Parish Elementary (APW), Sandy Creek Elementary, Oswego High School, Bellevue Elementary (Syracuse) and Corlears Jr. HS (Manhattan). These schools/districts were chosen because they are:

a. High need schools in high need districts;
   - Hannibal: 80% state aid; 46% free/reduced lunch; poverty index of 12
   - Pulaski: 65% state aid; 44% free/reduced lunch; poverty index of 15.
   - APW: 69% state aid; 49% free/reduced lunch; poverty index of 12.
   - Fulton: 65% state aid; 43% free/reduced lunch; poverty index of 15.
   - Bellevue: 87% free/reduced lunch
   - Corlears: PCN state aid: $211,763; free/reduced lunch 92.5%; children w/disabilities 16%
   - Sandy Creek: 69% state aid; 49% free/reduced lunch; poverty index of 12

b. Demonstrating a high level of technology integration; Oswego City Schools has led the state in technology acquisition and staff development.
c. Low-performing schools; each participating district had to write at least one LAP (local assistance plan) as a result of low scores on state tests;
d. Schools with highly motivated teachers who are committed to improving instruction of children with diverse needs;
e. Schools with active shared decision-making teams;
f. Schools experiencing difficulty in integrating technology into student learning due to lack of resources and staff training;
g. Schools that implement inclusion of all children—a model with which preservice teachers have few real-life experiences;
h. Schools that have partnered with SUNY Oswego for several years in preservice programs such as field experiences, student teaching, and internships; and
i. Schools with diverse populations (Bellevue in Syracuse, 43% historically underrepresented population; Corlears in Manhattan, 97% historically underrepresented population).

7. Degree to which the Proposed Budget Supports the Project

Professional Salaries include adjunct replacement ($2500/course) for the 2 Project Directors (1/4 time—1 course each during the fall, and ½ time-two courses each during spring). The Directors will also receive a summer stipend equivalent of teaching one course ($2500). In addition, 10 education faculty (who are new Goals participants for the 2000-2001 school year) will receive adjunct replacement for one course during either the fall or spring semester. Oswego State University has agreed to receive reimbursement for only the cost of adjunct replacement of $2500 per course instead of 1/4 of faculty salary, which could range from $8000 to $12000. Four faculty members will also receive stipends ($1,000) during the 2000-2001 school year for mentoring new Goals participants and extending the technological infusion into their courses. Additionally, for attending the summer workshop and revising courses, 20 faculty members will a $1,000 stipend. Thirty-three teachers will receive a stipend ($1,000) for their participation in the summer workshop of 2001 plus travel costs, as well as six days of release time during the academic year.

Support Staff Salaries include the cost of one Technical Coordinator who will oversee/maintain all equipment and technical procedures and oversee all clerical duties including the data collection process, a graduate assistant who will provide technical and research support for the fall and spring semesters, and an undergraduate student who will help with technical support.

Purchased Services include the costs of all additional human resources needed to carry out the project. Substitute teachers will be provided to participating classroom teachers and technology collaborators so that they may participate in training and planning sessions as well as presentations; fees for Learning Resources (Oswego State University) professional to transport and set up the mobile videoconferencing system; maintenance of dedicated phone line for videoconferencing system
in 4 classrooms; computer installation in 5 new classrooms. Supplies and Materials include all program supplies and materials necessary to implement the project.

Equipment includes the costs of all necessary technical/computer equipment to implement the proposed project. A detailed list of equipment for each site is attached. In general, equipment is being purchased so that each participating classroom will have at least 4 computers, 1 laptop, 1 printer, 1 digital camera, and 1 LCD projector. Since the participating classrooms from Kenney Elementary (Hannibal), Lura M. Sharp Elementary (Pulaski), Hannibal HS, and Oswego HS, Parish Elementary, Lanigan Elementary, Bellevue Elementary, and Corlears Jr. HS classrooms were equipped last year through Goals 2000, this grant will focus its equipment resources on Sandy Creek Elementary, another first grade classroom in Parish, a fourth grade classroom at Lura Sharp in Pulaski, an Earth Science classroom at Hannibal High School, a second grade classroom at Lanigan Elementary, and in a second grade classroom at Fairley Street School in the Hannibal School District. Equipment will also be purchased to provide additional laptops, zip drives and discs, and software for SUNY Oswego faculty and student use as well as to enhance the mobility of the videoconferencing system that was purchased last year.

Travel Expenses will be provided to participating faculty and teachers presenting at a conference on the grant activities. Additional travel money is provided for visits between NYC and Oswego County to provide academic year technology infusion support.

8. Coordination of Other Funds

The 1999 Goals 2000 Preservice Grant enabled the purchase of over $91,341 worth of technology equipment, all of which will continue to be used in the implementation of the 2000--2001 proposal. In addition, Microsoft provides SUNY Oswego with nearly $20,000 worth of educational software that can be used at all participating sites. Four teachers and five faculty members also participate in Project SMART and will be further supported in that project in developing Standards-based technology infusion activities highlighting technology in the workplace.

Each district as well as Oswego State University's School of Education is implementing comprehensive technology plans that include the allocation of funds for: hiring staff to direct/maintain technology, wiring buildings for Internet access, purchasing equipment for computer labs and classrooms, and providing staff development for computer use and integration.

Goals 2000 is working closely with the Oswego County Targeted Instructional Improvement Grant to support technology infusion in their two designated Professional Development Schools.

DDE Funded Project SMART disseminators will provide several workshops to help K-16 educators link classroom learning to the workplace.

9. Systemic Change and Continuity of Project

The proposed plan is the most extensive plan of restructuring the Oswego State University's Department of Curriculum and Instruction has taken in many years. Two-thirds of the department will receive release time or stipends for training, course development and implementation, and collaboration with practitioners and technology experts. In one year 16 education courses will be revised to infuse technology applications and the NYS Standards. Since faculty members will receive such extensive technology training, they will infuse technology and Standards in the other education courses taught. In addition, this proposal will create and/or sustain and enrich sixteen model K-12 classrooms—classrooms that will continue to be used in the instruction of preservice teachers in all content-area methods (math, science, English Language Arts, social studies, reading, technology, and special ed.) as well as elementary methods. All equipment purchased through this grant will continue to be used to facilitate such systemic, collaborative preservice instruction.

1. Enhance Preservice Teacher Knowledge of Technology Integration

Sixteen teacher preparation courses will participate in the project. Approximately 1485* elementary preservice teachers, 120 secondary preservice teachers, 100 special education preservice teachers, and 50 technology education preservice teachers will be participating in the proposed project. See table of participating courses below.

Course #	Course Title	Instructor	# Of Students
EDU 301	Foundations of Education	Pat Russo	100
	Elementary Math Methods		
EDU 306		Mary Reeves	275
	Elementary Social Studies Methods		
EDU 304		Yigasu Tucho	250
	Elementary Methods of Instruction		
EED 394		Audrey Hurley,	50
	Reading Instruction in Elem School	Barb Beyerbach,	50
	Schools in Urban Society	Jo Farrell	50

EED 395	Reading in Content Area	Dennis Parsons	100
EDU 505	Secondary ELA Methods		20
	Elementary Science Methods		
RED 396	Achievement, Motivation, and Management	Sharon Kane	75
SED 412	Methods for Special Educators	Sharon Kane	25
EDU 305	Methods of Teaching Technology Education	Ann Keen	180
SPE 506		Ginny MacEntee	50
	Methods of Teaching Foreign/Second Language	Roberta Schnorr	50
SPE 514			
	Graduate Research		
	Foundations of Literacy		
TED 306		Vern Tryon	25
SED 414/534		Jean Ann	20
EED 596		Faith Mania	60
RED 501		Claire Putala	50
RED 510		Pam Michel	30

*This number is calculated by adding the number of students in each participating Goals course; some of these students will be signed up for more than one course (at the same time) that is participating in this grant.

In contrast to traditional teacher education methods courses, the proposed project will provide preservice and practicing teachers multiple ways of learning innovative instructional methods that integrate technology. Although preservice teachers currently participate in a field placement within their education programs, it is currently impossible to place every preservice teacher in classrooms where technology is effectively integrated. In addition, although several education faculties have already mastered many technology infusion skills, the majority are struggling to infuse technology in their instruction. Funding this grant would facilitate the continuation and development of new collaborative teams in the development of model technology integration classrooms and the restructuring of education courses to infuse technology.

Revised education courses will provide preservice teachers with learning activities that integrate technology, instruction of how to integrate technology in teaching, and modeling of technology integration by both the college instructor and the classroom teacher. In addition, Goals 2000 funds would bring technology equipment into the instruction of teacher education courses so that preservice teachers would experience firsthand technology integration used to enhance their learning of teaching methods and assessment.

More specifically, the following substantive changes with regard to technology integration will be made in the sixteen education courses:

a. Addition of a field-based experience at either Hannibal High School, Kenney Elementary, Lura M. Sharp Elementary, Lanigan Elementary, Parish Elementary, Oswego High School, Bellevue Elementary, Sandy Creek Elementary, Fairley Elementary, or Corlears Jr. HS via desktop videoconferencing ("Netmeeting"), e-mail, websites, and other technologies;
b. Required use of word processing programs and/or presentation software (eg. PowerPoint) for all course work submitted;
c. Required activation and use of electronic mail accounts for professor/student and student/student communications;
d. Instruction and experience relating to connection, operation, and maintenance of technology systems environment;
e. Instruction and experience relating to use of assistive technology;
f. Instruction and experience relating to use of hypermedia, telecommunications, and software for lesson presentation and student activities;
g. Instruction and experience relating to use of individualized and cooperative learning computer assisted applications in the inclusive classroom;
h. Increased emphasis on technological applications which promote social development and social integration of all learners;
i. Instruction in classroom teacher's use of authoring programs, desktop publishing, and CMI for planning, assessment, record-keeping, and IEP development;
j. Increased emphasis on technology opportunities relevant to the school-to-work transition;
k. Utilization of Internet and computer resources in the development of lesson and unit plans; and in two cases developmental online courses;
l. Required development of an instructional plan to integrate technology that will subsequently be modified and implemented during field placements; and
m. Providing opportunities for all participants to share, learn about, and plan new parent involvement activities related to technology infusion in the schools.

Since the Secondary Math Methods Courses will be working with Hannibal High School to develop and implement an integrated MST Course, math and science preservice teachers will also experience first hand and observe Hannibal High School students utilize CADKEY, computer simulations, video and audio equipment, and portfolio development. Additionally, preservice secondary students will have an opportunity to participate with an urban (New York City) school district that is offering the class, "Spanish as a Second Language."

2. Change Requirements of Teacher Education Programs to Support Standards

Because two-thirds of the Department of Curriculum and Instruction will be participating in the 2000--2001 Goals 2000 grant, the primary intent of this grant is to implement systemic change throughout the preservice teacher education programs to include educational technology, special education, NYS Standards, and classroom assessment. A Technology Integration Task force has been initiated in the Oswego State University's School of Education to determine the technology skills that will be infused in specific education courses and address the need for revision in program requirements in relation to educational technology. Teams will address the Task Force's recommendations as they revise education courses to prepare preservice teacher in technology integration and implementation of the NYS Standards.

The Department of Curriculum and Instruction has also recently added a requirement for all majors beginning in fall 2000: SOE 345 Applied Instructional Technologies for Educators. In general, however, the Department of Curriculum and Instruction believes that instruction of educational technology should be addressed not only in a required technology course but also through the integration of educational technology in all education courses.

3. Enable Diverse Populations to Reach/Exceed MST, ELA, SS Standards

The school districts of Hannibal, Pulaski, Oswego, Altmar-Parish-Williamstown, Fulton, Syracuse, Sandy Creek, and Manhattan have a high number of students receiving special services. In addition, these districts have created inclusive classrooms to adequately serve their diverse populations. The Syracuse and NYC classrooms provide culturally and linguistically diverse contexts for virtual and real field placements. Anti-bias curriculum will be infused in all courses and will be explored in depth in the C & I Department's "Schools and Urban Society" course, in which 20 students will have a two-week field placement in NYC in January and May. Several hundred students will videoconference with the NYC classrooms, tutoring middle school students and interacting with their teachers. The preservice teachers enrolled in the participating courses will have the opportunity to observe classroom teachers utilize a variety of instructional and assessment methods with a diverse population of students. Specific NYS Standards will be addressed as follows.

Math, Science, Technology

The MST standards are the foundation of the integrated MST course at Hannibal High School. An MST team that consists of education methods faculty, content-area faculty, and classroom teachers from math, science, and technology designed this course. A team of 3 teachers representing math, science, and technology and addresses technological design and systems focusing on physical science and mathematical concepts teaches the MST course. MST students are actively involved in hands-on activities and projects that foster problem-solving skills and enable students to maximize their creative potential. Preservice teachers enrolled in Secondary Science Methods and Methods of Teaching Technology Education will experience the integration of math, science, and technology by observing the implementation of the MST course on numerous occasions, conducting integrated MST experiments, and learning methods of integrating MST in math and science instruction.

In addition to Secondary Science Methods and Technology Methods, MST standards will also be addressed in Elementary Methods of Instruction. Team members from each of these teams will receive training on the MST standards and create activities for the participating classrooms that exemplify MST integration. Preservice teachers enrolled in these courses will observe the implementation of these activities as well as receive instruction on the methods of integrating MST standards in their classrooms.

English Language Arts

The ELA standards will be addressed in the following college education courses: Reading in the Content Area, Foundations of Literacy, Reading Instruction in Elementary Schools, Applied Reading Instruction and Elementary Methods of Instruction. Members from each of these teams will receive training on the ELA standards and create activities for the participating classrooms that demonstrate effective implementation of the ELA standards. Preservice teachers enrolled in these courses will observe the implementation of these activities as well as receive instruction on the methods of integrating ELA standards in their classrooms. Obviously, students enrolled in Reading in the Content Area and Reading Instruction in Elementary Schools will receive more in-depth instruction in ELA.

Career Development and Occupational Studies

Experienced CDOS disseminators will provide training for all participants from Project SMART's Kids at Work project to ensure that CDOS standards are infused into existing curriculum.

Social Studies

Social Studies Standards will be studied in the Social Studies Methods course and infused in the Elementary Methods block.

All NYS Learning Standards

All of the NY State Learning Standards, with particular emphasis on CDOS, will be addressed in the Special Education Methods, Methods of Instruction, and Foundations of Educations courses via e-mail, website, videoconferencing ("Netmeeting"), and word processing programs. In addition to learning the Standards, preservice teachers will communicate with classroom teachers regarding their integration of all learning standards into their curriculum and how they use technology as a means of helping all children achieve and exceed learning standards.

4. Collaboratinn between Methnds and Content Area Professors

Content area professors from the Departments of Mathematics, Science, Technology (supported by Project SMART), and English (supported by the grant) will be collaborating with education professors of the respective methods to revise education courses and develop activities for these courses and the participating classrooms. Collaboration will occur in teams and will be facilitated by extensive workshops, follow-up sessions, team meetings, and classroom visitations.

5. Enhance Preservice Teacher Knowledge of School-to-Work

In congruence with the 1994 Federal School-to-Work Opportunity Act, this program will extend existing community and education partnerships to help students gain the skills necessary in bridging the gap between school and work. The Consortium will be working closely with the Oswego County Workforce Preparation Partnership and Project SMART to provide teams with training on School-to-Work implementation. Teams will create STW activities to be implemented in the participating classrooms. Preservice teachers enrolled in the participating education courses will observe the implementation of these work-based and school-based activities as well as learn methods of implementing STW activities in the classroom. Preservice teachers will be required to create lessons that integrate work-based and/or school-based activities.

6. Staff Development of Teacher Education Faculty

Last summer, under the 1999 grant, 11 college faculty participants attended five days of training in technology processes and integration to support NYS Standards into classroom instruction, as well as weekly open labs. However, there is still a great need to provide and expand such training utilizing last year's participants as mentors for this year's new faculty. Building upon lessons learned from the 1999 grant, the 2000--2001 proposal would provide staff development to 18 committed education faculties and 2 content-area faculty. Staff development will consist of a 2-day fall workshop plus a 3-day workshop in July or August, as well as weekly open labs. Work sessions will also provide time to collaborate with classroom teachers and technology collaborators in the development of classroom activities and the revision of education courses. Faculty who participated in the 1997, 1998, and/or 1999 grant, Oswego City Schools, Oswego BOCES staff, and Project SMART disseminators will provide training. Follow-up sessions will provide team participants with the opportunity to share implementation activities and troubleshoot implementation problems.

7. Collaborations between Oswego State University and K-12 Teachers

Each preservice team for the 2000-2001 proposal consists of at least one K-12 teacher, at least one college education faculty member, and either a technology collaborator from the college or K-12 school or a content area collaborator from the college who also teaches preservice teachers. All teams participate together in summer training and planning as well as on-going collaboration on various implementation and evaluation projects throughout the school year.

Goals 2000 Preservice Teams

MST Team Math Methods faculty: Mary Reeves Technology faculty (Consultant): Vern Tryon Hannibal Tech Ed: Bob Jones Hannibal Science: Carol Burch Hannibal Math: Joanne Birchenough Earth Science teacher: Tom O'Neil Special Education teacher: Terri Dunning New Science faculty: TBA (search underway)	Elementary Science/Social Studies Methods Team .Science Methods faculty: Sue Weber; Ann Keen Science faculty: Diane Jackson Kenney Elementary teachers: Nancy Labbe; Mary Lee O'Brien; Pam Burlingame Social Studies Methods faculty: Yigasu Tucho Farley Elementary teachers: Barb Blaise; Bonnie Holmes
ELA Secondary Team ELA Methods faculty: Sharon Kane English faculty: Inez Alfors Oswego HS English teacher: Sharon Morley	Foundations/Reading/Math Team Foundations faculty: Pat Russo Corlears Jr. HS, Manhattan teacher: Dale Schofield Reading /Urban Ed faculty: Dennis Parsons Math faculty: Mary Reeves Technology Collaborator: Michael Fallo
PDS Elementary Team Graduate Research Methods faculty: Faith Mania Parish Elementary teacher: Peggy Scorzelli Parish Elementary teacher: Maria Hendricks Technology Collaborator: Fay McElveen	Bellevue Special Education Methods Team 1. Special Education Methods faculty: Ginny MacEntee Bellevue Elementary teachers: Michelle Alcock; Colleen Elmer
Reading Graduate Team Reading Graduate faculty: Pam Michel Reading Graduate faculty: Claire Putala Elementary Methods faculty: Audrey Hurley Oswego City Literacy Director: Barbara Parry	Sandy Creek Special Education Team .Special Education Methods faculty: Bobbi Schnoor Sandy Creek Elementary teachers: Lisa Overton; Val Fowler; Ben Archibee
Elementary Methods (Pulaski) Team Elementary Methods faculty: Jo Farrell Lura Sharp Elementary Teacher: Alan Woods; Christa Bertrand; Christine McArdell	Elementary Methods PDS (Lanigan) Team Elementary Methods faculty: Barb Beyerbach Lanigan Elementary Teachers: Susan Patrick; Sue Shaw; Pat Roy; Becca Koe; Frances (Cissy) Forgar; Terry Merritt; Jeff Hendrickson; Tina Geers
Secondary Language Methods Team Secondary Language faculty: Jean Ann NYC teacher: Sonia Toviar	

8. Performance Indicators/Benchmarks

A.

A. The Consortium's project in preservice teacher education will be subjected to rigorous formative and summative evaluation. Like other aspects of this 2000--2001 proposal, the evaluation plan for this project will build upon the evaluation methods utilized in 1999 and revised for 2000-2001. During the 1999 Goals 2000 grant, several survey instruments were developed and administered to determine the impact that the grant activities had on the participating faculty, preservice teachers, classroom teachers, and K-12 students. These instruments and other methods of data collection are described in the table on the following page.

In addition to these quantitative methods, qualitative methods will also be utilized, as focus group interviews will be conducted during the fall semester with preservice teachers and students in participating K-12 classrooms. Products created by teams (e.g., revised course syllabi, classroom activities for preservice teachers and K-12 classrooms, course web pages, online courses), preservice teachers (e.g., lessons/units integrating technology and Standards, presentations, papers), and K-12 students (papers, pamphlets, web sites, posters) will be evaluated for progress in the use of technology and implementation/understanding of Standards. In addition, videoconference transmissions will be observed with field notes written. Jo Farrell will serve as the primary evaluator of the project, however an external evaluator (Rachel Vannatta) will be consulted.

B. Student Performance

Program impact on students enrolled in the participating K-12 classrooms will be evaluated in a variety of ways. First, surveying and interviewing, through focus groups, students at the beginning of the school year, will determine a baseline of data. This baseline of data will identify students' attitudes and current use of educational technology. Surveys and focus groups will be conducted again in the spring of 2001 to determine the impact the grant activities may have had on students' attitudes toward technology, use of technology, and learning through activities that integrate technology and Standards. Student performance will also be evaluated through student products and grades.

Teachers will be engaged in action research projects that examine when and how technology infusion supports students' standards-based learning. They will learn to disaggregate data on NYS assessments and use this information to plan for instruction. Additionally, they will design performance tasks linked to standards and will analyze performance data of their students with particular attention to abilities, disabilities, race, language proficiency, race, class, and gender.

C. Teacher Knowledge of Standards and Instructional Technology

To determine if the grant activities have increased education faculty's and classroom teachers' knowledge and implementation of educational technology and the Standards, the Consortium will gather evaluative data from several sources. A survey will be administered to team members at the beginning of September and then in the spring of 2001. This survey will measure faculty's/teachers' attitudes toward technology, current use and implementation of technology, knowledge of Standards, and current implementation of Standards. Faculty and teachers will also be observed on numerous occasions during classroom instruction to determine the effectiveness of technology integration and Standards; field notes will be written during these observations. Faculty and teachers will also be interviewed during the spring of 2001. In addition, courses, units, lessons, and activities created by faculty and teachers will also be evaluated. Evaluation methods are explained in table on the next page.

DATA COLLECTION METHOD	PARTICIPANTS	DATES	VARIABLES ASSESSED
Survey Instruments			
Preservice Tech Attitudes	Preservice Teachers	9/00,12/00, 1/01, 5/01	Attitudes toward technology; Frequency & variety of technology activities experience; Knowledge of Standards; Perceived impact of grant
Student Tech Attitudes	Elementary Students Secondary Students	9/00, 5/01	Attitudes toward technology; Frequency & variety of technology activities experience; Perceived impact of how technology and Activities have improved learning.
Faculty/Teacher Attitudes	Faculty and K-12 Teacher Participants	9/00,5/01	Attitudes toward technology; Frequency and variety of technology activities experience; Knowledge of Standards; Perceived impact of grant
Evaluations of summer training	Faculty Classroom Teachers	July/August/01	Quality of training/planning sessions; additional session needs of participants
Focus Group Interviews	Faculty Classroom Teachers	9/00,5/01	Attitudes toward technology; Frequency & variety of technology activities implemented; Knowledge of Standards; Perceived impact of grant; Impact of training; Success/problems of technology and Standards implementation; Success/problems in using video-conferencing technology.
	Preservice Teachers	9/00, 12/00,	Attitudes toward technology; Frequency & variety of technology activities experienced; Perceived impact of how technology and activities have prepared them to assist students in reaching Standards; Success/problems in using video-conferencing technology
	K-12 students	9/00, 5/01	Attitudes toward technology; Frequency & variety of technology activities experienced; perceived impact of how technology and activities have improved learning.
Observation	Preservice Courses	9/00-5/01	Success of implementation of technology and Standards; impact on preservice teachers.
	K-12 Classrooms	9/00-5/01	Success of implementation of technology and Standards; impact K-12 students learning.
Product Evaluation			
Course Syllabi, lessons, course evaluations	Faculty Classroom Teachers	9/00-5/01	Success of implementation of technology and Standards
Lessons, papers, presentations	Preservice Teachers	9/00-5/01	Knowledge of and effective integration of technology and Standards
Projects, papers, presentations	K-12 Students	9/00-5/01	Use of technology and attainment of Standards by all students.

As a result of the following, we were awarded $388,000.00 from Goals 2000 funding for the 2000—2001 year.

As a result of this project, there was a definite change in the way students received instruction in their classes, which resulted in an improvement in student achievement. Students' lessons and units of study were focused on the State learning standards and enhanced by the judicious use of technology. Student achievement and attitudes were evaluated through observation of student use of technology in inquiry oriented projects, student performance-based products, focus groups with students from all of the participating districts, and pre/post student surveys. The participating students integrated a wide variety of computer applications (Microsoft Office, Encarta, KidPix, ClarisWorks, Claris Slide Show, HyperStudio, Inspiration, ZAP, Internet research) on a regular basis to complete performance-based assessment tasks in language arts, social studies, and integrated MST instruction. Student achievement of respective standards was demonstrated at higher levels through the performance-based assessments that used digital camera technology, videoconferencing, and selective software. In addition, students' attitudes were positive towards the technology integration. They claim that technology empowered them, since they could learn more because they could go to "www.stuff" and ask any questions they had. Fourth graders indicated that they used word games like ZAP that helped them with the State science test. One student commented that, "I didn't even know about ZAP last year."

What evidence do you have that systemic change has resulted from this project and will continue after the grant period ends (e.g., comprehensive coordinated improvement, coordinated access to appropriate health and social services, effective mechanisms and appropriate paths to the workforce as well as to higher education, innovative use of technology, utilization of quality management services)?

The acquisition of equipment and video-conferencing abilities, creation of nine K-12 model classrooms (a low-income, rural first grade classroom with 20 students, a suburban first grade classroom with 20 students, an urban middle-school class with 25 students, a 6th grade elementary classroom with 25 students, a fifth grade elementary classroom with 25 students, a team-taught 4/5 urban inclusion classroom with 30 children, a 4th grade team-taught inclusion class with 50 students, a High School English classroom with 25 students, and a High School integrated MST classroom with 20 students), and implementation of technology integration training for higher education and K-12 faculty and their public school and college students, incorporating videoconferencing links between contexts, have all created numerous opportunities for the participating institutions and individuals to collaborate. The following activities have been accomplished:

- Video links between eight preservice teacher education courses and respective K-12 classrooms, with eight new higher education faculty being added in the upcoming year.
- Revision of all preservice teacher education courses to infuse technology, and provide technology rich field placements. Sixteen faculty from the school of education and arts and sciences will be involved in this year's grant and will focus on developing a comprehensive scope and sequence of technology related activities, based on the NCATE standards for technology.
- Teams of teachers and teacher educators partnering via the videoconferencing presented findings of their research on the effectiveness of technology infusion at international, national and state level conferences (ED-MEDIA, NSTA and the NYS-SUNY Technology Infusion Conference).
- All of the teacher educators participating in this year's grant are mentoring other teacher education faculty on technology infusion. This mentoring is built into this year's grant. A similar mentoring network will be created at the K-12 level.
- Collaborations among K-12 and higher education faculty will continue in the instruction of preservice teachers. Preservice teachers will continue to observe model classrooms through the video conferencing system.
- Preservice teachers will continue to experience technology integration in their education courses that is more coordinated across the program, at more advanced levels, in more courses.

What changes in teaching and learning have resulted from the acquisition and use of technology supported by this grant? How are teachers teaching differently? How are students learning differently?

Oswego State University's School of Education has developed a conceptual framework centering on authentic learning for all students with a commitment to social justice. Technology infusion activities have also focused on those goals, supporting a constructivist pedagogy. Since educator training focused on use of the computer as a tool to support learning, educators implemented numerous lessons that used technology for the creation of student products and the facilitation of student performance-based assessments. Teachers implemented lessons that focused on students using technology in meaningful and authentic ways that are reflective of technology use in the workplace. Students have come to realize that computers are not just for e-mail, games, and "skill/drill" activities. Preservice teacher surveys and focus group data evidenced profound changes in their vision of technology infusion; it indicated that they are focused on how they can use technology to enhance students' learning. Finally, teachers also learned that computer-generated products increased the quality of work among special needs students since handwriting and spelling did not impact their projects. Therefore, students with special needs were able to produce very impressive products that clearly demonstrated what they learned, which in a sense provided them with a level playing field.

Because of this project, what are teachers and/administrators doing differently to engage in constant review of professional practice and inquiry for improving teaching, learning, and student performance?

The project used an action research model, in which all participants (K-12 teachers and college faculty) were involved in survey construction, focus group question generation, administering surveys and conducting focus groups, and analyzing data. Themes generated through this process were compared to those generated by an outside evaluator, as a member checking procedure. Teachers found this action research model to be a powerful form of professional development. Such action research projects, focused on the analysis of student learning of standards-based curriculum, were also incorporated into the preservice courses. Pre/post surveys as well as focus group data indicated huge increases in teacher proficiency in all areas, particularly methods of technology infusion. Teachers found that conducting focus groups and examining survey data of their students offer new insights into the teaching/learning process.

What changes have occurred as a result of this project to improve preservice programs for teachers, pupil personnel services professionals or school administrators to equip them with the subject matter and pedagogical expertise-including the use of instructional technology-necessary for preparing all students to meet the standards?

The impact of this grant on our preservice program was measured through pre/post faculty surveys, pre/post preservice teacher surveys, focus groups with preservice teachers, observation of technology use in preservice courses, and analysis of course syllabi and student work. It was found that:

- Preservice teacher proficiency of technology--All areas increased significantly. All areas increased at the highly significant (.001) level, except Database and Spreadsheet.
- Faculty use of technology in the classroom increased in all areas except Spreadsheet, Instructional Software, and Hypermedia. 10 out of 17 areas increased at the highly significant (.001) level.
- Examination of preservice teacher portfolios evidenced ability to plan standards-based lessons and unit plans that infused technology to enhance student learning.
- Focus group data reflected significant changes in preservice teacher visions of technology infusion, towards a more constructivist orientation that viewed technology as a tool to support student learning. Their **views** of how you can use technology have **broadened**. Where they once limited their thoughts to word-processing—"now the sky is the limit."
- On the basis of the Goals 2000 data, the School of Education passed the NCATE standard on technology in our spring site visit from NCATE.

Using these results, the Department of Curriculum and Instruction is committed to engaging more faculty in the Goals 2000 project, and is empowering this group to develop a program-wide scope and sequence for technology infusion in all teacher education courses. We will expand involvement to 16 faculty in the upcoming year, and technology infusion will occur at each level of the program. We have learned that it is important to use a team approach that showcases effective technology infusion in K-12 classrooms as well as providing technology rich field experiences. This project has resulted in broad-based faculty reflection and dialogue on how technology fits into the education curriculum, as well as extensive program restructuring.

Anchored Instruction Using WebQuests in a Post-Baccalaureate Teacher Education Course

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Abstract: This paper discusses the process of designing a post-baccalaureate Educational Technology class for pre-service teachers. The class used an anchored instruction model based on WebQuests to ensure student exploration, modeling of technology integration, and the wide range of abilities of all students were addressed. The design process, class content, and student evaluations will be discussed.

Introduction

Teacher education coursework in Educational Technology has traditionally required students to learn software tools that will support their future role in the K12 learning environment. These courses have usually been taught in a didactic manner where the instructor demonstrates the software and then asks students to replicate a product. A didactic model is in contrast to the technology infusion model the instructor hoped to achieve. While learning the tools of the trade is necessary, it is also important to model for pre-service teachers the way technology integration can look.

The history of anchored instruction goes back to Dewey (1933) who advocated learning by doing. More recently, the Cognition and Technology Group at Vanderbilt have advocated anchored instruction as a way to support learners with a wide range of abilities and backgrounds. Students are taught over time how to take responsibility for their own learning and teachers become co-facilitators or coaches of learning. Bransford, Sherwood, Hasselbring, Kinzer and Williams (1990) suggest that curriculum materials need to allow the learner to explore, actively manipulate, and question information.

Design Process

While preparing a post-baccalaureate pre-service teacher education course in Educational Technology, the instructor decided to anchor the coursework on WebQuests in order to allow student exploration within the learning environment and meet a wide range of abilities. WebQuests are being used in elementary, middle, and secondary classrooms and it has been suggested that anchored instruction could be an effective approach in higher education (Bauer, 1998). The process of designing a 500 level class (Applications of Educational Technology) followed that advocated by Dodge (1997) and March (1995) in order to bridge the transition between the traditional didactic approach and a student-centered focus. The overall design of the class had four stages: a) determine outcomes, b) draft the project framework, c) develop the rubrics and d) design the tasks.

The six project outcomes of the class were based on the approved University of Northern Colorado curriculum for ET 501, Applications of Educational Technology. These outcomes were then tied to the Performance-Based Standards for Colorado Teachers, as well as National Council for Accreditation of Teacher Education (NCATE) and International Society for Technology in Education (ISTE) standards. The six projects included one activity based on each of the following: word processing/desktop publishing, spreadsheets, multimedia authoring, presentations, web authoring, and software evaluation.

The framework for the class followed a somewhat different pattern than that advocated by Dodge (1997) and March (1995) because of the variety of projects. It did include the subject (project software program), and expected finished project. The audience for each project was student dependent due to the wide range of content and grade level programs. Each of the finished projects was anchored to a specific WebQuest with support from online tutorials, class notes, discussion questions, rubrics, web resources, course text, and in some instances, PowerPoint presentations.

Once the framework for each activity was completed and linked to specific standards, the rubrics were developed. Each was a scaled set of criteria for evaluating students' projects and communicating to students what was expected for the end product. All of the rubrics had four performance levels (non-proficient, partially proficient, proficient, advanced) modeling the way most projects are graded in the K-12 educational system of Colorado. Categories for the individual projects differed depending on the intended final product. The final step in the creation of the rubric was to write the descriptors for each category and proficiency. The criteria for level three was written first as the standard of what the students were expected to be able to do.

The final phase of this process was to design each task or end product. Each task had an introduction, a short, clear statement describing the activity to the students. The activity section described what the end-result of the learner's activities should be. Proficiency was shown through a variety of products (i.e., brochure, newsletter, lesson plan, story, budget, grade book, graph, HyperStudio stack, multimedia presentation, WebQuest). The resource section included sites on the Internet (tutorials, design criteria, relevant information, rubrics, class notes, WebQuest URLs, PowerPoint presentations, discussion questions) and physical resources (texts, research articles, content books).

Findings

The 50 students in the three sections of ET501, to this point, have been positive and enthusiastic about the instructional techniques (anchored instruction, WebQuests, self-paced learning) of the class. At the end of the term, a Likert scale, attitude survey will be administered in order to assess the success of anchoring the class instruction on WebQuests. Data gathered from students will be analyzed at the end of the term (Fall, 2000) and discussed at the time of the presentation.

References

Bauer, J. W. (1998). *Anchored instruction in preservice educational technology classes: A research project.* [On-line] Available: http://www.coe.uh.edu/insite/elec_pub/HTML1998/ec_baue.htm

Bransford, J., Sherwood, R., Hasselbring, T., Kinzer, C., & Williams, S. (1990). Anchored instruction: Why we need it and how technology can help. In D. Nix & R. Sprio (Eds.), *Cognition education and multimedia: Exploring ideas in high technology* (pp. 115-141). Hillsdale, NJ: Lawrence Erlbaum Associates.

Dodge, B. J. (1995). WebQuests: A structure for active learning on the World Wide Web. *The Distance Educator,* 1(2).

March, T. (1995). *Working the web for education.* [On-line] Available: http://www.ozline.com/learning/theory.html

Virtual Leaning, Web Videos, and Elementary Mathematics Teacher Education

by
Janice L. Flake

This project has been to build a collection of virtual learning experiences for teacher education in the form of viewing and analyzing videotapes of interviews of children discussing their mathematical concepts and problem solving. The intended audiences are both preservice and inservice teachers.

Many times in prospective teachers in teacher education programs often have little experience with students prior to their internship, or they have lots of field experience that is not necessarily connected with theory. The bridge between theory and practice varies greatly, and sometimes the bridge is a big gap. It is difficult to make connections between the abstract theories and the real world of practice. To treat theory in the absence of experiences with children will likely result in the theory quickly being abandoned or forgotten. At the same time building a class based heavily on field experiences has its problems as well. The experiences are often random, may or may connect with the underlying theories, and risk the possibility that the students never make the links between theory and practice. Furthermore, consequences of actions can affect real students and sometimes do damage to the students, and the supervision of field experiences often is labor intensive and/or not easy to do. In addition the actions in a classroom are multidimensional and often difficult to isolate and control one variable at a time.

In 1972-73 I had a vision of building a simulated teaching laboratory. Initial efforts occurred with a PLATO program where I created a program that allowed perspective teachers to instruct simulated students (see Flake, 1973). The results were very encouraging. Participants in the study commented that they began to think of these simulated students as real; they also liked the notion that they were not doing permanent damage to the simulated students; and after going out into the schools the participants reported back that the real students behaved just like the simulated students. In addition a very popular button that was added at the request of the students was the restart button, where participants were not happy with the way things were going and just wanted to throw out that class and start all over again—phenomenon that does not normally happen with real classes. Furthermore, the simulation provided a common experience for class discussion of alternatives for interacting with the simulation. Brown (1999) found similar results as described above.

Flake (In-Review) describes a project involving 268 videos already posted on the Web of interviews of 23 children in K through 5 doing mathematical tasks illustrating their understandings of mathematical thinking following the major strands in mathematics that have been identified by national and state mathematics standards. Prospective teachers use these videos to study the students' responses and build connections between theory and practice. Samples of these videotapes will be presented at the VideoFestival.

References

Brown, A. H. (1999). Simulated classrooms and artificial students: the potential effects of new technologies on teacher education. ***Journal of Research on Computing in Education***. 32(2), 307-18.

Flake, J. L. (1973). The use of interactive computer simulations for sensitizing mathematics methods students in questioning behaviors. Ph.D. Dissertation. University of Illinois. ERIC ED 107 503. 133 pages.

Flake, J. L. (1975, March). Interactive computer simulation for teacher education. **Educational Technology**. **15**, 54-7.

Flake, J. L. (In-Review). Using Web Videos and Virtual Learning to Help Prospective Teachers Construct Meaning about Children's Mathematical Thinking. A paper being prepared for publication.

Object: An Important Concept for Pre-service Teachers to Learn Technology

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Abstract: This paper discusses the importance of the concept of objects for pre-service teachers who are learning technology. Educational information is composed of different objects: text, graphics, audio, video, data, and table. Each object has many attributes. Many operations can be performed on objects. These operations are directly related to menus of application programs. Objects, attributes, and operations form concept maps corresponding to specific objects. Mastering these concept maps benefits students' understanding of the structure of software, learning of new software, and implementing multimedia material.

Introduction

Computer software application programs are an essential part of computer technology in the information age. There are many application programs available right now and more will be coming out. It is impossible for anybody to learn all the software applications in his/her discipline. But it is possible to know the basic structure of software and the basics of using software. This is true for pre-service teachers. To meet the technology standards for educators in twenty-first century, pre-service teachers should be proficient in using technologies for learning and teaching. Learning how to use the commonly-used software or application programs in educational settings is an important aspect of using technologies. Just as the object concept is very important for designing software with programming languages like C++, Java, and Perl, the object concept is also very important for pre-service teachers to learn how to use computer software. The following sections will discuss object concept, attributes of an object, operations performed on objects, concept maps related to objects, and benefits of learning the object concept.

Objects

Educational information can be represented in many forms and delivered with different media. Each form of information can be viewed as a kind of object. There are five basic types of objects that represent the educational information delivered through instruction: text object, graphics object, audio object, video object, and data object (Verduin & Clark, 1991; Heinich, Molenda & Russell, 1993).

A text object can be a letter, a word, a sentence, a paragraph, or paragraphs. The text object has always been the basic and fundamental format of information in education and will continue to be. Because of its long history, it is familiar to students, inexpensive to produce, and portable. But it can give only a vicarious experience of reality and may not be understood very well if students do not have the necessary experience to comprehend a concrete illustration.

A graphic object can be a picture, a drawing, a chart, an animation, or any kind of combination of them. It can illustrate difficult concepts, reflect the creativity of human beings, and depict the realism in different levels.

An audio object can be a recorded natural or artificial sound clip, or a piece of music. It can present stimulating verbal messages more dramatically than text can, reflect natural sound resources, and express various feelings.

A video object is the body that contains time-varying-picture images, possibly with color and coordinated sound. Video provides realistic experiences through showing/documenting places, viewpoints, complex and dynamic changing processes, slow/fast motion, real world events, and chronological sequence.

A data object can be any number, date, and/or any unit of the above objects.

In addition to the above, another element, table, is heavily used in some application programs such as Word and web development packages. A table is an information container that is composed of various numbers of rows and columns and allows the user to organize information in many nice and neat ways. Because it always comes with other kinds of information together, it can be viewed as an object.

Attributes of objects

Each kind of object has many attributes. These attributes determine the appearance of the object and the ways that information can be represented and manipulated according to a predetermined design. Different software applications deploy different attributes of an object depending on the purposes of the software. Attributes of an object can be divided into two types: basic and extended.

The basic attributes of an object exist in general purpose software and define the primary aspects of the object. Below is a table showing the basic attributes of some objects.

Table 1. Basic Attributes of Objects

Object	Attributes
Text	Font, size, alignment, color, style, line spacing, borders, and shading
Graphics	Size, position, border, layout, brightness, color, file format, and contrast
Audio	Volume and loop
Video	Position, volume, size, and play control
Table	Border and shading, number of rows and columns, and alignment

Besides the basic attributes, many software application programs add more attributes to the objects depending on the special requirements of the software. In Web development, software packages like Netscape Composer, Dreamweaver, and Frontpage add alt, hyperlink, transparent, rollover, target, and interlaced to graphic objects to fit the new features of the software. In the same way, table object has colspan, rowspan, colored borders, cellspadding, cellspacing, background color, caption, heading, width, and extra HTML attributes besides the basic ones mentioned above. Adobe Photoshop adds more attributes to the graphics, some of which are resolution, effects, image mode, histogram, and layer. Extended attributes of objects give the user more freedom to control and manipulate the objects for special purposes in addition to the basics.

Operations on objects

In every kind of software, a file is an essential container for the user to work with. A file is composed of one or more objects. For example, pure text can form a Word file; text plus graphics also form a Word file. Therefore, a file can be viewed as an object or objects. In order to make use of various objects while working with a file, various operations on objects are designed. Some of them are almost universal; some are specially designed. Corresponding to the attributes of an object, there are two types of operations: basic and extended.

Basic operations are the operations performed on the basic attributes. File, edit, and format (or menus similar to format) are the three basic menus. All the files can be manipulated through the *File* menu with the commonly used *new*, *open*, *close*, *save*, *save as*, *import*, *print*, and *print preview* operations. *New* creates a brand new file to let users put object or objects on it. *Open* opens an existing file for editing. The products (saved files) created by software can be viewed as objects as well. For example, *Dreamweaver* treats products from *Flash*, *Fireworks*, and shockwaved materials as objects that can be integrated directly into the file. For each kind of object, *undo, copy, cut, paste, select all, find* and *replace* operations can be performed through the *Edit* menu. To change the attribute(s) of an object, the *Format* menu can be used to make the needed change(s). *File*, *Edit*, and *Format* are the three basic menus seen in various software packages.

If a software application program can incorporate more objects into the file, either an *Insert* or *Import* menu is designed to bring them into the file to work with them. For example, *Microsoft Word*, *PowerPoint*, *Excel*, and *Access* have an *Insert* menu. These menus plus the *Help* and *Window* menus are almost the same for every kind of software. With these menus, users can perform general tasks regarding manipulation of objects (except the table object). Other menus in the software are supportive. In programs that incorporate a table object, there is a *Table* menu or a menu specially designed for table object to perform: insert row (column), delete row (column), split or merge cells, and change attributes of a table.

Extended operations on objects refer to the operations that can be done through special software focusing on a specific kind of object regarding the extended attributes. Adobe Premiere focuses on video object. Microsoft Word and PageMaker mainly focus on text objects. Adobe Photoshop, Image Composer, Photo Editor, and Fireworks focus on graphics. Microsoft Excel and Microsoft Access focus on data object. Take Adobe Photoshop as an example. Operations like *filter*, *adjustment*, *rotate*, *extract*, *add layer mask*, and *add types* are added to the basic operations on graphics.

Concept maps of objects

A concept map is a graphical representation of concepts and their interconnections. It is believed that concept maps reflect the student's cognitive structure, enabling both teachers and students to determine the level of understanding of material attained before, during, or after instruction (Burke 1998). The purpose of a concept map is to identify key concepts and the relationships in an instructional setting under various levels of abstraction with a visualized diagram. Research has shown that a concept map is very helpful as an instructional tool, a tool to access a student's knowledge structure, a tool to evaluate a student's learning, and a navigational tool in hypermedia (Lee, 1997).

Objects, attributes, and operations can be represented by concept maps of objects: basic concept maps about objects and extended concept maps about objects. The basic concept maps depict the objects, their basic attributes, and basic operations on them. Basic attributes of and operations on objects are universal. Teaching pre-service students the object concept while they learn how to use software like Word, PowerPoint, Excel, and HyperStudio will enable them to develop concept maps of objects. With the concept maps, students can manipulate the objects effectively and efficiently while they learn technologies and perform tasks with technologies. Below is a concept map of a general object.

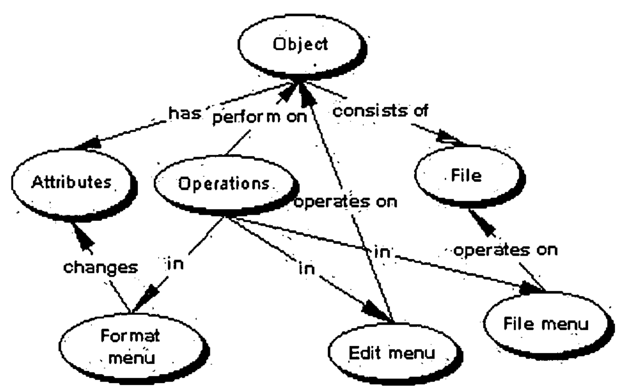

Figure 1. A basic concept map of an object

A concept map not only allows people to connect ideas they already have, but also to connect new ideas to knowledge they already have, and to organize ideas in a logical but not rigid structure that allows future information or viewpoints to be included. Extended concept maps about objects can be formed by adding more attributes and operations to the basic concept maps, which leads to the expanded knowledge structures and to the potential to perform more complex tasks. Below is an extended concept map that can be formed from the graphic object in Adobe Photoshop.

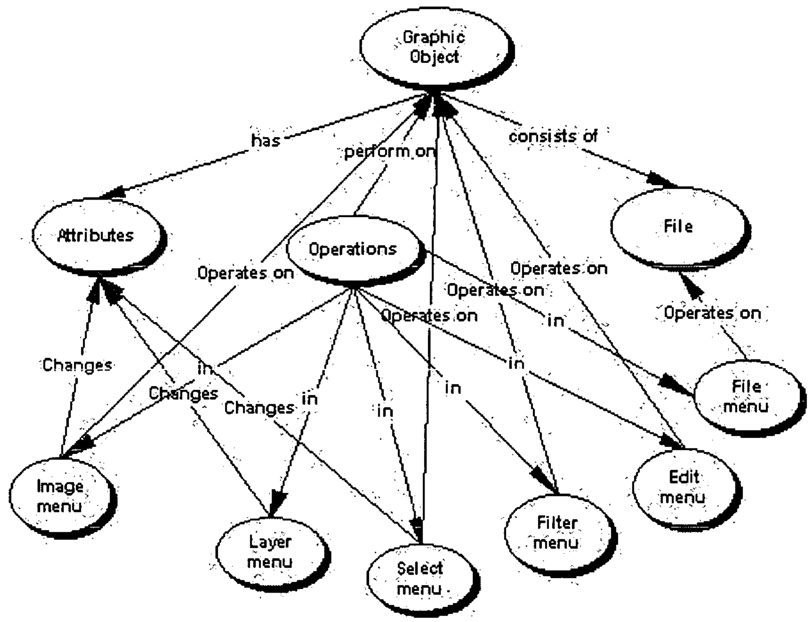

Figure 2. An extended concept map of the graphic object

Benefits of object concept learning

Mastering the concept maps of objects benefits three aspects of students' learning about technology. Concept maps help students understand the structure of software. Knowing the concept maps of objects, the learners can understand the essential part of the software interface and supportive menus. For example, in Microsoft Word, *File, Edit, Format, Table, Window*, and *Help* are the main parts of the interface. *View, Insert*, and *Tools* are supportive menus. Therefore, learners can understand the structure of software effectively.

Concept maps help students learn how to use new software. In education settings, different software employs different objects. Some use one, some use two, and some even use more. If the object concept and concept maps are stressed from the beginning of using software such as Microsoft Word, this will be very beneficial for students to learn other software like Excel, PowerPoint, and HyperStudio. Microsoft Word usually uses text objects and graphic objects; Excel usually uses graphic objects and data objects; PowerPoint uses text, graphics, audio, and video objects. With more specially designed software, such as Adobe Photoshop, extended concept maps help the learning process.

Concept maps can also help students implement multimedia instructional materials. The object concept is critical to many multimedia application programs such as HyperCard, HyperStudio, Authorware, Dreamweaver, and Frontpage. These multimedia software packages integrate text, graphics, audio, and video information into multimedia learning materials. The process of implementing multimedia instructional materials with these programs is a process of manipulating the text, graphics, audio, and video object to a design. The concept maps greatly benefit the manipulation of objects used in the implementation process.

Summary

From the above discussion, we can see that object is an important concept for learning technology. Categorizing educational information into different objects helps students learn concept maps, which consist of objects, attributes, and operation while they learn the technology. This object-oriented strategy not only benefits the students' current learning of technology, but also helps their learning of new technologies in the future.

References

Burke, D. M. (1998). The relationship of multiple intelligence profiles to success in computer-based concept mapping. Doctoral dissertation. University of Lowell.

Heinich, R., Molenda, M. and Russell, J. (1993). Instructional media and the new technologies of instruction. New York: Macmillan Publishing Company.

Lee, P. L. (1997). Integrating concept mapping and metacognitive methods in a hypermedia environment for learning science. Doctoral dissertation, Purdue University.

Verduin, J. R. Jr., and Clark, T. A. (1991). Distance education: The foundations of effective practice. San Francisco: Jossey-Bass.

Infusing Technology into Pre-Service Teacher Education

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Abstract: Ensuring that pre-service teachers are prepared to integrate technology into their teaching is a top priority for teacher education programs today. One way to help achieve this goal is to model the integration of technology throughout the teacher preparation program. This pilot study examines the integration of technology into a language arts methods course and the effects of this integration on pre-service teachers.

Introduction

The role of technology in society has become an increasingly important issue in the public school. Reports on numbers of computers in public schools show that 98% of all schools now own computers, which puts the current student to computer ratio at about 10 to 1 (Coley, Cradler, & Engel, 1997). It is imperative for educators to help prepare students in the use of technology in everyday tasks. One goal of pre-service teacher education programs is to help prepare these future teachers to become proficient in the integration of technology into the curriculum. Federal and state agencies (US Department of Education, Texas State Board for Educator Certification) as well as educational organizations and society have an expectation for the use of technology in schools. Institutions of higher learning have approached this expectation in a variety of ways. The primary mode in which teacher preparation programs have chosen to meet this need is through a separate course in educational technology course that is part of the pre-service curriculum (Thomas, 1996; Thompson, Schmidt & Hadjiyani, 1995; Zachariades & Roberts, 1996). This separate course tends to present computers and technology as an isolated subject. This tends to model the use of technology as a separate component or 'add-on' rather than the integration that is vital in today's society (Jensen, 1992; Novak & Berger, 1991). Technology use has not been central to the pre-service preparation experience of most colleges of education. Most new teachers graduate with limited knowledge of use of technology integration strategies in their day-to-day teaching (US Congress, 1995; Byrum & Cashman, 1993; Davis, 1994).

It seems unreasonable to expect that pre-service teachers would be able to integrate technology effectively after taking an isolated technology course. Integrating technology into pre-service programs must become the norm if future educators are to use technology effectively in the classroom. One way to help ensure that pre-service teachers get the most from their technology experience in the preparation program is through effective modeling of technology integration throughout courses in the pre-service program (Bias, 1995, Wetzel, 1993, Ehley, 1992). When pre-service teachers participate in a preparation program that models the integration of technology, these students are much more confident in their own technology use as well as gaining ideas for use in their own teaching practices (Stuhlman, 1998).

The Study

This pilot study proposed the integration of technology into the undergraduate teacher education program by modeling the use of technology in different courses throughout the program. This pilot study focused on technology integration strategies in a language arts methods class. To help with the integration of technology as part of this methods course, participant's integrated technology into their lesson plans in many ways. This included the use of educational software, desktop publishing, Internet teaching resources, presentation software, HyperStudio© and WebQuest©. Additionally, the instructor modeled each of these applications throughout the course. This modeling demonstrated to participants how technology integration occurs without becoming an add-on to the curriculum.

Participants for this pilot study consisted of undergraduate elementary education students enrolled in the Language Arts methods course in the fall of 2000. All students enrolled in this course also enrolled in Math, Science, and Social Science methods at the same time. There were 72 students enrolled in methods who participated in this study. All participants have taken the basic computer course required by the university. Participants attended the language arts methods class one day a week for three hours in a field based setting at a local elementary school. Participants attended class two days a week and observed and interacted all day in an elementary classroom two other days of the week.

All participants completed a computer use survey focusing on confidence with use of computers. Administration of the survey again at the end of the student teaching semester adds more information for this study.

Before the implementation of this study, the Language Arts methods course contained several varied assignments in order to make sure that students understood language arts concepts and strategies. These course assignments consisted of the following:

- Internet resources- a list of useful resources for teachers of language arts in grades K-8.
- Classroom design – a drawing of the students' ideal classroom including all items, centers, room arrangement, etc... These were hand drawn and labeled.
- Language arts mini unit- consists of five lesson plans written around a theme, a web summary of the unit, and an annotated bibliography of fiction and nonfiction books related to the theme.
- Portfolio- in concert with the other methods courses, a compilation of process, product and performances of competencies related to the Texas teacher certification exam.

For this pilot study, the instructor for the language arts methods course and a member of the instructional technology faculty planned together to make changes to the course assignments. The Internet resources assignment and the portfolio assignment did not change but other assignments did in order to reflect the integration of technology into the projects. The classroom design changed so that students were required to draw their ideal classroom design using the computer rather than drawing it by hand. A paragraph reflecting on this design became a part of this assignment as well.

For the language arts mini unit several changes were made:

- A typed web summary with text boxes replaced the hand written web summary of the unit.
- Participants were required to create a newsletter for parents introducing the unit.
- The annotated bibliography must come directly from web resources.
- Four of the five lesson plans required the integration of technology into the lesson. These included the integration of educational software, use of presentation software, use of Hyperstudio© and the use of a Web Quest©.

Participants in this study did not have experience with any of the technology application tools required for each of these assignments so it was necessary to teach them the skills needed to utilize each of these components. The IT faculty member taught application skills using mini-lessons. These mini-lessons took place in the field-based classroom at the elementary school where the methods class met. The language arts instructor and the IT instructor rotated groups through a small media center with eight computers. This helped to demonstrate to participants how to utilize integration with a limited number of computers.

Since this study examined the use of modeling integration throughout the semester, it was imperative that modeling of technology takes place in the appropriate manner during methods instruction. The faculty member for the language arts methods class did most of the integration modeling. An instructional technology faculty member served as mentor and support for the language arts instructor and modeled technology integration for the students. Examples of modeling technology during instruction included the following tools:

<u>PowerPoint© for presentations</u> Utilization of this tool occurred several times during the semester to present information to the participants on various subjects related to reading and language arts. Participants had handouts of the presentations for use in note taking and to save as a study aid or resource for the future.

<u>KidPix© for demonstrating interactive writing</u> During a presentation on emergent literacy, students role-played as kindergarten students while the instructor modeled interactive writing with this program.

Participants dictated story ideas based on a book read in class. The instructor recorded these ideas using KidPix©. Interactive writing also allows the young emergent reader to come up to the front of the classroom and write in the words they know. Modeling of interactive writing took place as well using the computer and software rather than the traditional chart tablet. Participants were able to see technology integration in an appropriate manner and to understand the process of interactive writing.

Word processing software Use of word processing software occurred many times during the course. On the first day of class, the participants completed a KWL chart listing what they Knew, and Wanted to know about language arts. What they Learned was added to the last column at the end of the semester. The methods faculty created a chart using word processing software and filled it in as participants thought of concepts that fit in each category. Generation of a newsletter as an example also utilized this software. The newsletter described course content and serves as a model for the newsletter participants would create for the introduction to their mini unit.

Internet The methods faculty modeled the use of the Internet as a means to locate teacher resources related to language arts and other areas. Additionally, the faculty members provided examples of WebQuests© for students to use in adapting or developing their own (for the lesson requiring the integration of a WebQuest©.

Educational Software Individual copies of educational software were set up in stations in the classroom so that participants could review them. Participants incorporated educational software into the second lesson plan of the thematic unit.

Hyper Studio© A Hyper Studio© card stack was created by the language arts and instructional technology faculty members to serve as a demonstration of how this tool could be used in classrooms.

Implications

The changes in course assignments produced several changes in the final products completed by the participants. The computer drawn classroom designs were much neater and more concise than the hand drawn ones turned in during previous semesters. Students had to take more time when deciding where objects should go in the classroom. Although color was not required for this assignment, many participants opted to add color to the design where few did in earlier semesters. Similarly, the unit summary web was much neater when done on the computer than when it was hand drawn in previous semesters. This made both projects easier to read and understand. Students commented that although they would not have used the computer for either of these assignments unless it was required, they thought the results were better. Participants felt that the initial use of the computer to draw the classroom design was more time consuming that if they had drawn it by hand but decided that the next time they had to do it would be easier and faster.

Although the quality of lesson plans did not really change, participants were able to integrate technology into their lesson plans without making the technology the whole lesson. Because of the way the technology components became a part of the class, students were able to do the same with their own lesson plans. Students in previous semesters would not even attempt integrating any of the technology tools into their lesson plans. For the first time, students also included their technology implementations into their final portfolios.

The use of technology in language arts lesson plans also crossed over into the other methods areas of math, science and social sciences. Participants were able to use what they learned to apply in these other courses as well. Participants often wrote lesson plans that integrated language arts and science and turned these in to both instructors. In this way, their use of technology for language arts also influenced lesson planning in other areas. The participants frequently and enthusiastically shared their experiences of integrating technology into lessons developed for the other methods classes, especially with the instructional technology faculty member. One particular example stands out where the participant developed an interactive bulletin board for the social studies methods course on the election. This assignment included activities for using the Internet to search for information on the candidates, as well as participate in an election WebQuest©.

Participants showed an increased use in technology of all kinds. Several participants utilized email to send in lesson plans. This was not the case in previous semesters. Participants were also more willing to use email to ask questions about the course than they had in past semesters.

Since this is an ongoing pilot study, there are changes are being made to the program following the completion of this first semester. One problem with this study was that too much technology information was crammed into one methods course. It was extremely difficult to include all the regular course content and the technology skill lessons needed to complete the assigned projects. During the next phase of the study, technology skill mini-lessons have been integrated throughout the methods courses in order to make the time spent more equitable between the courses. In addition, some time in the computer lab on the university campus before the courses are field based. This will allow participants to gain some of the skills they need before going out into the field based school where it is harder to find computers to work with.

Conclusions

This ongoing pilot study has shown that integration of technology into the pre-service teacher program can be beneficial. There was an increase in the quality of student projects after exposure to technology integration than in past semesters. Participants seemed more willing to use technology overall after their exposure to it in class. The increased use of email and the willingness to use technology in lessons for courses that did not require it are examples of this.

It is important to note that participants were able to draw on the technology skills learned early in the semester for projects later in the semester. Participants learned to make text boxes and other shapes for their physical classroom design. When it came time to work on the newsletter, one participant volunteered to show the rest of the class how she used text boxes to make her newsletter. This is a great example of a student using this prior skill to apply it in a new and appropriate way. The class this particular example was in completed their newsletters before the other two sections of the class did.

The changes occurring in the undergraduate teacher preparation program to integrate technology are ongoing and will be cyclical in nature. One participant in this semester's course was teaching a lesson out at her field-based school. The lesson happened to be a lesson that integrated a PowerPoint presentation. The school principal entered the room and was very impressed with the lesson. He then asked this student if she could teach the rest of his faculty how to use PowerPoint. This is one of the reasons that modeling the appropriate use of technology is so important. The university students will show what they are learning and will be able to assist in-service teachers with their technology integration. More of this will occur as the students move from methods to student teaching in the next semester. Participants who completed methods and moved on to student teaching will remain in touch with the faculty during student teaching through email. At the end of the student teaching semester, they will complete the computer use survey again to compare with the results of the first survey. It is anticipated the computer use and confidence will increase by the end of the student teaching semester.

This study will continue as the methods courses change again for the Spring 2001 semester. These changes should bring about positive effects on the use of technology as an everyday tool in the classroom. As the State of Texas puts an increasingly higher emphasis on the use of technology in the classroom, undergraduates in the teacher preparation program need as much technology integration as they can get. Changes in state certification in Texas are forcing universities to cut some courses in order to make room for others and the technology for teachers course is one that is likely to reorganized in the course rotation. Integration of technology into all undergraduate education courses will help with the problem of the loss of this course. Based on the changes in technology use noted for the participants in this study, there will be an even greater change for upcoming students as technology use trickles down to other undergraduate education courses before the methods semester.

References

Bias, G. (1995). New staff development ideas. In *Technology and Telecommunications: Catalyst for change, Volume 2. Proceedings of the Thirteenth International Conference on Technology and Education* (pp. 585-587).

Byrum, D. C., & Cashman, C. (1993). Pre-service teacher training in educational computing: Problems, perceptions, and preparation. *Journal of Technology and Teacher Education, 1(3)*, 259-274.

Coley, R., Cradler, J., & Engel, P. (1997). *Computers and classrooms: The status of technology in U.S. schools.* Princeton, NJ: Educational Testing Service.

Davis, N. (1994). Practicing what we preach: New technology models for teacher preparation. *Proceedings of the National Educational Computing Conference* (pp. 78-80). Boston, MA: ISTE and NEGA.

Ehley, L. (1992). *Building a vision for teacher technology in education.* (ERIC Document Reproduction Service No. ED 350 278.

Jensen, E. A. (1992). Media competencies for pre-service secondary teachers: Teaching discipline and competency selection (IR 015 706). In *Proceedings at the Convention of the Association for Educational Communications and Technology.* (ERIC Document Reproduction Service No. ED 347 998).

Novak, D.I. & Berger, C. F. (1991). Integrating technology into teacher education. *T.H.E. Journal, 18* (9), 83-86.

Stuhlman, J. (1998). A model for infusing technology into teacher training programs. *Journal of Technology and Teacher Education, 6*(2/3), 125-139.

Thomas, L. (1996 Winter). Integrating technology in teacher education programs: Lessons for the teaching teleapprentice project. *Action in Teacher Education, 17*
(4), 1-8.

Thompson, A., Schmidt, D., & Hadjiyianni, E. (1995). A three year program to infuse technology throughout a teacher education program. *Journal of Technology and Teacher Education, 3*, 13-24.

U.S. Congress, Office of Technology Assessment. (1995*). Teachers and technology: Making the connection* (OTA-HER-616). Washington, DC: U.S. Government Printing Office.

Wetzel, K. (1993). Teacher educator's uses of computers in teaching. *Journal of Technology and Teacher Education*. 1(4), 335-352.

Zachariades, I., & Roberts, S. K. (1996). A collaborative approach to helping teacher education faculty model technology integration into their courses: An informal case. *Journal of Technology and Teacher Education, 3* (4), 351-357.

Breaking Down Barriers: Integrating Technology in Teacher Education and Distributing it to K-12 Schools

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Abstract: Over the last decade Marietta College has integrated technology into its teacher education program. During that time students found it difficult if not impossible to utilize their knowledge and skills of technology in the K-12 arena. In an effort to accommodate students, the college engaged in multiple projects with the local schools to provide sites and experiences that demonstrated "best practices" for integrating technology in the K-12 curriculum. This paper discusses how some of the projects involved students and teachers from local schools, as well as college teacher education students and their faculty. As a result of these projects, Marietta College is making progress toward eradicating the barriers of teacher attitude and lack of willingness to allow teacher education students to try new technology in their classrooms. In addition, these future teachers see first hand how technology can enhance student success, thus insuring technology as an indispensable tool in the classroom.

Integrating technology into the Teacher Education program at Marietta College has been a priority for the last decade. However, while the college worked diligently to secure hardware, software, lab equipment, network services, course requirements, and pedagogical acceptance among faculty to facilitate this integration, our students frequently failed to utilize their knowledge of technology in their K-12 fieldwork. Barriers facing our students were numerous: lack of equipment in the public schools, lack of commitment to and knowledge about technology among local teachers, a mismatch of platform capabilities, and studentsÕ less than enthusiastic belief that technology could be integrated meaningfully into the K-12 curriculum. Because of these obstacles, the Education Department created new strategies, methods, and activities for addressing this Òbroken pipeÓ between higher education and K-12 educational technology.

Students in the Teacher Education program at Marietta College are required to take a course entitled ÒTechnology in the ClassroomÓ during their freshman year or immediately upon transferring into the college. This course acquaints students with research and best practices for integrating technology into their field of education. In addition, students learn software that is utilized for assignments in most of their other education courses. These assignments vary from simple to complex, incorporating such technology as graphics, sound, digitized video, digital photography, multimedia, and web page design.

Over the years, students enthusiastically completed their technology related assignments, but became frustrated when they attempted to utilize them during their field placements. Often the local schoolsÕ computers were outdated or utilized a different platform than the one used by the college students. Sometimes the cooperating teachers saw no value in allowing the students to utilize technology during their field work. The department began developing new methods and strategies to combat these problems.

First, only cross platform software was chosen for use. Second, where computers were in short supply, students were permitted to take department laptops to present lessons planned for field experience classrooms. Third, Zip disks and drives, which could be attached to school computers, were used for large multimedia projects, and finally, wherever possible the internet was used for accessing instructional material. These strategies solved most of the hardware and compatibility problems.

Addressing the problems of teacher enthusiasm for and willingness to integrate technology into their curriculum proved to be the most difficult obstacle to address. In attempts to change teacher opinion and create a technologically friendly climate, the Education Department began designing projects with local school teachers that incorporate technology into the teaching /learning process in meaningful, creative ways that complemented the K-12 curriculum. These activities, at times, brought K-12 students and teachers to the college to work with education students and faculty. Other activities involved taking education faculty and college students to schools to work with K-12 students. Through these projects, the potential of integrating technology into the K-12 curriculum was witnessed by K-12 students and their parents, teachers, administrators, college students, and college faculty.

One of the first attempts to model effective use of technology in K-12 curriculum involved work with talented and gifted seventh grade language arts students from Marietta Middle School. The education department was approached by the Middle School gifted teachers for ideas about how to adequately challenge these students. This led to the design of a project which linked childrenÕs literature, social studies, and technology using student-created multimedia projects. Led by two education faculty members, teacher education students assisted the seventh graders and their teachers as they learned to create Hyperstudio stacks about historical fiction selections during biweekly language arts periods spent in the college computer lab. Seventh graders were able to search internet sites to learn more about selected aspects of their books, scan photos and artifacts which related to the time periods of their books, create video clips which demonstrated various aspects of the time period, and digitize music to accompany their projects. Student projects were shared at an open house held for parents and school staff. Through this project, parents, teachers, and education students were able to see how multimedia can become a tool for integrating curriculum, encouraging critical and creative thinking, and fostering student enthusiasm for learning. After several projects with middle school talented and gifted students during a period of three years, it became evident that the gifted teacher and the middle school principal recognized the value of technology with this particular group of students. At this point, education faculty saw the need to model how technology can facilitate curriculum goals with heterogeneous groups of students and with students at different grade levels.

In an onsite program at Washington Elementary School, a class of mixed ability fifth graders was selected to work with students from the adolescent literature course to read historical fiction selections and create web pages about the books. Books were selected which could be tied to the fifth grade social studies focus on Native Americans. Students were asked to consider aspects of the cultural and historical contexts of their books which could be represented on their web pages. College students and education faculty worked on site with students in the schoolÕs computer lab as they investigated their books and learned to make web pages with Site Central. In addition to the class of fifth grade students and their teacher, the project attracted the interest of other teachers in the school. Once posted on the web, this project provided the opportunity to share studentsÕ work with parents and other teacher education students.

Additional opportunities to model effective technology integration are afforded through Marietta College Reading Clinic programs. A four week summer program, Summer Reading Camp, provides a practicum experience for undergraduate and graduate students who are seeking reading certification. Graduate students who teach in the summer program are typically practicing K-12 classroom teachers while undergraduate students are senior level teacher education students. Children who attend Reading Camp have been recommended due to poor literacy performance at school. The majority of these children also exhibit negative attitudes toward reading and writing. Teachers are required to address literacy needs using a variety of good childrenÕs literature and through the daily integration of technology. Practicing teachers and teacher education students are able to see the how technology can be used as a tool to enhance instruction and motivate reluctant readers and writers. Teachers use Kid Pix, Hyperstudio, and The Amazing Writing Machine to create lessons which facilitate literacy growth. Frequently, the practicing teachers are able to benefit from the modeling of technology use by undergraduate students who work with them in teaching teams. Projects utilizing pattern writing, language experience, and text for wordless picture books have successfully used technology as a way to encourage student writing.

Hyperstudio is a useful tool for Reading Camp teachers to create templates to encourage student writing. Students are able not only to write responses on stack pages, but can also record themselves reading their text. One example of this successful use of Hyperstudio involves wordless picture books such as David WeisnerÕs *Tuesday* which are scanned and incorporated into Hyperstudio stacks for student response. When first and second grade students are able not only to see the story but to hear ÒfrogsÓ in the background, ideas for writing abound. Children work in small groups to collaborate on their story and take turns adding text to pages with scanned images. This electronic book is printed and taken home by the proud authors who are able to read it to their parents. In other writing projects with Hyperstudio, teachers incorporate digital photos which become writing prompts for the students. One successful project followed the reading of *Wacky Wednesday* by Theo LeSeig with first grade students. Students and teachers posed for digital photos while reading a book in a Òwacky poseÓ. After the teacher inserted the photos in the Wacky Wednesday Hyperstudio stack, students were able to write and record sentences to describe the pictures. The classÕs version of Wacky Wednesday was a popular attraction during the community open house on the final day of Reading Camp.

Figure 1: A Reading Camp student's contribution to the class's "Wacky Wednesday" HyperStudio stack.

BroderbundÕs Kid Pix and Amazing Writing Machine are additional writing tools which have proven to be effective with reluctant readers and writers. Reading Clinic teachers use digital photos and discussions of classroom experiences and field trips to prompt student ideas for group language experience stories. In other lessons, students may use a predictable picture book as a pattern for their own Amazing Writing Machine or KidPix books. Students are then given the opportunity to illustrate their contributions on the KidPix screen or the Amazing Writing Machine page. The intriguing clip art and paint tools coupled with the child friendly interface of these programs has allowed many of the Clinic students to feel like successful authors when their books are printed and shared with other students and parents. The capacity for Amazing Writing Machine to read the studentÕs words is a popular feature with students and encourages them to double check spelling when the computer doesnÕt read the story properly. KidPix allows the students to record their own voices reading their work. Teachers have noted that this appeals to many children who are otherwise reluctant to read in front of a live audience.

Figure 2: KidPix slides created as part of a Reading Clinic language experience slide show.

The integration of technology into Reading Clinic lessons has been facilitated with the purchase of laptop computers which enable teachers to sit on the floor with collaborative groups of three to four students while the language experience story is discussed and constructed or while students share their creations with peers. The greatest advantage of the laptop computers has been to allow undergraduate Reading Clinic teachers to take computers with them as they conduct one on one tutoring with children at school sites. In this way, the college students are able to insure that they will have the necessary software need for the lesson and they are able to work in a variety of locations in the school building. Teachers working in the building are able to observe the college student tutors working with technology and have begun to indicate an interest in the applications they are using. Children frequently return to classrooms after tutoring sessions with a desire to share their excitement about working with technology with their teachers.

In a series of small steps, Marietta College is making progress in eradicating the barriers of teacher attitude and lack of willingness to allow teacher education students to try new technology in their classrooms. More importantly, teacher education students are successful participants in the integration of technology into their lesson plans with K-12 students. As future teachers see first hand how technology can enhance student success and engagement in learning, its future as an indispensable tool in the classroom is insured.

Ridges and Bridges: MentorNet Collaboration Yields a Watershed of Preservice Infusion

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Abstract: Mandatory technology requirements for student teachers have put faculty in teacher education programs in the position of being responsible for a learning environment enriched with technology. This paper addresses the processes being used by NC State faculty in the College of Education for infusing technology in all levels of classes (foundations through clinical semester) and across disciplines. MentorNet, a PT3 project, forms bridges between current and future educators by challenging and supporting each other in the creation and critical application of emerging technologies for 21st century classrooms.

Introduction

The state of North Carolina has a set of Technology Competencies for Teachers which grew out of a report from a statewide Technology Users Task Force in 1995. Aspiring teachers must demonstrate these competencies in order to receive an initial license to teach (NCDPI). The mandatory technology requirements have put faculty in teacher education programs in the position of being responsible for a learning environment enriched with technology. North Carolina's Department of Public Instruction has made meeting the competencies more serious by requiring preservice students to develop technology portfolios. The MentorNet project (http://www2.ncsu.edu:8010/ncsu/cep/mentornet/) addresses this issue by developing collaboration within and among programs to help students develop teaching portfolio artifacts throughout their coursework culminating with clinical practice and portfolio assessment by teacher supervisors and cooperating teachers. A technology thread serves as a bridge across programs including Content Area Reading, middle school interdisciplinary projects, a science education technology methods course, a mathematics education technology methods course, and a high school social studies professional semester.

WebQuests: Scaffolded Instruction for Content Area Reading on the World Wide Web

An instructional assumption that is regularly made by educators is that the hypertext nature of the WWW and the freedom of choice that it affords will facilitate studentsÕ understanding and use of large amounts of textual information. In some studies of hypertext, however, readers actually found hypertext more difficult to read than linear text (see Gordon, Gustavel, Moore & Hankey 1988; Rouet & Levonen 1996). Related to this issue, Shapiro (1998) found that her hierarchical system of information did not present a reader-advantage over a linearly-ordered one with respect to knowledge retention or quality of written essays. Shapiro concluded that in order to make hypertext advantageous as a learning tool, supportive links must be included to prompt readers to think explicitly about the information relationships they are encountering. A second assumption often made by educators is that students can critically evaluate their web-based resources, a task that has been historically relegated to editors of traditional print publishing companies. Since the flexibility inherent in web-based learning may allow too much freedom for some students to handle, teachers must determine how much freedom is appropriate and simultaneously teach students strategies for handling their new freedom. Fortunately, a number of recently designed online tools and activities address the potential problem of unlimited freedom.

One particularly promising organizational tool is the WebQuest (Dodge 1995). This web-based set of instructional activities can provide instructional scaffolding as teachers and students take advantage of the WebÕs informational resources in a directed, focused way. WebQuests are inquiry-oriented units of study that propose an open-ended problem for students to solve with the resources put at their disposal in the hypertext environment. A thorough description of WebQuests can be found at http://edweb.sdsu.edu/courses/edtec596/about_webquests.html.

WebQuests are undergirded by key instructional principles that: 1) allow teachers and students to set a purposeful context for reading in which everyone can participate; 2) give readers access to information on a topic at serveral levels of readability/difficulty; 3) provide multimedia (e.g., audio, video) dimensions to enhance the learning/reading process; 4) create opportunities for students to participate in social construciton of meaning and consensus building; 5 create opportunities for students to synthesize ideas across multiple source documents; 6) provide scaffolding for cognitive processing of text (see Spires & Estes, in press).

WebQuests are particularly useful as a technology Òpoint of entryÓ for students in Content Area Reading (see http://www.courses.ncsu.edu/classes/eci541001/index.html), a course that is required across degree programs. By requiring the development of a discipline-based WebQuest within the Content Area Reading course, students may use this web-based instructional product as part of their required technology portfolio as well as an instructional tool in their school-based internship experience. WebQuests are particularly appropriate in that they can be created as high-tech or low-tech projects, commensurate with a student's comfort level with technology. Since a primary aim of the Content Area Reading class is to help students explore theoretical and practical challenges of web-based reading and learning, a WebQuest is an appropriate instructional tool to help achieve this goal.

The Wetlands Preservation Project

The Wetlands Preservation Project brought preservice teachers in all core disciplines together with 100 middle school students and their teachers who sought a capstone eighth grade service learning experience (Arnold & Beal 95). Working with churches (Partners for Environmental Justice), state and city government, neighborhoods and North Carolina State University, the eighth graders conducted action research to become fully informed about wetlands, law and politics, city history (Beal 92) and environmental justice.

With the help of classroom and preservice teachers, the middle school students used web research, GIS technology, Excel and Power Point, topography maps, neighborhood interviews and conversations with city officials. Teachers guided and learned along side their students as they incorporated all forms of learning into this theme-based unit. They used math to draw and plot maps of the area, made flow charts of the problem cycle, prepared cost analyses and developed spread sheets that indicated the use and abuse of the wetland area. Their personal writings - essays, poems and songs - reflected a new found appreciation for the beauty and solitude of the wetland. In social studies they addressed the issue of environmental justice, examining the wetland area in light of land use and city services affecting residents of the area. GIS enabled them to study area demographics and determine that the area has long lacked for amenities that other parts of the capital city enjoyed. Letters to the members of city council and the mayor helped alert city officials to the need to carefully study city plans for the wetlands. Initially, science drove the unit, as students increased their knowledge base about wetland form and function. They studied the land and the hydrosphere, change over time, population dynamics, river systems and erosion.

As students took wetland theory to practice and examined their own cityÕs wetland, they discovered that being knowledgeable is not as simple as textbook learning in one core subject, but that, like life, learning must be integrative. The wetland project enabled them to use and acquire life skills by becoming involved and active in a community issue. Together with preservice teachers, students prepared a technology enhanced presentation about their wetland research for a university-wide Spell of the Land symposium. They presented their findings about the wetland issue in the form of poems, songs, reflections, a ten foot mural and a digital slide stream presentation with voice over reflection and music. Because preservice teachers were involved from the projectÕs inception, they experienced all aspects of teaching - brainstorming, planning, teaching technology skills in the context of the project, managing numerous groups with many different assignments, and, finally, helping students prepare and use technology in their presentation. All members of the Wetlands Preservation

Project team felt that this was just the beginning. Through the use of technology, they can stay current with this issue and perhaps discover more issues that need eighth grade champions.

OutVentures Incorporate Technology and Science

One of the education courses in the Science Education program has been restructured to focus on student practice of instructional technology and on student development of digital products for instruction (http://www.ncsu.edu/sciencejunction/route/usetech/index.html). One venue that allows students to practice the technology they are learning to use in the classroom and the lab are "OutVentures" (Outdoor Adventures). Activites are scheduled on a monthly basis to engage the Juniors taking the course to use the technology outside of the classroom and to develop instructional materials around the data they collected. Students who have already taken the course are also invited to the OutVentures. One such OutVenture was capturing the images of the January 1999 lunar eclipse. Web pages were developed from the images to promote earth-moon-sun motion inquiry activities, and provide service to the larger community by making these projects available to teachers.

Developing Teachers' Techno-Mathematical Knowledge

According to the National Council of Teachers of Mathematics, "technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning" (NCTM 2000, p.11). The use of the word essential in this statement has many implications for school mathematics, as well as mathematics teacher education. Not only are teachers charged with a vision of transforming their teaching and students' learning of mathematics, but teacher educators are challenged to prepare teachers who can utilize technology as an essential tool in developing a deep understanding of mathematics, for themselves and their students. Thus, teachers must develop techno-mathematical knowledge, which consists of several elements:

1. Solving mathematics problems and constructing mathematical ideas utilizing technological tools
2. Using technological tools to justify mathematical ideas and engage others in meaningful mathematics
3. Designing experiences with technology that will allow others to develop techno-mathematical knowledge. This includes designing lessons with appropriate tasks and questions, as well as interactive technology templates using dynamic geometry tools, spreadsheets, or web-based technologies (e.g., java, Shockwave).

A traditional approach to mathematics teacher education assumes that the skills needed in mathematics, pedagogy, and technology are distinct entities. In many mathematics teacher education programs, preservice teachers learn their mathematics content separate from their pedagogy content and separate from basic technological skills. These preservice teachers are then expected to make use of these separate skills in a classroom as a mathematics teacher. Some teacher education programs do combine content with pedagogy courses, but still have separate technology courses that are often taken jointly by preservice teachers from a variety of disciplines and grade level concentrations. The message behind this type of teacher preparation is that technology is an add-on "subject" rather than a subject-specific learning tool. Garofalo, Drier, Harper, Timmerman, and Shockey (2000) set forth guidelines advocating for an integrated and appropriate use of technology in mathematics teacher preparation.

Teaching and learning mathematics effectively in a technological classroom requires multifaceted knowledge that extends beyond what is typically learned in mathematics methods courses. The work of Garofalo et al (2000) can help teacher educators weave appropriate technology experiences into existing mathematics methods courses. As part of the sequence of courses required in the secondary mathematics education major, students take a course on teaching and learning mathematics with technology. The goals of the course are to have students revisit their own learning of school mathematics topics using technology. The preservice teachers gain a deepened and broadened understanding of school mathematics, learn how to use powerful interactive technology tools, and develop techno-mathematical knowledge needed for engaging their students in learning powerful mathematical ideas with technological tools.

Developing Critical Perspectives and Ethical Practices in Technology Applications in Social Studies

The North Carolina technology portfolio requirement for initial-license teaching candidates has impacted all subject area methods classes. To Social Studies Methods classes, this component adds another dimension to the methods through which the multidiscipline of Social Studies will bc taught and learned. Because of the portfolio requirement's recent development, there is little in the way of research on Technology Portfolios in Social Studies teacher education.

For the Methods instructor, this poses certain challenges in an already "loaded" course. In the first year, the response was to add two technology sessions, training students in Power Point and requiring that they construct a (minimum) 6-slide presentation that imported resources from the Web with relevant citations. In the second year, a computer lab each week was added across the 8-week pre-practicum intensified Methods schedule. By the third year, fortunately, courses that appear earlier in our program had also been adapted. The students' previous experience was built upon with designing WebQuests housed on remote sites such as "Filamentality" (http://www.kn.pacbell.com/wired/fil/). Students designed websites that coordinated with their unit design specifically for the course they would first teach in the practicum. North Carolina also requires a Beginning Teacher Portfolio that includes a unit plan of 5 consecutive lesson plans. Students design a unit of 10 days duration that must include the eight intelligences (Gardner 1983) plus a technology component. As one might imagine, these units are densely packed. The methods classroom experience indicates that students, lacking other models, simply adopt this model as their unit planning model and take seriously the importance of engaging the multiple intelligences as well as technology inclusion.

In requiring the website, students are asked to compose in Netscape Composer since that would be available in the greatest number of schools, no matter what their technology resources. This proved very useful to students. At the same time a website was built for the Methods class which links each of the students' sites as well. Students worked collaboratively, sharing links and Internet treasures. An important first step in this was a discussion of Boolean searches that would include certain key phrases such as "lesson plan," "simulation," "learning activity," "jigsaw," or whatever was desired. The purpose was to instill a reaction/response that would make the Internet the first source of instructional resources. Work on search strings, it turned out, was essential before the Netscape Composer lessons.

There were 2 Netscape Composer lessons, with 3 weeks in between. Each lesson was approximately an hour long with an hour practice or execution. In the first, we learned how to link internally and externally to pages of our own and on the Internet. In the second lesson,we learned how to post these onto the university webspaces set aside for student use. Each of the sessions was led by an undergraduate with technology work/study experience. One of the most important lessons in technology infusion is to let student teach one another. People learn and apply these new technologies on an as-needed basis; therefore in any group there is "distributed cognition" that the instructor must initially facilitate. Once a collaborative norm has been established, the resource sharing and co-teaching and learning become routine. I have written in the past about "modeling learning" (Alibrandi, 1997). In this case, the undergraduate was teaching all of us; myself included. I believe that if instructors model learnng to students, that there will be a more fluid approach to learning and teaching that will influence novices to be more open to distributive and other types of collaborative learning in their own classrooms. We have been very pleased with the (what I call) "uptake" by cooperating teachers who have responded positively to having a ready-made customized website.

We point to websites that may be helpful and describe the evolving adaptations that have been made in Social Studies Methods classes to accommodate the changes. Even as this process has become more "seamlessly" integrated, several questions remain that have implications for the teaching of Social Studies Methods. These are: Will there be adequate time to address the increasing methods of technology integration within existing course structures? Do Methods students learn as much, more or less about teaching Social Studies as they construct technology portfolio products? Will the portfolio products be useful in currently-equipped classrooms? How and when will it be appropriate to research Social Studies students' learning with technology? Finally, as we integrate technology into Methods classes, how do we exemplify the reflective nature of the NCSS theme of Science, Technology & Society by developing critical perspectives and ethical practices in technology applications?

References

Arnold, J. & Beal, C. (1995). *Service with a Smile: Service Learning Projects in North Carolina Middle Level Schools*. Raleigh, NC: North Carolina Middle School Association.

Beal, C. (1992). *Raleigh: The First 200 Years*. Raleigh, North Carolina: Martini Press.

Dodge, B. (1995). Some thoughts about WebQuests. http://edweb.sdsu.edu/courses/edtec596/about_webquests.html.

Gardner, H. (1983). *Frames of Mind*. New York: Basic Book Inc.

Garofalo, J., Drier, H. S., Harper, S., Timmerman, M. A. , & Shockey T. (2000). Promoting appropriate uses of technology in mathematics teacher preparation. *Contemporary Issues in Technology and Teacher Education*, 1(1), 66-88.

Gordon, S., Gustavel, J., Moore, J., & Hankey, J. (1988). The effects of hypertext on reader knowledge representation. *Proceedings of the 32nd Annual Meeting of the Human Factors Society*. 296-300.

National Council of Teachers of Mathematics. (2000). Principles and Standards for School Mathematics. Reston, VA: author.

North Carolina Department of Public Instruction. (n.d.) NC technology competencies for educators. Retrieved from the World Wide Web November 29, 2000: http://www.ncpublicschools.org/tap/techcomp.htm

Rouet, J., & Levonen, J. Dillon, A. & Spiro, R. (Eds.) (1996). *Hypertext and cognition*. Mahwah, NJ: Lawrence Erlbaum Associates.

Shapiro, A. (1998). Promoting active learning: The role of system structure in learning from hypertext. *Human-Computer Interaction,* 13 (1), 1-36.

Spires, H.A. & Estes, T. (in press). Reading in web-based learning environments. In M. Pressley & C. Collins (Eds.), *Comprehension research and instruction for the twenty-first century*. New York: Guilford Press.

Spires, H.A. (1999). Content Area Reading. http://www.courses.ncsu.edu/classes/eci541001/index.html

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Infusing Technology into the Teacher Education Program

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Abstract: Success in the elementary classroom demands that teachers understand and have a working knowledge of educational technology. In 1999 the Education Department at Rollins College set the goal that all education students would graduate with the skills needed to effectively use technology in the K-12 classroom. Using the competencies as a guide, a new educational technology course was designed and implemented in Fall 2000. This paperless, self-paced course uses e-mail messages to guide the students through the basics of a specific software program such as Word, Internet and databases searches, Excel, PowerPoint, and Netscape Composer. The exercises develop the technological skills necessary for other education courses. Pre and post surveys showed a positive change in computer skills and confidence in using technology. The dynamic course design incorporates the latest technology and provides the foundation necessary for teachers to adapt their knowledge to new technology as it develops.

To be successful in today's classroom teachers must understand and have a working knowledge of educational technology. With each passing day computers become a more integral part of the elementary curriculum, for instruction in and out of classroom, student assessment, and communication with parents and the community. Technological literacy is essential to be an effective teacher. This need is reflected in Florida Department of Education (FDOE) mandates (DeTure 99). Use of computers is specified as one of the twelve Accomplished Practices required of all pre-professional and professional teachers and is inherent for Florida state approved teacher education programs. Yet, the explosion of technological knowledge challenges even the most willing pre-service teacher.

The Education Department at Rollins College investigated a variety of options for helping pre-service teachers become technologically literate. Beginning with the 2000-01 Academic Year the Department instituted a systematic approach for elementary education students to develop their technology skills. Prior to this time, although students were exposed to some elements of educational technology in their course work, a technology course was not part of the teacher education curriculum. While pre-service teachers were advised to take short courses offered by the Information Technology Department, these courses were not designed to address the specific needs of teachers. The most successful approach for infusing technology into the educational curriculum was its integration into a biological science content course specifically designed by the authors for pre-service teachers (DeTure, et al. 90). The technology components were utilized by students concurrently enrolled in the science content course and the science methods course. Two problems emerged with this approach. One was the proliferation of the uses of technology, and the limited amount of course time to teach this material in a science content class. The second was that the science content course was not required of all majors, so many graduates did not have even this limited exposure to technology. Students not enrolled in the biological science content course were left to their own devises for developing their technology skills beyond the basic Internet searches used for activities and research in their education courses.

In the Fall of 1999 the Education Department, as part of the program evaluation plan, set the goal that all education students would graduate with the skills needed to effectively use technology in the K-12 classroom. The ensuing discussions, in conjunction with the review of state standards and FDOE mandates, led to the establishment of a set of computer competencies for elementary teachers. The Education Department concluded that the most practical approach to ensure that all students would met the goal was to develop a required course to provide the foundation for the technological skills needed throughout the curriculum. During Spring 2000, the

Education Director approached the instructor of the biological science content course to explore the possibility of deleting the technology components from the biology class and expanding this material into a new technology course. Using the competencies as a guide the education faculty and the biology instructor jointly designed the specific content and order of coverage for the course. This ensured that the needs of the students would be met and that students concurrently enrolled in other education courses would have the computer skills required for success in those classes. The design of this course was intended to be dynamic in order to incorporate the latest technological advances as they occur.

The new technology course was first offered as a pilot course and co-requisite for the science methods course in Fall 2000. All class sessions were attended by the science methods instructor in order to facilitate integration of the technology into the elementary science curriculum. This paperless, self-paced course met once each week for 75 minutes. Before each class session students were e-mailed instructions to guide them through the basics of a specific software program. Over the course of the term the students were introduced to e-mail, word processing, Internet and databases searches, Excel, PowerPoint, and Netscape Composer. The exercises were designed to develop the skills necessary to apply this technology in their other education courses. For example, students in the educational statistics course used Excel to solve problems and to graphically illustrate data, and science methods students used PowerPoint for their science curriculum presentations.

At the end of each class students were assigned a homework problem requiring them to apply what they learned in the session. Students worked individually but were encouraged to use the instructor and classmates as resources. In addition to the practice element and to further insure mastery of the material, each student constructed a technology portfolio demonstrating their ability to use each software application and its relevancy to the elementary classroom. This web-based portfolio also serves as the initial model for the student's electronic performance portfolio required by the Education Department for graduation. Uses of electronic portfolios is further developed in upper level curriculum courses. The instructor of the educational technology class acts as a consultant for the computer segments in the education courses that apply this technology.

All assessment was and will continue to be performance based inherently containing a mastery component. Homework assignments were submitted early, reviewed and commented on by the instructor prior to the due date giving the students the opportunity to revise and resubmit their work. All portfolio entries were reviewed through peer evaluation; entries could be altered through out the term and were only graded at the end of the course through an oral presentation for a mock interview with a school principal.

The need for an education oriented technology course at Rollins was documented in part by a technology literacy survey completed by all students in the biological science content course. Students enrolled in the new technology course completed a similar survey as pre and a post test to measure student perception of changes in their computer skills and their confidence in using technology. Survey results showed an increase in confidence in the use and application of computer technologies. Students reported a marked improvement in their ability to use the specific software introduced in the course. Anecdotal observations also indicated that these students served as technology mentors in their other education classes. Long-term assessment of the course will involve evaluation of the students throughout their academic program and in post-graduation follow-up studies conducted annually by the Education Department. The amount and effectiveness of computer usage by the students who have completed this course will be measured and compared to other new in-service teachers who have had not completed a similar course in educational technology.

While the initial indications regarding this approach to improving the technological skills of pre-service teachers are positive, it is understood that no single course can address all the technological needs of the students. This course at least addresses their initial basic needs and provides pre-service teachers with the foundation necessary to adapt their knowledge to new technology as it develops.

References

DeTure, L.R., Gregory, E. & Ramsey, B.G. (1990). A Program to Improve Elementary Teachers' Preparation in Science at Rollins College. *JSTE* 1, 49-53.

DeTure, L.R. (1999). Year 3 Modified Institutional Program Evaluation Plan 1999-2000, submitted to FDOE.

Teacher Education Changes, Transitions, and Substitutions: Technology to the Rescue!

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When, a new updated Early Childhood teacher education program with an entirely different set of courses had to be created to meet a new set of state competencies, a a flexible course - Early Childhood Practicum was crafted to ease the transition and provide coursework for twenty-three students who ncedcd a total of seven different courses in to graduate. The course individualized the learning so each student could complete the required competencies.

Technology came to the rescue as means for me to use email to keep track of pairs of students who worked with teachers in several schools on inquiry projects to improve teaching and learning for young children. The course design also included five face to face college class meetings and creation of a video tape. Successes of this learning experiences were win-win for teachers in the field and students. Since so much of the responsibility for creating and implementing the inquiry project was a collaboration of teacher and college student, the motivation levels were high and most results highly successful. As the professor, my job was made easier when the excitement levels reduced the need for an intensive mentoring on my part.

Graphic Representations for Learning: Developing a Learner's Conceptual Framework

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Abstract: The emphasis on knowledge attainment, higher order thinking skills and real-world learning opportunities within teacher education offers numerous opportunities for preservice teachers to develop a conceptual framework through which their future educational profession is viewed. The introduction of instructional technology into the educational environment offers the opportunity to represent such knowledge and understanding within a graphic format.

Introduction

The emphasis on knowledge attainment, higher order thinking skills and real-world learning opportunities within teacher education offers numerous opportunities for preservice teachers to develop a conceptual framework through which their future educational profession is viewed. The introduction of instructional technology into the educational environment offers the opportunity to represent such knowledge and understanding within a graphic format.

Graphic Representation of Information

Not only does the graphic representation of information through out the learning experience develop a visual framework for the preservice educator's understanding of the theories and concepts being presented, but the opportunity for preservice educators to graphically represent their own developing conceptual framework of understanding further encompasses a rich opportunity for reflection, discussion and possible revision of the graphic representation towards a fuller understanding of the personal, developing conceptual framework. Further, the preservice educators is developing an understanding of graphic representations within a learning environment, as well as offered the opportunity to view an instructional model that will be emulated within the PreK-12 instructional environment.

As an example of information developed into a graphic representation, the Instructional Technology specialization area of the University of Houston – Clear Lake's School of Education offers a philosophical orientation to all learners, so as to delineate the theoretical underpinnings of the specialization area. While a textual explanation is necessary, graphic representations of the textual information aid in the conceptual understanding and begin to develop a graphic realization and understanding of the reader's conceptual framework associated with the Instructional Technology specialization area. For example, following is a graphic representation of the Instructional Technology's philosophical orientation:

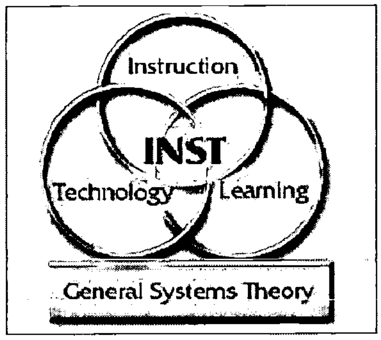

Figure 1: Instructional Technology Philosophical Orientation

Although this is an attractive graphic representation, which aids the user in realizing the main aspects of the information and how it fits together, the simplicity of the design respects the integrity of the information and the creation of a visual understanding; this understanding offers the user a conceptual framework through which to further integrate the philosophical orientation of the Instructional Technology specialization area.

Further, a second graphic that presents the Instructional Technology specialization area's philosophical orientation towards a student-centered model of instruction displays two representational models for the user's understanding: teacher-centered model of instruction, student-centered model of instruction. Through the representational modeling of the theoretical models of instruction, the user can create a thorough understanding of the Instructional Technology specialization area's focus upon the student-centered model of instruction that is apparent and modeled within the Instructional Technology courses offered.

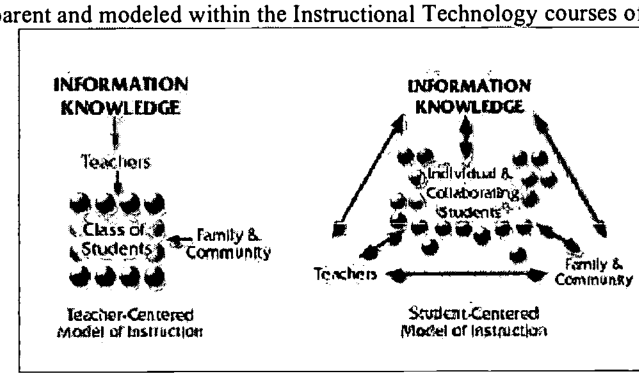

Figure 2: Teacher-Centered Versus Student-Centered Models of Instruction

The graphic representation of advanced theoretical viewpoints that are deemed important by faculty within the Instructional Technology specialization area aids the user in the creation of a conceptual framework of understanding through which the textual information can further delineate the knowledge obtained.

Conclusions

The opportunity to model the art of graphic representations of information within a learning environment aids the preservice teacher in the developmental process associated with realizing their own developing conceptual framework. Also, the preservice teacher observes the modeling of such a task, as well as the higher order thinking skills associated with this activity. The preservice teacher's understanding of their developing conceptual framework is imperative towards the professionalism associated with the field of education; through the graphic representation of such information, the preservice teacher will integrate the technological aspects of their training within an instructional environment. The simplistic representation of integrated knowledge and understanding is both difficult and imperative towards the development of the preservice teacher's higher order thinking skills and professional future. Graphic representation of a learner's conceptual framework may appear simplistic, yet this powerful activity emphasizes the preservice teacher's understanding of the profession, as well as areas of strength and possible areas of further growth.

Computer use in pre-service and in-service teachers

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Abstract: This study examines survey data from pre- and in-service teachers and makes observations from that data regarding computer use. The three main observations include; broad and common use of simple elements such as email was found; minor differences were found between men and women in technology use; and participants increased their usc of the internet for purchases and class registration during the study period. The teachers appeared to parallel computer acceptance in general society. As society embraces technology, so too will our newer teachers.

Introduction

The major portion of the impact of instructional technology will come through improved and continued education of in- and pre- service. The teachers existing knowledge, their use of computers, and their technology oriented activities all affect their learning in such courses, and their preparation as teachers.

This study uses data collected in a course entitled "Teaching via the Internet". The course was offered at the University of Minnesota's College of Education. A survey was conducted of each section by the instructor and was designed to support course instruction and not as part of a designed study. The questions dealt with computer use instead of investigating domain specific topics such as pedagogy, curriculum, or psychology. Data was collected over three academic years from five sections of the course. Each student was asked for their name, email address, and eleven multiple choice questions.

All data was examined *post hoc,* and was an examination of existing materials. The study has focused on a number of research questions. Each is examined in detail below. How computer use by teachers changed over the past three years, how that changed paralleled society as whole, and how gender differences in computer use are evident in teachers.

Use of the internet and computers has changed markedly over the period of the study and the results of this study illustrate that change. Over the past few years, we have witnessed exceptional growth in the use of the internet for commercial and educational activities. One would expect teachers, as learned professionals to act as early adaptors of technological innovation. Their use and involvement with computers and the internet should at least reflect, and to some extent precede computer use in the general population.

A final concern examined in the study dealt with gender differences in computer use. While the issue of gender and computer use is a substantial topic and one worthy of further study, this study only briefly examines differences by gender.

Results

Demographics: A total of 86 students completed the survey; 54 were female, and 32 were male. Respondents by year totaled 34, 32, and 19 students. The male-female ratio varied over the three years, but remained majority female in each year.

Chonological Differences: The number of computer owners remained relatively constant at about 82%. In comparison, the rate of use found by the NPR/Kaiser/Kennedy study was 69% for all adults under age 60. Participants in these classes said they use computers at a higher rate than the national average.

Almost all of the students reported 'surfing the net' in the final two years of the study. Buying something over the Internet, however, rose from a relatively rare phenomenon to a fairly common, well adapted one over the two years of the study. In the final sampling, over two thirds of all students had purchased something via the internet, and almost half had made multiple purchases; about a five fold increase in both measures. This change was statistically significant between the first and second years, the first and third years, but not between the second and third years of the study.

Similarly, registration procedures for the course reflected this evolution. About half of the students in the first year of the survey (1998) used the internet to register; in the final application of the survey (2000), about eighty percent registered via the net. Most of the change occurred at the "expense" of in person registration.

Gender Differences: Data from each of the sections of the course was combined and examined for gender related differences. Ownership of personal computers was about the same for men and women (84% v 81%). A significant difference was, however, found between genders and their purchases over the internet (t = 3.0%). 31% of women reported one or more purchases via the Internet, whereas 47% of men reported making a purchase. The significance was driven by the larger number of men reporting multiple purchases over the internet. (15% v. 41%).

A significant difference was also found in the means students used to register for the class (t= 2.9%). Women used the internet less (57% v 65%) and the fax more (23% v. 3%) than men. Men registered in person in greater numbers (32% v. 21%). There were not significant differences between the individual methods of registration by gender.

Observations/Conclusions

There is a base line of technological understanding that is fairly broad among pre-service and in-service teachers; most will have and use computers, access the internet, and evolve in their use of the technology with the rest of society. As computer use expands and develops in society, it appears that new and experienced teachers will continue to develop their computer/internet use and expertise, paralleling the general population. Men may adapt the new technologies sooner than women.

It is clear that while this limited study provides an insight into the a small portion of the newer teachers of this country; additional questions and observations must be made about teachers and computer use. Computer use will continue to develop and change; the educational impact will follow closely behind.

References

National Public Radio, Kaiser Family Foundation, and Harvard University Kennedy School of Government (2000). Rosenbaum, M. (Ed.), National survey of American adults on technology.

Black Bear, Black Bear. What Do You See? We See Teacher Educators Integrating Technology

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Abstract: This paper describes a staff development process used to support technology development of both faculty and preservice teachers at a large state university. The authors explain the progressive and innovative slant of the integration model, the three-day training and writing workshop for faculty, and the description of a pilot project using a technology-rich, integrated curriculum on Florida Black Bears to train preservice teachers.

Introduction

In 1990, a critic of the teacher preparation process proposed an interesting idea to the education community. The critic suggested that if one hundred years ago, a teacher had been cryogenically frozen and brought back to life in 1990, the teacher could just pick up their piece of chalk and without missing a beat, continue teaching. In the tradition of Eric Carle's (1993) Brown Bear, Brown Bear, What Do You See? a group of teacher educators involved in faculty development and a writing technology team in the year 2000 asked ourselves a similar question about what do we see in terms of technology and teacher education, do we see any changes, would we see any changes if we came back after one hundred years, and what do we want to see in the year 2000-2001? Using the content areas surrounding the Black Bear, we (as teacher educators) participated in a three-day training and writing workshop as part of **PT3** (Preparing Tomorrow's Teachers for Technology) funding. The outcome of which was to create a technology-rich, fully integrated curriculum piece to model for our preservice teachers. This paper tells the story of the process of creating "Black Bear, Black Bear" and how we plan for integrating technology.

What have we seen? How technology has been integrated in the past

In a recent issue of the Journal of Technology and Teacher Education, Hruskocy, Cennamo, and Ertmer (2000) reported that "although computers have been in the schools for nearly two decades, the Office of Technology Assessment (OTA, 1995) reported that relatively few of the nation's 2.8 million teachers use technology in their teaching" (p. 69). For the most part, the technology is becoming available, but the problem seems to be that teachers don't know how to integrate technology into their instruction. Not surprising, since the faculty who trained the teachers during these last twenty years were trained themselves before computers were even a consideration.

Throughout the research literature, teacher educators have reported many ways to use technology to enhance the content areas and to assure the preparedness of our preservice teachers. Like Hruskocy, et al. (2000), Stuhlmann (1998) describes a model developed at Louisiana State University for preservice teachers that trains elementary students to work with teachers and teacher educators. Others have given accounts of mentoring programs using graduate students and education faculty to infuse technology into methods courses (Sprague, Kopfman, & Dorsey, 1998; Zachariades & Roberts, 1995). Falba, Strudler, Bean, Dixon, Markos, McKinney, & Zehm (1999) formulated a team of teacher educators to use new technology across individual content areas in order to choreograph change in teacher education programs. They reported minimal effects in specific courses, but found positive overall effects. Thorson (1999) reports successful integration of technology within science and math courses. Cooper & Bull (1997) offer guidelines for integrating technology in teacher education programs by looking at past practice. They recommend taking the direction of working to integrate technology through the teacher education faculty. Their paper notes that teacher educators who arc comfortable with technology tend to create technological leaders as their product. As evidenced by most of these published reports, movement toward integrating technology seems to be effectively applied to separate methods courses and to be routed through the individual teacher educators.

What do we want to see? Moving in a new direction with a PT3 grant

Responding to the need for integrating technology in a meaningful way, our technology team submitted and received **PT3** (Preparing Tomorrow's Teachers for Technology) funding. The purpose of this grant initiative is to provide a systematic program and process of instruction with increasing levels of technology integration. The levels culminate with an intensive "TechIMPACT" experience for preservice teachers during their final internship. These interns are to be placed in technology-rich schools in diverse teaching settings with technology-proficient teachers. This total process will ensure that preservice teachers who graduate from the teacher preparation program are truly technology-proficient and ready to teach in the new millennium.

The levels of technology integration include foundations courses, methods coursework, Internship I, and Internship II. Like many of the successful programs reviewed in the research literature, individual coursework throughout their program will infuse technology in the following incremental ways. Foundations courses provide basic theory and use of technology. Methods courses provide specific practice in using technology to teach content areas. Internship I provides preliminary practice for teaching technology-based connected lessons, and Internship II provides support during the integration of technology throughout the subjects and throughout the elementary day with themed-use being a goal. Seamon (1999) explores a similar multi-level, interdisciplinary approach. She proposes problem solving as a conceptual framework to create scope and sequences for integrating technology into the elementary curriculum. This multi-tiered and integrated approach is to be followed throughout our preservice teachers' curriculum and then modeled in a way that they, too, will use technology in content-rich ways to learn in authentic ways and to solve real world problems. To obtain such growth in our preservice teachers throughout their coursework, the process must be systematic and involve all teacher education faculty in the program. The **PT3** grant (Lynch & Mitchell, 2000) has afforded our institution the opportunity to find ways to integrate technology in meaningful and seamless ways.

While four objectives clarify the vision of this grant, this paper focuses on the fruition of the first two of these objectives. All four objectives aim to:

(a) develop learning communities to provide specific technology integration training and support for faculty connecting the College of Education and the College of Arts & Sciences,
(b) develop learning communities to provide systematic training and support for preservice teachers to integrate technology into their curriculum,
(c) develop learning communities to provide internships in technology rich schools in diverse settings, and
(d) develop learning communities to facilitate change providing a structure to transform education that will sustain technology integration including methods to evaluate, share internally, and disseminate information nationally.

First, students are enrolled in a Technology for Educators course, usually taken in the sophomore year. This course provides preliminary study, which develops the foundational understanding of how technology should and could be used, and is the course upon which future levels build. Since this course may be taken at the community college level, university and community college faculty have begun to dialogue to maintain and increase consistency for students.

The next portion of the **PT3** grant requires that students have technology integration modeled in their methods courses followed by intensive "TechIMPACT" modules for Internships I and II. The teacher education faculty that attended the first three-day workshop created these modules. The Internship II module for elementary preservice teachers revolves around the "Black Bear, Black Bear" curriculum that evolved from our writing team. We wanted to extend the ideas gained in the level, which included their methods, courses to show how technology can be seamlessly integrated into all curricular areas using a theme rather than only into a particular curricular area.

What do we see? We see technology integration starting with me: Faculty development training

To have technology modeled by faculty for preservice teachers requires that faculty are comfortable using technology (Cooper & Bull, 1997). The initial series of training days was established to share a common understanding of how technology integration can be successful using specific approaches and a theme. This faculty development plan was based on National Council for Accreditation in Teacher Education (NCATE) and International Society for Technology in Education (ISTE) Standards (Thomas, 2000). During the initial **PT3** training for our institution, twenty participants from the Colleges of Education and Arts and Sciences formed the first learning community. Systematically and closely following the InTech model developed in Georgia, faculty were immersed in a technology-integrated, constructivist workshop developed around the theme of the environment. Most faculty arrived at the staff development expecting standard technology workshop sessions highlighting a particular software application without much content upon which to apply the technology.

Instead of technology instruction only, participants were required to use technology as a tool for learning about the environment. The workshop facilitators modeled technology infusion across authentic learning problems and all curricular areas, showing us how it all related to the theme of the environment. For many of the participants, this completely different approach allowed them to see an entirely new role that technology could play. Technology was the tool for learning about the environment and for solving problems in science, math, social studies, music, movement, and language arts, rather than technology being *the* focus. The excitement of learning about technology in this way led many teacher educators to race home and revise syllabi for the semester that was starting in five days.

The goals for the three-day experience included: (a) creating curriculum-focused, theme-based technology integration modules for Internship II students; (b) determining how to include all college of education faculty in the discussion of developing a program-wide look at technology, so that each preservice teacher has similar experiences; and (c) developing a learning community of faculty through which ideas are shared and instruction is enriched by collaboration and dialogue.

What do we see? We see interdisciplinary teams completing the scene

At the end of a three-day period, teacher education faculty formed interdisciplinary writing teams to take what we had experienced and create a series of integrated lessons for Internship II students incorporating International Society for Technology in Education (ISTE) Standards. Our writing team narrowed the theme of the environment to write the module entitled "Black Bear, Black Bear" related to the Florida Black Bear. These connected lessons (modules) were designed to re-create for the interns an experience similar to what we, the teacher education faculty, had experienced with the technology being integrated as a teaching and learning tool.

The writing teams were formed based on grade levels of interest. Our elementary writing team was truly interdisciplinary, consisting of special education, language arts, math, music and foundations faculty members. The team selected the Florida Black Bear as the content focus for its module. The Florida Black Bear had been the focus of materials published by the Florida Fish and Wildlife Conservation Commission and the Defenders of Wildlife. With the expert guidance of Linda Cronin-Jones (1999), these agencies have created an exemplary resource for elementary teachers in Florida to teach an integrated unit on the Florida Black Bear. The writing team's efforts were to overlay and enhance the already superior resources created for use in Florida schools with applications of technology. The hope of the writing team was to show that technology could be integrated in a seamless fashion that highlights the curriculum and enhances student learning, not necessarily to spotlight technology. After being exposed to the various uses of Inspiration, digital cameras and iMovie, the resources of the Internet, Webpage development, database spreadsheets, HyperStudio and PowerPoint formats, Microsoft Publishing, TrackStar and WebQuest templates, and Timeliner over the course of several days, the team immediately began to see a continuum of technological aids that could be integrated into the unit on the Black Bear to enhance the overall results.

Certainly, elementary school students could have learned about the Black Bear without these technological aids, but when technology can be an overlay, the students benefit and are better prepared for the seamless role technology will play in their world as adult learners and workers. After an intense brainstorming session, each member took a daily lesson plan to be retooled and rewritten through technology. ISTE standards as well as the Florida Sunshine Standards were correlated and included in the lesson plan as well. The writing team pictured our preservice teachers in Internship II experiencing technology integrated into the Black Bear unit throughout five model lesson plans. Following these five lessons, the interns themselves would be asked to find their own paths to technological integration by retooling one lesson plan themselves. In this way, the writing team will be able to assess not only their awareness of technology integration, but to assess the application or implementation level as well. This way of thinking somewhat mirrors the three levels of the original **PT3** grant: capacity, implementation, and catalyst levels (U. S. Department of Education, 1999) as well as the focus and intent of the ISTE Standards.

Implementing the pilot study: We see TechnoloGEE!

Preservice teachers have taken a Technology for Educators, but the focus of the course was not on integrating technology within lesson design for instruction. Lesson design and implementation is specifically taught in separate methods courses at the university. Often, preservice teachers will not and do not make the technology connections with instruction. Technology implementation most often occurs to complete research using Internet services and to create presentations (PowerPoint). Although technology is listed as a component for lesson design, data collected from other preservice teachers enrolled in methods courses would not usually include technology. Most preservice teachers indicated "not applicable" in their lesson design planning forms when considering technology within their lessons.

To pilot the Black Bear modules in the fall 2000, the target course to teach the Black Bear, Black Bear modules was a methods course, where initial lesson design was taught. The preservice teachers were taught how to write lessons plans. Copies of these initial lesson plans were collected. Upon analysis, these lesson plans were very similar to previous years as to the use, or lack, of technology. Subsequently, these same preservice teachers then participated in the technology integration modules as designed. Within the methods class, the preservice teachers experienced the various types of technology that had been infused into the environment curriculum. Over a period of several weeks, the preservice teachers experienced technology *within* the professor's instructional process. After each lesson, the participants were asked to reflect upon their learning and the use of the technology. Specific ideas were generated after each session and posted for the members of the class. In addition, written feedback was requested.

At the end of the semester, the preservice teachers in this course will be asked to revise their original lesson plans to include technology. Results of the Black Bear pilot program using the technology-rich, integrated curriculum to train preservice teachers will be evaluated and used to refine this experience before it is implemented with all preservice teachers during the spring semester.

What have we seen? Concluding remarks

Exposing teacher education faculty and preservice teachers to technology is not enough. Both entities must understand how to integrate technology in a pedagogically sound way so that the curriculum itself is highlighted and the technology is a means to an educational end. By instructing teacher education faculty in the integration process and aligning the learning process around the theme of the environment, teacher educators could easily see the power of *what* we learn as well as *how* we learned it. Technology plays a vital part as a tool for learning. By asking faculty participants in the writing team to create modules integrating technology around a similar environmental theme, faculty will now be better equipped to model for preservice teachers how technology can enhance a particular content area as well as to intensify the total learning process around a theme. In this way, preservice teachers can use the technological and content knowledge experienced during their Internships and gained from modules like our "Black Bear, Black Bear" to reform their own teaching. Truly, "Black Bear, Black Bear" will be seeing teacher educators and consequently preservice teachers using technology effectively.

References

Carle, E. (1993). Brown bear, brown bear. What do you see? New York: Putnam.

Cooper, J. M. & Bull, G. L. (1997). Technology and teacher education: Past practice and recommended direction. Action in Teacher Education, 19, 97-106.

Cronin-Jones, L. (1999). The Florida Black Bear Curriculum Guide. Published jointly by the Florida Fish and Wildlife Conservation Commission and the Defenders of Wildlife.

Falba, C. J., Strudler, N., Bean, T. W., Dixon, J. K., Markos, P. A., McKinney, M., & Zehm, S. J. (1999). Choreographing change one step at a time: Reflections on integrating technology into teacher education courses. Action in Teacher Education, 21, 61-76.

Hroskocy, C., Cennamo, K. S., Ertmer, P. A., & Johnson, T. (2000). Creating a community of technology users: Students become technology experts for teachers and peers. Journal of Technology and Teacher Education, 8, 69-80.

Lynch, J. S., & Mitchell, D. (2000). TechIMPACT grant with PT3/Preparing Tomorrow's Teachers for Technology. United States Department of Education Technology funding.

Seamon, M. P. (1999). Connecting learning and technology for effective lesson plan design. Paper presented at the Association for Supervision and Curriculum Development Conference, San Francisco. ERIC microfiche document: ED 432 982.

Sprague, D., Kopfman, K., & Dorsey, S. (1998). Faculty development in the integration of technology in teacher education courses. Journal of Computing in Teacher Education, 14, 24-28.

Stuhlmann, J. M. (1998). A model for infusing technology into teacher training programs. Journal of Technology and Teacher Education, 6, 125-139.

Thomas, L. (Project Director) (2000). National Educational Technology Standards for Teachers. Published by ISTE: International Society for Technology in Education & underwritten by Intel Corporation.

Thorson, A. (Ed.). (1999). Integrating technology in the classroom: A magazine for classroom innovators. Sponsored research by the Eisenhower National Clearinghouse for Mathematics and Science Education, Columbus, OH. ERIC document: ED 436 405.

U. S. Department of Education (1999). PT3 grant: Preparing Tomorrow's Teachers for Technology. U. S. Department of Education.

Zachariades, I., & Roberts, S. K. (1996). A collaborative approach to helping teacher education faculty model technology integration in their courses: An informal case. Journal of Technology and Teacher Education, 3, 351-358.

VisionQuest©: Creating Visions and Strategies for Technology Integration

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Abstract: As the need for meaningful technology integration has increased, various programs have been developed to support and help pre-service teachers accomplish this complex task. Decisions-makers for teacher-education programs could benefit from instructional information that highlights the strengths of these various development programs. This paper describes VisionQuest©, a CD-ROM teacher development tool, designed specifically to help teachers gain the critical skills needed to effectively use technology in classroom learning environments. VisionQuest© uses an instructional method that focuses on creating a vision and developing a personalized implementation strategy to achieve sound technology integration. This tool helps users reflect on exemplary cases, thereby engendering thoughtful consideration of the visions and strategies that enable exemplary use.

Introduction

According to the most recent report of the National Center for Education Statistics (NCES, 2000), 99 percent of all public school teachers now have access to computers or the Internet in their schools. However, nearly 70 percent of teachers still report not feeling well prepared to use computers and the Internet in their teaching (NCES). According to the 1998 Technology in Education Report (Market Data Retrieval), only 7 percent of schools, nationwide, boast a majority of teachers at an advanced skill level (i.e., able to integrate technology into the curriculum). Even among our newest teachers, instructional use is not as high as might be expected. Although beginning teachers report wanting to use computers, they often find it difficult to do so when so much of their time is consumed by routine classroom tasks related to organizing and managing instruction (Hruskocy, 1999; Novak & Knowles, 1991). Furthermore, teachers report finding "little incentive to tackle the technical and scheduling problems associated with technology unless they have a clear vision of how the technology can improve teaching and learning" (Office of Educational Research and Improvement, 1993, p. 83).

Thus, the barriers that teachers encounter when trying to integrate technology appear to be less related to a lack of resources and more related to teachers' pedagogical visions and beliefs. Based on recent survey results, NCES (2000) advocates a renewed emphasis on relevant technology educational experiences:

- Teachers with more hours of professional development reported feeling better prepared to use computers and the Internet for classroom instruction. Teachers with fewer hours of professional development reported feeling unprepared to use computers and the Internet.
- Teachers with more hours of professional development tended to use computers for constructivist activities like problem solving or graphical presentations. Teachers with fewer hours tended to use the computers for activities like drill and practice.

Traditionally, technology courses for pre-service teachers have focused on increasing their technical skills and competencies for using specific software applications with little time spent promoting educational best practices related to technology integration. As a result, even though most pre-service teachers recognize the importance of technology integration, visions for integrated practice remain narrow and unimaginative. Although pockets of exemplary technology practice exist, few pre-service teachers have opportunities to observe integrated technology practice in local schools or to examine the beliefs and visions that support exemplary use.

University and college faculty who are responsible for creating programs and/or courses that prepare future teachers to integrate technology in meaningful ways need to be aware of the various programmatic efforts that address these technology development concerns. To facilitate the decision-making process, several key elements need to be considered when selecting an appropriate development tool. An effective tool (Becker & Riel, 1999) will present pre-service teachers with the following set of learning activities:

- Discuss pedagogical beliefs supporting classroom practices of technology-using teachers
- Identify critical similarities and differences among teachers' beliefs and practices
- Outline strategies for increasing technology use among teachers who currently operate at different levels of use

Solution

To help pre-service teachers develop the complex skills associated with effective technology integration, the VisionQuest© CD-ROM was designed to address the previously identified concerns. Specifically, this tool uses electronic models as a means for pre-service teachers to create visions and develop strategies for sound technology integration. Exemplary models comprise a powerful means for helping pre-service teachers develop robust visions of, and effective strategies for, technology integration. Our intent is to encourage future teachers not just to use technology but to use it in ways that align with educational best practices.

VisionQuest© affords users the opportunity to examine different uses of technology through classroom video examples of exemplary technology-using teachers. The digitized video examples transport users into the classrooms of exemplary teachers so they can examine the instructional practices, classroom organization, and curricular emphases of exceptional users of technology. They can see for themselves the roles played by the students, the teacher, and technology in a classroom where technology is integrated. Users can examine how teachers' visions guide their uses of technology and how visions are translated into classroom practice.

To promote pre-service teachers' development as exemplary technology-using teachers, VisionQuest© provides opportunities to compare one's existing beliefs and approaches with those of the teachers observed. As pre-service teachers consider different ideas and teaching approaches (exemplified on the CD-ROM), changes in beliefs and subsequent practice are fostered.

Description

VisionQuest© uses the metaphor of a journey as its underlying organizational structure, incorporating and building on three main components of a journey: road map, path, and destination. Embedded within this metaphor is the powerful image of a vision that serves as both the beginning and ending point of a journey, as well as a guidepost along the way.

Users explore the three major components: 1) how teachers planned for integration (their visions and beliefs), 2) how teachers implemented technology within their classrooms, and 3) how teachers assessed the impact of their efforts. Within each component, the users can investigate the following list of topics.

Teachers' Road Map: Planning for Technology Integration

- Forming a Vision for Technology Integration
- Getting Started with Technology Integration
- Identifying Incentives and Overcoming Barriers to Technology Integration

Teachers' Path: Implementing Technology Integration

- Classroom Roles within an Integrated Classroom
- Classroom Organization within an Integrated Classroom
- Curricular Emphases within an Integrated Classroom

Teachers' Destination: Assessing Technology Integration

- Teacher Assessment within an Integrated Classroom
- Student Assessment within an Integrated Classroom
- Sample Assessment Tools used within an Integrated Classroom

Within each topic area, users explore the paths that three sets of teachers (high school, middle school, and elementary) have taken to achieve their current levels of technology use. Each case contains a variety of elements that illustrate how teachers' visions for technology use are translated into practice. In the Road Map component, users examine how teachers' pedagogical visions of classroom practice have shaped their journeys including how they got started, the roadblocks and challenges they faced, as well as the incentives that propelled them forward. To support each component, several classroom video examples comprise the center of each case. Specific videos include teachers' interview comments, reflections on lesson effectiveness, descriptions of how lessons evolved, and discussion of supporting pedagogy.

As pre-service teachers work with this tool, they begin the process of creating visions and developing strategies to prepare them to integrate technology in meaningful ways.

Instructional Strategy

A key to the success of an instructional program is the strategy used to design and implement the instruction. In designing the VisionQuest© CD-ROM, we not only considered the design of the media, but also a sound strategy for implementation. The VisionQuest© teacher development model (Fig. 1) (adapted from NCREL, 1997) serves as the underlying framework for the implementation of the CD-ROM. The main goal is to facilitate the growth of pre-service teachers' visions for teaching and learning with technology by engaging them in reflective and collaborative activities that nurture and sustain their development.

The six-step model facilitates reflection on, and the transformation of, classroom practice. Teachers are challenged to reflect on their current knowledge and classroom practices, relative to technology integration, and then, after observing exemplary models included on VisionQuest©, develop and pilot personal solutions to relevant classroom issues. Through a collaborative and reflective process, teachers gradually develop their own understandings about how to integrate technology in ways that address relevant curricular and pedagogical issues within their classrooms.

Following the model, pre-service teachers are asked to reveal their current ideas and beliefs about a specific component of technology integration (e.g., classroom organization, assessment). Next, they explore the beliefs and practices, relevant to this particular theme, illustrated by the featured teachers. In conversation with peers, pre-service teachers then consider the critical similarities and differences across cases, as well as make comparisons to their own beliefs and practices, revealed earlier. Recognizing that even exemplary technology integration is ever-changing, users will be challenged to articulate testable suggestions that refine observed practices. In a continually "evolving expert" process, pre-service teachers will be encouraged to pilot their ideas and refine their own practices as they continue along their unique integration journeys.

Figure 1: VisionQuest© Teacher Development Model

Project Significance

Although most teachers today recognize the importance of using technology in their classrooms, Roblyer (1993) lamented that educators lack a clear vision as to how technology can be used to achieve new goals or implement new teaching practices. Given that most technology training (educational computing courses, in-service workshops) emphasizes learning *about* computers rather than teaching/learning *with* computers, it is not surprising that few teachers can envision, let alone achieve, integrated technology use. Researchers for the Apple Classrooms of Tomorrow (e.g., Fisher, Dwyer, & Yocam, 1996) have suggested that novice technology users may benefit from reflecting on the beliefs and practices of others who have already achieved integrated practice.

VisionQuest© is designed to support the professional development of both pre- and in-service teachers by providing electronic access to models of technology-using teachers. First and foremost, VisionQuest© facilitates the growth of pre-service teachers' visions for teaching and learning with technology. As such, this technology development tool helps these teachers achieve those visions by engaging them in reflective activities that nurture and sustain the change process. By illustrating the best practices of exemplary teachers, this visioning and strategic tool has the potential to inspire reluctant pre-service teachers to initiate their own technology integration journeys. Finally, by increasing the number of technology-using teachers who enter the workforce, we also increase our potential to effect meaningful student learning.

References

Becker, H. J., & Riel, M. (1999) Teacher professionalism, school-work culture and the emergence of constructivist-compatible pedagogies. [World Wide Web]. Available: www.crito.uci.edu/tlc/findings/special_reports2/index.htm [1999, October 19]

Fisher, C., Dwyer, D. C., & Yocam, K. (Eds.). (1996). Education and technology: Reflections on computing in classrooms. San Francisco, Jossey-Bass.

Hruskocy, C. (1999). Student trainers as resource technologists (Project START): A study of classroom interactions and use of student trainers. Unpublished doctoral dissertation, Purdue University, West Lafayette, IN.

Market Data Retrieval (1998). Technology in Education Report. Available online at: http://www.schooldata.com on September 4, 2000.

National Center for Education Statistics (2000). Public school teachers' use of computers and the Internet. Washington DC: U. S. Department of Education.

North Central Regional Educational Laboratory (NCREL; 1998). *Learning with technology: Integrating new technologies into classroom instruction*. Oak Brook, IL. Also available online: http://www.ncrtec.org/pd/lwtres/npdm

Novak, D. I., & Knowles, J. G. (1991). Beginning elementary teachers' use of computers in classroom instruction. Action in Teacher Education, 23 (2), 43-51.

Roblyer, M. D. (1993). Why use technology in teaching? Making a case beyond research results. Florida Technology in Education Quarterly, 5 (4), 7-13.

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Mentoring and Assessment: A Case Study of Initial Teacher Education and In-Service Development.

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Abstract: This paper concentrates on the issues pertaining to the determination and accreditation for Qualified Teacher Status in Information Technology in England and Wales, and the role that School Based Tutors have in this process. The major problem faced in initial teacher preparation is that while there is broad agreement that high levels of practicum are important, the lack of suitably qualified teacher mentors in Information Technology is hampering the effective preparation of newly qualified teachers. This paper looks at one model for effective mentor support.

Description

The role of assessment in the professional year at the University of Sunderland, School of Education is complex in that the assessment provides both formative and summative data, which informs and validates the requirements of a number of external and internal forces. The assessment of secondary student teachers following the professional year falls into a number of different categories and is monitored by a range of mentors as it happens, and also at specified end-points. Broadly speaking the work undertaken by the student teachers can be broken down thus:

External Professional Requirements	Required by:	Monitored by:	Internal Academic Requirements	Supported by:	Moderated by:	Type of Assessment	Contribution to award
Teaching Standards	DfEE/TTA	UST USLT GSBT SSBT				Competency Based - Portfolio Evidence	Pass/Fail
			EDS291 - Generic Education Module 1	UST UET GSBT SSBT	UST	Written Assessments - Marked against academic criteria - provides some evidence for Teaching Standards	Marks according to University Grading Criteria (0 - 16)
			EDS293 - Teaching Practice 1	UST USLT GSBT SSBT	UST	Competency Based - Portfolio Evidence. Assessment based on student developed portfolio and on observation and response to feedback	Pass/Fail
			EDS391 - Generic Education Module 2	UST UET GSBT SSBT	UST	Written Assessments - Marked against academic criteria - provides some evidence for Teaching Standards	Marks according to University Grading Criteria (0 - 16)
			EDS393 - Teaching Practice 2	UST USLT GSBT SSBT	UST	Competency Based - Portfolio Evidence Assessment based on student developed portfolio and on observation and response to feedback	Pass/Fail
			EDExxx - Generic Option Module	UET	UET	Written Assessments - Marked against academic criteria - provides some evidence for Teaching Standards	Marks according to University Grading Criteria (0 - 16)
Subject Standards	OFSTED	UST				Portfolio of evidence of prior learning and learning contracts	Pass/Fail
			EDE207 - Subject Studies 1	UST SSBT	UST	Written Assessments - Marked against academic criteria - provides some evidence for Teaching Standards	Pass/Fail

			EDE307 - Subject Studies 2	UST SSBT	UST	Written Assessments - Marked against academic criteria - provides some evidence for Teaching Standards	Pass/Fail
			EDT343 - Subject Studies 3	UST	UST	Development of web site and written evaluation - Marked against academic criteria - provides some evidence for Teaching Standards	Marks according to University Grading Criteria (0 - 16)
ICT Standards	DfEE/TTA	UST SSBT				Portfolio of evidence of prior learning and learning contracts	Pass/Fail
			EDE237 - ICT Module	UST SSBT	UST UICTC	Written lesson plans, evaluations and analysis of ICT in subject teaching.	Pass/Fail
Numeracy Test	DfEE/TTA	DfEE/TTA				Examination	Pass/Fail

Key: UST - University Subject Tutor, USLT - University School Liaison Tutor, UET - University Education Tutor, GSBT - Generic School Based Tutor, SSBT - Subject School Based Tutor, UICTC - University ICT Co-ordinator.

Table 1 - **Assessment Matrix - University of Sunderland, School of Education - Professional Year**

The range of assessment requirements within the professional year as detailed in Table 1 indicates the centrality of the role that assessment plays in the overall management and co-ordination of the programme. The assessment framework balances the requirements of both internal and external mechanisms and quality indicators. It is comprised of assessments of knowledge based outcomes and of the 'standards' which form, in essence, a competency model - evidence for which is derived from a number of sources and validated by a number of partners in the training process. The role of the validating and contributory partners within the assessment framework is vital. While the burden of reporting and moderating falls on the UST (this being part and parcel of the quality management of the programme) the role of the GSBT and the SSBT is such that they contribute to both knowledge development and the progression towards competency. GSBTs and USBTs offer seminars and directed study during school placement for the education modules (EDS291 and EDS391) while the students are working through their directed study manuals to meet the assessment requirements of these two modules of study. The SSBTs also follow a University programme of tasks and activities aimed at providing opportunities for the development and auditing of subject knowledge and applying subject pedagogy towards the collection of portfolio evidence for the teaching and ICT standards.

As the UST responsible for IT Teacher Education I have ultimate responsibility for the management and co-ordination of the assessment requirements within the programme. All written assignments and standards portfolios are marked and validated by me at key points during the academic year. I liaise regularly with the subject mentors (SSBTs) to check that students are working effectively towards the standards and that enough support is being offered within the school in order to generate sufficient evidence for each of the teaching standards. Since the major conduit for assessment is through the UST, and since much of the work has been developed and supported outside of the University, a number of quality assurance mechanisms are in place to ensure fair play across all the secondary programmes within the School of Education. All academic assignments are internally moderated - a sample is second marked (preferably by a subject specialist) - and another sample is moderated by the Secondary Programmes Area Manager. All work is subject to external examination also.

The assessment of teaching standards is carried out by the GSBTs and the SSBTs, and moderated by both USLTs and USTs. A sample of student portfolios is collected at the end of the academic year and reviewed by an external examiner during review week. I see each student individually to moderate his or her portfolios before agreeing completion. What is interesting to me as a teacher educator is the whole question of competency as a measure of teacher performance. Questions we should be asking, especially in ICT where the question of school teacher competency is reported on year on year in the CHMI's annual report, include the question of when is competent simply not enough? Do we require teachers who are more than competent? Are there facets of 'being a teacher' which cannot be assessed either through knowledge based assessments or through a competency model?

Critical Evaluation

As can be seen in Table 1 the university subject tutor in the model employed for secondary teacher education at the University of Sunderland is a major player within the mentoring and assessment process: almost all the assessment is monitored and validated by the UST. This said, the relationship between student teacher, subject school based tutor and university subject tutor is very important in the collection and validation of evidence for the monitoring and validation of the teaching standards. At the heart of the whole process are the teaching standards as defined in Circular 4/98 (DfEE, 1998). All assessment throughout the programme leads to the development and provision of evidence for the students' knowledge, skills and understanding (KSU) in relation to the teaching standards. While the specific set of teaching standards remains firmly at the core of the system, the ICT standards and the subject have been further developed to provide the student teachers (and SSBTs in their moderation role) with more areas of KSU to evidence for their portfolios.

Although there is broad agreement among the student teachers and the SSBTs with whom I work about the benefits and drawbacks of the teaching standards, there are difficulties beyond those raised by Whitty and Willmott (1995 p217). Student teachers and their SSBTs often need support in their understanding of what the standards actually mean in the context in which they find themselves. The interaction of the UST is crucial here in enabling contextualisation, interpretation and progression to take place. The problem of reductionism, of a 'surface approach' to the learning taking place, is certainly apparent; but beyond the simple 'what do I need to do, specifically, to achieve this standard?' many student teachers are keen to search for the meaning inherent within the standards. This could be seen as student teachers and their SSBTs beginning to think in terms of the standards as elements in the process of reflective practitioner development (Schön, 1996, Boud, Keogh and Walker, 1996 p52). More often than not however this search for meaning veers towards the pragmatic: what counts as evidence, how much evidence do I need before I can be considered to have met the standard?

The answer is, naturally, not straightforward, and for many students the problem of evidence collection becomes their focus as they progress through teaching practice. Rather than being part and parcel of a reflective and reflexive response to the experiences they have on teaching practice the view that the portfolio is very important leads to the generation of masses of data and a mechanistic approach to the process.

Where the evidence is generated as a result of observations of teaching, reference is made against the narrative to the relevant teaching standard (see Fig. 1). The danger here is that when a student teacher sees the reference to A3 then the assumption is that A3 can be claimed and referenced within the portfolio. The question of whether or not the student understands why A3 can be claimed might not even enter the frame. The fact is - it is referenced and can therefore be ticked off.

Observation Record

Student Name	A Student Teacher	Date	28/03/00	Observer	Chris Jones	
Class Observed	GNVQ - I - Unit 7	Time	0900-1100	SSBT		
Placement	A North East College					
Teaching Standards	Commentary					
B1 B3	You introduced the session well - your exposition of the learning outcomes clearly identified to the students the structure and approach that they would experience during the learning session today. You had planned some leeway into the session to allow for student drift owing to the change of venue, which was necessary, since you had invited in a visiting speaker.					
A3	The students obviously had the background knowledge available to them in order to answer the questions that Steve threw at them. They appeared confident and able. Your brief to Steve had been clear in that he was able to pitch his delivery appropriately to meet the learning needs of the students.					

Figure 1 Example of Feedback Sheet for Student Teacher

The danger of following such a 'narrowly mechanistic approach' (Furlong, 1995, p230) is that while it enables student teachers to see what it is they have to do in order to meet the requirements, it removes elements of creativity and values from the teaching process. It reduces the concept of the 'teacher as professional' to that of the 'teacher as technician'. Furlong (op. cit.) would have it that such a consequence would be self-inflicted. I agree that the standards do establish a minimum entitlement for all student teachers, that there is a rigour in terms of systematic training and that they help to focus and structure our judgements of student teacher performance. The notion of the self-inflicted wound is not, in my view appropriate. It is the assessment of the assessors that drives 'the standards, the whole standards and nothing but the standards' as the tenet for initial teacher education.

The OFSTED criteria for the inspection of providers of initial teacher training make it clear that students must "when assessed, demonstrate that they meet the standards set out in circular 4/98, ... and for the use of ICT in subject teaching." (OFSTED/TTA, 1998, p 7) The evidence then for assessing the providers of initial teacher education is to be derived from observations of how the students are meeting the standards - all the standards. Beyond the teaching standards, there are the ICT standards, and for those subjects for which a national curriculum for ITT is not defined, the institutionally developed subject standards which demonstrate that a student is educated to degree level in the subject, and can apply that knowledge effectively within GCSE and A Level teaching.

What this means is evidence - portfolio evidence. The concept of student teacher as burgeoning reflective practitioner disappears under a mountain of paper. Referring back to Table 1 it is clear that the student teachers at the University of Sunderland have to undergo a lot of assessment in their thirty-six weeks of study. This pattern is repeated all over the country - and not just in England and Wales; Scotland too has a perceived problem of 'competence overkill':

> The SOEID guidelines for initial course list some 48 competences. The ICT consultation document takes just two of these and elaborates them to suggest another 46 competences relating to them. If the same elaboration were appropriate for all 48, we would have a total of 1104 competences in total ... It is not my intention here to ... tackle the more fundamental argument relating to the notion of competence based approaches in general, rather I wish to use this example to suggest that initial courses are in danger of being overwhelmed by this process of accretion. (Ward, 1999)

The danger of the competency model of teacher training, while demystifying the process of change from student through to student teacher and onto proto-professional (Whitty, 1995, p202, Whitty and Willmott, 1995, p217), is that it breaks the whole process down into a set of individually achievable targets which can, as separate entities, be recorded and evidenced. This may not, in terms of the NVQ 'can do' approach to vocational training, be a bad thing, and the discourse between Whitty and Pring (Moon and Shelton-Mayes, 1995, p235) highlights the dilemmas that both university and school-based teacher educators have to face. The whole question of when is a teacher more than the sum of the parts is very important in the process of making and recording our judgements of student teachers and their performances, both as academic students and as developing teachers. Moon and Shelton-Mayes (op. cit.) describe how the OU model has gone some way towards mitigating the attempts 'by assessors to *tick-off* competences in a discrete and isolated way' (p237). The inclusion of a values element which requires student teachers to demonstrate how their achieved competency relates to the professional qualities of the practising teacher is one which in some respects acknowledges the fact that being competent requires more than just the ability to meet a series of separate targets. What is implicit within the model they describe is the notion of progression (from novice to expert - Berliner, 1994) within the individual standards and also recognition that the standards should be seen not as separate entities but rather as contributory elements which describe the whole teacher.

There is, however, within this, a certain dichotomy that can obfuscate the training process and begin to re-mystify it. As Pring (1995) would have it, you either are, or are not competent. The definition and application of a set of standards appears clear and uncomplicated. The pattern is set out and there are, seemingly, definite pointers which delineate both the process to follow and the evidence indicators necessary for successful completion. The contradiction, or indeed the difficulty, for some comes from the demand for quality: the requirement for the student teacher to understand and apply the principles that underpin the standards.

This was a tangible dilemma for the ICT partnership in Sunderland. How were we to clarify the 'conceptual mess' (BERA, 1992) that the standards presented to us? Our partnership meetings allowed us opportunities to discuss and challenge the notion that the standards, if achieved, presented us, absolutely, with a passing student. Taking the Berliner scale (op. cit.) as our starting point, we looked at what it was that separated the novice student teacher from the competent one. We also looked at what is was that indicated a student teacher who was likely to progress during the induction year, and beyond, to expert status.

The importance of this discussion became clearer for the SSBTs as we began to tease out some of the distinctions. The student teacher beginning a first placement has more to deal with than the standards - there are at least two stages to go through (Maynard and Furlong, 1995) before assessment plays a part. And the SSBTs had different role to play in this also. The difficulty of balancing the nurturing role (Anderson and Lucasse-Shannon, 1995) with that of assessor and judge had to be recognised: and in doing so the SSBTs began themselves to see that the competency model was not sufficient in itself as the modus-operandi for teacher training. The recognition that they too played a part in professional growth and could begin to vocalise the associative benefits of the reflective practitioner model of teacher education (Elliot and Calderhead, 1995, Maynard and Furlong op. cit.) allowed us to begin to analyse the standards and to look at them as the basis for a more developmental and reflective model of student teacher assessment (Berrill, 1992).

The explicit inclusion of reflection and consolidation on the part of the SSBT into the mentoring and assessment process acknowledges that:

> The teaching profession is complex and heterogeneous, and the development of competency standards needs to take account of both the similarities and differences between various categories of teacher (e.g. beginning teacher, *master* teacher, primary teacher, secondary teacher, teacher of adults) and the variety of different specialities within these categories. (Hager and Gonczi, 1996).

There was a pragmatic element too in all this. The course was being re-inspected by HMI this academic year, and while all aspects of the programme were under review, the whole area of how the partnership was addressing the 'accuracy and consistency of the assessment of trainees against the standards for QTS' (DfEE/TTA, 1998, p7), was an area for specific examination.

This being so, the team began to distil our understanding of the Berrill scale we had reviewed and to begin to incorporate these within the teaching standards and OFSTED's criteria for the grading of cells within the framework. This meant identifying a four-point scale in line with the expectations set down in the framework:

1	Provision is consistently of very good quality with several outstanding features;	Very Good
2	Provision is of consistently of good quality with no significant weaknesses;	Good
3	Provision complies with the Secretary of State's criteria, but requires significant improvement to ensure that the trainees are enabled to reach a good standard of teaching;	Fair
4	Provision does not comply with the Secretary of State's criteria.	Poor

(DfEE/TTA, op. cit., p8)

We arrived at a series of statements which exemplified the nature of the performance which underpinned the achievement of the teaching standard whereby a student teacher could be deemed to have provided evidence for the standard - or not as the case may be. While the students themselves were not specifically made aware that they were being **assessed** in relation to the exemplification, the exemplification grid was seen as central to their professional development and set an expectation that, for each standard, they would be working towards achievement in the cells at the left hand side of the page.

This, as in the Open University model, enabled students to demonstrate clearly that as they were developing and collecting evidence for their teaching standards portfolio they were developing also 'a foundation of evidence for their capability in relation to their professional qualities' (Moon and Shelton-Mayes, op. cit., p 237). They were also working against clear criteria that enabled both themselves and their assessors to make summative judgements about their level of performance.

What it has also done is to focus the SSBTs in on the meaning and application of the standards. Rather than seeing them as a mechanistic tick list, the exemplification document encouraged discussion about the standards in a way that encouraged reflection at all levels. SSBTs were more focused in their feedback to the students and were in many respects more able to be objective in their judgements and commentaries. The students too commented favourably on the system in their feedback about the programme at the end of the year:

> My mentor was able to give me specific feedback about how I might improve in my approach to classroom management. This had happened during my first teaching practice - but the reference to the matrix seemed to make it much more focused.
>
> I was able to use the exemplification of the standards to help me to set my own agenda. It made me realise how important it was for students to action plan and to set realistic targets for development: it improved my understanding of the teaching of GNVQ Advanced IT no end.

What clearly happened for some students, I dare not claim that it happened for all, was that the pragmatism of the matrix helped them to become more reflective about the nature of the programme, and about teaching itself. The HMI inspection became, in many respects, incidental: the change to our approach which had been fostered by our previously poor inspection results took on a life of its own and enabled both SSBTs and student teachers to be much more confident in their analysis of their strengths and weaknesses.

There were students and SSBTs who simply saw the exemplification sheet as 'yet another document' to deal with. It was seen as part of the bureaucracy which for some simply slotted into to the notion of the 'professional community that is increasingly coming under the dictates of central government' (Hoyle and John, 1995, p160). While these participants presented a minority opinion - that opinion is valid in that the professional year has generated a number of booklets and help sheets that define and illuminate the structure and process of the programme. Consolidation is necessary in order to continue the process of demystification and to continue to encourage a reflective and reflexive approach to the teaching standards.

Summary and Recommendations

The progress made towards reflective practitioner status, by both student teachers and SSBTs, as a consequence of the assessment of student teacher competency owes something to the application of elements of total quality management within initial teacher education (Bank, 1992, Latta and Downey, 1994). The focusing in on strategies for improving the data collection for assessment and review processes, for both internal and external audiences, has provided opportunities for changing practices and raising the performance threshold (for individuals and for the partnership as a whole). Hoyle and John (op. cit.) in their review of government policy and its impact on teacher formation, while expressing some concern about impending de-professionalisation, offer a view which reflects appropriately the effects of the work on the measurement of student teacher performance against the standards, and which indicates that many teachers "have been enhanced professionally by the greater contact and involvement with teacher educators." (p161)

Working together to come to a common and agreed format for the exemplification of the teaching standards has enabled the training of teachers of ICT to begin to focus in on what it is that establishes the foundation for successful subject teaching within a professional and accountable context. The distinction between the teaching standards and the notion of simple competency has been an important one for us to make. The acceptance that being competent is but part way towards being a teacher and also that the notion of levelness can be applied to the standards in order to begin the process of personal and professional action planning is important also. What is interesting in the current climate is that the language of the teaching standards, the application of portfolio development and the notion of performance assessment are part and parcel of the threshold standards recently applied to teachers at the top of the pay scale.

This paper has concentrated mainly on the way the partnership between the UST and the SSBTs has contributed to the assessment of the teaching standards. The integration of a competence model with that of reflective practitioner has been worthwhile in terms of student confidence in their preparedness for teaching as measured at the end of their programme of study. There are other areas for development within the programme where the partnership can usefully work together to improve the quality of the experience for the student teacher. Table 1 demonstrates clearly that the professional year is over assessed and presents a burden on the students which can be lessened without undermining steps to ensure that they have met all the standards (both explicit and implicit) defined by the programme. This has to be a clear target for the next academic year: the addition of national tests for literacy and ICT on top of that for numeracy is one driver for a review of assessment. We have to question again the type and quality of evidence that exemplifies a standard and establishes the competence embedded within it. This will certainly provide a focal point for at least one of the partnership development meetings during the next academic year.

References

ANDERSON, E.M. and LUCASSE SHERMAN, A. (1995) 'Towards a conceptualisation of mentoring', in KERRY, T. and SHELTON MAYES, A. (eds.) *Issues in Mentoring*, London, Routledge/Open University

BANK, J. (1992) *The essence of total quality management*, London, Prentice-Hall

BERLINER, D. (1994) 'Teacher Expertise' in, MOON, B. and SHELTON MAYES, A. (eds.) *Teaching and Learning in the Secondary School*, London, Routledge/Open University

BERRILL, M. (1992) 'Structured Mentoring and The Development of Teaching Skill' in, WILKIN, M. (ed.) *Mentoring in Schools*, London, Kogan-Page

BERA (1992) 'Reform of initial teacher training', Report of the Task Group, *Research Intelligence*, Spring, 16 - 21

BOUD, D., KEOGH, R., and WALKER, D. (1996) 'Promoting reflection in learning: a model', in EDWARDS, R., HANSON, A., and RAGGATT, P. (eds.) *Boundaries of Adult Learning*, London, Routledge/Open University

DfEE (1998) *Teaching; High Status, High Standards*, Circular 4/98, London, DfEE

ELLIOT, B. and CALDERHEAD, J. (1995) 'Mentoring for teacher development: possibilities and caveats', in KERRY, T. and SHELTON MAYES, A. (eds.) *Issues in Mentoring*, London, Routledge/Open University

FURLONG, J. (1995) 'The limits of competence a cautionary note on Circular 9/92' in
KERRY, T. and SHELTON MAYES, A. (eds.) *Issues in Mentoring*, London, Routledge/Open University

HAGER, P and GONCZI, A. (1996) 'Professions and competences' in EDWARDS, R., HANSON, A., and RAGGATT, P. (eds.) *Boundaries of Adult Learning*, London, Routledge/Open University

HOYLE, E. and JOHN, P. D. (1995) *Professional knowledge and professional practice*, London, Cassell

LATTA, R. F. and DOWNEY, C. J. (1994) *Tools for achieving TQE*, London, SAGE Publications

MOON, B. and SHELTON MAYES, A. (1995) 'Integrating values into the assessment of teachers in initial education and training' in KERRY, T. and SHELTON MAYES, A. (eds.) *Issues in Mentoring*, London, Routledge/Open University

MAYNARD, T. and FURLONG, J. (1995) 'Learning to teach and models of mentoring', in KERRY, T. and SHELTON MAYES, A. (eds.) *Issues in Mentoring*, London, Routledge/Open University

OFSTED/TTA (1998) Framework for the assessment of quality and standards in initial teacher training, London, HMSO

SCHÖN, D. (1996) 'From technical rationality to reflection in action' in EDWARDS, R., HANSON, A., and RAGGATT, P. (eds.) *Boundaries of Adult Learning*, London, Routledge/Open University

WARD, T. (1999) 'Time for change', *Education in the North: The Journal of Scottish Education*, 7:79

WHITTY, G. (1995) 'Quality control in teacher education' in KERRY, T. and SHELTON MAYES, A. (eds.) *Issues in Mentoring*, London, Routledge/Open University

WHITTY, G. and WILLMOTT, E. (1995) 'Competence based teacher education: approaches and issues' in KERRY, T. and SHELTON MAYES, A. (eds.) *Issues in Mentoring*, London, Routledge/Open University

THREE COMPUTERS IN THE BACK OF THE CLASSROOM: PRESERVICE TEACHERS' CONCEPTIONS OF TECHNOLOGY INTEGRATION

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ABSTRACT: Faced with a new generation of pre-service teachers, teacher educators may easily assume that these young men and women are technology savvy and have mastered the skills required to word process, create presentations, surf the web, email professors and friends, and conduct their research online. Nevertheless, these same pre-service teachers may express anxiety and doubt about their ability to incorporate technology into their future classrooms. Our study, based on interviews with pre-service teachers, looks at this disconnect between using technology with confidence for personal use and using technology as an educator. We consider possible sources for this disconnect, and offer an alternative conception of technology in education we call "technological pedagogical content knowledge" (TPCK) which extends beyond computer proficiency to understanding the effect technology may have on student's conceptions of subject matter, the inevitable challenges that accompany technology, and the judicious use of technology when new forms of representation are most appropriate.

Introduction

In an age of technology related standards for students (ISTE, 2000) and teacher education programs (NCATE, 1997, CEO Forum, 2000) pre-service teachers feel the weight of knowing that the schools in which they will eventually teach require them not only to be personally proficient with computers, but also translate that proficiency into an effective use of technology in their classrooms. Schools of education and schools as potential employers often assume that these young teachers, many in their early twenties, have been inculcated into the use of technology from a young age. We imagine that this up and coming "generation" of teachers is technology-savvy, having grown up word processing their assignments, taking weekly trips to the computer lab, and mastering Nintendo. And our assumptions may not be far off. Pre-service teachers have had more exposure to technology, and as a result are quite comfortable surfing the web, emailing professors and friends, and conducting research online (Brown, 2000; Tapscott, 1997). But how does this measure of comfort translate to the classroom? Not well, according to our research with pre-service teachers. We found that pre-service teachers who feel comfortable with technology in their daily lives express reservations about using technology in their future classrooms. The source of this disconnect we have defined as a lack of "Technological Pedagogical Content Knowledge."

Question

Shulman (1986) defines pedagogical content knowledge as that form of pedagogical knowledge that "goes beyond knowledge of subject matter per se to the dimension of subject matter knowledge for teaching...the particular form of content knowledge that embodies the aspects of content most germane to its teachability." For Shulman, pedagogical content knowledge involves ways of representing subject matter so that it is comprehensible for students, and understanding the kinds of preconceptions and misconceptions students may have as they embark upon learning the new subject. Likewise technological pedagogical content knowledge (or TPCK) extends beyond proficiency with technology for personal use to an understanding of how technology can be integrated with subject matter in ways that open new avenues for student understanding of the subject matter *and* the technology itself (Jonassen, Peck & Wilson, 1999; Barab &Duffy, 2000). In our conception of a teacher's TPCK, the teacher has the ability to use technology judiciously, when new, technologically enabled forms of representing subject matter knowledge are most appropriate. He or she understands the effect technology may have on her student's conceptions of the subject, the extent to which student's use of technology may actually impede understanding of a subject, and the inevitable challenges that accompany any new technology.

In this study, we sought to determine the level of preparedness and comfort teachers exhibit as they begin to integrate technology into their practice in order to better help them understand how technology can potentially transform their teaching. We also wanted to get a sense of how teaching with technology fits into our student teachers' evolving pedagogical content knowledge.

Methodology

Using a grounded theory methodology (Strauss & Corbin, 1990), we eschewed coming to this study with any one specific theory to prove or disprove; rather we focused on collecting and studying our data to see what theories, if any, could be generated. Eleven pre-service teachers at a mid-sized New England private university, all of whom were students in a course entitled Transforming Classrooms with Technology, agreed take a survey and participate in interviews. The semi-structured interviews lasted approximately 20 minutes, were audio taped and later transcribed (See Appendix A for a list of the interview questions.)

Our initial review of the data revealed three areas related to teacher education that seemed to contribute to the pre-service teachers' lack of confidence in their ability to incorporate technology into future classrooms. Once identified we then used these areas to code the interviews, altering and refining our codes as needed. Ultimately, these areas were defined as Modeling, Usage, and Pedagogical Fit.

The first area we call modeling, which, for the purpose of this study, encompasses the kinds of modeling pre-service teachers encounter in their K-12 experiences and in their pre-service years. Our idea of modeling here has strong ties the to notion of "hidden curriculum" or the "content of the messages 'that are transmitted to students through the underlying structure of meaning in both the formal content as well as the social relations' in teacher education programs beyond that conveyed by the stated curriculum" (Ginsburg & Clift, 1990). We have altered this definition to include the messages conveyed by the formal content and social relations in teacher education programs and in the schools our pre-service teachers attend as both students (K-12) and as future educators. Thus, modeling is defined as those messages received by students through formal, stated curriculum; the actions of their teachers, professors, and cooperative teachers; and the underlying social relations they perceive in the use of technology in education (see also Carlson and Gooden, 1999). We also consider how these aspects of modeling have engendered certain preconceptions about teaching with technology.

The second area of concern we have defined simply as "usage." How have our pre-service teachers used technology in the past? How do they currently use technology in school, at home, and in their practica? By asking these questions we gain insight into our students' level of comfort with technology and the extent to which they mesh with current assumptions about young people and their technological prowess.

The final area we have defined as "pedagogical fit." We encouraged students to design their ideal classroom and discuss how technology relates to their philosophies of teaching, student learning and curriculum building. Our students' visions of themselves as future teachers who use technology are a revealing look at how, even at this stage, they have fixed certain limitations and potentialities into their conceptions of teaching with technology.

Results

Modeling

As we described earlier, our concept of modeling includes both the stated, formal curriculum, the actions of their teachers, and the social relations they perceive in the use of technology in education. In terms of a formal curriculum, our School of Education has incorporated two classes, Computer Applications for Educators and Transforming the Classroom with Technology. Our students noted, however, that these courses were not required either as a graduate or an undergraduate. "I'm not very familiar with computers...its not like a requirement in education or anything…and then my senior year my dad was like (because he's really into computers) you should look into it for an elective."

Our students also came away from their methods courses with both positive and negative attitudes towards various forms of technology, depending on how successfully it was modeled in class:
"I think it's important to have an overhead. The more and more methods classes you get into now that's what they stress…Well, I guess I'm biased because I spent four semesters with the same teacher for my math and she is always using overheads…so she's gotten me in the mind set of thinking."

"A couple of years ago in one of my Ed classes I was supposed to create a web site and I got through the whole thing and we had trouble I guess finishing it or getting it on the computer, it never ended up working so from then on I haven't tried to make any more web sites--it was a tad bit frustrating. I'm not sure what happened, a lot of people had trouble with it, and the professor ended up not counting that project."

In their practicum experiences, students who observed their cooperating teachers using technology came away with strong notions of the possibilities and limitations presented by technology. Most students said seeing their cooperating teachers use computers was important for their understanding of how technology works in the classroom:

"I still would love to see teachers that are using it now before I go out [to the practicum]. I can take out a program and try it but I won't know how it works until I really see kids with it, so any time I get an opportunity to see teachers using it I think its great and I' m excited. As much as I feel comfortable using it I'm always looking in my pre-pracs to see it out there…"

In addition, students expressed concern over the deep divide in funding between school systems in various parts of the area and recounted some of the frustration that accompanied poor quality hardware in districts that could not afford better resources:

"When I did my full practicum the computers in the class were down the entire semester I was there, it was awful. A couple of the other classrooms were working, there were like 3 computers in each class. The program…was a bunch of English and science and social studies activities the kids can use, but you can't do much else on it besides that. It was part of a…technology grant but I couldn't do any work on the computers… so that was a little frustrating."

Students also worked closely with the cooperating teacher to develop lessons and units. The cooperating teacher counted on the pre-service teacher's knowledge of computers and ability to research effective software programs.

"She [the cooperating teacher] loves the fact that I can't wait to bring in different things… like we were doing a unit on money and I brought in this money program but I never got to see anyone use it and she was just getting into it. She needed someone like me…the two of us worked out great together."

Another student, however, felt the pressure of having to impart her knowledge to other teachers:
"[When] they found out I was a math computer science major, it was like bombardment of 'show me how to do this, show me how to do this.' I did Kid Pix and all of a sudden I was presenting to the whole faculty how to use Kid Pix. It was good to see that they want to know and they were interested in using it. But some people didn't know how to print --they didn't know where the print function was." In fact, a number of our students expressed apprehension with being expected to assume a leadership role in modeling the use of technology in their courses and for their colleagues as a first year teacher.

Usage

Without exception, our pre-service teachers said they had grown up with computers in their home and in their schools. They each felt comfortable word processing, emailing, and searching the Internet. Some even had programming experience using LOGO or Hyperstudio in elementary school and high school. Despite similar backgrounds, however, students varied widely in their descriptions of themselves as computer users. Some students saw themselves as a "computer person," confident in their ability to translate their skills into a variety of settings. For these students, using technology in teaching was simply an extension of their identity. One student said, "I'm not typically a Barbie person--I used to love to play with Legos…we'd spend hours putting them together and I loved trying to figure…like even now my dad will call me and ask how I do this on the computer." Conversely, other students focused on what seemed to be a rather ill-defined set of technology skills that had escaped them but which they felt others had mastered. For example, a student told us she had learned LOGO in elementary school, word processed all her papers, conducted research on the internet, and had a computer at home while growing up. Nevertheless, she described herself as "very basic": "my whole family is good with computers; I just never felt comfortable with them because I didn't really know how to use them but I'm slowly learning now."

Pedagogical Fit

At this point in their education, our pre-service teachers had already begun forming a teaching philosophy, and when asked how technology fit into that philosophy, some of the responses showed a measure of uncertainty. They felt sure that technology would play some role, but just what that role entailed was unclear:

"Right now, because I don't know enough to teach my students how to use it I might not want that much [technology in the classroom] but if I was very confident in using the computer and programs and things like that I would want a lot of technology in the classroom."

Other students' conceptualizations of themselves teaching with technology were defined in opposition to what they observed in their practicum

"In my teaching I'd use it as an integral part. I think it goes hand in hand with instruction. I don't like to get up in front of the classroom and teach, I'd rather have kids working on the same topic area but doing different things, you know, like a computer center, and then kids working on other stuff, and I'd use that at the same time. I think now with a lot of older people in the teaching profession that it's [technology] just used as an enhancement. It's used like 'I don't have anything else to do so put the kids on the computer' because the teachers don't know how to use it."

Implications

Our student's responses suggest that we must be aware of the messages sent by the pre-service experience (both coursework and practical), and the ways in which technology is utilized in those contexts. In addition, our use of technology for teaching must not be seamless. We should make explicit exactly how technology functions in our classes, how it affects student understanding, and how it presents challenges our students must be prepared to handle with grace. Teachers of education should look to our student's past experiences and encourage them to discuss how technology has played a role in their lives. We cannot assume that our students come to us as blank "technology" slates. They have had encounters with technology, both positive and negative, throughout their school years and these encounters have left their mark. At the same time, we cannot assume these same encounters with technology sufficiently encompass all that a student needs to know in order to use technology effectively in his or her teaching. Despite what some teacher educators think, as suggested in a recent survey of technology use in schools of education (Leh, 1999), basic word processing and Internet search skills are only part of the knowledge teacher need to use technology judiciously and effectively.

Throughout this study, we were continually stuck by the prevalence of what we came to think of as the "3 or 4 computers in the back of the room" model of technology. For a majority of students, this "add-on" technology use, where students are sent to work on computers in the back of the room for remediation or enrichment, is the extent of their understanding of how technology fits in the classroom. In our course, then, we offer our students a much more complex picture of technology in education. We encourage them to consider that despite the push for technology in classrooms, there is little consensus that technology provides a positive impact on student learning or, in our current outcome driven society, on standardized tests (Jones and Paolucci, 1999; Mellon, 1999). By assuming that technology in schools is a given, predetermined expectation, rather than exploring with our students essential questions about access and impact on learning, we do them a disservice. Pre-service teachers should be actively engaged in creating their own informed opinions and perspectives on technology in their classrooms, and not be passive recipients of an overly simplified view that may be garnered from reading national technology standards (ISTE, 2000) alone. Another side of this complex picture is that of the relationship between learning theories and strategies and technology. Students should be engaged in thinking about how technology can be integrated into the various learning strategies to which they have been exposed in Schools of Education. It is unthinkable to position a single learning strategy as the best method for teaching; rather students are presented with a number of approaches that can be implemented depending on the students, the classroom and school context, the nature of the material, etc. And yet we easily might offer a single approach to technology driven by a single strategy, i.e., using drill based software programs in support of a delivery model of knowledge in education.

Finally, the overall message of our course is to encourage an innovative, responsible, and critical approach to technology in education in each of the areas we mention above. In other words, we seek to help our students develop a level of TPCK, an understanding of how technology can be used to teach content in rich and meaningful ways and the far-reaching implications of that use. The missing component in our program, and we presume in a majority of teacher education programs, is the facility to place our student teachers in classrooms with experienced teachers that possess a sophisticated level of TPCK. It is imperative that our cohort o f Twenty-First Century teachers, early on, have the opportunity to "work at the elbows" (Collins et al., 1989, Barab & Hay, 2000) of expert teachers integrating technology as a meaningful part of classroom instruction.

References

Barab, S.A. & Duffy, T. (2000) From practice fields to communities of practice. In D. Jonassen & S.M. Land. (Eds.). Theoretical Foundations of Learning Environments (pp. 25-56). Mahwah, NJ: Lawrence Erlbaum Associates.

Barab, S.A. & Hay, (2000). Doing science at the elbows of scientists: Issues related to the scientist apprentice camp. Journal of Research in Science Teaching, 37 (1), 1-33.

Brown, J.S. (2000). Growing up digital: How the web changes work, education, and the ways people learn. Change, March/April, 2000, 12-20.

Cadiero-Kaplan (1999). Integrating technology: Issues for traditional and constructivist pedagogies. Journal of Computing in Teacher Education 15:3, 14-18.

Carlson, R., Gooden, J. (1999). Mentoring preservice teachers for technology skills acquisition. Paper Presented to SITE 99: Society for Information Technology and Teacher Education International Conference (10th, San Antonio Tx, February 28-March 4, 1999).

Collins, A., Brown, J.S., & Newman, S.E. (1989). Cognitive apprenticeship: Teaching the crafts of reading, writing, and mathematics. In L.B. Resnick (Ed.) Knowing, learning and instruction: Essays in honor of Robert Glaser (pp. 453-494). Hillsdale, NJ: Erlbaum.

Ginsberg & Clift (1990). The hidden curriculum of preservice teacher education. Handbook of Research in Teacher Education, New York: MacMillian Publishing Co.

Falba C., Strudler, N., Bean, T., Dixon, J., Marcos, P., McKinney, M., & Zehm, S. (1999) Choreographing change one step at a time: reflections on integrating technology into teacher education courses. Action in Teacher Education. 21:1, 61-76.

CEO Forum on Education & Technology. (2000). Teacher Preparation STaR Chart: A self-assessment tool for colleges of education. Available online at http://www.ceoforum.org

International Society for Technology in Education. (2000). National Educational Technology Standards for Students: Connecting Curriculum and Technology. Eugene, Oregon: International Society for Technology in Education.

Jonassen, D.H., Peck, K.C. & Wilson, B.G. (1999). Learning with technology: A constructivist perspective. Upper Saddle River, NJ: Merrill/Prentice Hall.

Jones, T., Paolucci, R. (1999). Research framework and the dimensions for evaluating the effectiveness of educational technology systems on learning outcomes. Journal of Research on Computing in Education. 32:1, 17-29.

Leh, Amy Sheng Chieh. (1999). Research on technology courses at colleges of education. Paper Presented to National Convention of Association for Educational Communications and Technology (21st, Houston Tx. February 10-14, 1999).

Mellon, C. (1999). Technology and the great pendulum of education. Journal of Research on Computing in Education. 32:1, 28-35.

National Council for Accreditation of Teacher Education. (1997). Technology and the new professional teacher. Preparing for the 21st century classroom. Washington, DC:NCATE.

Shulman, L.S. (1986). Those who understand: knowledge growth in teaching. Educational Researcher 15:2, 4-14.

Smithy, Margaret W. (1999). Connecting preservice teachers with technology. T.H.E. Journal 26:8, 78-79.

Strauss, A., & Corbin, J. (1990). Basics of qualitative research: Grounded theory procedures and techniques. Newbury Park, CA: Sage.

Tapscott, D. (1997). Growing up digital: The rise of the net generation. New York: McGraw-Hill.

Appendix A

Questions from Semi-structured Interview

A. Background information

1. Talk a little about your personal use of technology—any projects, web sites, etc. you would like to describe or show us?
2. As both a student and a teacher, describe some of your experiences with technology in the classroom (how did you use technology and, if relevant, how did you teach with it?).

B. Technology and classroom instruction

1. When you think of the word "technology" what comes to mind? What comes to mind when you think of technology in classroom?
2. Describe your experiences with technology in K-12 courses.
3. What is your opinion of equity issues and technology (is technology a divider or an equalizer)?
4. Do you see technology as an enhancement to curriculum & instruction or an integral part of curriculum & instruction?

C. Overall

1. What does it mean to you to "transform classrooms with technology?
2. Describe or sketch your ideal technology classroom.

Using Dreamweaver 3 For Generating Preservice Web-Based Teaching Portfolios

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Abstract: One of the tasks that our students have in our Educational Psychology / Introduction to Teaching sequence is that of creating an assessment and professional portfolio. This assignment becomes the foundation for their continuing portfolio, which they build on in the remainder of their Education coursework, and becomes the basis for their professional portfolio. Last year, for the first time, we changed our format from a portfolio that was stored in a binder to one that is stored on the World Wide Web. We found that this allowed us to assess our students in a way that also gave them an important tool as they enter the teaching profession. Challenges that we faced in this having our students complete this assignment, responses to those challenges and outstanding questions are addressed.

Background

Colleges and departments of education have shown a growing interest in performance assessment. The stiff competition for teaching jobs has resulted in a chorus of voices telling both prospective teachers and practicing teachers, "You ought to develop professional portfolios" (Campbell, Cignetti, Melenyzer, Nettles, & Wyman, 1997). In our Educational Psychology and Introduction to Teaching courses, we found ourselves joining that chorus about five years ago with the addition of a final examination in the form of a portfolio assessment. Our expectation was that our students would continue to develop their portfolios until the end of their preservice education and would also use them as part of their professional growth in their teaching careers.

In addition to viewing portfolios as a good thing to do for our student's professional growth, our accrediting body's increased emphasis on performance-based assessment tools was moving us toward using portfolio assessment. The Interstate New Teacher Assessment and Support Consortium (INTASC) standards require, among other things, that beginning teachers demonstrate entry-level competencies of teaching through the development of a portfolio (Bullock & Hawk, 2001). The INTASC standards have been incorporated into the National Council for the Accreditation of Teacher Education (NCATE) new accreditation process for teacher-education programs. Thus, the new NCATE standards have been developed with an increased focus on the performance of preservice teachers, as they become teacher candidates. When Arthur Wise (1998) announced the new direction for NCATE, he noted,

> The emphasis on performance has been spurred by a realization among policy makers that changes in curriculum and courses have not significantly increased student achievement. The number one factor in enhancing student learning is the capability of the teacher. How to determine quality and knowledge are central questions as NCATE develops its performance-based accreditation system. (p.1)

Because the NCATE standards are a critical element in our education program's review process, we have found increasing institutional support for requiring a portfolio in our course. Dorothy Campbell (2000) and her colleagues note that the key question that a quality teacher-education portfolio hopes to answer is "What do candidates know and what can they do when they graduate?" That question will continue to shape the content of our portfolio assignment. Currently the content is based on the major content areas of the course but it will increasingly need to represent a significant portion of our department's response to and adaptation of the INTASC standards.

Portfolio Components

While the content of our portfolio will undergo significant change during the next few years the basic components will likely remain the same. Bullock and Hawk (2001) identify four portfolio components: purpose, audience, evidence, and reflection. The purpose is for students to demonstrate their knowledge, skills, abilities, values, and beliefs about educational psychology and classroom practice. The content will expand as the students continue their professional course work. Students design their portfolios with both external reviewers and themselves as the audiences. External reviewers are currently their peers and the course instructors, but the review process will likely soon involve some sort of exit committee as the students become teacher candidates. Evidence currently collected includes papers that synthesize knowledge, lesson plans, units, use-of-technology examples and other professional documents. The students write reflective introductions to each section of the portfolio, explaining and reviewing the content to be encountered by the reader.

Initially a standard paper/notebook portfolio was the final outcome. Students presented their portfolios at the end of the course to a group of peers in a mock interview setting. As the course instructors, we then evaluated the portfolios as a final examination for the course. The portfolios were then returned to students with comments and suggestions for revision. The students were encouraged to revise and develop new material as they moved toward teacher-certification.

The final products were often well designed and clearly showed what the students had learned. But they were also large and cumbersome and did not seem to be all that useful as a beginning step toward a professional portfolio. We suspected that, while these portfolios would give those hiring our graduates an adequate and accurate picture of the student's knowledge and skills for teaching, they were not being used very often. Having only one large printed portfolio meant that a student would likely not use it except as part of an interview and often near the end of the candidate selection process. Thus a desire for more portability led us to explore other media as vehicles for the portfolio. Initially we thought that the students might create a CD-ROM that included all of their written work and could also easily incorporate video and other visual artifacts. These could be produced in multiple copies. However, as we were beginning to move in that direction, easy world-wide-web design tools became available. Thus during the spring semester of 1999, we made our first attempt at a web-based portfolio.

Challenges

We faced a number of challenges in our attempt to move our students from paper portfolios to web portfolios. Some of them were relatively easy to address while others were more difficult.

The first challenge was to determine whether we had the technological resources at our disposal to make this assignment possible for our students. If the college's Information Technology department would not support students having ready access to computers and software that will allow them to do this task with relative ease then a web-based portfolio would not be possible. We were fortunate that, in addition to many of our students having their own computers, our college has a well equipped computer center and residence halls where students have access to computers with web authoring software, in our case, Macromedia's Dreamweaver 3.

Dreamweaver was a choice that we endorsed for a variety of reasons. The program is easy to use with a WYSISYG interface. The commands are intuitive, using many of the same features found in most software so the learning time for those who are computer literate is minimal. The program is also very powerful, allowing the students to easily do simple web creation but also giving them the opportunity to do more sophisticated things (such as the inclusion of frames) if they wish to do so. Dreamweaver also includes an ftp client, which makes uploading of the web page to the college's site (or to another site of the students' choosing) relatively simple.

Even with the opportunity to use computers and the availability of software, some students were resistant to the idea of creating web portfolios. Some of them were under the impression that this would involve a lot more work than paper portfolios. Others who were uncomfortable with the use of computers were frightened of the prospect of being forced to use computers to such a great extent for something with which they were unfamiliar. We addressed this issue a number of ways. First of all, we chose to begin this project in a semester in which our class sizes were relatively small, only about 24 students between the two instructors. This allowed us to give added attention to those students who needed additional support with the technology. In addition, we met as a class with a member of our Information Technology staff who taught the introductory lesson on the use of Dreamweaver. This instructor and others in the IT lab were available for assistance other times as well.

Even with the promise of support, some students were unconvinced that creating a web portfolio was a good idea. We had coincidentally scheduled a class session in which three local high school principals visited our class and answered questions regarding expectations for new teachers and other educational issues. One of the first questions that our students asked challenged the notion that new teachers needed to be technologically adept. Specifically, one student wondered what these principals thought of web portfolios. The response from the principals was overwhelmingly positive about the portfolios, pointing out that it allowed them as potential employers to have access to some information about the prospective teacher easily, without going through all the steps of requesting information from the college. They also said that they look to their new teachers to bring a certain technological expertise to their school. They recognize that their current staffs have many teaching skills but could use help in including new technology into their teaching. They hope that younger, more technologically savvy teachers can help their schools better meet the needs of students in a technological society. Hearing these sentiments from school principals was compelling for our students. Complaints about the assignment diminished almost immediately.

Once we got into the project, though, we realized that more conceptual challenges needed to be faced. Our traditional portfolio assignment included a number of essays written by our students. For example, they were required to write papers that indicated their view of the learner and the curriculum. Other manditory written materials include a complete management plan and at least one unit plan. While it is technologically easy to convert word processed documents to web documents, we realized that technology was only part of the issue. Merely transferring essay to the web may lead to ineffective presentation. In researching web design issues we discovered that in reading web content "It was more than three times as common for users to limit their reading to a brief as opposed to reading a full article. Even when reading a "full" article, users only read about 75% of the text." (Nielson, 2000) Consequently, merely transferring word processed documents to the web would not be sufficient.

One of the purposes of assigning these papers was to encourage reflection on the part of the students regarding to their view of the learner and of curriculum. We did not want to lose that important piece of our curriculum, nor did wc want our students to present themselves in their portfolio with the equivalent of sound bites. Our dilemma was how to allow our students to present thoughtful reflections in the context of a medium which seems to exist in contrast to such presentations.

To address this issue we asked our students to do two things. First the students wrote the essays for our classes as they ordinarily would, going through a peer review before submission. After the instructors have graded and commented on the papers they were returned to the students who were then asked to revise them again before including them in their portfolios. Recognizing the way web documents are read, however, we also asked them to prepare a 200-word abstract of the essay that they could post on the site along with a link to the full essay. In this way we not only met our objectives but also gave those looking at the portfolio (both fellow students as well as potential employers) an opportunity to quickly assess the views of the students while being able to look at a more complete treatment of the subject. We also encouraged them to make liberal use of headings and links.

Results

The results from our first attempt at web portfolios yielded mostly positive results. (Examples may be seen at http://www.calvin.edu/~lblack20/index.htm or at http://www.calvin.edu/~lkonin69/portf.htm) Many of our students created web portfolios that truly reflected the vision that we had for this assignment. One noteworthy result is that a few of the best portfolios came from students for whom work in web page authoring was a new and sometimes frustrating experience. These same students, who we would have expected to produce excellent notebook portfolios were able to produce excellent web portfolios in spite of their lack of experience. Conversely, some students who had exhibited proficiency with creating web documents prior to this assignment were able to produce good looking front pages but demonstrated the same lack of depth in their portfolios as they had shown in their papers and other assignments.

Even though all students were able to complete the assignment on time, there were a few concerns. This process required a lot more time on behalf of students unfamiliar with web page authoring than the traditional portfolio did. Much of this time was spent learning how to use Dreamweaver 3 and struggling with translating documents from Microsoft Word to html. We wondered if this was time well spent. In addition, despite attempts to get everything "just right", some of the pages continued to have broken links and images that did not work properly.

We addressed these concerns in subsequent semesters primarily by creating a technology assignment that is given earlier in the semester that required more web authoring proficiency. By addressing the technical aspect of the project earlier, we believe we can help the students focus more clearly on the content of their portfolios at the end of the semester.

Questions

There are still some outstanding questions that we are considering as we continue to work with our students in this project. We continue to wonder about the issue of how to adjust for the way people read web content as opposed to paper documents. We are not fully convinced that an abstract is a sufficient remedy. We also wonder if students should prepare paper documents in addition to web documents. Are some employers still going to want to see a portfolio that they can carry with them and handle? Will a printout of the web site be sufficient or will the student need to reformat the entire portfolio for print? Is the web the proper place for the storage of these portfolios? Items stored on the web are available for everyone to see. Even though these are professional documents, students may not want to have them available to everyone. They may want potential employers to have to request them to have access to them. Are there other ways to store these documents (like CD-ROM or floppy disc) that would do as well and restrict access? Was our dismissal of the CD-ROM format premature?

In conclusion, reaction from our students, our colleagues at the college and the principals of schools in which our students work indicate that our preliminary efforts were successful. Students left our class with additional technological proficiency and with an artifact from the class that we could use as an assessment tool and that they could use in helping them in their search for employment.

References

Bullock, A.A., & Hawk, P.P. (2001). *Developing a teaching portfolio: A guide for preservice and practicing teachers.* Columbus, OH: Merrill.

Campbell, D.M., Cignetti, P.B., Melenyzer, B.J., Nettles, D.H., & Wyman, R.H. (1997). *How to develop a professional portfolio: A manual for teachers.* Boston: Allyn & Bacon.

Campbell, D.M., Melenyzer, B.J, Nettles, D.H. & Wyman, R.M. (2000). *Portfolio and performance assessment in teacher education.* Boston: Allyn & Bacon.

Nielson, J. (2000). *Eyetracking study of web readers* [On-line]. Available: http://www.useit.com/alertbox/20000514.html

Wise, A.E. (1998). NCATE 2000 will emphasize candidate performance. *NCATE Quality: The Newsletter of the National Council for Accreditation of Teacher Education, 7*(2), 1-2.

INTEGRATING TECHNOLOGY INTO TEACHER PREPARATION AND PRACTICE

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NATURE OF THE STUDY:

This paper is a report on a pilot project undertaken by the authors. In the spring of 2000, 15 preservice teacher candidates from a Faculty of Education were placed with associate teachers in elementary classrooms in local schools for a four-week practice teaching block. In addition to the normal expectations of such a practice teaching experience, there was an additional expectation that there be an enhanced use of technology. Either the preservice student was identified as 'relatively computer literate' or their associate was deemed to possess effective computer skills. In some cases, both the student and associate were competent in the use of the technology. The expectation was that both groups of subjects would derive benefit in their teaching practices and their personal use of Information and Communication Skills as a result of this pairing and this project.

RATIONALE:

Information and Communication technologies, in their various forms, are becoming the driving forces behind many of the changes that are occurring in education at the present time. Teachers are being asked to incorporate these technologies into their courses and lessons on a regular basis. Schools are spending millions of dollars each year on technology – including network backbone, hardware, software and related materials. Parents are supporting computer programs in their schools through fund-raising efforts. Students are coming to their classrooms much more technologically literate.

The speed with which innovation and change have been occurring in the classroom and society in general has been blamed for a perceived increase in the level of stress. It is difficult to manage the list of new devices that have been introduced and have become commonplace. Before one can gain sufficient expertise with these mechanisms, we are again bombarded with a whole range of new mechanisms. For example, Sony has recently made available an MP3 player that is the size of a marker pen, has 64 meg of memory and is capable of playing 2 hours of near CD quality music. This device has no moving parts and therefore never skips musical sections. The new Motorola iRadio has the ability to group digital radio stations into genre so that your favorite rock music can be grouped on one screen and can be accessed right across the country. There is also a CD and a large built-in hard drive that allows you to store files and plays all types of music formats. Mercedes-Benz will be equipping some cars with Distronics, or Proximity-Controlled Cruising. A small grill-mounted radar sensor calculates the car's speed and distance from the car in front. In a fraction of a second it will automatically let off the gas and begin braking when it calculates that you are too close for your speed. There is also the Global Position System (GPS) that is being installed in cars to track a vehicle's position, lock and unlock doors, provide precise direction, guide the driver to the nearest gas station and prepare other information that can assist the driving endeavour. These products and others like big screen TVs, HDTV, DVD, and surround-sound speakers are all part of the landscape for current automobiles. If this is *now* what does the future hold?

It does not seem possible to maintain a working knowledge of all of the contrivances even if one had many hours to dedicate to such a task not to mention an excessive amount of money. Therefore, it seems like an opportune time to ask if educators, who are responsible for the daily care of children and operation of classrooms, can be expected to remain abreast of these changes. Of course the logical following question is how could educators not only learn to use the new technologies but also devise ways to use them to enhance lesson delivery and management functions? With all of the constraints and additional demands that seem to be impinging on their time, is it any wonder that much computer equipment appears to be underused by dedicated teachers?

Although technology seems to be present in many locations in schools, the consistent integration of technology and related applications with classroom teaching practices is not going as quickly or as seamlessly as it should be. Often, computers are found to be drastically underused, despite the fact that the students know what to do once they are in front of a keyboard. In its "Year 2 STaR Report" (1999), *CEO Forum on Education and Technology*, in the United States found that the single greatest deterrent to this taking place is teacher attitude and / or lack of training. While 80% of schools have Internet connections and the number of schools effectively using technology is almost 25%, only 20% of teachers reported feeling very well prepared to integrate educational technology into classroom instruction. The Office of Technology, U.S. Congress (1995) also listed the lack of teacher training as the greatest roadblock to integrating technology into a school's curriculum. Unfortunately, when in-service training is provided, it is often ineffective. The quick workshop that is delivered through PD days does not use current best practices in methodology to ensure that what is taught is relevant, retained, and used by teachers.

A discussion paper produced by the advisory panel on *Creating an Innovation Culture* sponsored by the Ontario Jobs and Investment Board had this to say about technology, education, and innovation proposals.

> " Technology and technological change have defined the 20th century.
> And, the 21st century could witness an even faster pace of change.
> A key challenge will be to not merely adapt to change, but to anticipate
> it and to take the steps to stay ahead of change to make the most of it.
> The new jobs of the future will depend on innovation. Innovation can
> lead to vast improvements in the ways we learn, teach,
> and communicate."

There have been many books, articles and discussion papers that focus on the nature of change in the classroom and all indicate that unless a culture of change exists, no meaningful change will occur.

Teachers are faced with a myriad of changes in their schools and may not always have the time to learn new technology and how to apply it. In many cases, instructional strategies have not been modified to take into account the many facets of the technology and how it should be used most effectively in the classroom. Teachers don't know how to use the technology or when to use it to its greatest advantage. However, it is a fact, oft repeated, that the demographics of the teaching profession in the province of Ontario will change drastically in the next five years. These new teachers will not only replace those who are retiring, but they are expected to come to their classrooms much better prepared to integrate technology competencies into their teaching practices.

Recently, there has been, in any number of professional journals, much written about the problem of ensuring that graduating preservice teachers possess the capability to successfully integrate the computer as a tool into their classroom programming. These several articles suggest that it is not merely enough to make sure that "computers" is being taught as a subject at the preservice level. There must also be some specific attempt to ensure that the skills being acquired during formal classes are being utilized during practice teaching placements and beyond. However, if they are not encouraged, by those already in the field, to use their technology skills in the delivery of program, then little change will occur. Since they really aren't too comfortable with the technology as professionals, if the culture of the staff room is to leave the technologies alone, then new rookie teachers will be reticent to break those taboos and forge new ground. The same CEO Forum report referred to above also points out that new teachers entering classrooms currently do not take advantage of the technology that is in place. Rather they adapt to the culture of the classroom already in place and leave the computers and peripherals alone.

There has also been much published about the same concerns for the regular in-service teacher. It seems that many are still finding it very difficult to integrate the use of the computer as a tool to enhance the delivery of lessons or to individualize instruction for their students. Often the reasons cited are lack of time, resources, support to acquire the skills and/or the fear of not having the level of mastery that their students already possess. Workshops and training sessions outside of the time frame of the regular school day are increasingly seen as untenable and an intrusion on already overtaxed workloads. In-service that requires secondment is expensive for boards of education and once again strains overtaxed personnel and resources. However, alternative learning approaches, including the teaming of teachers in reciprocal teaching, peer-mentor and tutor-tutee relationship can be effective

Fullan & Hargreaves (1999), in their article Mentoring in the New Millenium, (Professionally Speaking, December) point out that a paradigm shift is occurring in how new teachers should be seen as they enter the profession. Whereas, in the past, new teachers were seen as relatively unskilled and in need of support by the system, we should now see them as possessing competencies that those already in the classroom could benefit from. We know that classroom culture changes slowly but, might it not be possible to use these new teachers and their skills to speed up the use of technology by the system as a whole by providing them with opportunities to mentor those relatively unskilled in the use of technology? Such mentoring would be seen as a positive approach to the enhancement of technology skills in the experienced classroom teacher.

We, the researchers, believe that there was a need for a research study that would look at these concerns and issues surrounding the integration of technology into teacher preparation and practice, taking advantage of the concept of mentoring posited by Fullan and Hargreaves. As outcomes of such a study, one might expect to:

- determine what technological competencies teachers need in order to effectively integrate information and communication technologies into their teaching practices and professional requirements;

- develop strategies to assist teachers to determine how, when and why to integrate technology into their program based upon the current Ontario Curriculum expectations, subject by subject;

- raise the comfort and confidence level of practicing teachers when using technology in the classroom;

- foster a culture of change in individual schools by encouraging a mentorship program that sees not only practicing teachers but preservice and newly appointed teachers as possessing skills that can make a positive contribution to the classroom and school environment.

PROCEDURE:

In the early fall of 1999, it was decided to identify by some means, students enrolled in the class of 1999-2000 at the Faculty of Education, who possess a higher than average level of computer expertise and literacy or were desirous of becoming so. The authors of this study would also identify classroom teachers in the schools who would consider themselves similarly expert and literate and would be willing to serve as partners during one of the teaching blocks of the preservice students. They would match up these students and classroom teachers and ensure that one of the expectations of the teaching block in the schools would be to use the technology to its fullest in their practice teaching lessons. It would be the responsibility of the Faculty representatives to ensure that lesson plans reflect this specific outcome.

Prior to the start of the teaching block, the researchers would administer an instrument to establish perceptions of professional competency specific to computers and information technologies. They would then track the success of these matches during the teaching block and track indicators of computer integration in the classroom. Following the end of the placements, the same instrument would be administered a second time to measure change. The in-service teachers, preservice teachers and faculty advisors were to ensure that lesson plans reflect the specific expectation of computers in the classroom.

Support was solicited from faculty advisors in the Faculty of Education, as they would have to agree to involvement on the part of the authors in their on-going work with students. Preservice students who were interested in the possibilities inherent in the project were encouraged to volunteer themselves as subjects. Principals in the schools were invited to volunteer to participate in the project with the intent that it would facilitate change in their staff around Information & Communication Technologies (ICT) competencies. Some 30 principals indicated a willingness to participate and from this list, sites were chosen based upon the requests of the students for placement.

Since one of the assumptions of the researchers was that both students and teachers would enhance their competency levels in ICT skills, it was agreed that some sort of rating scale had to be found to use as a measurement tool. After considerable searching, a suitable tool was found on the Internet at the International Society for Technological Education (ISTE) website. These ISTE Foundation Standards were the result of a partnership between ISTE and the National Council for Accreditation of Teacher Education (NCATE) as both groups move towards some sort of permanent definition of what specific ICT skills new teachers should have as they enter the profession. It was agreed that we would adapt this tool, having been given permission in advance by one of the authors who previously worked at the Millken Foundation which was underwriting the project, in part. (See article - "National Standards For Technology in Teacher Preparation" by ISTE Accreditation and Standards Committee in Connections ;Vol. 15, No. 1; Fall, 1998.)

The "Recommended Foundation Competencies in Technology" checklist was given to the preservice teachers when they were gathered at a meeting. They were also supplied with the same form at the end of their teaching block when they had returned for classes. Similarly, a meeting was called of all the identified teachers in the field and the form was distributed to them then. The second copy of the form was distributed by interoffice mail after the teaching block was completed. At each meeting, both researchers outlined the major expectations for the four-week teaching block and answered any questions either the students or their associate teachers had.

There are a total of 61 competencies in the rating scale used in this study. These were divided into 9 categories. These are -

- 1.1 Basic Computer / Technology Operations & Concepts
- 1.2 Personal & Professional Use of Technology
- 1.3 Application of Technology in Instruction
- 2.1 Social, Ethical & Human Issues
- 2.2 Productivity Tools
- 2.3 Telecommunications and Information Access
- 2.4 Research, Problem Solving and Product Development
- 3.1 Teaching Methodology
- 3.2 Hardware, Software Selection, Installation and Maintenance.

On each of the competencies, all respondents were asked to assess themselves as at the Entry, Adoption, Adaptation or Appropriation level. To arrive at a single numerical descriptor which could be used to assess change over time, the scoring of the competencies check list was done through a simple assignment of a value (1 for Entry - 4 for Appropriation) to each of the possible categories. A total for each category was arrived at, as well as a percentage representing how far below perfect (Appropriation) on all competencies combined the respondent perceived himself or herself to be.

At the meetings referred to above and through written communication, the pairs of preservice / associate teachers were asked to identify an area of ICT which both felt could benefit from collaboration. The assumption was that each dyad needed a focus for their collaboration and choosing one area upon which to focus would better facilitate growth. The researchers assumed that, following the teaching block's completion, not only would participants rate themselves as higher in that one specific area, but that there would be generalized growth over all the competency categories.

Following the meetings with the two groups of participants, there were phone calls to those individual classroom teachers unable to make the whole group sessions. There were individual briefings for those students who missed their whole group session as well. There were visits to each of the sites during the four-week teaching block and time was found to interview each of the preservice candidates as well as their associates separately. These interviews took the form of informal discussions to elicit impressions and subjective feedback on the success of the placements, the pairings and the use of the technology.

OBSERVATIONS & FINDINGS:

Both the preservice and their designated associate teachers were anxious to become involved with the project. Both groups viewed this project as a way to gain experience with technology in an educational setting by collaborating with others who had similar interests and possibly who had superior expertise. They wanted, even welcomed the chance to work with the technology in an environment where such experimentation was not only encouraged but also expected.

The students also viewed participation in this project as a possible venue to gain recognition for their desire to collaborate with practicing professionals and to gain experience working with the technology to improve their own teaching practice. Some even verbalized their expectations that participation in such a project might have positive effects on their future employment possibilities.

Teachers in the field perceived the project as a vehicle to advance their knowledge of technological applications in the classroom by working with preservice teachers who might have a higher level of expertise with the technology. Some also saw this as an opportunity to convey some of the ideas and skills that they had developed over the years as they advanced their knowledge of the teaching environment.

Principals were very anxious to volunteer their schools and nominate associates to become involved. In each case, they were very intrigued by the possibilities inherent in the situation and wanted to provide their staff member with an opportunity to become more computer-literate or technologically competent.

During the four-week teaching block which was the focus of this initiative, visits were paid to each of the sites where preservice student and associate teacher pairings occurred. Informal interviews were conducted on site with both preservice and practicing teachers too elicit feedback on the process and establish whether any further intervention was required or any additional resources needed in order to facilitate program planning. After the fact, the comments made in discussion were grouped according to similarity of statement and the number of similar responses tabulated. Table 1 below summarizes that information.

Table 1
Comments from Participants

COMMENTS	NUMBER OF TIMES REPEATED
I learned many new things about technology. / I gained experience with the technology.	15
The process of mentoring was very worthwhile. / The mentoring process was very good.	14
I made much progress with my skills. / My competency level has significantly improved.	14
I learned a lot from my partner.	13
Technical problems (scheduling, hardware malfunctioning, Internet access down) prevented the successful completion of our plans / expectations / outcomes.	8
We found areas to collaborate on quite easily. / It was easy to identify an area of mutual interest to work at.	8
I learned a lot about how to teach using technology.	8
I learned a lot about how to integrate technology into my program planning	8
I put the technology front and centre as part of my program planning because it was expected of me.	6
My fear level in terms of using the technology in front of group of students has been significantly lowered.	6
I could have used / enjoyed / profited from more time with my partner.	5
My student / I was a resource for the entire staff.	5
I could have used much more time.	5
I gained a new perspective on the reality of the technology in a school setting.	3
I learned more about the role of technology in the achievement of specific curriculum expectations.	3
I could have used more specific guidelines for this entire process.	3
I learned very little or nothing as a result of this process. / I experienced no growth in my skill level as a result of this process.	2
I had more free time to work with students as a result of this process.	2

As can be seen from Table 1, the subjective feedback from the respondents in this study reinforces the original assumption of success. Repeatedly, in one way or another, individual teachers and students commented on how much they were enjoying the partnership, how much they were learning, how much more competent they felt about the technology and its use in the classroom. One teacher even suggested that as a result of her experience as a result of the project, she would not hesitate to try and integrate ICT skills from the outset in her first year of teaching. She revealed that, in the past, when she reflected upon the future and the use of the computer, she was sure she would be unable to manage teaching and the technology at the same time. However, her experiences within this study forced her to change her mind and lowered her fear level considerably. Nor was she the only one who felt that way. Invariably, comment was made in passing about lowering fear levels and not just with the preservice teachers.

It was very pleasing, as well, to go from school to school and find the associates so enthusiastic and exuberant about the project. The comments in Table 2 and Table 3 reinforce the positive feedback elicited by classroom teachers. What was not entirely surprising was the fact that the younger preservice student became a resource for the whole staff. In two cases, specifically, a process had been worked out whereby the staff as whole was working individually with the preservice candidate to enhance competencies in one area or another. In one situation, it was with presentation software, in another it was in the area of spreadsheets.

Originally there were 15 placement sites with one site having a preservice student working with two teachers. The results displayed and herein discussed represent feedback from all 16 associate teachers. Unfortunately, one of the weaknesses of the process lies in the return of the measurement instrument. It took several weeks and much repeated reminding to gather the instruments from the teachers who were associates. As of the writing of this paper, we never did get returned survey forms from all 15 students. For a variety of reasons discussed below, we ended up with data to use from only 8 of the preservice students. The graphs and tables included in this article represent data gathered and tabulated in the above-mentioned fashion.

As Table 2 and Table 3 indicate, the predicted outcomes were evidenced by the results. Both groups did, in fact, experience growth in their perceived competency levels over all the criteria. Using the same standard of measurement for perceived competency levels, associate teachers self-rated their own growth by 6% over all, while preservice student teachers saw their competency levels grow by 19%.

While it would be very interesting to analyze the results by category and perhaps speculate on why growth was greater in some categories than in others, this particular study was meant to focus on general perceived competency. The classroom teachers in this study did not grow as much as was expected overall, perhaps due to the fact that they were chosen in most of the situations because of their leadership and proven ability in ICT skills. The exact opposite is borne out by the results of the group of preservice teachers. Growth was real and significant in each category and in general. This result supported the comments elicited during the interviews as indicated in Table 1.

Table 2

Associate Teacher Self Assessed Degree of Competency in Nine Categories of ISTE Recommended Foundation Competencies in Technology (In Percentages)

Time of Testing	1.1	1.2	1.3	2.1	2.2	2.3	2.4	3.1	3.2	Over-All
Prior to Teaching Block	62	58	60	51	49	59	48	51	48	54
After the Teaching Block	71	64	67	57	58	67	47	58	54	60

Table 3

PreService Student Self Assessed Degree of Competency in Nine Categories of ISTE Recommended Foundation Competencies in Technology (In Percentages)

Time of Testing	1.1	1.2	1.3	2.1	2.2	2.3	2.4	3.1	3.2	Over-All
Prior to Teaching Block	59	64	62	48	58	61	47	55	45	55
After the Teaching Block	80	79	84	61	78	87	69	77	55	74

In this section the results of the data analyses are presented. A profile of the sample has been presented earlier in the paper. Individual comparisons (t-tests) were calculated to identify significant differences between the pre-teaching block and post teaching block periods within the two groups (i.e. the teachers and the students).

Table 4 illustrates that there were no significant differences between the means for the teachers' pre teaching block and post teaching block for section 1.1 $t(15) = 0.262$, $p > 0.05$; for section 1.2 $t(15) = 0.141$, $p > 0.05$; for section 1.3 $t(15) = 0.255$, $p > 0.05$; for section 2.1 $t(15) = 0.245$, $p > 0.05$; for section 2.2 $t(15) = 0.052$, $p > 0.05$; for section 2.3 $t(15) = 0.112$, $p > 0.05$; for section 2.4 $t(15) = 0.071$, $p > 0.05$; for section 3.1 $t(15) = 0.112$, $p > 0.05$; or for section 3.2 $t(15) = 0.278$, $p > 0.05$.

Even though no significant differences were found, it should be noted that there was an increase for the means in all 9 sections from pre teaching block to post teaching block. Teachers also reported increases in their perceived skill levels and were positive about their gains. Further explanations for the statistical result with the teacher group are advanced below, as well.

Table 4

Change in Perceived Skills by Category for TEACHERS (n=16)

Section #	Pre Teaching Block		Post Teaching Block	
	M	SD	M	SD
1.1	12.0000	4.3050	14.1250	4.6601
1.2	17.8125	4.9155	20.5625	6.0108
1.3	11.4375	4.8300	13.5625	4.6039
2.1	3.8750	1.9958	4.6875	1.9568
2.2	13.0000	5.2915	16.8125	6.1343
2.3	6.8125	2.3726	8.1250	2.4732
2.3	15.3750	5.6554	19.4375	8.1156
3.1	25.0000	9.2952	30.9375	11.8461
3.2	14.5000	7.8994	17.6875	8.3644

Table 5 illustrates that there were significant differences between the means for the students' pre Teaching Block and post Teaching Block for section 1.1 $t(6) = 0.009$, $p < 0.05$; for section 1.2 $t(6) = 0.011$, $p < 0.05$; for section 1.3 $t(6) = 0.024$, $p < 0.05$; for section 2.2 $t(6) = 0.010$, $p < 0.05$; for section 2.3 $t(6) = 0.019$, $p < 0.05$; for section 2.4 $t(6) = 0.001$, $p < 0.001$ and for section 3.1 $t(6) = 0.001$, $p < 0.001$.

Also Table 5 illustrates that there were no significant differences between the means for the students' pre Teaching Block and post Teaching Block for section 2.1 $t(6) = 0.156$, $p > 0.05$ or for section 3.2 $t(6) = 0.195$, $p > 0.05$.

Table 5

Change in Perceived Skills by Category for STUDENTS (n=7)

Section #	pre Teaching Block		post Teaching Block	
	M	SD	M	SD
1.1	11.8751*	4.0591	16.0000*	3.0000
1.2	20.4286*	6.9488	25.4286*	4.5774
1.3	12.4286*	3.9097	16.8571*	2.4785
2.1	3.8571	1.7728	4.8571	1.5736
2.2	16.2857*	6.5247	21.8571*	4.4132

2.3	7.2857*	2.7516	10.4286*	1.9024
2.3	18.7143**	7.9313	27.7143**	7.1581
3.1	28.5714**	12.3134	40.0000**	7.9373
3.2	14.2857	5.2509	17.7143	4.6085

** $p <= 0.001$ *$p < 0.05$

Significant difference between pre Teaching Block and post Teaching Block results for the student group.

DISCUSSION:

This project began with the assumption that there would be benefits in matching preservice students and associate teachers and putting the development of ICT competencies in the forefront of their planning. The former perceived themselves to be technologically competent and wanted to put into practice these skills in their practice teaching blocks. The latter would be anxious to either further their skills or mentor a student to help him or her become similarly competent. The results of these pairings, while positive, should be viewed in light of several factors.

- The completion of the survey forms used was not done at the same time in the same circumstances by both groups, or even by individuals in each group. Some participants made their choices and returned them immediately. Others needed to be repeatedly reminded until they were returned. In the end, only 8 of 15 preservice students completed and returned both the pre and post surveys within the time constraints of the project.
- Often, respondents did not fully understand the terminology of the descriptors on the measurement instrument and questioned just exactly what each line was alluding to. There was also a great deal of reticence to self-rate oneself at the higher end of the rating scale because they felt that next to a technician or technical support person, they had to be much lower down in their skill set. Teachers and students both had a tendency to under-appraise themselves in terms of their general levels of technical ability.
- Although the original intent had been that each pair would identify a specific area that they intended to work at developing competency in, at no time were they asked to follow that up and identify the area they had agreed upon. It would have been much better for interpretation and generalization of the findings if there had been some indication of the area to be focussed on so that the results for that one area might be compared to that of the other areas and ICT skills in general.
- Since this was a project that evolved over time and solidified its main outlines, the process of matching up preservice students and associate placements was very happenstance. No criteria were defined to set parameters for the working environment of the teaching block.
- The matches made between students and their placements were in found at all grade levels and therefore included rotary and non-rotary teaching situations. Indeed, one of the matches was found in a secondary school and because of its rotary nature, the expectations of both the associates and their single assigned student could not be easily compared to a situation in a primary classroom.
- Many of the results were significantly altered by problems with the technology itself. In several situations, major work being done on the networks and their infrastructure prevented access on a continuing basis by all concerned. In other situations, the demands upon the networked machines made it necessary for planning to take into account shared access rather than access upon demand.

This project documents the impact on practicing teachers and pre service students who participated in a program that was designed to increase their focus on the use of information technology in their teaching practices. It was found that an average of four weeks of focussing on the use of technology in classroom practice resulted in increases in perceived skill levels for:

1.1 Basic Computer / Technology Operations & Concepts
1.2 Personal & Professional Use of Technology
1.3 Application of Technology in Instruction
2.1 Social, Ethical & Human Issues
2.2 Productivity Tools
2.3 Telecommunications and Information Access
2.4 Research, Problem Solving and Product Development
3.1 Teaching Methodology
3.2 Hardware, Software Selection, Installation and Maintenance.

Moreover, participants in this program reported that they enjoyed the experience and the chance to pay particular attention to the technology. Additionally, statistical analyses demonstrate that student teachers had significant gains in 7 of the nine sections. Those areas of identified gains are:

1.1 Basic Computer / Technology Operations & Concepts
1.2 Personal & Professional Use of Technology
1.3 Application of Technology in Instruction
2.2 Productivity Tools
2.3 Telecommunications and Information Access
2.4 Research, Problem Solving and Product Development
3.1 Teaching Methodology

The measured increases are meaningful for the teachers who decide to use this mentorship approach for increasing their own technological skill and perhaps raising awareness of the technology at the school and board levels. It is important to recognize that this project described elsewhere in this study represents one component of the ongoing quest for expertise with technology and its use in an educational setting.

RECOMMENDATIONS:

As pointed out above, this project was very successful and fulfilled most of the expectations of the researchers who directed it. However, this was only a pilot. The authors look forward, next year, to broadening the scope of the process. They plan to oversee the mentorship pairings in both the second and the third teaching blocks. It is also expected that the study will include classroom sites in the coterminous Roman Catholic board. The researchers will make the following changes to the process:

- The survey instrument will be administered to everyone at the same time and collected immediately, both at the beginning and at the end of the teaching block.

- Each pair of teachers will have to identify a competency skill set that they wish to work on enhancing so that the researchers will then be able to compare results between the specific competency and the general set of competencies.

- There will be greater coordination between the placements and the students interested in being part of the project so that there are more schools to choose from for test sites.

- We will begin in the fall to involve our partners at the Catholic District School Board so that it can involve all Preservice students, regardless of practice teaching assignment location.

- We will rework the wording of the Competency Measurement Instrument so that the individual items are self explanatory and easy for teachers to understand.

We acknowledge that there is much to work at to improve our project scope and process. However, we also are very pleased with the results it has yielded for us as researchers and for the implications of those findings.

CONCLUSIONS:

Teachers in classrooms around the world are struggling with how to keep up with the changes in technology that are brought into the school by students. They are grappling with the problem of how to deliver effective classroom program based upon the new curriculum as it is centrally defined, while also finding the time to integrate skills that are required for success in the future, which are, by definition, in a constant state of flux. Professional educators work in an environment where the goals of the program are not matched by the level or state of the technology it depends upon for delivery. Finally, they are trying to implement new methods of program delivery, assessment and evaluation while being expected to become professionally developed in Information and Communication Technologies. All of these expectations add tremendous pressures on their day to day functioning.

Preservice teachers are coming to the Colleges of Education having many of the ICT competencies in place but unable to apply these to their developing teaching repertoires. They have been kept abreast of all the changes in the world of technology by definition of the culture they have grown up in and somehow expect to be able to use these in their classrooms. Instruction and the expectations of practice teaching do not purposefully include technology so newly hired teachers begin to become acculturated to an environment that does not place high value on the use of the hardware and software already in the schools.

When individuals from both groups are brought together to mentor each other not just in sound professional teaching practice but also in the integration of the new technologies with the old, both gain immeasurably. Mentorship is a two way street in our classrooms and by purposefully including technology we provide in-service for our practicing teachers in ICT that is 'in time' and on demand. It provides support for the in-service teachers for risk-taking because they are involved in mentoring students who are in a learning mode. It also provides chances for preservice teachers to use their ICT skills while learning how to apply them to their prospective careers, and modeling for both groups how to integrate technology in useful and productive ways.

Given that there is a paucity of research demonstrating educational projects that are of benefit to teachers who wish to use technology more effectively, the findings from this pilot study are indeed encouraging. Nevertheless, further research is warranted to establish the most efficacious balance between traditional classroom approaches and the use of computer based instructional methodologies. Since four weeks was the time allocated for this study, one might reasonably question whether an increase to 8 weeks of involvement with the program would result in an equal ratio of skills gains.

SELECTIVE BIBLIOGRAPHY:

Becker, Henry J., Ravitz, Jason; The Influence of Computer and Internet Use on Teachers= Pedagogical Practices and Perceptions@; Journal of Research on Computing in Education; Volume 31 (Summer, 1999).

Best, Anita (Editor); AInformation Technology Underused in Teacher Education, New Study Reports@; ISTE Update; Volume 11 (May, 1999).

DeWert, Marjorie Helsel; "Preparing Tomorrow's Teachers to Use Technology: ISTE's National Educational Technology Standards for Teachers' Programs"; Journal of Computing in Teacher Education; (Volume 16: Winter 2000).

Hargreaves, Andy, Fullan, Michael; "Mentoring in the New Millenium" in Professionally Speaking; December, 1999.

International Society for Technology in Education; National Educational Technology Standards for Students, Connecting Curriculum and Technology; ISTE, 2000.

Kamens, Michele Wilson; "Technology in the Schools: Perspectives of a Collaborative Training Partnership"; Journal of Computing in Teacher Education; (Volume 16: Winter 2000).

Moonen, Bert, Voogt, Joke; ALearning How to Teach Online: Preservice Teaching Experiences@; Journal of Online Learning; Volume 10 (June, 1999).

Ropp, Margaret Merlyn; AExploring Individual Characteristics Associated with Learning to Use Computers in Preservice Teacher Preparation@; Journal of Research on Computing in Education; Volume 31 (Summer, 1999).

Sadera, William, Hargrave, Constance; AIdentification of Preservice Teachers= Preconceptions about the Role of the Computer in Learning and Teaching@; Journal of Computing in Teacher Education; Volume 15 (Summer, 1999).

Technological Foundations: Integrating the Use of Technology in Teaching and Learning in an Educational Foundations Course

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Abstract: This paper presents one example of how technology was integrated successfully into an existing educational foundations course. Preservice teachers at the University of Virginia acquired knowledge of educational technology and developed technological competencies while learning about their future profession in EDIS 201: Teaching as a Profession. Student feedback collected during and after the course suggests that the strategies for integrating technology were appropriate and enjoyable. Technology blended with constructivist teaching methods made learning more engaging, effective, and efficient.

Rationale for Technology Integration

This paper presents one example of how technology was integrated successfully into an existing educational foundations course. Preservice teachers at the University of Virginia acquired knowledge of educational technology and developed technological competencies while learning about their future profession in EDIS 201: Teaching as a Profession. Student feedback collected during and after the course suggests that the strategies for integrating technology were appropriate and enjoyable. Technology blended with constructivist teaching methods made learning more engaging, effective, and efficient.

In 1996, Willis and Mehlinger challenged teacher educators to consider the benefit of an integrated approach to technology in the professional preparation of teachers (1996). They suggested preservice teachers might benefit from exposure to technology beyond simple participation in stand-alone computer courses and called for integration of technology across all existing components of teacher education programs namely foundations courses, methods courses, content-area courses, and student teaching. In 1997, the National Council for Accreditation of Teacher Education [NCATE] seconded this idea of an integrated approach for technology in teacher education. NCATE called for schools of education to "create a vision of what their programs would be like if they took full advantage of information technology" (NCATE, 1997, p. 9). In July 2000, the International Society for Technology in Education released a comprehensive list of technology standards developed for NCATE. These new standards will be used to determine how schools of education prepare their all of their graduates to use technology across all areas of professional preparation, including foundations courses.

Foundations courses are a standard component of most teacher education programs. They address a broad spectrum of contemporary issues in the profession, while also exploring the sociological, philosophical, and historical contexts of education. These courses serve an important role in prospective teachers' introduction to the profession—often allowing preservice teachers to build frameworks for future understandings of the field. Most preservice teachers experience at least one of these courses during their first year of professional preparation. They are often a "common experience" in which preservice teachers across diverse programs share experiences, ideas, and beliefs with colleagues

Proper preparation and support increase the likelihood that the integration of technology into the instruction of these courses will be successful. Technology, when blended with constructivist learning strategies, might create better instructional opportunities for students and revitalize teacher education faculty. Here, we illustrate one example of how two different teacher educators during two different semesters used technology to help students examine crucial course content in a more engaging and effective manner.

A Case Study

At the Curry School of Education, EDIS 201: Teaching as a Profession is an introductory course for students planning careers in education. In this survey course, students examine education history, philosophy in action in schools, student diversity, curriculum, effective teaching, school organization and governance, and other topics affecting the role of the teacher as professional. Approximately 35 students, most in their second-year of a five-year program, take the course each semester. During fall semester of 1998, 1999, and 2000, technology was used in a variety of ways to: 1) assist the instructors in more effectively communicating course content, 2) involve students actively in thinking about their future profession, 3) build community among students with diverse interests and backgrounds, 4) provide students opportunities to develop comfort and competence with technology applications, and 5) model effective and engaging instruction with technology. Thesc tcchniques addressed new NCATE standards. (See http://www-unix.oit.umass.edu/~kilbane/ncate/matrix.html)

In EDIS 201, technology was used to allow instructors to "do things differently and to do different things (Riel & Fulton, 1998). Teaching during two separate semesters, each instructor found different methods for teaching a traditional course. Both used "The Foundations of Education" (McNergney & Herbert, 2000) as a course textbook and met with their students twice a week for an hour and fifteen minutes. But what happened during many of these class meetings and outside of class made education for students more efficient, more engaging, and more effective.

Doing Things Differently

Some basic uses of technology allowed the instructors to approach traditional activities differently—making course operations more efficient in some cases. The class webpage enabled the instructor to update assignments more easily, provided students with easy access to online resources (syllabus, readings, videos, multimedia case studies) used to enhance the use of the course textbook. Additionally, the course website allowed students to communicate with one another outside of class about issues of concern including their field experience placements. PowerPoint presentations took the place of traditional lectures providing instructors with an easier way to organize content and provide instruction for different learning styles. A Quicktime video of each student articulating her beliefs about teaching at the beginning and end of the semester allowed classmates to learn each others' names and faces and made it easy for virtual guest lecturers to "get a feel" for the students and their ideas about teaching and learning. Inspiration, a semantic mapping program, facilitated class brainstorming about various educational concepts.

Doing Different Things

Technology also allowed instructors to implement new kinds of activities that encouraged students to think critically about course content. The software program Excel supported a problem-based lesson on school budgets and finance. Students manipulated vast amounts of information on educational history using a database program. To integrate and personalize ideas from the text, students designed philosophy of teaching Web pages and learned to post them on the public server space provided by the University. They also participated in a forum on careers in education with the US Department of Education's Technology Teacher in Residence using iVisit, a desktop videoconferencing program.

Obstacles to Integration

Technological innovations will continue to influence the practice of education, though the combination of online technologies with current course content will not always be seamless. O'Bannon and Brownell (1999) suggest that faculty members prepare themselves for a fundamentally new way of conveying knowledge while ensuring that the requisite learning takes place. The authors will discuss the obstacles encountered as they integrated technology in EDIS 201, and suggest strategies to anticipate and address such problems.

References

McNergney, R. F. & Herbert, J. M. (2000). *Foundations of Education*, 3rd edition. Boston: Allyn & Bacon.

National Council for Accreditation of Teacher Education. (1997). Technology and the New Professional Teacher. Washington, D. C.: Author.

O'Bannon, B., & Brownell, G. (1999). Networks for learning: Using the Internet to enhance instruction. *Journal of Computing in Teacher Education, 15*(4), 11-17.

Riel, M. & Fulton, K.(1998). *Technology in the Classroom: Tools for Doing Things Differently or Doing Different Things*, AERA presentation, San Diego, April 14.

Willis, J., & Mehlinger. H. (1996). Information technology and teacher education. In J. Sikula, T. Buttery, & E. Guyton, (Eds.), *Handbook of Research on Teacher Education*. (2nd ed.). (pp. 978-1029). New York: Macmillan.

Perceptions of Teachers' Technology Competency Skills in Arizona

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Abstract: This study investigated the perceptions of the education community in the Phoenix, Arizona metropolitan area regarding technology competency skills for preservice and inservice teachers. Participants included 67 preservice teachers, 67 inservice teachers, 45 school principals, and 21 school district human resource directors. Two sets of survey instruments were used for this study. One survey containing 26 items of technology skills for preservice teachers was distributed to preservice teachers, inservice teachers, and principals. Mean scores were calculated to test for significant multivariate effects on items among three groups. Another survey regarding hiring decisions was distributed to principals and human resource directors. Frequency and percentage analysis were used for the second survey. The results showed that preservice teachers placed more emphasis on overall technology skills than inservice teachers and principals and there were significant differences by group in nine of 26 items. The opinions from principals and human resource directors regarding hiring decisions were also explored.

Introduction

There are growing demands and continuing needs to infuse instructional technology in all professional education programs to better prepare teachers and administrators to use computer technology in classroom learning (Hill & Somers, 1996, Northrup & Little, 1996). However, recent research studies indicate that teacher-preparation programs in most universities are not adequately preparing future teachers to teach with technology (Strudler & Wetzel, 1999). A report prepared by the National Commission on Teaching and America's Future (NCTAF, 1996) stated that teachers programs are described as "fragmented, superficial, and unconnected to real classroom experiences". Wetzel (1993) has suggested that the best way to meet the International Society for Technology in Education (ISTE) teacher technology standards is through the combination of a core computer literacy course model and an integration model with specific standards being met. Although many universities offer specific preparation programs in the area of educational technology for preservice teachers, most of them have not yet developed curriculum that meets the ISTE standards for basic skill. This is especially true in states that do not require evidence of computer competency for teacher certification. Preservice teachers do not routinely use technology while in the field or work with supervising teachers who model the integration of technology (Moursund & Bielefieldt, 1999). Therefore, many preservice teachers are still entering the classroom with minimum technology skills and feel incompetent to utilize technology effectively to support classroom activities. In *Teacher's Tools for 21st Century: A Report on Teacher's Use of Technology* (Smerdon & Cronen, 2000), only one-third of teachers in the U.S. reported feeling well prepared to use computers and the Internet for classroom instruction. Teachers with fewer years of teaching experience were more likely to use home computers and/or Internet for planning lessons and creating instructional materials. The lack of release time for teachers to learn how to use the computer and Internet was the biggest obstacle reported by 82% of U.S. teachers. This study investigated the perceptions of the importance of technology competency for preservice and inservice teachers and the results will be used to create a strong foundation for an effective technology training program for preservice teachers. With the input from the school system, we hope to design training programs that meet the needs of the schools while developing technology competency skills for preservice teachers that meet or exceed the national standards set forth by ISTE. With these technology skills, preservice teachers will meet the hiring requirements of schools and will be competent to integrate technology appropriately in the classroom.

Research Questions

The following research questions were investigated in this study:

1. What are the preservice teachers', inservice teachers', and school principals' perceptions toward the importance of teacher technology skills?
2. Are there any significant differences in the perceptions of preservice teachers, inservice teachers, and school principals toward the importance of technology skills?
3. What are the current professional development mechanisms and opportunities for developing inservice teacher technology skills?
4. What technology skills and competencies are currently being considered during the hiring process of teachers?

Method

Subjects

Participants were preservice teachers enrolled in technology courses at a university and inservice teachers and administrators in the public school system in Arizona. The subjects included 67 preservice teachers, 67 inservice teachers, 45 principals, and 21 human resource directors from public school districts in the Phoenix metropolitan area.

Materials

The first survey was based on the National Educational Technology Standards and the North Carolina Public Schools Technology Competencies for Educators. The survey questions focused on the basic technology skills and competencies defined in these documents. Researchers asked preservice teachers, inservice teachers, and principals to rate the importance of 26 items of basic technology skills for a teacher. In the second survey, school principals and human resource directors were asked whether basic technology competency skills were an important factor in the hiring process and determined their preferred forms of assessing technology skills for new graduates.

Procedures

The survey for preservice teachers was administered during their regular class meeting times at a university. The surveys for inservice teachers, principals, and human resource directors were distributed at several local conferences and workshops and mailed directly to randomly selected public schools in Arizona.

Criterion Measures

The rating scores on the first survey that range from not important to very important on the five-point agreement scale were converted by the researchers to their numerical equivalents (1 = not important to 5 = very important). Mean scores were calculated for each survey item by different groups of participants. A multivariate univariate analysis (MANOVA) was used to test for significant multivariate effects on items within different groups. Follow-up univariate analyses were performed on the individual items in each area for which a significant MANOVA was obtained. Frequency and percentage were tabulated and calculated for the second set of survey.

Results

Four hundred and ninety surveys were distributed. The return rate was 54% for preservice teachers, 34% for inservice teachers, 39% for principals, and 54% for human resource directors.

1. What are the preservice teachers', inservice teachers', and school principals' perceptions toward the importance of teacher technology skills?

The mean scores for each statement that assesses the importance of a preservice teacher's ability to perform specific technology skills were analyzed and are shown in Table 1 (http://www.public.asu.edu/~hengyuku/SITE.htm). The highest level of agreement on importance for the survey was with the statement "Basic computer operations - start up and shut down the computer and its peripherals; start an application" (Overall Mean = 4.82). Three other statements with high levels of agreement on importance (Overall Mean > 4.50) indicated that preservice teachers should be able to: (1) create a document; name, save, retrieve and revise a document and use printing options (M = 4.78), (2) use word processing/desktop publishing to create letters and instructional materials (M = 4.56), and (3) use the Internet to browse, search, and send e-mail (M = 4.53).

The lowest level of agreement on importance was with the statement "Developing web pages and/or sites for instructional use and relating information to parents" (Overall Mean = 3.17). Three other statements with low levels of agreement on importance (Overall Mean < 3.50) included (1) creating a database to manage information (M = 3.48), (2) setting up and operating a presentation system that works with a computer (M = 3.47), and (3) producing electronic slides/overheads (M = 3.40).

2. Are there any significant differences in the perceptions of preservice teachers, inservice teachers, and school principals toward the importance of technology skills?

The overall mean score for the 26-item survey was 4.03. Overall mean scores by respondent groups were 4.21 for preservice teachers, 3.98 for inservice teachers, and 3.80 for principals, $F(2, 147) = 4.60$, $p < .05$. The multivariate analysis of variance at $p < .01$, followed by the Tukey HSD on the overall means revealed statistical differences between preservice teachers and principals.

An ANOVA was performed on each of the 26 items and the results are shown here in Table 1A. Statistically significant differences occurred between the three respondent groups on nine of the 26 items. Preservice teachers agreed significantly more strongly than both inservice teachers and principals on six statements. These six statements were (1) setting up and operating a VCR and monitor/TV, $F(2,172) = 10.17$, $p < .01$, (2) creating spreadsheets to manage information, $F(2,171) = 6.55$, $p < .01$, (3) creating a database to manage information, $F(2,172) = 8.45$, $p < .01$, (4) setting up and operating a presentation system that works with a computer $F(2,171) = 5.63$, $p < .01$, (5) producing electronic slides/overheads, $F(2,171) = 8.20$, $p < .01$, and (6) developing web pages and/or sites for instructional use and relating information to parents $F(2,174) = 6.71$, $p < .01$.

Both preservice teachers and inservice teachers agreed significantly more strongly on three statements of the technology skills than principals. These statements were (1) create a document; name, save, retrieve and revise a document and use printing options, $F(2,175) = 4.82$, $p < .01$, (2) apply strategies for identifying and solving routine hardware and software problems that occur during everyday use, $F(2,175) = 5.62$, $p < .01$, and (3) evaluate software and technology for instructional use, $F(2,172) = 6.00$, $p < .01$, as part of a certification process.

3. What are the current professional development mechanisms and opportunities for developing inservice teacher technology skills used in schools today?

Inservice teachers and principals were asked about the use of technology in instruction at schools and the types of technology professional development opportunities that were available for inservice teachers. Their responses were analyzed and are reported in Table 2 (http://www.public.asu.edu/~hengyuku/SITE.htm).

Which of the following technology skills are important for a preservice teacher to be able to perform as part of a certification process? Item Statement	Overall Mean (N = 179)	Preservice Mean (N = 67)	Inservice Mean (N = 67)	Principal Mean (N = 45)	Significant Difference
1. Create a document; name, save, retrieve and revise a document; use printing options.	4.78	4.84	4.87	4.56	Preservice> Principal Inservice> Principal
2. Set up and operate a VCR and monitor/TV.	4.35	4.73	4.21	4.00	Preservice> Inservice Preservice> Principal
3. Apply strategies for identifying and solving routine hardware and software problems that occur during everyday use.	4.02	4.18	4.15	3.58	Preservice> Principal Inservice> Principal
4. Evaluate software and technology for instructional use.	3.85	4.09	3.88	3.43	Preservice> Principal Inservice> Principal
5. Create spreadsheets to manage information.	3.69	4.06	3.42	3.52	Preservice> Inservice Preservice> Principal
6. Create a database to manage information.	3.48	3.92	3.12	3.34	Preservice> Inservice Preservice> Principal
7. Set up and operate a presentation system that works with a computer.	3.47	3.82	3.23	3.26	Preservice> Inservice Preservice> Principal
8. Produce electronic slides/overheads.	3.40	3.80	3.21	3.09	Preservice> Inservice Preservice> Principal
9. Develop web pages and/or sites for instructional use and relating information to parents.	3.17	3.55	2.93	2.95	Preservice> Inservice Preservice> Principal

Table 1A: Mean Ratings and Significant Differences by Group and Item Statement.

When researchers asked whether teachers are evaluated in their use of technology in instruction, the results revealed that only 10 inservice teachers (15%) and 11 principals (26%) indicated "Yes" while 55 inservice teachers (85%) and 32 principals (74%) responded "No."

When researchers asked which areas inservice teachers and principals feel their faculty could improve their current skills a total of 83 respondents (74%) indicated "Computer use for instruction", 80 respondents (71%) indicated "Use of Internet resources for instruction", 77 respondents (69%) indicated "Multimedia – video and electronic slides", 67 respondents (60%) indicated "Computer use for management – grades, lesson plans, and instructional materials", and eight respondents (7%) indicated "Other".

When researchers asked what types of technology training opportunities are available for inservice teachers a total of 93 responded (83%) "District workshops", 71 (63%) responded "Pccr training", 53 (47%) responded "Consultant training at school", 31 (28%) indicated "University professional development or courses", 24 (21%) indicated "Industry courses", and 4 (4%) indicated "None".

4. What technology skills and competencies are currently being considered during the hiring process of teachers?

The responses regarding hiring decisions for preservice teachers from both principals and human resource directors were analyzed and are shown in Table 3 (http://www.public.asu.edu/~hengyuku/SITE.htm). The researchers asked whether they would rate a new or preservice teaching applicant with well-developed technology skills higher than an applicant with minimum technology skills. The results revealed that 35 principals (78%) and 12 human resources directors (57%) indicated "Yes" while 10 principals (22%) and 9 human resource directors (43%) responded "Not considered."

Principals and human resource directors also were asked about how they currently assess an applicant's skills to use technology as an instructional and management tool. A total of 41 respondents (62%) indicated "Application interview", 28 respondents (42%) indicated "Portfolio", 21 respondents (32%) indicated "Transcript", 12 respondents (18%) indicated "Certificate of training", six respondents (9%) indicated "District interview", four respondents (6%) indicated "Not assessed", and three respondents (5%) indicated "Other".

For the question regarding what methods they would prefer to use to assess an applicant's technology skills as an instructional and management tool in the future a total of 26 respondents (41%) indicated "Portfolio", 26 respondents (39%) indicated "Application interview", 17 respondents (26%) indicated "Certificate of training", 16 respondents (24%) indicated "District interview", eight respondents (12%) indicated "Transcript", and four respondents (6%) indicated "Other".

Conclusions

The results from this study can offer a foundation for developing a new model for technology courses for preservice teachers. This model can be implemented at universities and, in addition, provide guidelines for local community colleges and other educational facilities for the development of technology courses that cover the basic skills required by the National Educational Technology Standards. The results can also demonstrate to preservice teachers what technology skills that future employers are expecting from them and provide assistance to those employers in the correct assessment of a teacher's technological skill.

Research has shown that the educator who has developed skills before entering the classroom will use technology more in instruction and will make more of an effort to continue acquiring new skills. Research has also shown that teachers with fewer years of teaching experience are more likely to use technology as a tool in instruction and planning. Our survey results corresponded with these findings. The preservice teachers placed more importance on many of the technology skills than inservice teachers or principals did, and we can assume that they will want to use these skills in the classroom. The inservice teachers surveyed agreed more than the principals did that many of the basic technology skills in the survey were important. This is an indication that they are finding opportunities to use these skills in the classroom and are convinced of their importance.

It is interesting to note that both principals and teachers found areas for improvement in the current technology skill sets of teachers and that those skills include computer use for instruction, using the internet and multimedia for instruction, and using technology for grading and management tasks. Again, these are the basic skills determined by the ISTE standards. Schools are currently providing workshops and other forms of commercial training for teachers to improve technology skills, and 63% of the teachers reported learning technology skills from a peer trainer. These findings point out the need for universities and other educational institutions to provide technology training for preservice teachers

Basic technology skills must be developed before integration into instruction can be achieved. Results from this survey are being used in dialogue with university professors and community colleges to develop computer courses that cover basic skills outlined in the National Educational Technology Standards. The goal is to develop classes that not only would benefit the professional educator, but skills that would be used by the paraprofessional in a school setting. Once a student has a foundation of basic skills, the university preservice courses can focus on the integration of technology as a teaching tool. The technology course would develop the pedagogy for integration and methods courses would model and require the application of technology in student projects. Modeling the integration of technology would not only be in methods courses, but also in field study placements. When possible, the education colleges can also look outside of their own curriculum and identify other coursework that will benefit educators as they develop their technology skills. For example, technical writing, graphic design, and multimedia development can all play major roles in instructional development.

Our survey results also indicated that administrators are looking for skilled applicants and assess technology skills in various ways. Current assessment of technology skills is done by an application interview (62%) and by portfolio (42%). The survey results for future assessment show that these two assessment tools remain the most important, but that portfolio is as preferred (41%) as the application interview (39%). Schools of Education can provide a great service to the educational community by creating a consistent portfolio mechanism that identifies those students who have achieved a high level of technology skill and who are prepared to integrate technology into their classrooms immediately.

If our children are to become technically literate, it falls to the university to produce well-trained teachers who can provide models of technology skill as well as instruction and practice opportunities for their students. We believe that technology training will never be a static process and there will always be new skills to be learned. It will be important for university teaching programs to be riding the leading edge of technology in the future.

References

Hill, R. B., & Somers, J. A. (1996). A process for initiating change: Developing technology goals for a college of education. *Journal of Teacher Education,* 47, 300-306.

Moursund, D. & Bielefieldt, T. (1999). *Will new teachers be prepared to teach in a digital age? A national survey on information technology in teacher education.* Santa Monica, CA.

National Commission on Teaching and America's Future (1996). *What matters most: Teaching for America's Future.* New York. Author.

Northrup, P. T., & Little, W. (1996). Establishing instructional technology benchmarks for teacher preparation programs. *Journal of Teacher Education*, 47, 213-222.

Smerdon, B., & Cronen, S. (2000). *Teachers' Tools for the 21st Century: A Report on Teacher's Use of Technology.* National Center for Education Statistics. U.S. Department of Education Office of Education Research and Improvement.

Strudler, N. & Wetzel, K. (1999). Lessons from exemplary colleges of education: Factors affecting technology integration in preservice programs. *Educational Technology Research and Development,* 47 (4), 63-81.

Wetzel, K. (1993). Models for achieving computer competencies in preservice education. *Journal of Computing in Teacher Education*, 9 (4), 4-6.

Learning with Internet Resources: Task Structure and Group Collaboration

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Abstract: The purpose of this project was to study how task structure and group collaboration may influence the way children learn with Internet resources. A group of 27 elementary school children and two classes of pre-service teachers participated in this study during the summer 2000. The children were assigned to work on a WebQuest designed by the pre-service teachers either individually or in pairs. Data were collected through an observation scheme and journals. The results showed differential patterns of behaviors and emotions when children learned individually and in small groups. In addition, the differences were often related to the different characteristics of the learners and the task structure.

Introduction

The Internet, with its vast array of information, offers students opportunities for learning from rich, up-to-date and authentic resources and for developing information-seeking skills. On the other hand, complaints are often heard from students that it is time-consuming to find useful and relevant information on the Web. Although more expansive and up-to-date than any encyclopedia, the information on the Web is not organized and filtered as that in encyclopedia (March, 1998). A lot of valuable time can be wasted if students lack the necessary research skills and appropriate guidance is not provided to them.

WebQuests, an inquiry-oriented activity in which most or all of the information used by learners is drawn from the Web, were developed by Dodge (1995) to help educators design meaningful and structured learning activities for students. Since then, WebQuests have become increasingly popular as a component in teacher education courses and in the K-12 schools. However, few studies have been conducted to date investigating the effects of using WebQuests, the adequacy of the structures provided and the influence of social context. A recent meta-analysis (Lou, 1999; Lou et al., 1998) of 103 studies comparing small group and individual learning with technology indicated that the effects of social context appeared to be moderated by type of technology-mediated learning activities, task structures, and group or individual outcomes. The purpose of this project was, therefore, to study how task structure and group collaboration may influence the way children learn with Internet resources.

Method

A group of 27 elementary school children ranging from grade 2 to 7 participated in this study during the summer 2000. These children were brought in by two classes of pre-service teachers who were taking a technology literacy course learning to use various software and ways to facilitate children's learning with technology. One of the course components is to design a WebQuest. In order to make the activity more meaningful and to observe how children learn with technology individually and in small groups, we suggested to the pre-service teachers that they bring in one or two children for the WebQuest try-out. Thus, each pair of pre-service teachers designed their WebQuest specifically for the children they knew. Each WebQuest contained all the five essential components (i.e., introduction, task specification, detailed procedures, a list of resources, and some concluding remarks) as suggested by Dodge (2000).

In one class, the WebQuest try-out was conducted in two days. About half of the children participated on Day 1, where each child worked on the WebQuest individually. On Day 2, the other half of the children worked in pairs. In the other class, the activity was conducted in one day. About half of the children worked individually and half in pairs. At the beginning of the activities, the pre-service teachers provided a brief introduction to the WebQuest activity each child or each pair of children would work on. Then the children worked on their own while the pre-service teachers sat beside the child(ren) observing, taking notes, and answering children's questions when needed. For those working in pairs, they were instructed to share and help each other.

Data were collected using an observation scheme with broad questions on how children interacted with each other and with the learning activities. In addition to the observation notes, each pre-service teacher also wrote a journal after the study, reflecting on what they observed and learned from the study.

Findings

Differential patterns of behaviors and emotions were observed when children learned individually and in small groups. In general, children working alone asked more directional questions of the facilitators, whereas pairs appeared to rely more on each other than on the facilitators. When working in pairs, the children shared work, decisions, as well as excitement and they appeared to enjoy the tasks more than those working alone. However, some observers noticed that the learner in control of the mouse was often actively involved in making decisions, while the one not in control often struggled to keep up.

Type of tasks appeared to have differential effects on children. Tasks that combined information-seeking activities with multimedia design appeared to motivate the children more than the former alone. In many cases, both individuals and pairs became more engaged and motivated when they applied the information they gathered in some multimedia design activities.

Although each WebQuest designed was quite structured and contained all the five essential components, a few children, especially those that were at younger age and were working alone, felt somewhat at a loss as to what to do after reading through the package and listening to a brief oral introduction by the facilitator. In addition, a few children expressed some frustration having to weed through irrelevant information on some Web sites.

Implications of the Study

The results of this exploratory study contribute to the knowledge of how children at different grade levels learn with Internet resources in small groups and individually. Although WebQuests are intended to provide structure when children learn with internet resources, results of this study suggest that the effectiveness of WebQuests may vary based on the type of tasks designed, the age level and cognitive ability of the learners, and whether children learn with others or by themselves. However, more studies may be needed to replicate the results.

This study also indicates that incorporating observation studies in teacher technology training courses can be a valuable experience for pre-service teachers. Through close observation, the pre-service teachers involved in this study noticed both the strengths and limitations of their designed learning activities and realized the importance of effective instructional design in motivating the students and enhancing their learning. They also realized that both individual cognition and social interaction play an important role in children's learning (Anderson et al., 2000). The activities designed have to be closely related to the children's prior knowledge as well as interests. A few pre-service teachers were disappointed that the excitement and enthusiasm they expected of their learners were not exhibited. Through close observation and reflection, they found what was lacking in their designed activities and suggested ways that their activities and learning experiences may be improved.

References

Anderson, J. R., Greeno, J. G., Reder, L. M., & Simon, H. A. (2000). Perspectives on learning, thinking, and activity. *Educational Researcher, 4*, 4-10.

Dodge, B. J. (2000). *The WebQuest Page*. http://edweb.sdsu.edu/webquest/.

Dodge, B. J. (1995). Some thoughts about webquests. *The Distance Educator, 1*(3), 12-15.

Lou, Y. (1999*). The role of social context when learning with computer technology: A series of meta-analysis.* Unpublished doctoral dissertation. Concordia University, Montreal, Canada.

Lou, Y., Abrami, C. A. & Muni, S. (1998, April). *Effects of social context when learning with computer technology: A meta-analysis*. Paper presented at the Annual Conference of the American Educational Research Association, San Diego, CA.

March, T. (1998). *WebQuests for learning*. http://www.ozline.com/WebQuests/intro.html.

Culture Clash in the College Classroom: Changing the Work Teachers and Students Do

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Abstract: This paper examines the experiences of beginning teacher education students in an inquiry-based, technology rich course that has been designed to change the work that both teachers and students do as they explore contemporary issues in the profession of teaching. Analysis of these experiences is framed by concepts from cross-cultural psychology, often used to understand experiences of individuals who abruptly find themselves living in a different culture. The premise is that classrooms characterized by changed teaching and learning design and activity are, in fact, "new cultures" to those who participate in them.

Introduction

In 1994, responding to a State of Ohio initiative to replace its certification program with one that licensed its new teachers, faculty in the College of Education at Kent State University began the process of reevaluating its teacher education program. That reevaluation led to the completely redesigned program that has been in place since the fall of 1998. Central to the goals of the new program has been to change the work students and teachers do: to make course work more interactive, to engage students and teachers in inquiry-based research, and to demonstrate student outcomes, experience, and achievement in new ways. In all these areas, the integration of technology has been a major tool.

In all segments of the program, students and teachers have experienced major changes in the work they do, how that work is done, and with whom. As might be expected, the transition to the new program has not been easy and not least of the difficulties has been—for all of us—the necessity of learning new ways to "do school." The purpose of this essay is to focus on the experiences of students and teachers in one particular course—the initial core Inquiry seminar in which students are introduced to three major ideas: contemporary changes in the profession of teaching, the impact of a diverse population on classroom cultures, and the integration of technology into instruction.

The Argument from Design

The physicist, Freeman Dyson, writes of cosmological theories of the development of the universe, one of which is called "the argument from design" [Dyson 1979]. In that theory, the thesis is that a single "designer" created the universe, thus ensuring at least some degree of coherence in the design. Our small universe did not have the benefit (and the costs) of a single designer. Rather, it had the costs (and the benefits) of many "designers." As is customary in an era suffused with the "argument for collaboration," the reevaluation of our teacher education program began with a relatively small and partially representative committee, expanded—like the universe—to a number of partially representative committees, expanded again to the full teacher education faculty, reduced itself on a number of occasions to other, still partially representative committees for further consideration, and was finally accepted in 1997 by a group called, in our College, the Teacher Education Council, which is fully representative of all program areas involved in the preparation of teachers.

Along the way, many ideas were put forth, rejected, brought back, altered, refined, discarded, brought back again, and altered again. In the end, our "universe" settled into the elements of design with which we are working today.

The first of these is that it is a four-year program. Students start in teacher education as freshmen, or as newly-converted upper-classmen, whichever comes first.

Second, the program is inquiry-based. That is, increasingly more responsibility is placed on students to engage with us in their own education. This means that, wherever possible, knowledge and skills are framed in terms of questions, not answers, and students are encouraged—one could say, "forced"—to begin to frame their educational experiences in terms of their own questions about the relation between school and society, about the profession, the classroom, their own future students, and about methods of instruction.

Third, the program has what we might call "strands of design." These include emphases on a community of inquiry, integrative studies, reflective practice, responsiveness to differences, and the integration of technology into instruction. Each of these strands, although in different degrees as appropriate, are woven throughout the program.

Fourth, students are assessed not only through investigation, projects, writing, and testing, but finally in terms of initially, student portfolios, and later, professional portfolios. Soon, all students will have electronic portfolios.

Fifth, the program enlists classroom teachers and agency professionals as partners in the education of pre-service teachers. This is done in a number of ways, beginning with placement in schools in the freshman year and extending through student teaching.

Finally, the program includes introduction to a variety of forms of research, culminating with a major action-research project associated with student teaching.

The Inquiry Seminars

A central feature of the new curriculum design is a series of four Inquiry Seminars. The first three of these seminars combine elements of sociocultural and psychological foundations, are thematic in nature, and are designed in a spiral, so that concepts and issues introduced initially are revisited repeatedly, each time from a different angle or in more depth, or both. The fourth seminar, "Inquiry Intro Professional Practice," is taught in the program areas in association with student teaching. In addition, a series of three inquiry-based seminars is offered in individual program areas, beginning in the sophomore year. Students thus have seven such seminars in their whole program, three in foundational areas and four in program or licensure areas.

The first, Inquiry I, is called "Inquiry Into the Profession." The focus of this course is on our own students and their development as beginning pre-service teachers. It has three major elements: 1) inquiry into the nature of the teaching profession, its history and its current status and requirements; 2) inquiry into the diverse nature of learners in the United States today; and 3) inquiry into the integration of technology into instruction. It is not only an introduction to the teacher education program; it is also an introduction to a new *culture* of teacher education. The challenges inherent in this course appear, in varying degrees in all of the Inquiry seminars, as well as in the program as a whole. But because this particular course is the first, the challenges of a new culture are more apparent here.

The New Culture of Teacher Education

The new *culture* that students find when they enter the Inquiry I course can be characterized in the following ways:

it is a shift from passive to active orientation;
it is a shift from "getting" answers to formulating questions;
it is a shift from "knowing" to reflection;
it is a shift from teaching to learning;
it is a shift from individual work to collaboration;
It is a shift from certainty to ambiguity; and, in our case,
It is a shift from paper (textbooks, articles) to electronics (browsers, web sites)

Positing a Culture-Clash in the New Program

. While there has been a great deal of literature on student "resistance" to new kinds of classroom organization and instruction, I think it is more helpful to conceptualize the situation in terms of a clash of cultures. We are familiar, I imagine, with the concept of "culture clash," as representing what happens when one suddenly finds oneself in a different cultural milieu. My observation is that much the same thing is happening to our students, and--to a large extent--to ourselves as we struggle to find new and better ways of educating teachers. Thus, I want to borrow a schema from cross-cultural psychology to describe what happens when students who have learned, for the most part, how to be effective students in traditional teaching and learning situations, react when they find themselves, with little preparation, in a very different kind of classroom culture.

The schema is adapted from Cushner and Brislin [Cushner & Brislin 1996] as one that may be useful in analyzing and understanding the challenge we face with our students. Briefly, the schema "illustrates three psychological stages though which individuals usually proceed when immersed in an intercultural encounter" [Cusher, McClelland, & Safford 1996]:

Stage One: Emotional Arousal
Stage Two: Understanding Unfamiliar Behavior
Stage Three: Personal Adjustment and Growth

Emotional Responses

Emotional responses arise quickly when one is confronted with unpredictable behavior on the part of others and when their own behavior does not produce expected results. Among the emotional responses are anxiety, ambiguity, disconfirmed expectations, a need to belong coupled with a certain fear of rejection, and unhappiness at having to examine their own preconceived notions.

These emotions are almost immediately aroused in our students by a number of activities in the class. They are anxious because we have them reading trade books with no bold-face headings that tell them what is "important to learn." They are anxious because we give them "teaching opportunities" in the class almost right away. They are anxious because we require them to articulate their own judgments, based on their inquiries, and there is no right answer.

They quickly develop a sense of ambiguity about the class for a number of reasons. For example, at first it seems to them to be a kind of "easy" class, because much of it is discussion. But it soon occurs to them that "opinions" are not enough; they need not only to *support* their opinions but those opinions are subject to public scrutiny in the class.

Their expectations are disconfirmed rather quickly, as well. I cannot emphasize enough the degree to which most of them have learned to "do school" successfully—by taking good notes, by learning concepts helpfully bold-faced or underlined in a recognizable text book, by learning definitions, and by giving "right answers." How, they say, can they take notes on a free-flowing discussion? What concepts and ideas should they "learn"? How can they define an idea like "cultural identity," which, for our mostly white, middle-class students, "belong" only to people of color? What if there *are* no right answers? Indeed, what if questions—inquiry—are more important than answers? My, how the rules have changed!

Not "knowing the rules" of appropriate behavior in this new situation makes it difficult for many to feel that they "belong" in this milieu. At the very least, they expect this course to help them "learn to teach," which they define primarily as exercising control of classrooms, imparting information that they know and their students don't, and generally being effectively "in charge." And they say, to themselves and to their instructions, many variations of "What is this, and what am I doing here, and how is this going to help me get a job as a teacher." Indeed, the students who most easily come to "belong" are often those who have never been truly socialized to "doing school" in the traditional way. They are kind of "closet rebels," and they ask extremely interesting questions, which, of course, is what inquiry is all about.

Finally, they have a difficult time—and are generally driven crazy—by having to first, identify, and then examine the development of their own cultural identity—particularly since most are completely unaware that they have one. In the process, they must step out of their own cultural enclave and "see" it, when it is perceived as all but invisible. To say that many are unhappy about this activity is something of an understatement. To say they would really like a textbook and be left alone is something of an understatement as well.

Understanding Unfamiliar Behavior

After about a month, most accept they are stuck in this all-too-required class, and begin to try to figure out what this class is about, and why it's important, and what reconstitution of their own mindset is necessary. In short, they have to acquire knowledge about this classroom culture and they have to learn the new rules. This, too, is something one has to do when one finds oneself in a new cultural milieu. There are several kinds of knowledge that they are required to gain.

First, they must learn a new kind of communication, and, in part, a new language. They are very used to one-way communication patterns in school—from the teacher to the student. They are also used, in traditional classrooms, to speaking answers, not generating questions. They have been taught that the text, or the teacher, or some expert of some kind "knows" the answer and they must "learn" it. They have a hard time even *thinking* of questions—because, after all, who are *they* to question the text, or the teacher? Further, they are not accustomed to having a question answered with another question—how frustrating is *that*?

The language, of course, is English—but we throw a great deal of educational jargon at them, and to give them credit, they pick it up rather quickly, immersed in it as they are. Collaborative learning, the *Praxis Series*, reflective teaching, AACTE, NCATE, state educational funding formulae, portfolio assessment, the induction year—and on and on and on. Indeed, they are learning a "professional" language.

In addition, they must learn new values and new rituals. The chief difference, I think, in values lies in the area of individual work: they come from a culture in which one must keep one's eye on one's own paper and not talk with one's neighbors, into a culture where helping one another, teaching one another, making sure everyone learns, are the overriding values. While they do individual work—largely writing—they also work in small groups a good deal—and are rewarded (with grades) on the basis of the effectiveness of the group, not the individual. This is a rather different relationship to one another than they have come to expect.

There are new classroom rituals, as well. Look at each other, not just at the teacher; go to work on on-going projects when first entering the room—don't wait for the teacher to get you started; and, of course, a whole lot of rituals involving the computers that are in the classrooms where these courses are taught.

Status and roles often change, too, in this kind of classroom, particularly those of the heretofore "excellent student." The most plaintive exclamation is often, "But I *always* get As on my papers!" after a student who, using the rules she has learned well, writes a paper that merely paraphrases someone else—that "expert" I mentioned earlier. And does not get an A. Another, nearly universal, status that they have acquired in school is the very status as "student"—one who listens but does not venture an original idea or a critique. "What do you want???" they ask me. "I want you to *think*?" I answer.

Finally, differences in time and space are hallmarks of different cultural milieux. Accustomed to 50-minutes liberal arts classes at this stage of their college experience, they spend 2 ½ hours in this class—time to explore, to inquire, to discuss, to work on projects—and to get *bored*! And the space is also used differently; there are five computers for 20-25 students; there are tables and chairs on wheels; they never know when they come to class just how the place is going to *look*. Quite often, *they* are responsible for decided how it will look. Good grief!

Making Adjustments

By about two-thirds of the way through the 15-week class, most—but not all—students have become reasonably adept at the "new" culture of this classroom. They have accomplished what anyone dropped into a different culture must do—they have undergone some degree of personal change. They have adopted a different frame of reference for thinking about teaching—with new categories and new values (e.g., questions are good; answers are open for discussion). They have learned, more or less, to work effectively in small groups—and often take a good deal of pride in "their" group. They have begun to learn that, as teachers, they will be expected to be learners—a new concept for those for whom the teacher is the ultimate authority with the power of the grade. They have begun to sense the scope of this new culture inhabited by "professional" teachers; and they have begun to develop a healthy respect for that culture. They have some new ways to differentiate effective classrooms from ineffective ones, and have begun to refine their notions of "good teaching."

They have also begun—only begun—to learn to integrate technology, especially computer technology, into instruction. Even those for whom a computer is a new and frightening *thing* in the classroom, the end of the semester finds them mostly comfortable with them, and talking to each other in a language they didn't know before. "Well," they say to one another, "a PowerPoint presentation is really just a fancy overhead; what about actually linking the kids to web sites or having in-class chat rooms or threaded discussions?" I'm amazed.

New Roles for Teacher Educators

Given the nature of our program, and the degree to which we are all—students and faculty alike—"strangers in a strange land," I believe that the role of the instructor in these courses is many-layered. Of the greatest importance is understanding that we are, indeed, in a different culture, and being overt about it. That is, we must, all along the way, not only *model* this different pedagogy, but *explain* what we are doing, *why* it is different from what students are used to, and *how* it is different (as well as how it is the same as) what they are used to. We must also enable students to stand back from and reflect on their own experiences in these courses, and this program; we must listen to them and adjust accordingly; and we must give them—and ourselves—the time necessary to "play" with it.

Since many of the sections of Inquiry I are taught by graduate teaching fellows, this also means a significant investment in both initial and on-going education for instructors, which is difficult, inasmuch as we are inventing it as we go along. This means, of course, that we must *share* the development of this culture with them—not simply *tell* them what to do. They, too, have grown up in traditional schooling systems, and they, too, tend to "teach as they were taught."

If this "new" culture is of intrinsic worth, it is worth our best and most creative efforts to understand it, and to pass it along to our students. In a society (and a University) that values high-stakes testing and accountability, and does not particularly value long-term solutions to immediate problems, that is not an easy task. What is at stake, however, may very well be the ability of our students' students to flourish in a century about whose requirements we can only guess.

References

Cushner, K. & Brislin, R. (1996) *Intercultural interactions: A practical guide*, 2nd ed., Thousand Oaks, CA, Sage.

Cushner, K., McClelland, A., & Safford, P.(1996) H*uman diversity in education: An integrative approach*, 3rd ed., Boston, McGraw-Hill, p. 100.

Dyson, F. (1979). The argument from design. *Disturbing the universe,* New York, Harper and Row.

Ready or Not – Here They Come

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Abstract: ISTE NETS for Students and the new NETS for Teachers raise expectations of what students and teachers should know and be able to do. Because of this, we sometimes assume that teacher candidates come with more technology experience than they actually do.

Focus groups with undergraduate Foundations of Technology classes indicate that students leaving high school have had little experience using technology in school. None had college professors who modeled technology use.

As teacher education programs are redesigned, stand alone technology classes are often eliminated. However, teacher education programs can not assume that students will come with extensive experience in technology. An Essential Technology Skills Assessment was developed to help students gain basic skills needed to be successful in technology rich classes.

This session will focus on the technology skills and experiences our students are bringing to teacher education programs and one evolving process for building their entry technology skills.

Introduction

Focus groups with undergraduate Foundations of Technology classes indicate that students leaving high school as well as those returning to college after an absence have had little experience using technology in school. Most had used word processors and some had used telecommunications applications. Only one had used technology to support project based learning. While there were pockets of students with more advanced skills, most were still at the novice level of use of other applications.

When asked how technology was included in college courses, most indicated they used word processing to complete assignments but the Foundations of Technology course was the first where professors modeled technology use. In a few classes, they used e-mail to communicate with the instructor. They used the Internet to find information. Most did not know how to search effectively or to evaluate the information they found.

ISTE NETS for Students and the new NETS for Teachers raise expectations of what students and teachers should know and be able to do. Because of these higher standards, we sometimes assume that teacher candidates come with more technology experience than they actually do. However studies continue to show that only about 25% of the teachers in the country feel comfortable enough to use technology in their classes. School districts and teacher education programs are working to improve the percentage of teachers who effectively use technoloogy in the classroom.

Schools of Education are being asked to provide appropriate experiences in less time with fewer credits. This sometimes leads to the elimination of the stand-alone technology class. Many studies have shown that stand along technology classes are not effective by themselves. Students need to use technology through out their program (ISTE). Others have found that foundation technology courses provide students with the skills they need to be able to use technology in their other classes. Some studies suggest that a combination of a foundations class and technology infusion in all other classes if the most appropriate way to prepare technology proficient teachers. Not all Schools of Education have been able to provide that.

Identifying and Assessing Pre-requisite Technology Skills

Through support from the federal Alaska Partnership for Teacher Enhancement (APTE) grant, our teacher education program is being redesigned to meet the needs of our state. The results of this partnership was a one year, post-graduate, intensive, internship model. One of the changes to the current program was students would no longer take a stand-alone technology course. Educational technology was being integrated throughout the program. However, we could not assume that students would come with extensive experience in technology. Students need alternatives methods of developing pre-requisite skills when there is no foundations technology class.

To ensure that students entering the new certification program would have the basic skills needed to be successful in their classes, an essential technology skills assessment was created as part of our PT3 grant. The technology assessment is based on the new ISTE National Educational Technology Standards (NETS) for Teachers (Level 1 performance indicators).

The Essential Skills Assessment (http://cwolf.uaa.alaska.edu/~afahm/) was designed to show students what they already knew and fill in the gaps where there were missing skills. It assessed only the basic skills that we felt were essential for students to know to be able to use technology successfully in their classes. Many university education program web sites were surveyed to develop a common list of basic skills We tell students the assessment helps them gain only enough skills to be able to keep their heads above water using technology in their courses.

The Essential Skills Technology Assessment is a performance based assessment that addresses 11 skill areas: 1. Personal History of Tech Use, 2. Internet tools (e-mail, listserv), 3. Search strategies, site evaluation, information literacy, 4. Simple Web Page & Bookmarks, 5. Word processing, 6. Spread sheet, 7. Data base, 8. Graphics (including. scanner, camera), 9. Non-linear hypermedia presentation, 10. Linear Slide Show, and 11. Basic computer operations and troubleshooting. There were three ways for students to demonstrate competence in each area of the Essential Technology Skills Assessment. Option A asked them to provide evidence of prior learning. Option B was an on-line tutorial that helped them gain the skill individually. Option C was an on-campus workshop where they learned the skill. Students were allowed to mix and match options to meet their needs and skills. One option, that was not considered as the during the development of the skills assessment, evolved during the assessment interviews. That option was tutoring by the Tech Assessor during the scheduled assessment interview time.

Students were instructed to visit the Essential Technology Skills Assessment web site where they could work on the skills in any order. They were given general instructions which included the expectations for each of the options.

Instructions for Options to Completing the Essential Technology Skills Assessment.

Option A: Evidence

1. Use a word processor to reflect on your skill. Describe what you know and how you learned it. Tell about the evidence you are submitting to show your competence.
2. Gather evidence that demonstrates you are proficient in the skill as described in the table.
3. Assemble the reflections and evidence on disk. Share the results with a Tech Skills Assessor.

Option B: Tutorial

1. Complete an online skills tutorial.
2. Save your work to disk.
3. Use a word processor to write about what you learned and how you learned it.
4. Bring the files on disk and share your results with a Tech Skills Assessor.

Option C: Workshop

1. Participate in an essential skills workshop on campus.
2. Workshops will be scheduled for each of the skills.
3. Check the class calendar for dates.

Graduate assistants and undergraduate School of Education computer lab aides were used as Tech Assessors. At the beginning of the program, Tech Assessors met and determined the criteria for successful completion of each task. As students completed tasks, they scheduled interviews with a Tech Assessor. If they successfully completed the task, they were checked off. If not, they were told what they still needed to do and asked to come back to be rechecked.

Findings

Twenty four students participated in the Essential Technology Skills Assessment. All students were asked to write a short, one to two page paper to complete Technology Skill 1. They generally chose Option A to complete Technology Skill 2. Internet tools (e-mail, listserv). While students felt they knew Technology Skill 3. Search strategies, site evaluation, information literacy, in reality the Tech Assessors found they needed assistance with this skill. This was one of the skills where the Tech Assessors tutored them during the assessment session. Some students already had their own web page and were able to use Option A for Technology Skill 4. Simple Web Page & Bookmarks. Most students did this learned this with the Tech Assessor. Almost all students chose Option A to demonstrate Technology Skill 5. Word processing. About half of the students chose Option A and the other half Option C for Technology Skill 6. Spread sheet. We decided to teach Technology Skill 7. Data base to the whole group when we introduced them to electronic portfolios. A majority of the students chose Option C for Technology Skill 8. Graphics (including. scanner, camera), Technology Skill 9. Non-linear hypermedia presentation, and Technology Skill 10. Linear Slide Show. We presented Technology Skill 11. Basic computer operations and troubleshooting to the whole group when we distributed the iBooks we were loaning them.

Another part of our PT3 grant provided leased iBooks for each of the students in the new program. This allowed them to take the technology from the university to their PDS site and to their homes. We are evaluating the effect of this access to technology on technology use by faculty and students.

Students completed additional technology activities in the Foundations Class. Those activities were also based on the new ISTE/NCATE NETS for teachers (Level 1). Students were instructed to keep electronic copics of all their work so it would be available for the electronic portfolio they were to compile by the end of the program.

Conclusions

As we were developing the new program, we recommended that basic technology skills be a prerequisite for entrance into the program. The Essential Technology Skills Assessment was designed to help students meet the prerequisite level of basic skills. The intent was for them to complete it prior to beginning the program. The fast timeline for developemt of the program did not allow that to occur with the first cohort. Students were notified of their acceptance into the program by early June. Almost immediately they started the program with an online experience in mid-June, followed by à 9 credit Foundations of Education class, which integrated technology, in July and August. So rather than coming with the basic skills, they were having to complete the technology assessment and develop the skills as they were taking classes.

While the Essential Technology Skills laid a foundation, completing it in conjunction with the foundations course was too intense to be effective. The students did not become comfortable with the technology before they were asked to use it for class. They did not have time to thoughtfully complete the foundations content assignments. In short, they were overwhelmed.

Faculty realized what was done with the first cohort did not work. Because timelines from acceptance to starting the program will continue to be short, it was difficult to require a technology prerequisite. However, the post baccalaureate certification program continues to evolve. Next summer we plan to split the foundations course into two sections. Technology skills will be taught in conjunction with history of education in the first section. The second section will contain the other foundations content and will continue to develop technology skills and provide students with technology integration activities.

If the program had a technology prerequisite, an expanded Essential Technology Skills Assessment could be an appropriate method for students to demonstrate minimal technology competency.

References

International Society for Technology in Education (ISTE). (2000). *National educational technology standards for students: Connecting curriculum and technology*. Eugene, OR: ISTE NETS Project.

International Society for Technology in Education (ISTE). (2000). *National educational technology standards for teachers*. Eugene, OR: ISTE NETS Project.

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Using Multimedia and Technology to Teach Mathematics and Science: Research-Based Professional Development Materials

Abstract

The ultimate goal of this project is to have a new crop of teacher candidates finish their undergraduate teacher education program with a full understanding of the interconnections between mathematical scientific principles. This project supplied preservice teachers with the equipment and knowledge of how to use the latest technology that makes real-life data collecting and computational explorations routine. This was done by incorporating the use of multimedia and technology in the classroom in an effort to actively involve students in an integrated, reformed, technology-based, visual instructional model. Through the use of mathematical modeling and scientific inquiry, the tendency to teach each of the disciplines in isolation will be removed.

Need For the Project

Recognition of the importance of technology in teacher certification is gaining momentum. According to Arthur Wise, president of NCATE (National Council for Accreditation of Teacher Education), "beginning October 1, 1995, accredited schools of education must meet NCATE's new standards for technology in teacher education to become or remain accredited." (Wise 1995) NCATE recommends that (1) K-12 staff and university educators must work together to integrate technology into curriculum and classroom practices, (2) teacher educator and K-12 staff must receive training and support, and (3) **models must be developed with technology supporting content areas.**

The Office of Technology Assessment issued a report entitled *Teachers and Technology: Making the Connection* (1995) which found the most technology instruction in colleges of education focuses on teaching about technology as a separate subject, not teaching with technology with technology across the curriculum. These institutions do not model use, nor do they teach pre-service teachers how to use information technology for instruction. Most new teachers graduate from teacher preparation institutions with limited knowledge of the ways technology can be used in their professional practice. Telling preservice teachers about what is possible is not enough; they must see their instructors use technology in their own learning, observe uses of technological tools in classrooms, and practice teaching with technologies themselves if they are to use these effectively in their own teaching. Curriculum integration is central if technology is to become a truly effective educational resources.

Preservice teachers need to understand the applicability of multimedia and technology to their teaching of mathematics and science. Using multimedia and technology to teach mathematics and science would change undergraduate teacher education for the preparation of middle school mathematics and science teachers. In addition, the methods courses and the materials would cut across disciplinary boundaries by integrating mathematics and science. By providing a solid foundation for the preservice teachers' proficiencies with computer/calculator applications in mathematics and science, this project would become a model to support the preparation of mathematics and science preservice teachers in their content area.

Purpose

The project initiated reform in the mathematics and science preservice middle school teacher education on the campus of North Carolina State University. The preservice teachers were prepared for effective instruction in the scientific/information based twenty-first century. The objective of the project are:

1. to develop professional research-based materials for use in undergraduate teacher preparation courses which incorporate laboratory experiments and/or field experiences that actively engage students to use scientific process and explore concepts; these materials will reflect the necessary integration of mathematics, science, and technology into the preservice pedagogical content preparation of undergraduate students.

2. to use cooperative/collaborative learning, peer teaching, learning communities, and technology to improve pedagogical in methods courses.
3. develop a methods course that requires preservice teachers to use visual imagery, manipulatives, multimedia, and technology to enhance the learning and teaching of mathematics and science.
4. to encourage change by providing preservice teachers an opportunity to reflect about the use of technology and multimedia in teaching mathematics and science and the teaching strategies needed to fully integrate the mathematics and science curriculum.

Project

This project involved about 15 mathematics and science dually certified middle school preservice teachers per year. This curriculum reform focused on the use of graphing calculators, calculator-based laboratories, digital cameras, multimedia, and computers to collect and analyze real-time experimental data. The calculator-based laboratories facilitated the development of the students; understanding of instructional strategies that facilitate the integration of mathematics and science into the curriculum. Professional materials for use using technology to teach mathematics and science and integrating mathematics and science into other disciplines through the use of technology are in the process of being developed. Both students and teachers involved in the project created interactive, multimedia laboratory reports for presentation purposes.

In addition, the researcher required all the participants (preservice teachers, cooperating teachers, and students) complete a Teacher Technology Survey to determine their attitudes about the usefulness of the technology for selected activities designed to integrate the mathematics and science. The students were given a pre-assessment before selected activities and a post-assessment after completing the activities. Data was gathered and analyzed (results are not yet available) to determine the effect of the technology on the participants attitudes about the use of the technology on learning the concepts, and to determine the effect of the technology on their conceptual development of various scientific topics.

References

Wise, Arthur E. (1995). Raising expectations for technology in teacher education. Newsletter of the National Council Accredation of Teacher Education, 5(1), 1-2.

Report from the Office of Technology Assessment (1995). Teachers & Technology: Making the Connection.

Preparing Teachers to Succeed in Online Professional Development Courses

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Abstract Specific learner characteristics are apparent in students who successfully complete online professional development courses. Self-motivation, time management skills, field independence, and proficient technological skills have each been sited as beneficial to the online learner. This paper reviews those characteristics and suggests changes that may contribute to preparing teachers to succeed in this learning environment.

Introduction

Colleges, Universities and other institutions currently offer a wide variety of courses online. Advancements in technology will allow for a greater number of these courses to be delivered in the future as more options, such as streaming audio and video, become widely available. Online courses addressing the professional development of teachers are part of this new trend. Many states are increasing requirements for continued certification by expecting their teachers to complete a specific number of professional development hours or credit each year. Teachers may choose to accomplish this in an online learning situation.

Studies indicate that specific learner characteristics are apparent in students that are more successful in this type of learning environment. These characteristics include self-motivation, time management skills, field independence, and proficient technological skills. Many undergraduate students havc not mastered and do not possess these skills and subsequently, may fail to learn in this environment. For this reason these skills should be developed in the undergraduate pre-service teacher education program so those students may be successful in professional development courses offered in the online format.

Self-motivation

The development of self-motivated, life long learners is a common goal for most teacher preparation programs. Faculty recognizes the importance of fostering these ideals in future educators. Motivation has been linked to a student's confidence in their ability to successfully complete a task. This confidence is developed over time through a variety of techniques such as descriptive feedback and frequent communication with faculty when needed.

Studies indicate that student motivation plays an important role in the successful completion of an online course. Confidence is necessary in the ability to grasp the content, and to complete the task. Although students usually graduate with a mastery of the content, they may lack the skills necessary to complete an online class.

Time management

Excellent teachers must manage the students' class time efficiently and effectively. A well-prepared teacher competently plans the schedule and follows through on time lines with ease. Faculty foster these skills by providing guidance or structure for the completion of projects early in a students career and then systematically fading those structures to allow students to develop their own strategies.

Time management strategies are essential for success in an online classroom environment. Students report extreme difficulty in managing the time needed to complete an online class. Due to the flexibility, they often must be responsible for setting their own time schedules. Teachers should be well suited to planning their time.

Field dependence

Students who are field dependent will require a greater amount of structure throughout their educational career to complete specific tasks. Given this structure, they can successfully complete assignments. Careful planning of rubrics that outline expectations and specific learning outcomes are beneficial. Cooperative learning groups that include field independent students also assist the field dependent student. Students who are field independent can often provide the structure necessary for the field dependent learner. Strategies allowing students to develop a structure when none is apparent will provide the guidance necessary for these students to succeed.

Technological skills

Finally, technology skills must be developed and mastered to succeed in an online classroom environment. Technological proficiency is not obtained through an event such as a training session or even a computer course. It is a process. Mastery of the needed skills must be developed over years. Students need to learn about an application, have opportunities to practice the appropriate use of such a program, and then continue to develop their skills. This process must begin early in the student's educational career. Currently, students enter into programs with diverse abilities in the area of technology. All students must be skilled in the basic computing skills. These include word processing, spreadsheet, presentation technologies, communication tools such as the use of E-mail, and electronic research techniques. One method to address this is to require a computing course in the first year or an introductory set of sessions for academic computing.

In addition, faculty in all disciplines throughout the institution should be encouraged to integrate technology into their own teaching, as appropriate, and particularly in assignments for students. For example:

- College writing courses may consider including writing E-mail and bulletin board exchanges as a separate method and style of communication.
- Public speaking courses may require the use of presentation software in one speech.
- Internet resources may be included in the compilation of research references.
- Web based bulletin boards may be utilized to share views and exchange ideas.
- Faculty may require some assignments to be submitted electronically.
- Course syllabi as well as other learning materials may be available through the class web site.
- Some communication to students may be provided through E-mail.
- All students should be expected to complete written assignments in a word processing program.

Summary

When students are required to utilize the technology throughout their educational experience, over time, they will master the technological skills needed to enable them to become competent self-directed learners in an on-line classroom environment.

The development of self-motivation, time management strategies, and technological proficiency will benefit all students whether or not they intend to complete professional development courses offered in an online format. The systematic development of these learner characteristics will ultimately promote student success and should be incorporated into programs initially and throughout the educational experience.

Empowering teachers through cognitive literacy skills development: Implications for restructuring teacher education programs through technology infusion

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Abstract

Technology has opened Pandora's Box in many respects. Perhaps one of the greatest challenges is building college students' advanced literacy and technical skills, especially preservice teachers. This aspect of technology in education is raising unprecedented levels of new concerns for educators. It has presented educators and policymakers with problematic decision-making about how to attract, sustain, and prepare students for careers and living in an increasingly technological education society (Prager, 1993). The Comprehensive Educational Restructuring and Technology Infusion Initiative Pt3 Project is addressing the problem ($CERTI^2$ 2000). Educators need direction for retooling to restructure instructional approaches to help entering students construct new knowledge and skills. A electronic portfolio and performance-based assessment may be the key to identifying new teacher competencies and instructional practices. A recap of how 11 partners joined hands at the University of Cincinnati to connect K-16 teacher education restructuring and technology infusion.

Keywords: advanced literacy, teacher preparation, technology and pedagogy

Overview

Today's students are faced with a great challenge as the first generation expected to have knowledge and skills to meet industry's demand for more high skilled and qualified workers (SCANS, 1991). In 1997 a report, *Mathematics Equals Opportunity* provides information about problems that college students face that do not take rigorous science and mathematics courses. Additionally, given the emphasis on advanced literacy skills in these courses and in technology pedagogy environments (teaching with technology), students without them may have serious gaps in advanced literacy and critical processing skills, especially preservice teachers (Riley, 1997). These students risk having doors to colleges and new career opportunities closed because they lack required advanced literacy and technical skills now in demand by our technological society. Advanced literacy skills are those that require students to demonstrate a high capacity to think, reason, solve complex problems, and communicate their ideas to others while continuing to learn basic skills. Ongoing support is especially important in environments where pedagogy and technology are being interconnected. National studies report that liberal arts, minority, and low-income students continue to be less likely to have challenging academic courses in their secondary education experience are most likely to need additional support to develop these skills (NAEP, 1996).

Defining Cognitive Literacy

Research on guidelines for preparing students to function in a 21st Century workforce indicates that literacy is being redefined by technology integration in education and this presents new instructional challenges to teacher educators (International Reading Association, 1997; National Council of Teachers of Mathematics, 1989). Because I believe the proposed new definition of literacy is rooted in cognitive science I will use the term *cognitive literacy*. Cognitive literacy defines the process of demonstrating a high capacity to think, reason, solve complex problems, and communicate ideas while continuing to learn new basic skills.

The Problem

The International Society for Technology in Education (ISTE) and the National Educational Technology Standards project (NETS) is leading the nation in making teachers and teacher educators more aware of the need for reskilling in basic computer and technical skills (ISTE & NETS, 2000). During the past few years reports from a number of experts on entering skills and competencies of entering college support findings that some college students may lack advanced literacy skills necessary to master more challenging subject matter have emerged (Levy & Murnane, 1996). Research shows the highest concentration of students lacking rigorous academic skills may be education majors or those planning to enter the teaching profession (ETS Score Reports, 1990-1998). Too often it appears the problem may be deeply rooted in the definition of what it once meant to be literate than it does in students' ability to perform and learn challenging subject matter (National Assessment of Educational Progress Scales/NAEP, 1969-1998). As new technologies continue to transform education, the research suggests our understanding of literacy is being reconstructed by cognitive learning theory (CLT). Sticht and Armstrong (1994) in *Adult Literacy in the United States: A Compendium of Quantitative Data and Interpretive Comments* discuss concise and comprehensive research about literacy and assessment, which led me to reason cognitive literacy may be premised in cognitive science. These findings are reflected in my discussion about methods to instruct, assess, prepare, and improve students' cognitive literacy skills through new instructional strategies and ways of thinking from a more pragmatic view. A primary assumption in this paper is that learning takes the form of both knowledge- and skilled based domains in technology-pedagogy (teaching with technology) and that:

1. Human cognitive systems emphasize the role of knowledge in literacy along with the information processes involved in oral and written language use and reasoning with graphic tools of thought (flow charts, tables, etc.) and
2. Information processing views of learning emphasize the active, constructive nature of cognitive development (including literacy) in social contexts.

The connections between these two approaches may provide new information for policy makers and educators to develop guidelines about the extent of students' needs and how to best meet these needs with programs and new instructional approaches (Herman, Aschbacher & Winters, 1992).

Background

Our research at the University of Cincinnati revealed that the first years in college for new students can be the most critical years of their educational experience. The first years will no doubt be a primary determinant in whether they will remain or join the open-door generation [those who leave without their desired credentials] (U.S. Department of Education Longitudinal Study, *Bachelors and Beyond, 1993-94*). When we consider the shortages projected for teachers in the next century, the potential lack of early success is especially concerning. It becomes more concerning when we reflect on the number of potential teachers lost during the beginning years--the time when students are considering the teaching profession or some other direction.

There is a need to examine the definition of cognitive literacy through technology-pedagogy perspectives and the most effective approach (es) for infusing new instructional strategies into general and specialized academia. These skills are being called the "new basics" (Weitzel, 1999). More importantly to determine which comes first--the knowledge or the skills in connecting technology-pedagogy? or are the two increasingly dependent on the other in new learning environments? The review discusses five issues centered on educators helping college students develop cognitive literacy:

1. Cognitive Literacy in Education
2. Revisiting Literacy Through Cognitive Literacy Perspectives
3. Implications for Restructuring Pedagogy by Focusing on Cognitive Literacy
4. Software for Building Cognitive Literacy Skills

References

Educational Testing Service. (1990-1994). *Scholastic Aptitude Test/SAT Policy Center Summary Reports*. Available: ets.org.

Gardner, H. (1985). Frames of mind. *The theory of multiple intelligences*. Fontana Press. London.

Herman, J.L., Aschbacher, P.R., & Winters, L. (1992) *A practical guide to alternative assessment* (1992). Association for Supervision and Curriculum Development. Alexandria, VA.

International Society for Technology in Education/ISTE, (1997). [Online document]. Available: iste.org

International Reading Association. (1996). *Standards for Reading and Language Arts*. p.4.

Kozma, R.B. (1994). Will media influence learning? Reframing the debate. *Educational Technology Research & Development*, 42(2), 7-19.

Levy, F., & Murnane, R., (1996). *Teaching the new basic skills: Principles for educating children to thrivew in a changing economy*, New York: The Free Press.

Lieberman, D.A. & Linn, M.C. (1991). Learning to learn revisited: Computers and the development of self-directed learning skills. *Journal of Research on Computing Education*. (23(3). 373-395.

National Assessment of Educational Progress Assessments/NAEP, (1969-1998). [Online document]. Available. http://www/nagb.org/about/achieve.html & http://www. nagb. org/about /abt_naep.html

National Council for Accreditation of Teacher Education/NCATE, (1997). Technology and the new professional teacher: Preparing for the 21st century classroom. Washington, D.C.

National Council forTeachers of Mathematics. (1989). *Curriculum and evaluation standards for school mathematics*. Reston, VA: Author.

Prager, C. (1994). *Harmonizing general education programs in career curricula*. Franklin University, Columbus OH. An unpublished paper presented at the 74th Annual Meeting of the American Association of Community Colleges. Washington, D.C.1-8.

Riley, R, W. (1997). *Mathematics equals opportunity.* White paper prepared for U.S. Secretary of Education. U.S. Department of Education. Washington, D.C.

Sticht, T., & Armstrong, B. (1994). Adult literacy in the United States: A compendium of quantitative data and interpretive comments. National Institute for Education. Available: Statistics in adult literacy. http://literacy.nitl.gov. /nitl-family/1997/0354.html

U.S. Department of Labor Secretary's Commission on Achieving Necessary Skills. (1991). *Learning a living. A blueprint for high performance* [Online document]. Available: http://infinia.wpmc.jhu.edu/principles.html

U.S. Department of Education. (1999). Longitudinal Study *-1993-94*) Bachelors and Beyond, The National Center for Educational Statistics/NCES. No. 2000-152.Washington, D.C.

U.S. Department of Labor. (1991). What work requires of schools-*a SCANS report for America 2000.* Springfield, VA. U.S. Department of Commerce. Washington, D.C.

Weitzel, K. (1999). Getting in the technology game. *Learning and Leading with Technology*. 27 (2), 32-35.

Teacher Preparation and Online Learning: Is It Working?

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Abstract: The collaborative exploration, development and implementation of the use of web technology in the UW-Green Bay Professional Program in Education for early childhood students is discussed. This paper begins with a discussion of the origins of this innovative response to the process of teacher preparation, beginning with the award of a 3-year FIPSE Grant to support the vision and ending with the incorporation of distance learning to deliver course content and class contact hours. An overview of the technological issues, problems and glitches is shared, from institutional resistance to software incompatibility to instructional design, as well as the solutions that were used to address them. A summary of what is working, what is not, and why is presented and recommendations for what needs to be done next are made.

Introduction

The University of Wisconsin-Green Bay is committed to providing students in the Education Program with relevant, best-practice environments in which to demonstrate a variety of competencies needed for certification. To achieve this goal, the Education Program is moving toward a teacher preparation model built on collaborative relationships with local school districts, to share and combine the experiences of pre-service students and seasoned practitioners, and to provide earlier, more extensive, and more relevant field experiences for students in preparation. One of the first initiatives to emerge was and innovative response to the national call to reform teacher preparation. The UW-Green Bay Professional Program in Education, in collaboration with public schools and private childcare and family resource programs, was awarded a 3-year FIPSE Grant for the development of an on-site Early Childhood Teacher Preparation Program that matches program competencies with PK-12 school and community needs in a technologically-relevant, community-based model. Pre-service teachers now engage in performance-based learning in community-based early childhood settings where they receive hands-on training in problem-solving, collaborative teaching, and competency-based performance and assessment strategies, learn to develop family-school-community partnerships to increase family involvement, and help provide greater continuity between the early childhood and elementary school years.

The 22-credit program sequence was converted into competency-based outcomes and transformed into on-line "core" offerings. Students now access core content on-line while spending 4 to 6 hours a week in a series of clinical rotations that include infant/toddler sites, nonprofit childcare centers, inclusive childcare programs, public and private preschools, Head Start classrooms, and full-day kindergartens. Competency acquisition is supported by a field-based faculty mentor who models best practice and provides students with ongoing feedback and support. Seminars at the university give pre-service teachers an opportunity to critically reflect on their experiences and problem-solve issues of concern, and a variety of ongoing performance-based assessment tools and techniques are used to measure student learning outcomes as they are reflected in increased knowledge, relevant and appropriate application in real-life settings, and positive changes in learning in the young children they work with.

Technological Implementation

The provision of more intensive and extensive field experiences required the adoption of a web-based format for the delivery of course content. Several software packages written to take advantage of the hypermedia profile common to the World Wide Web were available. Among them, several were designed for general education purposes. From those options, one specific package, WebCT, was selected to translate course material to web-ready form. This initial move to introduce technology into teacher preparation served as a major catalyst for change, beginning a sequence of events that led the institution to create an environment supportive of technology. The University was running its computer operations under the Windows NT version 4 environment and at that time, would not support the Web-based software, WebCT. Working collaboratively with the computer science department, a powerful version of a Linux Operating system was installed on a medium duty desktop computer purchased with grant funds. As expected from typical Universities and IT departments, the non-windows operating system, Linux, was under tight scrutiny with regards to security, reliability, and performance, but the project was allowed to go forward. This computer operated solely as the server for WebCT. Later this server would be networked and accessed by all students registered in the first web-enhanced early childhood course. Two additional education-based courses would use WebCT, but only as a supplement to the traditional delivery of course content. Table 1 illustrates how WebCT was used in these courses.

Table 1

	COURSES		
	Early Childhood	**Math Related**	**Technology Related**
Receive Assignments	Yes	No	Yes
Turn in Assignments	Yes	No	Yes
Read articles on-line	Yes	Yes	Yes
Forum Discussions "chat"	Yes	No	No
Calendar	Yes	No	Yes
Bulletin Board	Yes	Yes	Yes
Threaded Discussions	Yes	Yes	Yes
Audio Examples	Yes	No	No
Video Examples	No	Yes	Yes
Student Note Taking	Yes	No	Yes
Student Web Page	No	No	Yes
Course Image Database	No	Yes	No
Internal Email	Yes	No	Yes

Along with the university's inability to support Web-based software, came issues dealing with the generation and management of simple web page development and the conversion of course documents to web page format. A standards-based curriculum, with clearly defined competencies was designed to ensure pre-service teacher proficiency in all applicable standards and content knowledge, but the instructional design of a web-based course differs substantially from that of a traditional course and campus-based expertise in instructional design did not exist. It became necessary for project faculty to join forces with an alternative degree program on campus with grant funding to begin distance learning for nontraditional learners. Resources were pooled to bring in an outside consultant to provide training in instructional design.

If hardware and software issues were not enough, the human side of technology made the transition of course delivery from traditional to electronic an almost insurmountable task. Educators at all levels, from university faculty to classroom teachers, were feeling national, state and local level pressure to implement newly designed rigorous standards in technology into district curriculums and classroom activities. Effective integration and implementation of technology within a classroom curriculum, however, demands that educators know and understand how to operate the technology effectively, efficiently, and productively. Knowing that proficiency in the use of WebCT should precede the facilitation of student learning using WebCT, and that there was no time to develop proficiency in the use of WebCT and meet grant timelines, it was decided to move ahead. The faculty motto became, "Risk takers initiate change, and we will learn from our failures as well as our successes."

All of these implementation issues – institutional resistance, lack of resources and support, and insufficient training in the use of the software –contributed to the later difficulties that were encountered during the setup, course conversion, maintenance, and delivery of web-based coursework.

Technological Conversion

The journey from traditional to Web-based learning was a rocky one, as faculty and students immersed themselves in the unfamiliar territory of on-line learning. Right from the start there were obstacles and challenges (sometimes referred to as bugs, glitches, software irregularities, lack of technology literacy, etc.) that required adaptation, improvisation, and problem solving to overcome. They too became part of the learning process for faculty and students alike.

An instructional technology specialist and member of the Education faculty was identified to take the lead with respect to technology issues and training. This faculty member had a solid foundation and background in technology literacy, taught a major instructional technology course that all education students were required to take, and had the expertise for software and hardware training. In addition to the teaching and learning components of web-based delivery were other critical areas in which he was highly competent: (a) troubleshooting, (b) testing that deals with the electronic transition of courses, and (c) maintaining and managing the computer server running WebCT.

The first major task of our WebCT Administrator was to develop a strategy to convert and deliver courses from a traditional to a web-based design. The first step was to do research into WebCT. This involved asking questions of people who had experience working with the program, gathering information about web-based learning from numerous resources on the Internet, and visiting the WebCT homepage. Feedback from experienced users was overwhelmingly positive and, as we later discovered, negativity usually stemmed from misunderstanding, lack of experience, or lack of vision. Surprisingly, WebCT could be downloaded from the website at no cost and installed on the computer server, where all of the WebCT elements could be explored by participating staff. Some of these elements included: (a) WebCT access from anywhere in the world using the internet browsers such as Netscape Navigator and Internet Explorer, (b) uploading of files of many types from remote computers, and (c) WebCT course maintenance from remote computers. Additionally, users had the ability to browse, download, and print assignments and other course material, submit electronic mail within WebCT to other members and instructor(s) of the course, and browse a calendar of events that they can edit for their own use. Students were also able to browse digital images, listen to audio clips, and even view video clips. WebCT more than satisfied the on-line learning strategies and outcomes needed to effectively teach course content online.

The next step was to thoroughly explore the operation and procedures within WebCT and form some type of logical process for the production of the on-line courses. After testing and analyzing the program, a list of tasks was generated that needed to be accomplished before and after an enhanced course was set into *live* status. Before the course goes *live,* electronic text files that were formatted for HTML (Hypertext Markup Language) file type needed to be created. These files included course syllabi, assignments, articles to read, lectures, and audio clips. Once formatted for Html, the files could then be loaded onto WebCT.

Throughout the process of preparing the courses for web-based delivery, obstacles were identified in three major areas: converting electronic course components from non-html form to html, converting hard copy course components to electronic html documents, and local and network file management. The pros and cons of these three areas are discussed below.

Converting Non-HTML Electronic Course Content to HTML (Hypertext Markup Language)

The course content for all three courses consisted of computer generated media such as documents created in word processing, spreadsheet, and presentation formats, as well as hard copy media such as copies of articles, worksheets, and "passed down" curricular material. The hard copy media required a much more difficult process of digital conversion and will be explained following this section.

Word Processing Documents: Most of the major "brand name" word processors could convert documents into html form but did so at a cost. At a minimum, they added "garbage or extra baggage consisting of html code and JavaScript to the main document code to increase document efficiency and cross platform and cross browser uniformity. In the case for the three courses, this "baggage was not necessary and tended to add potentially serious formatting problems within high-end web-based programs such as WebCT. If the word processing software had worked as intended, then the traditional course documents along with special formatting such as attributes like bold, text color, etc., along with tables and graphics, would have transferred efficiently and in a seamless manner. This "easy" method was not the case for this project and would involve a little more work and some recreation of certain aspects within documents. Before the document conversion could occur, a suitable software application, which would not require a large learning curve, needed to be identified and taught to each WebCT instructor. Two designated software packages, Microsoft FrontPage and Netscape Composer were found to satisfy the requirements of only writing the necessary background html code that would be compatible with the two major browsers and system platforms. The first step was to save the original document as "text only" which would strip the document down to plain text with no attributes including no tables, tabs, or columns. The next step was copy the text into a blank html document. Once the text was within an html environment, the process of converting the document continued until all attributes were assigned including font type, size, color, indentation, etc. Tables and graphics were lost in the text translation and needed to be recreated and/or imported back into the html document. The number of columns, graphics, and tables corresponded directly with the amount of time and effort needed to convert a document.

Spreadsheets: Any documents created in a spreadsheet environment had to be recreated using tables within an html environment. Text and graphics needed to be added in the same manner as the document conversion for word processing.

Presentation software: The conversion to html for presentation software was the easiest and quickest to accomplish due to the unique and extremely powerful built-in html conversion feature. This feature simply created a graphic image of each entire page and created an multi-page html document complete with hyperlinks, JavaScript, and navigation buttons.

Converting Hard Copy Course Components to Electronic HTML Documents

This process dealt with scanning hard copy documents and then utilizing an OCR (optical character recognition) process to covert the document to contain editable text. This process can prove to be a very time consuming process and required some considerable problem solving techniques to overcome. The main reason that we had to scan documents was because we did not have the original document in electronic form. Some of the trouble spots dealt with the original document to scan. If the document was in good condition, contained only 1-3 continuous columns, and no graphics, then the scanning and OCR process was efficient and effective. Unfortunately, most of the documents contained multiple, non-continuous columns with tables, graphs, and other graphic images. These presented major problems in the scanning and OCR process and created a very labor-intensive project. One solution was to scan an entire page as an image and then create links to the image or create image documents. While this proved to a viable and efficient option when the WebCT course was accessed on campus, it proved to be a frustratingly slow process from the students typical home computer where download speeds are extremely slow in comparison. It was decided not to use this option and were forced to succumb to the labor-intensive alterative of scanning and converting text, column by column, scanning graphics one at a time, and then literally cutting and pasting and recreating new documents that resembled the originals. It was realized that once a document was finished, it could be used again for future courses, but the overall choice was to keep non-electronic original documents to a minimum.

File Management

File management deals with two areas, local on the users own workstation, and over a network either a LAN (local area network) or WAN (wide area network). Additionally, this topic was one of the most important elements for the conversion of course materials and working within the WebCT environment. In fact, file management turns out to be the single most important reason, both positively and negatively, why people and educators carry such a high level of anxiety about using technology. The project quickly made good file management practices relevant and necessary because of the potential loss of data, accidental overwritten files and "updated" versions of documents being mistaken for other documents. Strategies were quickly put into place to ensure that all converted documents and traditional course documents were kept separate. Additionally, the WebCT program required course instructors to upload all course material into a built in "file manager" where they would be linked to specific course areas within the WebCT course modules. The easiest and most efficient way to organize files and folders was to create and maintain duplicate file and folder structures on local workstations and within the WebCT "file manager" environment. Besides local (user workstation) file management, network file management became extremely important because not all software and hardware was located locally, meaning that users were required to import and export files from non-local workstations to workstations used to upload files into the WebCT environment.

Technological Delivery

The WebCT project proved to be a success as educators took the challenge of converting traditional course content and documents into html documents that would serve in a web-based environment. Within the teaching realm, instructors and students faced numerable challenges throughout the first semester dealing with low student proficiency in technology, software incompatibility , problcms with access to the internet, limited student contact time, perceptions of interaction or lack of it, lack of backup plans when the server went down, and frustration in learning a new mode of content delivery. Most of these challenges were minimized or eliminated after the first semester with university conversion to the NT system, university-wide support for WebCT, and increased faculty experience in managing a web-based course. Despite recurring obstacles, the long-term positive outcomes far outweighed these initial issues, and the project served as a major catalyst for change in the students level of technological proficiency, in the use of technology in the Education Unit and other units across campus, and in the level of support provided at the university level.

Results

Program effectiveness was assessed through survey data collected on: (a) the use of technology to deliver content; (b) student comfort level and perceptions of success; and (c) student and instructor evaluations. Student evaluations were completed after each "core" offering, and final program evaluations were sent to pre-service students near the end of their student teaching experience. Faculty evaluations were completed by all instructors at the end of the 3 year project.

The positive features identified by the faculty and students were substantial. Faculty believed that web-based course delivery has the potential for high-level interaction, with instructors having the opportunity to track the cognitive processing and conceptual development of all of their students and correct faulty inferences before they escalate. Student complaints of insufficient availability were accurate but stemmed from unaddressed issues of workload. A 3-credit online course requires substantially more time if it is to be sufficiently interactive than does a course delivered in the traditional manner.

Flexibility in delivcry and access was viewed positively by faculty and students alike, but there were differing perspectives on the issue of self-responsibility for one's learning. Students needed to complete weekly assignments within a designated timeline in order to participate in weekly chat or discussion groups. This requirement was a mismatch for the traditional "cramming before the test" model that many college students opt for. Faculty viewed this as an opportunity for students to develop or strength personal responsibility skills, but many students found it difficult to adapt. Faculty also noted that there were opportunities for frequent feedback and review via email, the bulletin board, chats, and quizzes. In addition, the model was seen to support the provision of more relevant performance-based settings with mentoring support.

In the area of technology use, information was gathered on the variety of technological components and strategies used within WebCT, flexibility in the use of the medium to adapt the delivery model to diverse student populations, and pre and post-survey data on technology knowledge, skills and attitudes. Pre and post-survey data on technology knowledge, skills and attitudes over the 3 years of the grant, reported significant gains for students across all areas, and by the third year, 67% of Education students reported having taken a web-based or web-enhanced course by the second semester of their professional studies. Student comfort levels with technology, as well as their perceptions of success, as measured by course evaluations, also increased significantly for all course offerings across the 3 years of the grant. All instructors reported trying all the components available within WebCT, and, except for issues of workload, found them all to support the learning process. No data was reported on adaptations because of the absence of student requests.

Most of the issues, obstacles, and concerns were addressed earlier in the article. Additional concerns expressed in faculty and student feedback included: (a) institutional, faculty and student resistance, (b) TIME ,TIME, TIME (instructional design, student contact, backup plans, communication among partners), (c) a lack of models to assess pedagogy, (d) the difficulties involved in scheduling and communicating with students in the field, (e) the critical need for the mentor component and the lack of institutional support for the workload issues, (f) the provision of more training for faculty in how to facilitate and support interaction in a web-based course, and (g) the need for a multimedia lab in the education unit for training.

Conclusions

On the strength of our data, the following recommendations are made and have important implications for the future success of online learning and teacher preparation.

- Institutional resistance must be addressed and new faculty roles defined.
- Issues of workload must be reexamined within the existing "course-for-credit" structure of higher education.
- Universities must provide strong, ongoing training and support for online teaching.
- If student learning is to become performance-based in intensive field settings, a mentoring component must be established along with online course delivery. It is a critical component.
- A variety of "models" for providing mentoring support need to be explored, beginning with a redefinition of "teaching" across all educational systems.

Across the nation, the major force driving change in educational systems is technology. Distance learning is here to stay. In the area of early childhood, there is a national effort to increase both the quantity and quality of early childhood providers. Professional development continuums and articulation initiatives are being established at the state level to move this population into higher education. Early childhood staff and directors affiliated with the new apprenticeship programs, working in Head Start programs, or accessing scholarship funding with work requirements, will find online teacher education courses an attractive and accessible option for pursuit of a degree. In other areas of education, federal Title II guidelines for teacher preparation require more extensive and intensive field experiences, again making a web-based or web-enhanced model a desirable alternative for delivering course content. Institutions must create campus environments that attract and support technologically driven change in teacher preparation.

References

Becker, H.J. (1999). Internet use by teachers: conditions of professional use and teacher-directed student use. *Irvine, CA: Center for Research on Information Technology and Organizations.*

Bergen, D. (1999-2000, Winter). Technology in the classroom. *Childhood Education, 76, (2),* 116-118.

Clark, R.C., & Lyons, C. (1999) Using web-based training wisely. *Training, 36, (7),* 51-56.

Clow, K.E. (1999). Interactive distance learning: impact on student course evaluations. *Journal of Marketing Education, 21, (2),* 97-105.

Cornell, R. (1999). The onrush of technology in education: the professor's new dilemma. *Educational Technology, 39, (3),* 60-64.

Frances, C., Pumerantz, R., & Caplan, J. (1999, August). Planning for instructional technology: what you thought you knew could lead you astray. *Change, 31, (4),* 24-33.

Maddux, C.D., Cummings, R., & Torres-Rivera, E. (1999). Facilitating the integration of information technology into higher education instruction. *Educational Technology, 39, (3),* 43-47.

Means, B.k & Golan, S. (1998). Transforming teaching and learning with multimedia technology. *San Jose, CA: Joint Venture Silicon Valley Network.*

Mergendoller, J.R. (2000). Technology and learning: a critical assessment. *Principal, 79, (3),* 5-9.
Teaching, Learning and Computing. "Snapshot # 4. Technical and Instructional Support for Teachers."
www.crito.uci.edu/tlc/findings/snapshot4/left_zeromargins.html

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First Things First: Addressing Teacher Concerns Toward Technology

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Abstract: Many teachers, especially more experienced teachers, have been unable to find effective ways to use technology in their classrooms. One possible explanation for this lack of success is that the use of technology in the classroom has been viewed in terms of simple skill acquisition instead of as a change process that affects the behavior of individuals on a very profound level. This study analyzed the concerns of PK-12 teachers (n=659) toward the use of instructional technology using the Stages of Concern Questionnaire. Results indicate that the highest two stages of concern for the respondents reflect intense, personal, lower level concerns along with a desire to learn from what other teachers know and are doing. The lowest stage of concern for the aggregate data indicates that the respondents have minimal to no concerns about the relationship of students to the use technology.

Introduction

The ultimate goal of instructional technology integration into PK-12 education is improved student achievement, but teachers must view technology in a positive manner, be comfortable with the technology, and use it effectively before improved student achievement can occur. Teacher technology training frequently produces less than desirable effects for a number of reasons including lack of time, funds, and direct connection of the technology training to the curriculum. As a result, the effect of technology on classroom instruction frequently fails to live up to its potential.

Even teachers who hold positive attitudes toward technology may have difficulty transferring these attitudes into actions. Millions of dollars have placed technology in PK-12 classrooms, but there has been considerably less attention paid to helping teachers make the transition into a technology-rich learning environment which would, in turn, impact student learning (National Center for Education Statistics, 1999). As greater numbers of technology installations occur in schools, the demands on classroom teachers to integrate technology into instruction increase. Many teachers, especially more experienced teachers, have been unable to find effective ways to use technology in their classrooms (Smerdon, Cronen, Lanahan, Anderson, Iannotti, Angeles, & Greene, 2000). One possible explanation for this lack of success is that the use of technology in the classroom has been viewed in terms of simple skill acquisition instead of as a change process that affects the behavior of individuals on a very profound level.

Fuller (1969) and Hall (1978) conducted studies on teacher concerns toward innovation which resulted in the development of theories regarding change. Frances Fuller theorized that preservice teachers were preoccupied with concerns about self, task, and impact. Hall, Wallace, and Dosset (1973) discovered those three sequences of concern were present when inservice teachers faced implementation of innovations. Hall's hypothesis specifies seven stages of concern through which individuals progress when something new is introduced into their environment. The stages of concern (from lowest to highest levels) include Awareness (0), Informational (1), Personal (2), Management (3), Consequence (4), Collaboration (5), and Refocusing (6).

Ultimately, the Concerns Based Adoption Model (CBAM) was developed and has become a change model widely used by those individuals planning for staff development accompanying any educational innovation. Hall and Hord (1987) stressed the relevance of information regarding individuals impacted by the change. Personal comfort with instructional technology is essential to an individual's concern with its implementation and impact (Martin, 1989). According to Hall (1976), an individual's concerns directly affect performance; and since concern levels correspond with levels of performance, lower level concerns must be removed before higher level concerns can emerge.

The Study

The following research question was investigated: What are technology using teachers' concerns about instructional technology as measured by the Stages of Concern Questionnaire? The question was answered using the theoretical basis of the Concerns Based Adoption Model (CBAM) (Hall, Wallace & Dorsett, 1973). CBAM is a research-based framework that explains the process individuals follow as they undergo the process of change. The Stages of Concern Questionnaire is designed to capture teachers' current concerns about adopting such an innovation, in this case instructional technology.

Respondents (n=659) were PK-12 teachers, including at least two respondents from each of the 50 states, who currently use instructional technology in some form related to their teaching. All transactions were electronic. The survey was provided to respondents on the Internet; email was used to transmit the responses. The sample was purposively selected from PK-12 teachers who subscribe to four email lists. Demographic information is seen in Table 1 below.

Variable	*n*	percent
Grade Taught		
PK-K	26	3.9
1-3	140	21.2
4-6	140	21.2
Middle School	120	18.2
7-9	23	3.5
7-12	69	10.5
10-12	141	21.4
Highest Degree Earned		
Bachelors	245	37.2
Masters	204	31.0
Specialist	182	27.6
+30 hours	24	3.6
Doctorate	4	0.6
Years Teaching Experience		
0 - 5 years	102	15.5
6 - 10 years	120	18.2
11 - 15 years	108	16.4
16 - 20 years	98	19.0
21 - 25 years	103	15.6
over 25 years	128	19.4
Hours of Technology Training Received in the Past Year		
0-30	334	50.7
31-50	129	19.6

51-70	59	9.0
+70	137	20.8

table continues

Variable	*n*	percent
Home Computer		
yes	619	93.9
no	37	5.6
missing cases	3	.5
Classroom Computer		
yes	629	95.4
no	28	4.2
missing cases	2	.3
Length of Technology Use		
0-3 months	13	2.0
3 months - 2 years	67	10.2
2 years - 3 years	70	10.6
over 3 years	505	76.6
missing cases	4	.6
Time for Technology Training/Preparation Provided During School Hours		
yes	210	31.9
no	449	68.1

Table 1: Respondent demographics.

The Stages of Concern Questionnaire (SoCQ) uses a Likert scale response format to measure seven hypothesized stages of concerns individuals have toward implementing change. The questionnaire contains 35 statements (five statements for each stage) that allow respondents to describe a concern they currently feel on a scale of 0 to 7. A response of 0 indicates a very low concern; a rcsponse of 7 indicates a very high concern.

The Stages of Concern Questionnaire was originally validated in 1979 (Hall, George, & Rutherford) and has been validated numerous times since its creation as it has been used in many studies over the past 20 years. Cronbach's alpha was used to establish the instrument's internal validity, with a sample (n=830) of teachers involved in team teaching and professors concerned about innovation. A sub sample (n=132) participated in a test-retest of the instrument over a 2 week period. Alpha coefficients ranged from .64 to .83, and the test-retest correlation ranged from .65 to .84, indicating the internal consistency and stability for each of the seven stages (Hall et al., 1979).

The Stages of Concern Questionnaire was converted to hypertext markup language and placed on the Internet. Email messages were sent to mailing list and listserv managers, asking them to share the URL for the online instrument with their participants.

Findings

One way of looking at group concerns is to aggregate individual data by developing a profile that provides the average scores for each stage of thc individuals in a group. Participant responses on the SoCQ were initially analyzed using SPSSX (Statistical Package for the Social Sciences). Mean scores were plotted following the procedures outlined by Hall, George, and Rutherford (1998) using the SoCQ Quick Scoring Device. Typically, the group averages reflect the dominant high and low Stages of Concern of the entire group. The highest two stages of concern were analyzed along with the lowest stage of concern.

The raw score for each of the seven scales is the sum of the responses to the five statements on that scale. The mean scores for each item were computed for each item. The mean scores were converted to percentile scores in order to interpret the results. The percentiles are represented graphically in Figure 1.

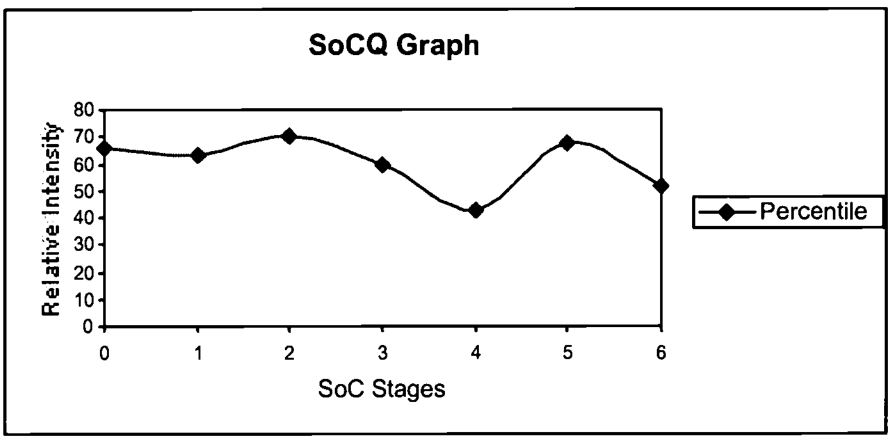

Figure 1: Graph of the percentiles for each stage of concern.

Interpretation of the scores is based on guidelines contained in *Measuring stages of concern about the innovation: A manual for use of the SoC Questionnaire* (Hall, George, & Rutherford, 1998). The highest stage of concern for the aggregate data was Stage 2. A high Stage 2 indicates an intense personal concern about instructional technology and its consequences for the respondents on a personal level. Though these concerns reflect uneasiness regarding technology, they do not necessarily indicate resistance to technology. Personal concerns deal with what Fuller (1969) calls self concerns. A high Stage 2 score indicates ego-oriented questions and uncertainties about technology. Individuals at this stage reflect high concerns about the status, reward, and potential or real effects of technology. Individuals with intense personal concerns may, in effect, operationally block out more substantive concerns.

The second highest concern was Stage 5. This stage reflects strong concerns about working with colleagues in coordinating the use of technology. The high Stage 5 typically indicates great concern about coordination with others in relation to the innovation. Since Stage 1 is also moderately high, it may be that these respondents have concerns about looking for ideas from others, reflecting more of a desire to learn from what other teachers know and are doing. The low stage of concern for the aggregate data was Stage 4. A low Stage 4 indicates that the respondents have minimal to no concerns about the relationship of students to the use of the innovation.

Conclusions

These results indicate that the intense, personal concerns of teachers may have been sacrificed as emphasis has been placed on student achievement. If it is desirable for teachers to be concerned with the application and use of technology with and for students, teachers' personal concerns must be addressed first. Concerns about innovations appear to be developmental in that earlier concerns must first be resolved (lowered in intensity) before later concerns emerge (increase in intensity). If these early concerns toward technology remain intense, teachers may even attempt to discontinue its use, in order to reduce the intensity of these concerns.

Administrators and trainers hoping to positively impact student learning through use of instructional technology first need to provide a clear demonstration of how the use of instructional technology tools can address the personal concerns of teachers. Use of a concerns-based training model rather than a skills-based training model is one method for addressing attitudes and feelings that may be inhibiting teacher use of technology. This finding supports those of Fuller (2000) who found that teacher technology support is more critical to student use than direct student support in a school. She also found that teachers who receive adequate, personal support for the use of technology tend to have students who use technology more and use it more effectively.

It is critical to note that another person cannot simply manipulate higher level concerns development. Holding and changing concerns is an individual matter. However, timely provision of experiences and resources can assist with concerns arousal and resolution, encouraging the development of higher level concerns. Providing training or other interventions that are not aimed at the appropriate concerns (e.g., attempting to force high level concerns) is an almost certain way to increase the intensity of lower, less desirable stage concerns. Training must target the individual concerns of teachers before moving on to concerns of how others, even their own students, will use the available technology.

Results also indicate a strong curiosity for increased information as to how other teachers are using technology. Although the demographic data indicates that computers are readily available to the majority of the respondents and that a substantial number of hours have been spent in technology training efforts, about two-thirds (68%) of the respondents indicated they are given no time during the school day to practice what has been taught. McKenzie (2000) says that making solid change with regard to the use of instructional technology necessitates time away from the "daily press" of teaching. Providing additional professional development opportunities for technology training should enable sharing and interaction among peers, not just with a trainer.

Despite millions of dollars invested in hardware and software, many teachers are still very uncomfortable with the use of instructional technology in their classrooms. Administrators under pressure to improve student performance are frequently reluctant to address teacher concerns, thus thwarting efforts to accomplish their goals.

From the perspective of concerns based theory, institutionalization of an innovation only occurs when a majority of the individuals within the target group have resolved (lowered) their concerns on Stages 1, 2, and 3. In order for any innovation to become a vital, lasting part of that institution, high intensity Informational, Personal, and Management concerns must be resolved. (Hall, George, & Rutherford, 1978). The results of this study indicate that this institutionalization has not occurred. "If these early concerns remain intense, then the user is apt to modify the innovation or their use of the innovation, or perhaps discontinue use, in order to reduce the intensity of these concerns" (p. 13). Administrators and trainers seeking to make technology an integral part of teaching and learning first need to provide a clear demonstration of how the use of instructional technology tools can address the personal concerns of teachers.

References

Fuller, F.F. (1969). Concerns of teachers: A developmental conceptualization. *American Educational Research Journal, 6*, 207-226.

Fuller, H.L. (2000). First teach their teachers: Technology support and computer use in academic subjects. *Journal of Research on Computing in Education, 32*(4), pp. 511-535.

Hall, G. (1976). The study of individual teacher and professor concerns about innovations. *Journal of Teacher Education, 27*(1), 22-23.

Hall, G.E. (1978). *The study of teachers' concerns and consequent implications for staff development.* Austin, TX: Research and Development Center for Teacher Education, The University of Texas.

Hall, G., George, A., & Rutherford, W. (1979). *R & D Report No. 3032.* Austin, TX: University of Texas, Research and Development Center for Teacher Education, The University of Texas.

Hall, G., George, A., & Rutherford, W. (1998). *Measuring stages of concern about the innovation: A manual for use of the SoC Questionnaire.* Austin, TX: Southwest Educational Development Laboratory.

Hall, G., George, A.A., and Rutherford, W.L. (1978). *Stages of concern about the innovation: The concept, verification, and implications.* Austin, TX: Southwest Educational Development Laboratory.

Hall, G., & Hord, S. (1987). *Change in schools: Facilitating the process.* Albany, NY: State University of New York Press.

Hall, B., Wallace Jr., R.C., & Dosset, W. A. (1973). *A development conceptualization of the adoption process with educational institutions.* Austin, TX: Research and Development Center for Teacher Education, The University of Texas.

McKenzie, J. (2000). Making good change happen. *FromNowOn. 9* (10). Retrieved November 2, 2000 from the World Wide Web: http://www.fno.org/jun00/goodchange.html

Martin, J. B. (1989). *Measuring the stages of concerning the development of computing expertise.* Unpublished doctoral dissertation, University of Florida, Gainesville.

National Center for Education Statistics (1999). *Toward better teaching: Professional Development in 1993-94.* United States Department of Education, Office of Educational Research and Improvement.

Smerdon, B., Cronen, S., Lanahan, L. Anderson, J., Iannotti, N., Angeles, J., & Greene, B. (2000). *Teachers' tools for the 21st century: A report on teachers' use of technology.* Washington, D.C.: U.S. Department of Education, National Center for Education Statistics.

Technological Tools and Mathematical Guided-Discovery

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Abstract: Using technological tools to guide mathematical discovery is a relatively new adventure. Graphing calculators, dynamic geometry software, and spreadsheets are powerful and adaptable technological tools to create engaging guided-discovery activities for diverse backgrounds of middle and secondary students whether the to-be-discovered objects are concepts, generalizations, algorithms, heuristic problem-solving strategies, or something else. This paper shows how to use these technological tools to manage mathematical guided discovery so that the intended learning takes place with relative certainty within an appropriate amount of instructional time. A final premise is that the *process of discovery* is at least as important as what is to be discovered, since learning by discovery promotes understanding, learning to discover, problem solving, independent thinking, and life-long learning.

Teaching by discovery is probably as old as formal education itself given that its origins can be traced as far back as 430- 320 B.C. to Plato and Socrates. Nonetheless, discovery learning, guided or otherwise, using technological tools such as graphing calculators, spreadsheets, or dynamic computer software is a relatively new teaching adventure! Depending upon the age and mathematical background of the students engaged in selected guided-discovery activities, the objects to be discovered can vary - e.g., concepts, generalizations[1], algorithms, heuristic problem-solving strategies[2], or whatever. TI-83 graphing calculators (Texas Instruments, 1996) , CABRI Geometry II software(Laborder, and Franck. (1994-1997) , and Microsoft@ Excel spreadsheets, for example, are technological tools that can be used to create high fidelity mathematical settings in which students are able to discover enhanced significance for mathematical concepts such as - ***independent variable***, ***dependent variable***, ***function***, ***regression line***, ***expected value***, ***residual***, and ***symmetry of power functions***. The use of such tools is highly recommended since they facilitate discovery, managing it with relative certainty in estimable amounts of instructional time. This paper illustrates how to engage students in mathematical guided discovery activities with the use the tools and demonstrates the stages of discovery in technological setting which like those in other settings, and note that sensitivity to the learners' reactions, familiarity especially, is critical to producing positive results. This paper advocates appropriate infusions of emerging technology into mathematics instruction and offers its approach as an example of how it might be done[3].

The events of guided discovery seem to fall into five sequential stages, not necessarily mutually exclusive, which we call: **The Relax and Get Ready Stage; The Exploring Instances Stage; The Exchange Emerging Views Stage; The Information Gathering Stage**; and **The Review and Summary Stage**[4]. These stages provide a guide for dialogue between teacher and learners that elicits genuine discoveries of mathematical concepts or generalizations as illustrated in the activities that follow. The first activity (refer to **Activity 1**) is entitled ***Why Worry About Spilled Ink? Measure It!***. This activity

[1] See pages 60 to 65, and page 176 in: Cooney, Thomas J., Edward J. Davis, and Kenneth B. Henderson. *Dynamics of Teaching Secondary School Mathematics*. Boston: Houghton Mifflin Co., 1975 & 1983. ISBN: 0-88133-061-2.

[2] George Polya states, "Thus, a teacher of mathematics has a great opportunity. If he fills his allotted time with drilling his students in routine operations he kills their interest, hampers their intellectual development, and misuses his opportunity. But if he challenges the curiosity of his students by setting them problems proportionate to their knowledge, and helps them to solve their problems with stimulating questions, he may give them a taste for, and some means of, independent thinking." See page v in: Polya, George. *How to Solve It*. Princeton, New Jersey: Princeton University Press, 1945, 1957 (2nd Ed.), & 1973. ISBN: 0-691-02356-5

[3] The National Council of Teachers of Mathematics has stated, A the study of algebra is bound to change dramatically with the infusion of currently available and emerging technology" (1996); this, indeed, is occurring more generally.

[4] See the **Phases of Learning** in the van Hiele model pages 5 and 6 in: *Learning and Teaching Geometry, K-12: 1987 Yearbook*. Mary Montgomery Lindquist (1987 Yearbook Editor) and Albert P. Schulte (General Yearbook Editor). Reston, Virginia: National Council of Teachers of Mathematics, 1987. ISBN: 0-87353-235-X

educes relatively young learners[5] to face new situations with a spirit of inquiry that promotes exploration, collection of data, analyses of the data, and the use of technology to investigate relationships among objects. The second activity (refer to **Activity 2**)[6], entitled ***Symmetry of Power Functions*** shows how technological tools might facilitate and simplify discovery. Both activities advance the idea that technological tools in guided discovery activities promote learning to discover.

In both activities, the initial stage calls for the teacher and students to engage in conversation and activity related to the ultimate intended discovery; but not necessarily work required for the discovery to occur. The work done here is simply for the ***purpose*** of having the learners **Relax and Get Ready**. It can be done in a playful, attention-getting manner, yet include low-stress discovery related work. The teacher's solicitations for actions should help students relax and get ready for the process of discovery. In the ***Spilled Ink*** activity (refer to **Activity 1**), for example, the teacher might ask, "What is a blob?... The diameter of a blob?... The average diameter of a blob?". The teacher could direct students to practice making blobs with their medicine droppers. Then students may be asked to practice making a blob with one drop, then a blob with two drops. They could continue making blobs, for practice until the teacher notices that "blob-making" has been mastered! In the second activity, the **Symmetry of Power Functions**, the teacher may simply ask the students to graph functions, not necessarily power functions, on a TI-83 graphing calculator. If necessary, however, the teacher might "talk students through" the graphing of functions such as $y = (x+3)(x+2)$ or $y = (x+3)(x-3)$ and invite individuals to graph derivations or variations of these. If opportunities arise naturally, leading questions may be introduced such as, "You noticed the graph shift, what type of shift did it make?... Can you make the function graph shift again?... Up?... Left?... Can you predict the shift?... Control it?". If symmetry is noted, "Is it line symmetry? With respect to which line? Which axis, the y-axis or x-axis?... Is there rotational symmetry? About which point?". The purpose of these instructional moves is twofold: (1) the teacher encourages the students to relax and to be cognitively ready with knowledge and skills required of the activity; and (2) the students accustom themselves to what direction further study will take. For **Activity 1**, although students can be asked to turn their graphing calculators on at this time if applicable to review certain procedures[7], such can also be delayed until necessary.

During the *second stage* or **The Emerging Views Stage**, level-specific vocabulary related to the discovery objectives is introduced to the extent necessary as students explore characteristics of instances of data samples collected through materials that the teacher has carefully sequenced (e.g., diameter of circular blobs in the ink activity, or as they make graphs and explore characteristics (symmetries) for even and odd power functions in the ***Symmetry of Power Functions*** activity. The sequence of instructional moves[8] becomes more focused and formal and should gradually reveal to the students that instances within the guided-discovery activities are leading towards stable, observable patterns (e.g., the number of drops used to form blobs influences the size of the diameter; the symmetry of specific even and odd functions are indicating particular types of symmetry). Thus, many of the activities during this phase will be organized as sequences of short tasks designed to elicit specific responses.

In stage three, **The Exchange Emerging Views Stage**, drawing fro m their mathematical backgrounds, students build upon previous experiences as well as on their explorations of instances that embody the relationship between the number of drops required to make a blob and its diameter in **Activity 1**, or the kinds of symmetry found in even or odd functions in **Activity 2**. Students should be permitted to express and exchange their emerging views about the structures or patterns that have been observed. Other than to assist students with use of appropriate and accurate language (Vygotsky, 1978), plus correct uses of the technological tools, the teacher's role is minimal. It is during this phase that the notion of relations (e.g., independent variable, dependent variable, function, line symmetry, rotational symmetry) begins to become apparent.

Next, in phase four or **The Information Gathering Stage**, as information is gathered (e.g., varied and specific graphs) students encounter more complex tasks, possibly tasks with many steps (especially in using TI-83 graphing calculators), or tasks that can be completed in several ways, and they respond to convergent as well as open-ended questions.

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[5] Intended for grades 6 to 8.

[6] Intended for grades 8 to 12.

[7] Students may or may not have had previous experiences with graphing calculators in general, or TI-83's in particular. Some assessment of students' prerequisite technology related knowledge and skills is warranted.

[8] Instructional moves include such things as: assertion, exemplification, non example, counterexample, comparison and contrast, characterization, motivation, instantiation, non instance, counter instance, analysis, interpretation, justification, review, paraphrasing, pattern generation, analogy, demonstration, practice, and so on. The Cooney, Davis, and Henderson text *Dynamics of Teaching Secondary School Mathematics* incorporates these and makes use of them in designing instructional, teaching-learning strategies.

By orienting themselves in the field of investigation, many relations between the objects of study become explicit to the students. Extensions might surface, as well as associations to other topics in mathematics.

In the fifth and last stage, **The Review and Summary Stage**, students review and summarize what they have learned with the goal of forming an overview of the new network of objects and relations. The teacher can assist in this synthesis "by furnishing global surveys" of what the students have learned. It is important, however, that these surveys not present anything new, the emphasis being on the attainment of psychological closure. The relations that have emerged would be summarized and their origins reviewed. At the end of this phase, students have attained a new level of thought. The new domain of thinking replaces the old, and students are more appreciative of learning via guided-discovery. Technological tools can structure and facilitate movement through these stages and the learning of the objects selected for discovery. Using such tools is thus highly recommended!

Activity 1: Why Worry About Spilled Ink? Measure It!

Introduction: In this activity, intended for 6th-8th grade students, the diameter of a blob is studied in relation to the number of drops. Collecting the data for this experiment works best if students use a double layer of paper towels. Using medicine droppers, they should try to make small "ink" drops of equal size in about the same location away from the edge of the towels and away from where the towels have creases. Blobs should be measured as soon as the "ink" finishes spreading. Some blobs will be somewhat elliptical but not circular; take an arithmetic average of the largest and smallest diameters to provide usable data. If the "ink" blobs are made and measured carefully, the data form a discoverable pattern. This activity lends itself very well to a mathematical guided discovery lesson given that students generate data physically, and probably have little reason to know what it will look like. The stages for mathematical guided-discovery have been laid out below, but recall that they are not necessarily mutually exclusive from one another. Nonetheless, the point to be made is that the technological tools play a key role in the discoveries that will be made, specifically in that the technological tools facilitate the discoveries, and even make them more explicit!

Equipment Needed: Ink or colored water, food coloring, paper towels (quality brown & smooth, not especially absorbent towels), one ruler per group of four, and one medicine dropper per group. A TI-83 Graphing Calculator or Excel spreadsheet.

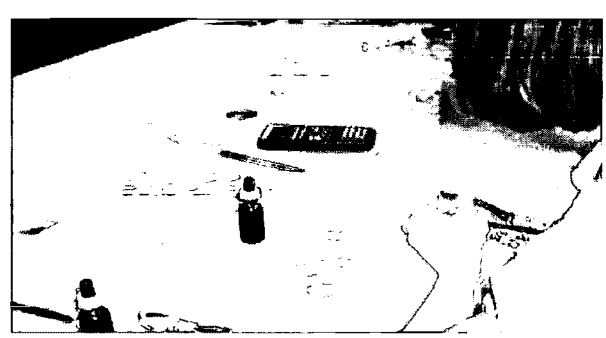
Mathematical Guided-Discovery Stages

A. The Relax & Get Ready Stage

Have students practice making blobs using the medicine droppers.

B. The Exploring Instances Stage

Have students determine whether a blob is circular or non-circular elliptical.
Have students determine when the average of the smallest and largest diameter should be determined.
Have students measure the diameter of a blob made with one drop.
Have students measure the diameter of a blob made with two drops.
Continue until blobs have been made with six drops.



C. The Exchange Emerging Views Stage

Record the findings in a table in the respective rows and columns where the independent variable is the number of drops to make a blob and the dependent variable is the diameter of the blob.

Graph the data using the STAT function of a TI-83 graphing calculator or using an Excel spreadsheet.

D. The Information Gathering Stage

Graph the curve that best fits the data using technological tools.
Suppose 11 drops were to be used, what would be the diameter of the formed blob?
How many drops would be needed to form a blob with a diameter of 80 cm?
How many drops would be needed to form a blob with a diameter of 95 cm?
How would the graph change if larger drops were to used?

E. The Review and Summary Stage

Have the students explain the process of discovery, their findings, and their conjectures regarding the relationship between the variables explored. Have the students write a generalization regarding the relationship between the number of drops needed to make a blob and the measure of its diameter, or the average of the smallest and largest diameters.

Activity 2: The Symmetry of Power Functions

Introduction: In this activity, intended for 8th-12th grade students, the symmetry of power functions is studied in relation to the exponent (even or odd) of a power function. Collecting data for this experiment works best by graphing functions in the order listed below using a TI-83 graphing calculator, then analyzing the graphs of the functions, and analyzing the TI-83 graphing calculator TABLE output when appropriate. The questions that follow direct students to arrive at discoveries regarding symmetries of power functions. By using the TI-83 graphing calculator as guided, the learners are able to focus on the varying characteristics between graphs without spending enormous time drawing less than "perfect" or "near perfect" graphs[9], specifically regarding symmetry (if any). The mathematical guided-discovery stages as depicted below purport to draw distinctions between stages of work and thought processes as also suggested by The Van Hiele Model of Thinking in Geometry Among Adolescents (NCTM, 1988). Again, the stages are not necessarily mutually exclusive, but do lead to psychological closure as per the discoveries.

Mathematical Guided-Discovery Stages

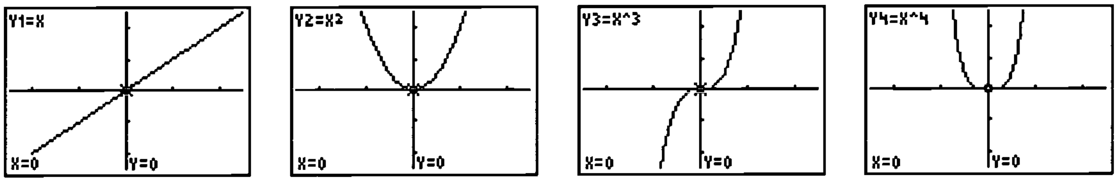
A. The Relax and Get Ready Stage

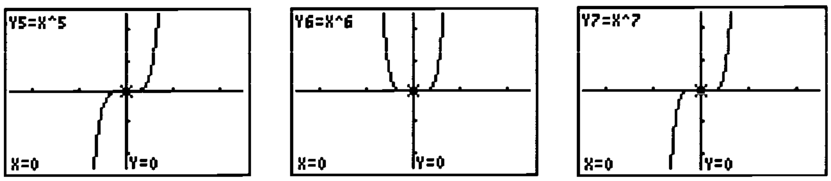
Have the students do some warm-up graphing (open-ended or structured, as appropriate); include such functions as $y = (x+3)(x+2)$ or $y = (x+3)(x-3)$, and others.
Keep relatively informal, yet interject leading questions, "What is line symmetry? What is the point symmetry? What is rotational symmetry?" should opportunities arise naturally.

B. The Exploring Instances Stage

[9] Readers familiar with graphing calculator will note a multitude of details (window settings, connected or dot plotting modes, "square" axes, ...) associated with drawing and interpreting the graphs.

Graph the following functions[10]: $y = x$, $y = x^2$, $y = x^3$, $y = x^4$, $y = x^5$, $y = x^6$, $y = x^7$
What patterns do you notice in the graphs?



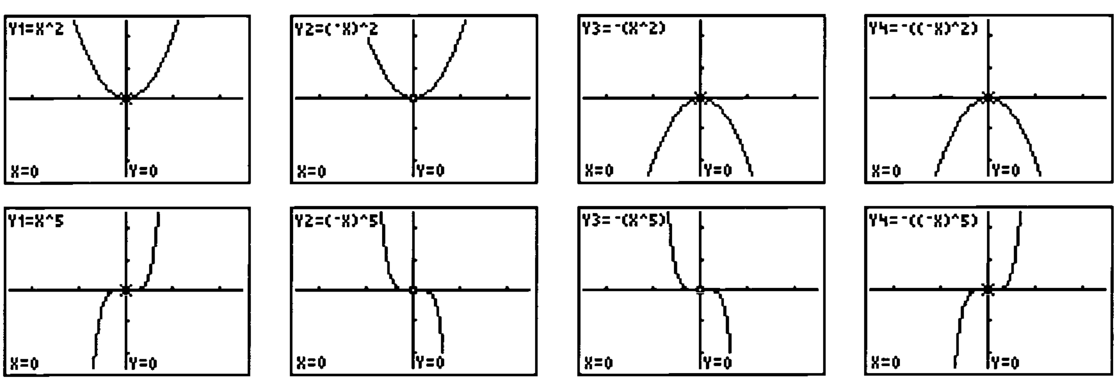


Window Settings
Xmin= -5 Xmax= 5
Ymin= -5 Ymax= 5
Xscl = 2 Yscl = 2
Note: Plots are NOT "Square"
Connected
Expression ON

Graph the following functions on a TI-83 Graphing Calculator, first[11], let n = 2, then 3, then 4, then 5, then 6, then 7.

	Function	**Does it have line symmetry? If so, describe it.**	**Does it have point symmetry? If so, describe it.**
a)	$y = x^n$		
b)	$y = (-x)^n$		
c)	$y = -(x^n)$		
d)	$y = -((-x)^n)$		

The cases for n = 2 and n = 5 are done for you using the same window settings as above.



Which power functions n = 2, 3, 4, 5, 6, 7, … have line symmetry?

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[10] In each case, y is a real-valued function of the real variable x. Thus, ℝ, the set of all real numbers, is the domain and an appropriate codomain for each function.
[11] What happens when n is equal to 1?

Which power functions n = 2, 3, 4, 5, 6, 7, ... have point symmetry?

C. The Exchange Emerging Views Stage

Look at the even power functions. What symmetry do they have?
Look at the odd power functions. What symmetry do they have?

D. The Information Gathering Stage

Suppose n is even. Is $x^n = (-x)^n$? What are the possible values for n?[12]

Still supposing n is even. Is $x^n = -(-x)^n$? Again, what are some possible values for n?
When n is even, what symmetry does the power function possess?[13]

Now suppose n is odd. Is $x^n = (-x)^n$? What are the possible values for n?[14]

Still supposing n is odd. Is $x^n = -(-x)^n$? Again, what are some possible values for n?
When n is odd, what symmetry does the power function possess?

E. The Review and Summary Stage

Have students review the different explorations made, and have them write a generalization regarding even power functions and odd power functions. Students should be encouraged to make connections between the concepts of symmetry and the even and odd power functions and to express them in a generalization expressing their views[15]. By doing this, students may be assessed regarding multidimensional aspects that are integral to instruction (NCTM, 1991).

References

Laborder, Jean-Marie, Bellemain Franck.(developers) (1994-1997) *CABRI Geometre II.* Instituit d=Informatique et Mathematiques Applique es de Grenoble, Universite Joseph Fourier, Grenoble, France.

National Council of Teachers of Mathematics (1988), *The Van Hiele Model of Thinking in Geometry Among Adolescents*. Journal for Research in Mathematics Education, Monograph 3.

National Council of Teachers of Mathematics (1991). *Connecting Mathematics*. Reston, VA: NCTM.

National Council of Teachers of Mathematics (1996). *Algebra in a Technological World*. Addenda Series: 9-12. Reston, VA: NCTM.

Texas Instruments TI-83 Graphing Calculator Guidebook (1996), Texas Instruments.

Vygotsky, L.S. *Mind in Society: The Development of Higher Psychological Processes*. Cambridge, Massachusetts: Harvard University Press, 1978.

[12] The even natural, counting numbers 2, 4, 6, 8, 10, 12, ... n = 0 could also be considered, and one might possibly introduce some negative even integers, -2, -4, -6, ...

[13] Here, we are helping the students inductively formulate the discovered generalization as a means of describing the observed/noted patterns. This also takes place in the next section.

[14] The odd natural, counting numbers 3, 5, 7, 9, 11, 13, ... n = 1 could also be considered, and one might possibly introduce some negative odd integers, -1, -3, -5, -7, ...

[15] Here we have "mathematics in the making." Their observations, speaking more formally, constitute mathematical conjectures and, once proved, theorems.

The R.O.A.D Learning System (Read, Own, Apply, Discuss) An On-line Method for Enhancing Teacher Pre-service and In-service Professional Growth

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Abstract: We (NEWTcom: a non-profit organization) have been developing a state of the art, Web-based, interactive, multimedia enhanced web-service to support the training and on-going development of teachers. We aim to serve both in-service and pre-service educator needs. The service is being built in collaboration with the Ottawa Carleton District School Board, the Ottawa Center for Research and Innovation (OCRI) and the Communications Research Center of Canada (CRC). We would like to show the resource to staff-developers and teacher-trainers to get their feedback and advice for further development. The goal of this session is to introduce this type of training medium to leading educators.

This hour long interactive presentation will be of interest to education faculty staff, school district staff development officials and state educational officials concerned with the on-going professional development of teachers.

Introduction

R.O.A.D Learning™ has a central philosophy based on "professional growth" rather than the "improvement model". What do we mean by that? One of the central problems with the "P.D." process in teaching is that it historically proceeds from the "improvement model". The idea is that, "you need professional development!" This conveys the subtle, but clear message that you need to improve because your skills are inadequate. This is poor starting point.

Looked at from another perspective, Dr. Wilder Penfield, a pioneer in the field of brain surgery, was not an inadequate doctor the day before he risked a new procedure, mapping the actual functions of the brain to help a patient. He was a darned good doctor. The point is that he chose to engage in "action research". In the process, he extended his own capacities as a doctor, and pushed the envelope of his profession. He was not engaged in "professional development", but professional and personal growth.

This is the mind-set that teachers must be given the opportunity to acquire. R.O.A.D™ rejects the "improvement model" and embraces the personal, professional growth model. We do so with our distinctive content, delivery model and features.

R.O.A.D. Learning™, therefore, fills a need that the World Wide Web has not met: the professional growth of teachers. Web sites that deal with teaching ideas for specific K-12 subjects are legion. There are, however, few that focus on the foundational best practices of the teaching profession.

None do it the way we do. We offer a World Wide Web site and service, supported by an Internet CD-ROM containing large movie examples of teacher behavior, delivered quickly to the end user's computer, rather than slowly via the Internet.

The service presents practical, next-day-usable strategies for enhancing success in the classroom for teachers. R.O.A.D.™ is written in an engaging style and is supported by multimedia (images, animations and movies). R.O.A.D.™ offers a safe, virtual environment in which practitioners can experiment with new methods, collaborate and share results with their peers, reach levels of scored mastery of knowledge, and skill sets, and have their professional development tracked for official purposes. No other web-sites offer this feature.

R.O.A.D™ offers a safe, virtual environment in which practitioners can experiment with new methods, collaborate and share results with their peers, reach levels of scored mastery of knowledge and skill sets, and have their professional development tracked for official purposes.

The service also "gets to know the user". Responding to user pre-test surveys of knowledge and skill, it suggests best starting points and next actions. Furthermore, the service allows the end user to acquire expert mentoring while engaged in learning. These mentors are automatically connected to the user via e-mail and thereafter by whatever means suit the mentor and user.

Finally, the service is self-perpetuating. We are a publisher of high quality, research supported strategies for teaching. New modules are constantly under production that must meet our exacting standards before they will be made available at our site.

Relationships and Community Building

RO.A.D. supports and facilitates a number of critical relationships depending on how its users choose to deploy and implement it.

Peer to Peer

In this case, a teacher or teacher trainee is linked to others in the same course, school, school district, or work group. They can simultaneously be members of many groups over great distances. They can send email within the service (no need to exit to another system), publish their action in the classroom to the PUBLIC Journals for comment, and schedule and organize meetings that will be either face-to-face or via telephone or computer.

Learners can access modules that are engagingly presented and which demonstrate foundational teaching skills (some include movies from an accompanying Internet CD-ROM , or animations of sequenced actions). This content, written by experienced, Master teachers, can become the focus of inter-peer discussion and distributed action research.

R.O.A.D.™ can also support collaborative, curriculum workgroups that are geographically dispersed. Communications are asynchronous, thus solving the common problem of the lack of discretionary and "flex' time amongst teacher. Peers interact when and where they wish or are able. All they need is a connection to the Internet. Very low connection speeds and modems will work just fine.

Instructor to Training Teacher

In this instance, a faculty member has a virtual office. There they can view their student role, a learning contract editor for the whole class and for individual students. They can also access each student's OFFICIAL Journal. The Journal results from items submitted from the student's PRIVATE Journal and successful completion of MASTERY EXAMS (an on-line database of questions tied to the behavioral learning objectives for each module). Students may take these exams as often as they wish (new questions are presented randomly, and old questions have the answers and foils scrambled) and are not said to have achieved Mastery until a grade of 90% is achieved. Attempts that fall short of this goal only appear in the student's PRIVATE Journal.

Furthermore, the Instructor can email through the service to individual students or to the entire class at once. Instructors may also change the order of presentation of modules and lessons within modules. They can also edit the master index, and insert new lesson pages with the a simple cut and paste, and a click of a button. This gives the faculty the ability to author existing content "on-the-fly" or to author new modules as they see fit.

Mentor to Student/Teacher In the Field

Training teachers can be supported while on their practice teaching rounds. They remain in contact through R.O.A.D™ to their peers and instructors. Meeting via conference call, real-time, or on-line chat can be organized to solve individual or shared problems.

Novice teachers can be specifically assigned to experienced ones who are anywhere in the world. Alternatively, such teachers can request mentors from a pool of mentors previously established. In this case, each mentor previously declares the number of people he or she is prepared to mentor. The novice simply requests a mentor. This triggers R.O.A.D™ to search for an available mentor. The available mentor is notified of the request for coaching. A message can then be sent by the mentor, either accepting or declining the invitation to mentor. From that point on, the nature of their relationship evolves to meet the needs of this new coaching pair.

Authoring New Content

One of the greatest barriers to Web publication of best practice for teachers is a lack of comfort or savvy with Web authoring tools. Web development houses routinely make a fortune from this discomfort. In a cash strapped system such as education, this is not acceptable. R.O.A.D™.'s creatorrs, therefore, developed a set of simple, on-line tools for putting useful content up on the Web. This new content is then automatically managed and delivered by the R.O.A.D™. software to learners. Thus, an author can publish important new information directly into R.O.A.D remotely, never leaving his or her office, with no greater skill than word processing. Our author's tools are on-line and include:

- A form that orders the presentation of lessons, sets prerequisites and creates interactions (applications or reflections). This provides the end-user with all the navigation and tools the author wants them to have.
- A template form for creating and editing a pretest based in behaviorally stated objectives. This will permit the learner to focus his or her learning tasks to those topics and concepts with which each is least confident first.
- An editable form to create an author's rccommcndcd "dcfault lcarning contract". This can uscd 'as is' by an instructor or modified to meet local needs).
- A template form for creating and editing on-line Mastery exams.
- A template form for giving the new course/module a title and a descriptive overview of the general goals and specific content that will be covered in the content.
- A form that allows the author to choose the graphic themes, button styles and even the language of the navigation and link buttons: English, French, Spanish, whatever the language of delivery of the author.

Conclusions

Our purpose for presenting R.O.A.D™. at the S.I.T.E. conference is to get feedback from educational leaders. Since our system does not require the installation of any software (all anyone needs is a standard Web-browser), we can modify the delivery shell to address comments from the field, and have these upgrades available to all users within hours. We are certain that our presentation will result in useful dialogue as we strive to improve and extend our work for the educational community.

Preparing Pre-Service Teachers to Use Technology

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Abstract: This paper describes how the UW-Oshkosh Teacher Education Program prepares pre-service teachers to integrate technology into instruction. Specifically, how the social studies methods and instructional technology courses are: using a framework for authentic instruction and assessment to help students develop and refine their pedagogical knowledge; using interdisciplinary teams to help students reflect on content, teaching methodologies, and appropriate use of technology; and having students develop and demonstrate technology based teaching materials.

Peter Martorella, in 1997 called the use of technology in the social studies classroom a sleeping giant. While he made mention of periodic unconfirmed reports of the giant's awakening, this does not appear to be a widespread phenomenon. This same "giant" slept in the secondary social studies methods course at the University of Wisconsin Oshkosh. While stirring occasionally, there seemed no way to sustain its consciousness, given the uneven computer knowledge among the preservice teachers taking social studies methods and a fragmented approach to teaching technology and then social studies methods .

Prior to 1997 social studies preservice teachers at University of Wisconsin Oshkosh did not have the opportunity to become part of a community of learners where they would learn about technology, become skillful in its use, and integrate it into to their teaching experience via the construction of subject matter units to be taught in clinical experiences and student teaching. Yet research suggests that offering these experiences heightens students success with technology and helps to foster positive values towards its use during instruction (Kellenberger, 1996). Further, the social studies methods course and the educational technology courses were disconnected making it difficult to model how technology could be integrated with other forms of instruction to foster powerful teaching and learning. Regular modeling of integration of technology in teacher education courses has been shown to positively influence latter adoption of technology in the classroom according to Willis (1997) and Keiper, Harwood, & Larson (2000). Our practical response to these ideas in the College of Education and Human Services at the University of Wisconsin Oshkosh was to create a learning community between three courses – Social Studies Methods, Instructional Technology, and Reading In the Content Area.

Why A Learning Community?

The research base about the effects of instruction assisted by technology in social studies is small but what does exists is encouraging. Richard Diem (2000) has suggested that technology is valuable and effective in problem based learning. He bases this observation on the research conducted by Eastmond and Gibbons (1998) and Stites (1999). Wenglinsky (1998) who studied mathematics achievement indicated that technology does make a difference in student achievement if computers are used to teach higher-order not lower-order thinking skills. Yet technology is unlikely to be used effectively in classrooms unless teachers have an adequate pedogagical framework for authentic instruction, assessment, and student performance. Such a framework can serve as a lens from which to view content, pedagogy, and how technology can help achieve powerful teaching.

Fred M. Newmann, Walter G. Secada and Gary G. Wehlage,1995 in *A Guide To Authentic Instruction and Assessment: Vision, Standards and Scoring*, offer a research based framework for thinking about the content and pedagogy. The book is a compilation of the findings of a national research study of teachers who practice authentic instruction, assessment, and student performances. Newmann et al. believe that a central purpose of schooling is to teach students to use their minds well. To achieve this end, lessons and the resulting assessment tasks and student performances must represent construction of knowledge, disciplined inquiry, and value beyond school (see figure 2). Construction of knowledge is a blend of the learner's prior knowledge of what others have produced about a topic or problem, how the learner organizes new information and considers alternatives to produce an original conversation, piece of writing, repairing or building physical objects, or through an artistic performance. Often conventional curriculums ask learners only to identify or reproduce the information others have produced. Disciplined inquiry which requires the use of prior knowledge, in-depth understanding of the content topic or problem rather than superficial awareness, and an expression of conclusions through elaborate communication. Value beyond school is when the in-class accomplishments of the learner have value apart from documenting the competence of the learner. Learners make connections between substantive knowledge and either personal experience or public problems.

Figure 2. Authentic Pedagogy

Authentic Achievement	**Authentic Assessment Tasks**	**Authentic Instruction**	**Authentic Student Performance**
Construction of Knowledge	• Organization of Information • Consideration of Alternatives	• Higher Order Thinking	• Analysis
Disciplined Inquiry	• Content • Process • Elaborate Written Communication	• Deep Knowledge • Substantive Conversation	• Disciplinary Concepts • Elaborated Written Communication
Value Beyond School	• Problem • Audience	• Connections to the World Beyond the Classroom	

Source: *A Guide to Authentic Instruction and, Assessment: A Vision, Standards, and Scoring*, 1995.

Social studies learning community students are required to use Newmann et al.'s conception of authentic pedagogy. Preservice teachers begin to design and organize instruction which promotes engaged learning, fosters critical thinking, and can take advantage of electronic resources for data collection, organization, and presentation. This type of instruction seeks to harness the power of technology to support powerful new forms of learning as opposed to focusing upon reiteration of facts, events, and causes as stated by others.

Another reason for establishing the learning community was to foster team work among the three courses in the learning community. To accomplish complex goals, organizations require teamwork. The reality of the workplace for most preservice teachers is that they will be working in teams, whether interdisciplinary middle school teams or single-discipline high school departments. In methods courses across the country, preservice teachers engage in cooperative learning, try out related teaching strategies, and develop instructional materials to support this approach.

Another rationale for creating our learning community was to allow students taking both courses to focus their energies on long-term collaborative projects. Moreover, allocating one section of Instructional Technology to social studies preservice teachers enables instructors to offer in- depth explanations related specifically to social studies. Unfortunately, the same kind of teamwork is not often modeled by faculty members, who treat each course as a separate entity. The development of a social studies/technology/reading learning community is an attempt to model collaboration and develop meaningful connections between courses.

The uneven computer skills displayed by our students and their weakness in designing instruction that utilizes technology to help achieve powerful teaching and learning goals during practice teaching was yet another reason to more fully integrate technology into the secondary education program. The learning community allowed us to become more authentic with assessment and student performance. Assignments are performance based, and students must demonstrate their understanding of how to integrate technology into social studies teaching. Previously, assignments in the technology course were perceived by some students as disconnected from their subject area, since a direct application was not necessarily evident.

Finally educational policymakers believe that technology is the answer to many issues associated with quality in education. Whether this is true is certainly debatable, but school policy is often based upon such perceptions. Schools are buying truckloads of computers. Preservice teachers who do not know how to use technology in instruction will not fit in well with schools of the 21st century.

Developing a Structure

Developing a learning community in social studies methods and technology required coordinating many elements. We needed to find instructors willing to work together and coordinate their schedules to allow for joint planning time. Syllabi, assignments, and timing of instructional segments had to be carefully arranged so that the courses built upon one another. Student schedules also required coordination for a specific section of the technology course to be allocated to the learning community. The result was nine hours of weekly instructional time-three hours each for Social Studies Methods, Instructional Technology, and Reading in the Content Area.

Within this community, students could choose either a disciplinary or an interdisciplinary team to work with during the semester. All major assignments in both courses were team efforts. A major semester-long project served as a "hub" to tie teams, courses, and learnings together. Each student team developed a 10 day resource and teaching unit about a significant historical or contemporary problem/issue based on authentic teaching, the use of technology, and reference to social studies standards. For each unit, teams developed comprehensive lesson plans, to developed a problem/issue statement, identified unit goals, and collected resources. In the technology course, teams consulted with the instructor to identify what types of technology could best achieve their instruction, knowledge, and skill goals.

One unit focused on the different factors that contributed to the North's victory in the Civil War. To introduce the problem, this team used PowerPoint to present data about railroad mileage and track-gauge, transportation networks, economic indicators, strength of armies, geographic factors, data on trade, and so forth. Then the team used web page development tools to developed a research web page with links to history-related websites, dealing with the quality of military leadership on each side. Another student design team applied their web page development skills and knowledge to developing a WebQuest that had students determine whether America's "War on Drugs" will share the same fate as Prohibition. The enabling technology skills and competencies were developed in the instructional technology course.

While the unit project was the basic connective tissue for the two courses, other topics and assignments bound them together. For example, while working on the use of charts, graphs, and other forms of data organization in the methods course, students also learned how to use spreadsheets and the graphing capabilities of various computer programs. Electronic communication (e-mail) facilitated communication between design teams. Each team was required to plan five complete lessons that employed one of the following instructional strategies: case study, cooperative learning, introducing a problem or issue, teaching a concept, and valuc analysis. For each lesson, one team member assumed responsibility for authorship and the other two members served as evaluator/critic. Team members used e-mail to send draft lessons and critiques to each other and to the instructors. Finally, teams were asked to review a videodisc and use multimedia authoring programs to design a presentation for teaching about an issue or problem. For example one team used images, speech, and music from the ABC Interactive Series *Powers of the Supreme Court* laser disc to introduce the issue of freedom of expression in their unit.

Obstacles and Solutions

Several obstacles may present themselves before a learning community like this can become a reality. The instructors must have some knowledge of and skill in using, technology. Although no one person has to know it all, it is helpful to have each professor's knowledge complement the other's. Collaborators also need time to coordinate topics, procedures, and student assignments.

Time for advising and scheduling students is also critical. We were fortunate in having a very supportive college advisor and a centralized scheduling system, but even so, scheduling was not without its difficulties.

Finally, successful collaboration between methods and technology courses requires sufficient infrastructure and resources. Our university provides each student with Internet access from any campus general access computer lab or residence hall. Students receive an e-mail account when they register for classes. Most computer labs have both Macintosh and Windows computers. All of the computers are on the campus electronic network "backbone" and therefore are connected to the Internet. We work in a technology classroom and an adjacent modernized multimedia lab.

A future obstacle will be having enough technology and workspace when other learning communities are brought on line. One potential solution to this condition is our new travelling computer lab which consist of Apple iBook computers using wireless technology.

Evaluation and Refinements

From our perspective, while the learning community was successful as a first time offering, several refinements need to be made. First, the successes. Student enthusiasm and motivation were strong, as evidenced by the number of hours the teams spent working together outside of class and in the computer lab. Methods, content, and technology were addressed in a holistic manner, and the design of collaborative unit projects enabled students to make direct application of what they were learning.

From our perspective, the "hub" teaching unit that combined technology with social studies methods was far and away superior to our previous unilateral assignments in separate courses. The problem-oriented teaching units designed by students were rich in information and purposeful about its use. Students developed both skill and confidence in their use of technology that far exceeded what had been possible in the methods course alone.

In subsequent offers of the learning community we plan to make a number of revisions. First, we need to take better account of the range of student computer skills. We misjudged how much time we would have to spend developing the basics. This tended to push back the more technical, and sometimes complicated, aspects of using computer technology, and resulted in an end-of-the-semester crunch. We have, for example, modified what we want to accomplish in the areas of multimedia and web page development.

Will the giant awaken in the social studies? This is anybody's guess. We hope that our example of a learning community based on collaboration between social Studies Methods, Instructional Technology, and Reading in the Content Area courses may help to stir the giant in our college.

References

Diem, Richard A. (2000) Can it make a difference? Technology and the social studies. *Theory and Research in social Education* 28 (4), 193-501.

Eastmond, N., & Gibbons, A.S. (1998). The single-parse method of design for problem based instruction. Educational Technology, 46, 110.

Keiper, Timothy, Harwood, angela, Larson Bruce E. Preservice teachers' perceptions of infusing computer technology into social studies instruction. *Theory and Research in social Education* 28 (4), 566-579.

Kellenberger, D.W. (1996). Preservice teachers' perceived computer self-efficacy based on achievement and value beliefs within a motivational framework. *Journal of Research on Computing in Education*, 29, 124-140.

Martorella, P.H. (1997). Technology and the social studies - or: Which way to the sleeping giant. Theory and Research in Social Education, 25, 58-71.

Newmann, Fred M., Secada, Walter G. and Wehlage, Gary G.,1995 in *A Guide To Authentic Instruction and Assessment: Vision, Standards and Scoring*. Madison, WI: Wisconsin Center for Education Research.

Stites, R. (1999). What does research say about outcomes from project based learning?Tessmer, M., McCann, D., & Ludvigsen, M. (1999). Reassessing training programs: A model for identifying training excesses and deficiencies. Educational Technology, 47, 86.

Wenglinsky, H. (1998). Does it compute? The relationship between educational technology and student achievement in mathematics [Online]. Available: http://www.ets.org/research/pic/dic/techtoc.html

Willis, E.M. (1997). Technology: Integrated into, not added onto the curriculum experiences in preservice teacher education. *Computers in the Schools*, 13, 141-153.

Building A Professional Cyberspace Community

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Abstract: This paper is a report of a newly-initiated project designed to connect preservice teachers, cooperating teachers, student teachers, and higher education faculty through the use of a world-wide-web site. Goals of the project were to enhance the teacher preparation program and curriculum, to provide professional development for P-12 faculty and mentoring support for novice P-12 faculty, to provide professional development opportunities for higher education faculty, to provide educational resources for web-users outside of the cyberspace community that was developed in the project and to form the basis for continual teacher education program input and assessment.

Introduction

Those familiar with the teacher accreditation guidelines of the National Council for the Accreditation of Teacher Education (NCATE) are very familiar with the concept of "professional community" as it relates to pre-service teacher education. This professional community encompasses all who play important roles in the development of preservice educators: education faculty, arts and sciences faculty, inservice mentor or "cooperating" teachers, P-12 students and their parents, the community, and preservice educators themselves. The NCATE 2000 Standards refer to the involvement of the "Professional Community" in developing an assessment system for the teacher education program and in designing, delivering and evaluating field experiences and clinical practices. Additionally, college faculty are expected to be "actively involved with the professional world of practice in P-12 schools," as well as to collaborate "regularly and systematically with colleagues in P-12 settings" and other members of the broader professional community "to improve teaching, candidate learning and the preparation of educators (NCATE, 2000).

Institutions of higher education have utilized the "learning community" approach since approximately 1927, when the first documented "learning community" was established by Alexander Meiklejohn at the Experimental College at the University of Wisconsin (Kellogg, 1999). While this learning community existed solely on one campus and encompassed only higher education faculty and their college students, the concept of a learning environment that will promote coherence and create a sense of common purpose and community can be expanded to include community members off-campus as well (Kellogg, 1999).

Technology has enhanced the opportunities for interaction among the members of a professional education community through e-mail and the Internet (web pages, bulletin boards, chat rooms, and other opportunities). Research on preservice student use of technology has indicated that student teachers often use technology in on-campus classes; however, their use of technology during the student teaching internship drops off sharply (Beck & Wynn, 1998). Robert Morris College has seized this opportunity to bridge the physical space between College faculty, inservice teachers, preservice teachers, and others through the development of a "professional cyberspace community" website. The interaction fostered by this professional community has the potential to empower teachers to become self-reflecting individuals who are willing to take charge of their own professional development and to encourage the effective utilization of technology in order to enhance learning for all community members.

Program Overview

At one time, much was written regarding the lack of hardware available to P-12 teachers, teacher education faculty, and preservice teachers. This is no longer a major concern as almost all schools and higher education institutions have numerous computers, internet access, and other multimedia resources. It is now possible to move beyond issues of acquisition to focus on the optimal usage of these resources for the enhancement of teacher preparation, P-12 faculty professional development, and higher education faculty professional development. The existing infrastructure provides the scaffolding for a professional cyberspace community. Robert Morris College has utilized existing resources to accomplish this goal. Using a web-based approach, it has been possible to develop an easily-accessible resource that provides general resource links for sites relating to these areas of interest to all members of the professional community: employment in education, lesson plans, national and state standards, professional organizations, on-line educational publications, and grant opportunities.

Utilization of the world wide web for this purpose is consistent with adult learning theory. In a learning environment in which technology is utilized, Imel (1998) has identified that adults want a place where learners can collect important ideas, express themselves, and feel some security that they are going in the right direction and to provide fast and productive access to help when it is needed. Similarly, the use of technology enhances adult learning because technology provides increased flexibility and access to expertise, and can reduce feelings of isolation often experienced by nontraditional learners (Imel, 1998).

In the Robert Morris project, the development of the professional cyberspace community has met established goals in the areas of teacher preparation program enhancement, professional development of preservice teachers, professional development of P-12 faculty, and professional development of higher education faculty.

Enhancement of the Teacher Preparation Program and Curriculum and Professional Development of Preservice Teachers

In teacher education, effective supervision of student teachers has often been hindered by factors such as a lack of communication and collaboration (Kauffman, 1992) which make it difficult for higher education faculty and P-12 faculty to provide a coherent and organized professional development program for preservice teachers.

Moon, Niemeyer, & Simmons (cited in Kauffman, 1992) reported that, as a result of this lack of communication and collaboration, "cooperating teachers and university supervisors often misunderstand each other, lack unity in front of the student teacher, and continue to teach and supervise the way they always have instead of working as a supervisory team." Facilitating communication and collaboration among higher education faculty, student teachers, and P-12 inservice teachers can serve to build cooperative and collaborative teams that can more effectively meet the needs of all participants.

Through the Professional Cyberspace Community website, access to the education unit's conceptual framework, assessments, curricula, long-range plans, and other information is provided to everyone in the professional community. This information exists as a resource and guide for teacher education majors at all stages in their programs, student teachers in the field, P-12 faculty working with education majors doing field experiences and/or student teaching, parents, community members, and higher education faculty in both arts and sciences as well as education programs. All constituents can comment on this information at any time, thereby providing continual feedback about the teacher education curriculum and programs. Student teachers can post messages and/or e-mail their peers, mentor cooperating teachers, and college supervisors. Lesson plans can be posted for review and constructive feedback, and requests for assistance and information can be posted. Students may access course descriptions, class schedules, and other program information.

P-12 Faculty Professional Development

According to Joyce, et al. (1990, p. 33-34): "Proposals both for the 'empowerment' of teachers and for an increase in the use of a knowledge base in education depend upon the realization of a radically revised workplace with very different relationships...and much greater attention to the application of professional knowledge." It is precisely this shift in relationships that has become possible through the use of technology to provide a workplace that is "radically revised" due to the replacement of teachers' feelings of isolation with opportunities for professional connections with others in their field.

Articles related to mentoring, preservice teacher education, action research, and related topics are available on the professional cyberspace community website. Inservice faculty may also post requests for information, materials, ideas, or other educationally-related needs. Information on workshops and inservice credit courses of interest to inservice teachers is made available; teachers may also make requests for workshops or courses to meet their needs in particular areas. In Pennsylvania, all certified teachers are required to obtain a minimum of six credits or 180 hours of professional development every five years in order to maintain their certification. The professional cyberspace community website provides up-to-date information on these "Act 48" requirements, including links to appropriate state information and lists of available opportunities for inservice credit.

These aspects of the website also provide support for recent Robert Morris College graduates who are in their first few years of teaching, who may continue to utilize the services and interact with the other members of the professional cyberspace community. Support for this population is critical, as research has indicated that many first-year teachers "are frequently left in a 'sink or swim' position with little support from colleagues and few opportunities for professional development" (Darling-Hammond, 1997). First through third year teachers may voluntarily remain as part of the cyberspace community, continuing to receive support from higher education faculty and other inservice P-12 faculty. In addition, these novice professionals also provide support for the student teachers in the community, as they share their tips and suggestions for "surviving" the first few years of teaching. Research has indicated that those beginning teachers who are mentored are more effective teachers at the beginning of their careers, tend to focus more on student learning, and leave the profession at a lower rate than beginning teachers who are not mentored (National Commission on Teaching and America's Future, 1996).

Higher Education Faculty Professional Development

The learning community developed within this project can be viewed, in a sense, as a cyberspace professional development school--a "learner-centered environment....in which reflective practice and teacher decision-making are part of a school culture where new teachers are naturally expected to collaborate with more experienced university-and school-based colleagues" (Levine & Trachtman, 1997). Obviously, this approach holds benefits for the experienced veterans, who may also learn from the novice teachers.

According to Kellogg (1999), "faculty who teach in learning communities reveal that they become re-energized and feel empowered..." While the learning communities in Kellogg's report referred to those comprised of on-campus individuals, it is logical to assume that the expansion of the learning community to include those off-campus will have similar, if not enhanced, results.

In the professional cyberspace community, higher education faculty also access and utilize the bulletin boards, e-mail services, program information, and mentoring information available to other community members. In addition, College faculty use the resources and relationships developed through the on-line community to establish contacts for action research projects, locate sites for field experience placements, and to develop additional projects cooperatively with P-12 colleagues.

Summary

The professional cyberspace community developed through this project supports a system of "co-mentoring," defined by Bona, et al. (cited in Mullen, 1999) as a name for "supportive assistance provided by several connected individuals. Placing the prefix 'co' before 'mentoring' reconstructs the relationship as non-hierarchial; 'co' makes mentoring 'reciprocal and mutual" (p. 119.) The public nature of the website allows co-mentoring to flourish; questions, ideas, and lesson plans become public and, therefore, open to constructive feedback from any and all members of the community.

According to Mullen (1999, p. 42), Synergistic co-mentoring groups require empowerment of the members, so that "each member feels that what s/he has to offer is important to the group and valuable." The professional cyberspace community allows everyone to participate on equal ground; the input and feedback provided by preservice teachers is valued as much as the input and feedback provided by others in the community. It may be that this feeling of empowerment will provide the basis for continued professional development of all members of the cyberspace community.

As a teacher preparation program working toward continuous assessment and improvement, enhanced P-12 student and teacher-candidate learning, and national accreditation, Robert Morris College has embraced technology as the infrastructure through which the scaffolding of our professional community can be strengthened and expanded. This is a model of an approach which can be replicated at any institution with a teacher preparation program.

References

Beck, J. & Wynn, H. (1998). *Technology in Teacher Education: Progress Along the Continuum.* ERIC Digest. Washington, D.C.: ERIC Clearinghouse on Teaching and Teacher Education.

Bona, Rinehart, & Volbrecht. (1995). Cited in Mullen, (Ed.) (1999). *New Directions in Mentoring: Creating a Culture of Synergy.* New York: Routledge.

Darling-Hammond, L. (1997). *Doing What Matters Most: Investing in Quality Teaching.* New York: National Commission on Teaching & America's Future.

Imel, S. (1998). *Supporting and Extending Adult Learning through Technology.* ERIC Digest. Columbus, OH: ERIC Clearinghouse on Adult Career and Vocational Education.

Joyce, Bennett & Rolheiser-Bennett. (1990). The Self-Educating Teacher: Empowering Teachers through Research. In *Changing School Culture Through Staff Development.* (pp.). Alexandria, VA: ASCD.

Kauffman, D. (1992). *Supervision of Student Teachers.* ERIC Digest. Washington, D.C.: ERIC Clearinghouse on Teacher Education.

Kellogg, K. (1999). *Learning Communities.* ERIC Digest. Washington, D.C.: ERIC Clearinghouse on Higher Education.

Levine, M. & Trachtman, R., eds. (1997). *Making Professional Development Schools Work: Politics, Practice, and Policy.* New York: Teachers College Press.

National Commission on Teaching and America's Future (1996). *What Matters Most: Teaching for America's Future.* New York: Teacher's College Columbia University.

National Council for the Accreditation of Teacher Education (NCATE). (2000). *NCATE 2000.*

Tomlinson, Peter. (1995). *Understanding Mentoring: Reflective Strategies for School-Based Teacher Preparation.*

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How We Integrated Technology Throughout Our Education Program

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Abstract: In this paper, we describe the technology integration efforts at Albion College over the past four years, with the hope of providing a vision to programs that are both similar and dissimilar to us. Of particular interest is our successful integration into methods courses, and the way that we used our diverse strengths and worked as a team to accomplish it.

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We would like to applaud the efforts of the following current and former faculty and staff whose content area understanding, pedagogical practice, willingness to share ideas and "ownership" of courses, and sense of community have been instrumental in helping to thoughtfully integrate technology into the Education program at Albion. In alphabetical order, they are: Carrie Dale, Albion College; Kathleen Fear, Olivet College; Karin Hanke, Albion College; Corinna Hasbach, Escola Graduada de São Paolo; Dorothy Kammer, Albion College (retired); Michael Michell, Escola Graduada de São Paolo; Deborah Roose, Albion College; Nicole Schonemann, Albion College; Pamela Schwartz, Albion College.

Introduction

In a given teacher education curriculum, it is not at all unusual to find a course in educational technology offered as a "stand-alone." Students either opt for or are required to take this course in order to learn the effective theory and practice of integrating technology into their teaching. While these classes can make a measurable impact in a student's preparation, the concept itself contradicts much of what we now believe about training teachers. We describe the importance of helping students build pedagogical content knowledge, but we deny them the opportunity to learn to use technology tools in parallel with their learning about content and its pedagogy. We value the notion of students dealing with ill-defined and complex problem spaces, but we stratify the study of educational technology and diminish its importance relative to study about content and its pedagogy. To wit, we do a disservice to pre-service teacher training when we separate classes in technology from classes in subject-specific methods or pedagogy.

There is probably a majority of education faculty who would agree that technology should be integrated into methods and pedagogy classes, even if this is not the case at their home institution. There are many reasons why integration is not possible, such as constraint by available personnel, by program review cycle, by facilities, or by the need for vision. It is in this latter area, vision, that our experience at Albion College may be of service and interest. Albion College is a liberal arts college for undergraduate education, with an Education program that accounts for over 10% of the total enrollment. Each year, approximately 30-35 elementary and secondary education students graduate from the program. Four years ago, the Ferguson Center for Technology-Aided Teaching was created with the involvement of a prominent member of the Board of Trustees, the President of the College, and the Chair of the Education Department. The primary goal of the Center was to help faculty in the Department to integrate technology across most or all courses and to help students learn to effectively use technology in the service of teaching and learning (http://www.albion.edu/education/technology_integration.asp). In this paper, we describe the efforts of the past four years, with the hope of providing a vision to programs that are both similar and dissimilar to us.

Courses

We will briefly describe our technology integration efforts across several different courses over the past four years, identifying course goals, software and hardware used, and course projects which were abetted by technology. The courses are laid out chronologically. At the heart of these efforts is the manner in which we coalesced our diverse strengths as faculty to produce an integrated curriculum. Almost all of the faculty saw themselves as average or below average in their personal or pedagogical technological ability. However, their expertise in diverse content areas and in teaching allowed us to have fruitful discussions about integration. As an example of this, the voice later in the paper that speaks about the course in Literacy Pedagogy differs from that used throughout the rest of the paper to convey the personal aspect of the collaboration. Some efforts resulting from these discussions were short-lived but important to the success of later ones. It was clear from the beginning that the responsibility for success did not rest on the shoulders of any one person; rather, our success depended upon our ability to be creative, to take risks, and to be honest about failures and triumphs.

Effective Instruction and Effective Schools (Elementary)

Effective Instruction and Effective Schools is a general methods course that is set against a backdrop of teaching elementary science. The course has been team-taught more often than not, and has been a valuable training ground for helping faculty, who are unsure of their ability to incorporate technology, come up to speed. It meets two hours a week, twice weekly, and has a two hour per week practicum component alongside.

Students who take this course are sophomores, and are often unsure of their ability to either teach science or use technology. Technology integration occurs in four different ways. The most far ranging is pointed towards helping students develop skills and self-efficacy in their personal use of technology. The goal is to help them increase their information literacy, understand the process of investigating and writing a research paper on an unfamiliar subject, and think about how to write good hypertext. The details of this project are provided elsewhere (Rubio, Michell, Kondelik, Blackwell, & Albery, 2000).

For the practicum, students spend most of the semester actively involved in working with teacher and students; near the end of the semester, they team-teach a curriculum-appropriate science unit with a classmate. They use the PIViT software (http://www.umich.edu/~pbsgroup/PIViT.html), described in the section on the Pedagogy classes, to plan their teaching. This is their first opportunity to use technology to plan and manage teaching.

One of the course assignments is a software or Internet site assessment. The students propose to study a piece of software or an Internet site for its educational value in teaching elementary science. Their selection must be approved by the instructor to make sure that it has sufficient depth for a worthwhile investigation; since some sites are extremely large, sometimes students are asked to focus on a particular segment of the site. Once their selection is approved, they explore the site or software, and assess it along several dimensions. These include ease of use, requisite background knowledge, purported educational use, how well it supports a constructivist view of learning, and whether it has any bias or strength towards gender or ethnicity. They must also give some specific scenarios for how it could be used in a classroom setting. Finally, they write a recommendation, a paragraph which stands alone but would adequately convey their opinion about the educational value to a fellow teacher. In order to help students with this assessment, the instructor spends up to a full day in class looking at software and sites which have overall positive and negative value in teaching elementary science.

Students also participate in a local, electronic discussion forum with a web interface. Their experience here is similar to that described in the Secondary Methods class.

Secondary Methods (Secondary)

Secondary Methods is a general methods course which takes a special, in-depth look at multicultural education, particularly ethnicity. Otherwise, it resembles the Effective Instruction course, but without the emphasis on science. To date, we have experimented with several possible ways to integrate technology into this course, but have yet to settle on anything because a different instructor has taught it for three consecutive years. One early attempt involved having the students create interdisciplinary units utilizing PIViT, a piece of software designed specifically for unit or project planning. It was ultimately decided that this component should be moved to the subject-specific Pedagogy classes, to allow students to learn to do such planning in the context of their own subject area. PIViT will be described more fully later in this paper, in the section devoted to those courses.

Another attempt at technology integration parallels some of the efforts involved in the Effective Instruction course, namely a discussion forum. During this semester, the course met once a week for three hours, with the students committed to a structured service learning project for an extra hour per week. Throughout the semester, the students commented that the discussion forum was especially useful in helping build a classroom community. The forum centered upon a weekly requirement that the students post a journal entry and respond to the entries of two other students. There are no specific assessment criteria other than "done well" or "not done at all." However, the overall grade is analogous to a grade for participation, in that a student cannot receive a high grade without taking part. The discussion forum was managed with O'Reilly's WebBoard®. WebBoard is accessed through a student-generated id and password; the instructor then gives students access to a specific forum. WebBoard provides threaded, dated discussions. It automatically places forum participants on an email listserv. It allows the instructor to review the number of posts made by each student, but has no other capability for assessment. The instructor must manually search postings to determine whether any were made on a certain day. The College's Instructional Technology Division provides instruction on the use of WebBoard on an individual basis. Faculty at Albion who use the forums comprise the spectrum from neophytes to techies.

Pedagogy of the Humanities, Social Sciences, and Natural Sciences (Secondary)

As noted previously, the student experience of unit/lesson planning utilizing PIViT was ultimately placed in this class. PIViT (Project Integration and Visualization Tool) allows teachers to plan units or projects in any content domain. It consists of a project map which allows the teacher to visually organize in a manner similar to that afforded by Inspiration (http://www.inspiration.com) or other concept mapping software. It also has an integrated calendar, so that teachers can assign dates to different classroom activities, investigations, and assessments and readily view or change those dates. Finally, teachers may enter specific lesson plans from within the project map. Thus, students who use this tool may view their plans from three different representations: visual/conceptual, chronological, and textual/detailed. There is a practicum placement with this class that is similar but not quite as all-encompassing as with the Effective Instruction class; the lessons that students create with PIViT are taught during that practicum.

PIViT only runs effectively on Macintosh computers, meaning that the vast majority of our students have to familiarize themselves with a computer platform that is largely unsupported by the College. However, since a significant percentage of schools utilize Macs, it is in our students' best interests to "force" them to use these computers so that they are prepared for the realities of a dual-platform profession.

Students in these classes are also asked to do a software or Internet site assessment in their own subject area. The parameters of this assignment are similar to the one used in the Effective Instruction course. Some simple HTML editing has also been taught and utilized, on the same scope as that in Secondary Methods.

Literacy Pedagogy (Elementary): An Implementation Story

I teach the Literacy methods courses for our elementary students. When I started at Albion College a year ago, Reuben came to me and said he'd like to help develop a technology component in each of our classes. I was excited by this, although I had to strongly warn him that I was less technologically skilled than most of our students. For this reason, we began with a plan to first help me learn how to use HyperStudio (http://www.hyperstudio.com), and then we could teach my students together.

I began by doing the tutorial in the HyperStudio manual; I actually had my nine year old son do it with me! I found thc manual very easy to follow and I also got many ideas as to how I could incorporate the technology into my already full course offering. Originally, Reuben and I had talked about just doing a board book, described to me as being like those children's books with the buttons down the side of the text you push in conjunction with the rebus picture in the text to get "exciting" sound effects as they read. But as I learned from the tutorial how to make cards into stacks, my mind switched from envisioning a board book to thinking of this as more of a teaching or reinforcing program my students could use in their classrooms when they did their student teaching.

The next step in our journey was to have the students repeat my own experience: begin by taking the tutorial, and then determine the skill or genre they wanted to teach or reinforce. As my model, I chose to reinforce my teaching of quotation marks, and made a sample storyboard of my stack. I then began to generate my cards, and this, more than anything, allowed me to acquire a realistic idea about the amount of time needed to create an effective stack. It also gave me the confidence to try to answer my students' questions during the two class work sessions (two hours each) in which we met in the computer lab for class.

On the day that the stacks were due, we asked the students present their programs to their peers. We had asked the students to self-evaluate their learning, as well as their product, before the presentations began. The students found the sharing very enlightening, and immediately asked to have their evaluations back so they could talk about the upgrades they wished they could make, now that they had seen what others had done. I found it helpful to hear from my students their explanations of the purpose of the stack and their intention for its use very helpful when we went back and individually evaluated each student's work. I was dismayed that it took me approximately one hour per stack to evaluate. We found many things that we wanted to hold the students accountable for, and other things we thought the students should consider before using their stack with students.

Based on our previous experiences, we revamped our rubric and I structured the assignments differently this year. I began by taking my students through the process slower. I made certain that all students had taken the tutorial prior to drafting their initial plans. I also had them create a well-developed, sequential lesson plan which structured the learning and the practice, to assure there was appropriate student support and levels of practice. I passed out a rubric which, I thought, better reflected my needs for the instruction and practice as well as Reuben's needs for effective use of technology. I did not have them create their initial storyboards until they had received back from me their lesson plans, complete with suggestions and considerations for thought. Once the storyboards were in place, we met together in the computer lab. As we expected from our experience last year, the first session was slow going, with most students only completing one or two cards. But during the second session in the lab, the students' questions were more advanced, and their level of anxiety was greatly decreased.

I think the benefits of doing the HyperStudio in this course are two-fold. I have seen the tremendous increase in confidence in my students, now that the first group are student teaching, when incorporating technology into their teaching and in their own presentations (such as in the Teaching of Science, Social Studies, and Mathematics, or the Student Teaching Seminar). But what I appreciate most, from the perspective of a methods instructor, is the quality of the direct interaction with curriculum design and implementation. My students now have discussions amongst themselves about effective methods for teaching or reinforcing skills, appropriate language use for children with limited experience and lexicons, and open analysis of the level of skill required by specific forms of practice. I have never been able to obtain similar levels of discussion regarding "paper and pencil" unit design.

Teaching of Science, Social Studies, and Mathematics (Secondary)

Elementary education students in this class have the privilege of conducting a summer day camp for local elementary children at the College's Nature Center. For part of the day, class is in session for the students as they learn to teach in an interdisciplinary, multiage, field-based setting; for the remainder of the day, the students actually run the camp. Students plan all of the lessons using either PIViT or any other piece of software that allows them to show their plans in all of the three representations described previously; they also aggregate their individual design/project maps into one big class map.

Different children in the camp focus on plant and animal biology, geology, environmental science, or the history and culture of historical and contemporary peoples. The environmental group that studies water quality makes use of computer-based laboratory probes which interface with a computer and provide real-time data. They use digital probes to measure the conductivity, dissolved oxygen, and temperature of a large river at disparate locations, and then report their findings on the health of the river to the camp. The college students spend some class time learning to use the equipment, and work with the campers to make the measurements and distill the data.

Students in the class also use HyperStudio to create a hypermedia anthology or retrospective of the camp, drawing on their experience of creating stacks in the Literacy Pedagogy course. Each content area group (biology, geology, etc.) develops a set of stacks that portray the camp experience from their own perspective, utilizing source or scanned digital images, digital video, and personal artwork. The class is responsible for creating a gateway stack and agreeing on a consistent navigational structure so that the stacks may be aggregated. Students then present their anthology in an Institute-wide colloquium.

Student Teaching Seminar (Elementary and Secondary)

In the first years of our efforts, we noted that during the student teaching semester, students had a tendency to fall back upon what they considered their "tried and true" techniques and degree of comfort, which generally had little to do with technology. While this was appropriate for those first years, we realized that we would have to build something substantive into the curriculum in order to help the students see their technological knowledge as a strength. Beginning last year, we asked students to create a digital presentation portfolio. Beginning this year, we asked them to implement a technology project.

We explain to the student teachers that they will compile a digital portfolio in order to convey the essence of "what they are all about" to a prospective employer. It is partly a focused presentation of their professional knowledge, experiences, and artifacts, containing such things as a statement of philosophy, resume, lesson plans from student teaching or practicum experiences, examples of work that their students have done, classroom video, or samples of their own academic work. They may also put in extracurricular or personal information about themselves which helps paint a holistic picture of their potential as a teacher. The portfolio will ultimately reside on a CD-ROM that they can loan or give out. As such, the CD-ROM should be wholly self-supporting in that every application or file that is needed is already loaded. All of the specialty software and hardware tools that they need to create a digital portfolio are maintained in the Ferguson Center computer lab. They can also access Microsoft FrontPage, the College's officially supported HTML editing software, in any campus computer lab.

The technology project represents a substantive effort by the student teacher to utilize available computer technology at their school in order to accomplish teaching and/or learning that could not be accomplished otherwise. The project is grade- and curriculum-appropriate and spread out over 7-10 hours of classroom time. This time span was chosen with the hope that it would strike a proper balance away from either a superficial or onerous attempt. Each student teacher writes a project proposal early in the semester in order to receive feedback and the assent of the seminar instructor. They must then carry out the project at a point in the semester of their choosing, and then document their efforts in the digital portfolio.

The seminar meets for two hours, once a week. During half or more seminar class meetings of the semester, basic information is presented or question and answer sessions are held for up to an hour. Either a student lab assistant or myself hold set lab hours throughout the semester to help students with individual problems. The lab has four computers, two scanners, a digital video workstation, a CD-RW/CD-R burner, a color printer, and software for creating and editing graphics, web pages, and audio or video.

Advanced/Directed Study (Elementary and Secondary)

This study course had its origins with a group of elementary students during the first year of the digital portfolio effort. They student taught during the fall semester, and wished to devote extra time to creating a more polished portfolio. One student from the group was particularly interested in applying for the Michigan Certificate for Outstanding Achievement in Teaching with Technology (see http://www.coatt.org). The course was beefed up to be worthy of academic credit, and initiated. The quality of the portfolios by these students was sufficiently high that we decided to continue to offer the study each semester to seniors who are anticipating student teaching or have just completed it. Apart from portfolio work, this elective course would allow students to extend a technology project or begin a new one. For example, in the fall semester a group of elementary student teachers used the study to prepare some HyperStudio stacks intended to provide their students with understanding of certain concepts that are perennially troublesome. The project resembles what was done in the Literacy Pedagogy, but is more wide-ranging because it involves research into how children learn math as well as beta testing of the software. In the spring semester, the students use the stacks in their teaching. This design experience is a more substantive utilization of technology than for someone who uses something "off the shelf," because they can understand and describe how multiple representations of difficult concepts can improve understanding.

Areas of Future Growth

All of the prior and current Education faculty agree that having a resource like the Ferguson Center is crucial to the success of technology integration. A willingness by methods instructors to "own" the use of technology in their teaching rather than see it as someone else's domain is equally important. Ongoing and future efforts for our education program in technology-aided teaching and learning include the ongoing effective integration of technology into other education courses, support for the technology projects of practicing teachers within the local education community, and research into possible uses of Personal Digital Assistants by practicing teachers. Three education courses, Foundations of Education, Reading in the Content Area, and Exceptional Child, have yet to experience appropriate integration. Some discussions have pointed toward the use of software for concept mapping and speech-to-text recognition in the latter course. Teaching regarding the use of technology for assessment (e.g. spreadsheets and mail merge) also needs to be housed in some courses. Since Albion is a four-year undergraduate institution, it does not deal with in-service teachers in a graduate program. However, a College-wide impetus for collaboration with community institutions finds a ready application in ongoing work with local teachers to make better use of technology in their teaching.

References

Rubio, R. A., Michell, M. J., Blackwell, C., Kondelik, J. P., & Albery, B. (2000). Technology in the service of information literacy and writing across the curriculum: Our experience. *Society for Information Technology and Teacher Education, 2000*, Association for the Advancement of Computers in Education, Charlottesville, VA. 1827-1833.

Cyber Space Communities for Pre-service Teachers

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Abstract: Technology impacts our professional lives in many ways. Instead of a disconnected voice over the PA system, classrooms are now invaded by the sounds of "You've got mail." Teachers record attendance and grades "on line." We teach our students how to conduct Internet research. We send students on "virtual field trips" and plan simulations. Instead of asking for home addresses, we ask for e-mail addresses. We have begun, albeit slowly in many cases, to integrate technology into our classrooms and profession. As a profession, we are learning to use technology to build a sense of community among our members. At Robert Morris College, we plan to concentrate on the ways in which a virtual community can be build using technology, specifically e-mail and electronic bulletin boards, might be used as a way to keep student teachers connected to one another in addition to providing information on current issues as they complete their field work.

Introduction

Technology impacts our professional lives in many ways. Instead of a disconnected voice over the PA system, our classrooms are now invaded by the sounds of "You've got mail." Teachers record attendance and grades "on line." We teach our students how to conduct Internet research and refer them to web sites. We send students on "virtual field trips" and plan simulations. Instead of asking students to supply home addresses, we ask for e-mail addresses. We have begun, albeit slowly in many cases, to integrate technology in our classrooms and in our profession. Professional organizations use technology to publicize conferences, list resources, and begin conversations about important issues. As a profession, we are learning to use technology to build a sense of community among our members.

Technology has expanded the resources available to pre-service teachers as well as inservice teachers. In teacher preparation institutions across the nation, pre-service teachers are given instruction and opportunities to integrate technology into daily lesson plans. They use technology to complete assignments, to present mini lessons, and to critique their own and others' tape-recorded performances. Using video conferencing technology, pre-service teachers are able to "look" into classrooms and see the interaction between real teachers and real students. Pre-service teachers can now log on and in a few minutes down load several different lesson plans on ways to teach a particular topic at a particular grade level. During content and methods courses, pre-service teachers are taught the importance of using technology as a teaching tool. Technology, however, can be much more than an instructional tool for our pre-service teachers. It can help pre-service teachers build their own community: their own support group.

There has been much research on the retention of teachers in the profession. The National Education Association (NEA) conducted a survey in 1982 and reported that less than 50% of the nation's teachers plan to stay in the profession. Wolfe and Smith (1996) discovered that of the 32,000+ teachers who begin teaching each year half will leave the profession within the first five years. One of the reasons for leaving the profession as cited in Zepeda and

Ponticell's (1996) study was the feelings of loneliness and isolation. The problems and concerns student teachers report has also been the subject of other research studies as well (Ball 1985, Grossman 1990, and Strickland 1987). All of these studies empathize the importance of maintaining a support system for student teachers and beginning teachers as they enter the profession.

At Robert Morris College, we plan to concentrate on the ways in which a virtual community can be build using technology, specifically e-mail and electronic bulletin boards, might be used as a way to keep student teachers connected to one another in addition to providing information on current issues as they complete their field work. We, therefore, are adding an additional requirement to the student teacher experience: our student teachers must read and respond to their e-mail messages and posted messages at least three times each week.

The familiarity our students have with technology, the availability of computers with Internet connections in the schools in which they are placed, and the ease of forming electronic groups through the college has led to the proposed implementation of this program requirement.

Overview of the Program

When our pre-service teachers begin their fieldwork, they are assigned to several different schools; we do not often cluster student teachers. This adds to the feeling of isolation that our pre-service teachers report. Our students tell us that they need someone who understands their situation and is at the same professional level to share the successes and failures they have in their classrooms. The distance between schools and the college makes it difficult for many of them to return to campus for a weekly seminar; therefore, we decided that an alternative to a face-to-face return seminar might be beneficial for our students. We began by evaluating the technology that our students would have some degree of expertise and familiarity.

Pre-service teachers at Robert Morris College complete many of their content courses in classrooms that are equipped with various types of technology. These rooms have document cameras, video cameras with voice tracking capability, VCR recorders, CD players, Internet access, and computers. Our students, therefore, are comfortable with using technology in their mini lessons and integrating technology into their instructional units. Additionally, many of their instructors post assignments and other information on line. Many instructors require students to e-mail draft copies of assignments to them or to evaluate specific web sites. All instructors at Robert Morris College have the capability of creating class groups by clicking a button on the electronic roster. Our system is designed to allow instructors to e-mail the entire group, select specific members, or to post messages. Our pre-service teachers, therefore, are familiar with electronic communication. We decided to utilize this type of technology to help our students maintain a connection with one another and with the college.

The Specifics of the Program

The first step in creating this component is to ensure that all pre-service teachers have current e-mail accounts. The next step is to explain the importance of building a community and operating within the community to all of our student teachers. In our program, all student teachers spend the first four weeks of the student teaching semester on campus. A portion of this time is spent in whole group seminars. Having the opportunity to explain the program to all the student teachers at the same time will ensure that all the student teachers have the same information. More importantly, bringing the student teachers together will allow us to begin to build the sense of community we want them to have as they are in the field.

required to visit. Then the conversations begin. After reading To ensure consistency in the program, each Monday education faculty will take turns posting a message about an educational issue or concern. For example, many of our student teachers have concerns about classroom management. One of the first messages they may receive is information about classroom management in general and two specific web sites that they will be the articles or evaluating the sites, student teachers are invited to share their reactions. We require that they make at least one comment with specific references about the material. As student teachers log on and read each other's comments, they are encouraged to respond in positive ways to comments. Other topics for discussion include: using technology effectively with real students, teacher parent conferences, managing the paper load, grading, and effective assignments. We will also use this forum to give our student teachers current information on educational issues such as the state requirements for inclusion, no tolerance policies, and testing.

Student teachers are encouraged to post concerns or issues that they may be having in their classrooms. For example, if a student teacher has a parent conference scheduled, the student teacher might post a message asking for ideas from peers about procedures, what to say and what not to say, or what might be necessary in terms of documentation. Other student teachers respond with their ideas; thus, a conversation among the student teachers begins and the community continues to grow.

Another expected advantage of this component is that it will encourage student teachers to reflect on their teaching: specifically, lesson plans, content, and delivery. Often when asked to reflect, student teachers merely give a short, general comment. They are reluctant to elaborate or explain alternatives, successes, and failures in their reflection. We require that each student teacher post at least one reflection during the week. We encourage other students to comment on the reflection, ask questions, and suggest alternatives, or use the reflection as a springboard for new ideas.

Program Assessment

Before implementing the program, it is necessary to decide how to assess its strengths and benefits. Initially, we have decided to post an issue or concern and then to monitor the conversations. As faculty, we do not intend on responding to our student teachers comments through e-mail. If a student teacher seems to be in danger of committing a serious error in judgment, we plan to intervene privately. Although, our student teachers know that we monitor and examine their individual responses, it is our belief that by remaining "silent" we will be able to blend into the background as many ethnographers do.

In essence, we plan to take turns posting a concern on Monday. Although any of the coordinators or the department chair might monitor the responses for any week, the coordinator responsible for posting the issue will be responsible for checking the responses during the week and making hard copies of the electronic responses for the others on the next Monday. Each of the content coordinators will be responsible for closely examining the responses from the student teachers in that discipline. To encourage student participation, coordinators will assign points to the student teachers for each contribution to the conversations that helps to move the conversation along. Comments like "I agree," will not receive points. Coordinators will be responsible for recording the points for student teachers in the coordinator's discipline. Although our intent is not to use the conversations as a way to evaluate student teachers as they practice, we believe that the transition from extrinsic to intrinsic motivation needs to be strengthen for our students. We also believe, based similar in class discussions, that once the discussion begins most of our student teachers will begin to "join in" without the extra motivation of "the grade" to do so.

In addition, coordinators will be responsible for noting trends in the conversations. At the monthly coordinators meetings, these trends will be discussed and plans for appropriate action will be made. By evaluating the comments for patterns of concerns and issues, we believe we can better service our students. The patterns that we discover in our students' conversations will enable us to engage in a continuous evaluation of our total program from the content and education courses to the field experiences. Thus, we believe this community of professionals will continue to grow and expand. We further believe that this sense of community will strengthen the profession by helping to retain teachers.

Conclusion

It is hoped that requiring student teachers to stay connected to each other and to the college as they complete their fieldwork will instill a habit of sharing and learning together. By providing this type of support system, student teachers will be able to rely on peers rather than instructors as they make important curricular decisions. We are confident that helping them to establish a community will sustain them through student teaching and provide a model for them as they begin their careers in their classrooms.

References

Ball, S. (1985). Understanding teachers: Concepts and contexts. In S. Ball & I. Goodson (Eds.), Teacher' lives and careers. (pp.1-26). London: Palmer.

Grossman, P. (1990). The making of a teacher: Teacher knowledge and teacher education. New York: Teachers' College Press.

Strickland, D. (1987). The development of reading and writing: Essential knowledge for teaching and learning. In F. S. Bolin & J. M. Falk (Eds.), Teacher renewal.

Wolfe, M., & Smith, M., (1996). Inducting new teachers: Insights for staff developers. Kappa Delta Pi, 32, 82-86.

Zepeda, S., & Ponicell, J. (1996). Classroom climate and first-year teachers. Kappa Delta Pi, 32, 91-93.

Internet Use in Teacher Education: What Are the Foundations for Determining Learner Outcomes?

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Abstract: This descriptive case study explored both the implementation of an interactive web module in a teacher education course and the instruments used to assess the learner outcomes of that implementation. Data collection consisted of a pre-post critical thinking measurement, which was the foundation for the construct of higher order reasoning, an analysis of student-teacher discourse through electronic mail, and an interview with a student. The findings from this study have implied that: 1. an integrated approach of instructional technology must be carefully planned and implemented to reduce anxiety and increase the likelihood of student use; 2. there is a need for differentiating between the types of learning goals and outcomes in relationship to different instructional web module designs, and 3. there is a need for developing a blueprint of a variety of instruments that assess learner outcomes, both quantitative and qualitative in nature.

Introduction

The details of the theoretical application and implementation of the web module used in this study, as an instructional tool in a teacher education course, can be found in previous studies (Hazari & Schnorr, 1998, 1999; Schnorr, Bracken, & Hazari, 1999). The aforementioned web module design includes McKenzie's (1995) considerations that it is essential for technology to be implemented through careful planning, and the necessity that learning theory be used as a foundation for technology's integration within course instruction. However, little is known about the effect of technology on learner outcomes as measured by higher order reasoning skills (McKenzie, 1995; Riel, 1994). Furthermore, Reid (1997) indicates that the demand is high but the supply is low for methods of assessing the teaching and learning experience in online education.

Therefore, this case study was conducted to solidify a plan for assessing the teaching and learning experience while using an interactive web module in an educational psychology teacher education course, ESEC 443, at California State University, San Bernardino (CSUSB). The course instruction is designed to embed practical applications, such as teaching strategies and learning tools, within a theoretical framework. In this course, the World Wide Web (WWW) is employed as an educational device where it provides a variety of sources, thereby significantly broadening the spectrum of practical applications. For example, it is a source for finding innovative lesson plans and current educational research and practices (Hazari & Schnorr, 1999).

This case study observes the applicability of the interactive web module within the classroom from the standpoint of the module's ability to be used in facilitating learner growth as defined by the construct of higher order reasoning.

Theoretical Foundations

The World Wide Web is ideal for teachers who wish to use interactive technology to enhance learning within their courses. Since the Web is a newer medium that requires its own presentation style, careful planning is required to building effective Web pages that use learning theory as their guide (McKenzie, 1995). Such learning theories include Constructivism, Cognitive Behaviorism, and Cognitive Social Learning. Bednar, Cunningham, Duffy, and Perry (1992) strongly recommend applying theories of instruction to learning. The Constructivist theory incorporates pedagogical goals for the process of constructing knowledge by providing appreciation for multiple perspectives, embedding learning in relevant contexts, encouraging ownership in the learning process, embedding learning in social experience, encouraging use of multiple modes of representation, and encouraging self-awareness of the knowledge construction process (Vygotsky, 1986; Bruner, 1990). By virtue of its interactive nature, the WWW is a complement for a Constructivist learning environment.

Additionally, Relan & Gillani (1997) define Web Based instruction as, "the application of a repertoire of cognitively oriented instructional strategies implemented within a constructivist and collaborative learning environment, utilizing the attributes and resources of the World Wide Web" (p. 43). Furthermore, effective Web Based Instruction promotes student centered cooperative learning (Johnson & Johnson, 1990), critical thinking (Beyer, 1988; Ennis, 1989), communication skills, reasoning power, in a non-discriminatory environment that takes into account student cognitive styles by offering a multi-sensory interface that supports interaction and contextual learning.

The Study

The participants in this study were thirty-two students in the Single Subject Credential Program (SSCP) in the College of Education at CSUSB. The focus of the SSCP is to prepare educators who will evaluate current school practices and imagine teaching and learning in new ways. This program is designed in three phases: foundations, pedagogy, and Praxis. The phases lead candidates through a process in which ideas, models, and skills are continually reexamined and expanded. The SSCP is based on the philosophy of education embodied in five intersecting themes: diversity, curriculum in social contexts, critical reflection, communication, and academic competence (Handbook for the Single Subject Credential Programs, 1999). CSUSB can be described as serving a diverse population with a significant ratio of minority students, specifically Latino and African-American. The students can also be described as a primarily commuter population. The average socioeconomic status of the surrounding community is lower to middle income. The majority of the participants of the study had little (less than 2 years) of teaching experience.

This case study observes students in an adolescent psychology class, which met once a week over ten weeks. The interactive web module was introduced in the first class, and each consecutive class involved integration and expansion upon the module's uses in the course. All instructions relating to the use of the web module were given during the first session by the instructor. Supplementary instructions were given over the time of the course on a one-to-one basis and as a reminder within the class instruction. In the first session, the students were asked to complete an on-line questionnaire and to pay particular attention to the following components of the instructor designed web module at http://soe.csusb.edu/schnorr: 1. Informal assessment/critical thinking questions, 2. On-line practice quiz, 3. Links within each chapter that would provide lecture notes and alternative WWW resources, 4. Examples of former students' projects.

The data collected in this study were 1. Student Interview, 2. Pre/Post test assessment: Principles of Learning and Teaching: Grades 7-12, 3. Summary of technology use as indicated by student/ teacher discourse, 4. Evaluation of the Cal Press rubric for the study's critical thinking assessment needs. The collection took place over the ten-week quarter period.

Findings

Student Interview

The student interview was chosen as a data source because of its ability to provide the descriptive self-report of any perceived influence of the web module application on the outcome of the learning process from an end-user perspective. This report includes affective and intellectualized descriptions of the experience. This data source was analyzed for underlying themes relating to the web module's use by the student. The interview was conducted through electronic mail after verbal acceptance for participation was obtained. The student chosen was female, Caucasian and in her mid-forties. She was chosen because of her stated lack of experience with Internet technology use before the class. The question asked was open-ended and was administered and analyzed by the research assistant. The interview consisted of the following open-ended question: "Tell, in your own words, about using the technology in class. Please be as complete as possible by describing the process from beginning to end. If possible, please include your feelings and thoughts as they occurred throughout the class." The interview response revealed several themes.

Theme 1: Use of the web page as an instructional tool allows the class experience to become relevant to the student's personal life.

The interviewee said, "Because Dr. Schnorr encouraged us to write our Learning Projects in an area where we felt strong in order to LEARN TECHNOLOGY, I now feel that I could move beyond this and use the same tools to learn about other topics and fields of study. One of the goals of learning is to keep learning outside of the classroom and continue to grow as a person in a more holistic approach to learning. In my Learning Project, I wanted to incorporate a broader base of cultural awareness as related to the arts. I did research and was able to connect to the Getty Museum discovering they had a vast amount of information on Cultural Context and Cooperative Learning among Students. I also became aware that I could research the art of many countries and museums all over the world."

Theme 2: The interactive technology is seen as an unknown, which has negative implications for the user from the first day. The initial emotional reaction to the unknown was anxiety.

The interviewee said, "I am an artist; therefore, abstraction is difficult for me at times. The computer itself seemed so foreign. I had been using the computer basically in the WORD program to type reports and to keep records. I had never been on-line, surfed the Internet or used E-mail. My first reaction to Dr. Schnorr's expectations of integrating technology into the classroom experience was anxiety."

Theme 3: The teacher/educator, over time, provides a non-threatening environment where the student can overcome initial anxieties.

The interviewee said, "She (Dr. Schnorr) had a web page with all other important information and went through it in class with us. This turned out to be very empowering. Dr. Schnorr was able to give us tremendous access to a rubric and exact requirements for each assignment. She also had several illustrations of other learning projects so that we could further understand what a successful project should look like. Dr. Schnorr was able to show us power point presentations on a large screen instead of using an overhead--modeling. I didn't even know what a Power Point presentation was! That isn't really even important--she exposed me to new information that became clearer later."

Pre/Post Test Assessment

The pre/post test assessment instrument was used to observe if the web design had any influence on the students' critical thinking ability in relation to a standardized instrument. The instrument used was the *Praxis Series On Line- Professional Assessments for Beginning Teachers, The Principles of Learning and Teaching: Grades 7-12 (0524)[www.teachingandlearning.org/licnsure/praxis]*. This instrument assesses the student's knowledge of educational psychology principles. This test was designed to assess beginning teacher's knowledge of a variety of job-related criteria. The exam assesses knowledge on human growth and development, classroom management, instructional design and delivery techniques, evaluation and assessment. There are fifteen (15) total questions with thirteen (13) multiple choice questions and two (2) essay. The pre-test and post-tests were given to all thirty-two (32) students in the first session of class. The results for the pre and post-test were analyzed both quantitatively and qualitatively. The essays were quantitatively scored using the rubric provided in the Test at a Glance booklet produced by the *Praxis*. The possible essay scores ranged from 0-3. The essays were then qualitatively scored using the guidelines from the booklet that had been modified to allow for the student's application of practical knowledge. The results of this analysis revealed that this instrument was not appropriate for the purposes of assessing critical thinking within a constructivist context. The standardized appropriate answers as outlined in the rubric did not account for the unique experiences that face the teachers in this sample.

Summary of Technology Use

The electronic mail represents the discourse between the instructor and students. This discourse took place over the ten-week course span. The analysis consisted of reading for and finding common themes that existed within the messages. The instructor noted that throughout the course, the same students seemed to be taking advantage of such features as the informal assessment templates and e-mail use.

Rubric Suitability

The Holistic Critical Thinking Rubric was the device chosen to measure the student's level of critical thinking employed in the pre/post test and on the students' learning project. The Holistic Critical Thinking Rubric is constructed by the Cal Press and can be found at http://www.calpress.org./ The rubric was found limited in its ability to score the level of applied critical and creative thinking skills of the student. This instrument requires the learner to analyze, among other cognitive skills, opposing arguments without bias. The Learning project reflects some level of creative thinking. The student has the potential to take from the educational psychology theories presented in class what is necessary and develop an applicable product to the student's own experience and, in doing so, that type of learning does not fit within the guidelines of this critical thinking rubric.

Conclusions

The objective of this study was: (a) to explore the role of technology as it relates to learner goals and learner outcomes as determined by the researcher's theoretical foundations for instruction, such as Constructivism and Cognitive Social Learning theories; and (b) to validate the choice of rubrics for quantifying learner outcomes in relation to higher order reasoning. The outcomes of this study can be described as falling within two categories: 1. necessary procedural modifications for the subsequent experimental research study (i.e. independent variable or treatment issues) and 2. modifications of the researcher's learning theory construct and ideals about use of the web-based technology in relation to higher order reasoning (i.e. dependent variable or measuring issues).

Treatment Issues

The data that resulted from student online correspondence with the instructor (e.g. e-mails, on line questions, and etc.) and the student interview, lead to the realization that procedural changes were needed for introducing and reinforcing the use of the internet within the course. The analysis of the online correspondence said that the use was minimal and, in fact, isolated to a minority number of students with definite trends within the correspondence (e.g. lack of understanding about an assignment, or request for additional information.). The only time that there was a guaranteed use of the technology was if it was required, as in the case of the Learning Project Contract. To compound this issue, the interview revealed that initial levels of anxiety are produced when being introduced to technology while also being introduced to another educational context such as educational psychology. There is inherently a level of anxiety that is attached to learning something new- educational psychology, and that anxiety could be increased with the introduction of technology. This led to the identification of procedural issues for the ensuing study that would need to be addressed.

The following question emerges from these results: "How can the instructor reduce anxieties toward technology in the beginning of the course while increasing the likelihood that it is being used effectively?" First, the technology must be accessible. The researcher could not count on ongoing use outside of the classroom setting, therefore the class would be held in a computer laboratory or near one where the whole class could be transferred. Through integrating the technology more as an in-class activity, its use would be convenient and students' learning curve could be increased. The most promising aspect of the in-class use is the scaffolding that could be provided by both the instructor and the peers; this would encourage the technology use, specifically in required assignments such as the Interdisciplinary Group projects.

Secondly, a non-threatening task must be given in the first class that enables the instructor to diagnose the technology-related weaknesses and strengths of the students. After the first class, the instructor can give an outside class activity using the web module so that during the next class such problems as interface issues can be assessed.

Measuring Issues

The need for modifying the researcher's construct on learning theory foundations in relation to the web-based technology came from two different sources, one being the analysis of the scores from The PRAXIS Series: Principles of Learning and Teaching: Grades 7-12 Sample Exam used as the pre and post-test. During the attempts to score the tests as prescribed by the scoring guide given with the sample exam, a discrepancy was determined in what was believed to reflect higher-order answers for the essay questions yet would not have been considered as such by the instrument's scoring guidelines. According to the scoring guidelines, what could be expected to be a "correct" answer was a standardized answer based upon discrete theoretical origin to the exclusion of answers that include, and value, personal experience within the context asked. This led to the findings that the use of the Sample Test for the purposes of this study was an invalid assessment of what the researcher believed was the effect of the web-based module on critical thinking skills. This study also had an impact on questioning the suitability of the Cal Press rubric for assessment of the thinking levels that emerged from the learning project assignment within this research study which appeared to be more *creative* in nature. These findings also lead to the realization that clarification was needed between the constructs of critical thinking and creative thinking. Critical thinking is considered evaluative thinking that is logical and creative thinking is defined as the ability to deal with a problem in an original way (Wakefield, 1996).

Finally, the researcher discovered that in the same way that various instructional strategies and assignments within a course target varying levels of reasoning and cognition, so do varying elements of instructional Internet designs. Whereas this researcher thought that some of the Internet scaffolding techniques produced higher order reasoning, the questions and feedback from the instructor with student use of the on-line critical thinking template, in some cases, narrowed the students' thinking more closely to the instructor's desired response. In line with all of the findings outlined above, the researcher's construct of what constituted higher order reasoning skills (critical and creative thinking) was determined as requiring realignment, and in fact, a more solid definition. The following question emerges from these results: Are there valid quantitative measures for critical and creative thinking given the qualitative nature of these constructs? Secondly, how does the interplay between the expected outcomes of the assignment itself and the use of the Internet in relation to that assignment affect learner outcomes? Thirdly, do unique components within the instructional Internet design target differential learner outcomes?

Recommendations

The results from this study have provided us with a solid framework from which to approach the subsequent quasi-experimental and qualitative research design that is outlined at http://soe.csusb.edu/schnorr/matrix.htm. The most pragmatic result was the determination that the ideology of the expected learner outcomes based upon Constructivist and Cognitive Behavioralist constructs required redefinition and realignment and how the web module design effects those outcomes. This result has led to the creation of a checklist (http://soe.csusb.edu/schnorr/matrix.htm) that can be used to evaluate the following ideals in concert: 1. the learning theory that provides the purpose for the web module design, 2. the relationship between the learning theory and the web module design components that align with that theory, 3. learner outcome assessment tools that align with the goal of the web module design.

References

Bednar, A., Cunningham, D., Duffy, T., & Perry, J. (1992). Theory into practice. In T.M. Duffy & D. H. Jonassen (Eds.), *Constructivism and the technology of instruction: A conversation* (pp. 17-34). NJ: Lawrence Erlbaum Associates.

Beyer, B.K. (1988). *Developing a thinking skills program.* MA: Allyn & Bacon.

Bruner, J. (1990). *Acts of meaning.* Cambridge, MA: Harvard University Press.

CSUSB (2000). *Handbook for the Single Subject Credential Programs.* CA: CSUSB.

Ennis, R. (1989). Critical thinking and subject specificity. *Education researcher,* 18(3), 4-10.

Hazari, S., & Schnorr, D. (June, 1999). Leveraging student feedback to improve teaching in web based courses. *Technological Horizons in Education,* 30-38.

Hazari, S., Schnorr, D. (1999). Implementation of interactive web module in a teacher education course. *The Journal of Computing in Teacher Education,* 15(3), 8-16.

Johnson, D. & Johnson, R. (1990). Cooperative leaning and achievement. In S. Sharon (Ed.), *Cooperative learning theory and research* (pp. 22-37). NY: Praeger.

Mckenzie, J. (1995, December). *"Did anybody learn anything?" Assessing technology programs and the learning accomplished from now on: a monthly electronic commentary on educational technology issues,* 5(4).

Reid. J., Jr. (1997) *Measurements in online study: Items useful in quantifying pedagogical, social and technical issues.* Retrieved November 3, 1998 from the World Wide Web: http://www.caso.com/articles/reid05html

Relan, A. & Gillani, B. (1997). Web based instruction and the traditional classroom: Similarities and differences. In B. A. Khan (Ed.), *Web-based instruction* (pp. 43). NJ: Educational Technology Publications.

Riel, M. (1994). Educational change in a technology-rich environment. *Journal of Research on Computing in Education*, 26(4), 452-474.

Riel, M., & Harasim, L. (1994). Research perspectives on network learning. *Machine-Mediated Learning*, 4(2-3), 91-113.

Schnorr, D., Bracken, N., & Hazari, S. (1999). *The goals and development of an interactive web module for a teacher education course.* Society for Information Technology and Teacher Education Conference Proceedings.

Vygotsky, L. (1986). *Thought and language.* Cambridge: MIT Press.

Wakefield, J.F. (1997). *Educational psychology: Learning to be a problem solver.* Boston: Houghton Mifflin Company.

Student Teacher Educational Technology Use

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Abstract: This paper deals with the use of instructional technology by student teachers. According to the results of three years of surveys, student teachers at our university are reporting limited use of instructional technology during this experience. Data from the surveys illustrate the restricted use of instructional technology, which technologies are being utilized, and some of the causes for concern.

Introduction

While working with colleagues in the Chemistry Department at Northern Kentucky University to develop a chemistry class for pre-education majors, I arrived at the idea of surveying our student teachers to see if the course had any impact on their use of educational technology. The following paper discusses the results of the survey, some implications, and direction for further research.

The Study and Findings

The following data were gathered over a three year period in which student teachers from Northern Kentucky University in the Elementary and Middle Grades Education Programs were surveyed concerning their use of educational technology. Surveys were distributed each Spring Semester. One hundred three surveys were returned out of just over three hundred. The overwhelming majority of respondents were female (93.2%). Most (68.9%) were seeking elementary certification.

Only 60.2% reported that they used educational technology while student teaching. Mathematics was the subject area that rated the most use of educational technology (14.1%). English and other subjects each accounted for 7.7%, while science and social studies each rated 6.4%. Many respondents reported that they used technology for a combination of subject areas (57.7%).

The most frequently used hardware was the CD ROM (48.5%). Second was LCD projectors (18%). That was followed by laser disc players (15.6%) and computer interfaced probes (1.7%). Results were consistent for the use of software with CD ROM's being the most used form of software (54%). Floppy discs were second with 37.7%. Laser discs were used by 21.8% of the respondents and 11.3% reported using simulations. Just over half (51.5%) of the student teachers stated that they or their students used Internet resources.

Student teachers were asked to rate the impact two courses that were specifically designed to promote and model educational technology usage had on their use of technology. The first course was CHE 105: Chemistry and Society. The second course was EDU 313: Computer Applications for Teachers. CHE 105 was rated by 23.1% of the respondents as having impact or the highest impact on their use of educational technology. 48.1% rated EDU 313 as having impact or the highest impact on their use of technology while student teaching. Several student teachers rated other courses as having greater impact, but these were courses that few in the program had taken.

Respondents were also asked to answer essay type questions to explain some of their responses to the other questions. The first essay asked, "Why haven't you used educational technology for instructional use?" The following are quotes from the student teachers:
"Because they were not readily available to me."
"During the first eight weeks of student teaching I was told what and how to teach.
During the second eight weeks, we have been covering materials to prepare for [state] testing."
"Technology was not readily available."
"In my classroom, technology is not available. I would like to use it if it would come available."
"The classroom has a few computers but are not set up to teach a whole class. In addition, I don't feel ready to use this technology to teach yet- maybe when I have more experience in the classroom."
"Would love to use computers if available and current teacher supervisors in the school district felt confident with them."

Recommendations

These responses indicate a direction the university and cooperating schools must take to improve the use of instructional technology by student teachers. Professors must model the use of technology in teacher preparation programs, especially those teaching courses in the content areas. University supervisors must encourage and support cooperating teachers to obtain and use educational technology.

Further Research

Interviews and focus groups will be conducted in the spring of 2001 to explore further the data resulting form the surveys and to identify ways universities and cooperating schools can improve student teacher use of educational technology.

The following is a quote from a student teacher you wanted to write his/her own essay:
"I feel like my education I received here at NKU prepared me for my career somewhat. I do not feel as if my computer knowledge or use of technology was enhanced at all. With our growing and changing society NKU should have smothered me with computer work and technological advances."

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Project Sun: Teacher Preparation at Brevard Community College

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Abstract: Brevard Community College (BCC), in partnership with the Florida Solar Energy Center (FSEC), the School District of Brevard County, the Astronauts Memorial Foundation (AMF), and the University of Central Florida (UCF), has submitted a proposal to the National Science Foundation, Advanced Technological Education Program called *Project Sun* to provide pre-service (BCC teacher education students) and in-service (Brevard County certified) teachers an exciting array of curriculum opportunities and technical experiences to enhance their scientific and technical instructional skills. *Project Sun* is a comprehensive plan that addresses an ATE project in the Technical Experiences program track with objectives that will provide 1) technical experiences for pre-service (PS) and in-service (IS) teachers, 2) a thematic approach to science instruction, 3) a method of scientific investigation, scientific practice, and thought, 4) exposure to working scientists and educators, 5) recruitment and articulation activities between all institutions involved, and 6) business partnership connections.

Introduction

The educational community does not fully realize and recognize the essential role of two-year colleges in teacher preparation. Nationwide, more than 40 percent of teachers complete a portion of their science and mathematics course work at two-year colleges, with most of the elementary and middle school teachers completing all of their college-level work at these institutions (NSF, 1998). Thus, for most public colleges, opting out of providing teacher education, especially in science, mathematics, and technology, is not a choice. Pursuing a concentrated effort to improve teacher education is both practical and moral (Gonzalez 1999). According to an industry task force, many teachers are teaching "rain forest mathematics" curricula that are light on the tools tomorrow's high-tech workers will need (Leopold 2000).

The solar curriculum and experiments will give impetus for teachers, both PS and IS, to expand their personal and academic capabilities in science, mathematics, and technology education. The four Solar Energy curriculum units ("Solar Matters," "Alternative Fuel Matters," "Solar Wonders," "Building Performance Matters") provide an exciting thematic approach to scientific and mathematic study through a myriad of topics, experiments, and activities. Each of the curriculum units and activities are adaptable and versatile, allowing them to be adjusted up or down to fit any academic level. Common materials and supplies are used in the experiments and activities so that they can be conducted in or outside the classroom. Most importantly, they use a renewable and readily available energy source - the Sun.

The project outcomes will enable educators to integrate creative and intriguing science and mathematic activities into their daily instruction, provide "hands-on" experiences to increase the PS and the IS teachers' scientific and technologic capacities and skills, increase their interest in teaching science and math, connect mentoring teachers with students, and engage educators, scientists, and industry in supporting teacher preparation. In addition, PS teachers will gain a clearer understanding of the career opportunities, roles of responsibility, and challenges of the teaching occupation. They will also be better prepared to continue their teacher preparation at the university level and be aware of occupations using science, mathematics, and technology skills. The dissemination activities, video, and the community forum will heighten the community's awareness and sense of stewardship of renewable energy, the importance of quality teacher preparation, and the role of the community in the education efforts.

The Project

The content focus of *Project Sun* are the solar energy curriculum units developed by the Florida Solar Encrgy Ccnter, a nationally recognized research institute of the University of Central Florida. The curriculum units are aligned to the national science standards and the Florida Sunshine State Standards.

Summer Sun Academy, a five-day workshop for 25 PS and 25 IS teachers, will be conducted. Subsequent mentorships will be created at this time, which will continue throughout the year as PS teachers complete their field experiences, internships, and curriculum projects. All participants will receive support from each other.

The *Project Sun* partnership was formed among BCC, UCF, FSEC, AMF and Brevard Public Schools so that each entity would provide resources toward the success of the project. Objectives regarding teacher preparation, enrollment, and articulation are focused on students at Brevard Community College. Founded in 1960, BCC is a comprehensive, public two-year community college in east central Florida, home of the nation's space program. In 1999, BCC enrolled over 14,000 students in degree and vocational courses. In 1997, Forbes Magazine listed BCC as one of America's top 20 "CyberU's"—the only community college to receive the distinction. In addition, The Association of Community College Trustees has recognized BCC as one of the two most outstanding community colleges in America in terms of equal opportunities for women and minorities.

The primary target population for the project participants is BCC students who have completed or intend to soon enroll for an education course. The secondary target population is in-service elementary school teachers in Brevard County, particularly those from schools with the highest percentages of children from low-income families. Participants should already have introductory computer skills. Before Sun Academy, participants will complete a technology self-evaluation rubric; they will also be encouraged to visit Web sites such as Computers for Lunch as a learning-readiness activity.

Designed for future and current elementary teachers, *Project Sun*'s contcnt of instruction focuses on the top three most requested training needs: Internet, PowerPoint, and Web design. This training will not duplicate existing training already provided by BCC or Brevard Public Schools, but rather complement and support other technology training. *Project Sun* consists of a summer workshop and school year activities. Project activities directly address the project objectives.

a. Sun Academy. The Sun Academy is an intensive, five-day workshop for 25 in-service and 25 pre-service teachers per year with a dual purpose of increasing technological literacy and science/math preparation. Sun Academy was developed in direct response to surveys which documented needs of elementary school teachers in Brevard County for integration of technology into the curriculum and specific technology applications. Pre-service teachers will choose to receive either a stipend or a fourth credit hour to the EME 2040 Teaching with Technology course; in-service teachers will receive 35 in-service points and a stipend. This Academy will unleash the technical potential of the participants, giving them practical experience in using the tools of technology, expose them to a thematic curriculum approach, and give them confidence in their own potential for teaching science, math, and technology. Participants receive a *Project Sun* notebook and are encouraged to keep a journal of their progress.

The *Project Sun*'s PI and Co-PI will supervise. During Sun Academy, activities are performed in teams that contain both in-service and pre-service teachers in order to build group problem-solving skills and develop mentoring relationships. The following is a schedule of activities for Year 1. Years 2 and 3 are similar except that 1) previous Project Sun participants will make presentations at Sun Academy about their experience, and 2) instruction will change according to what is most suitable and requested in the yearly survey of technology training needs in Brevard County.

Activities

The project activities during the academic year will directly address the objectives for technical experiences, preparation of teachers, recruitment, and partnerships. Providing experiential and hands-on activities with technologies and applications to PS teachers is a primary objective. PS teachers enrolled (approximately 300) in the BCC "Technology for Educators" course will learn to use and understand technology tools of the classroom teachers by engaging in the improvement of the existing solar energy posted on the FSEC website (www.fsec.ucf/edu/ed/teachers). Under the instruction of key faculty, students will develop, create, and integrate interactive components, a FAQ section, animation, video, and other activities for the text-based curriculum, making them livelier, real, and more interesting to teachers and students.

DAYS 1 – 2: Instruction for Sun Academy will be delivered by BCC technology and education faculty and Florida Solar Energy Center (FSEC) staff on Days 1 to 4. Participants will work in teams to evaluate "Solar Matters," a solar energy curriculum unit that includes 25 inquiry-based, cooperative learning projects for upper elementary school/early middle school students. Currently posted on the FSEC Teacher Web site (www.fsec.ucf.edu/ed/tcachers), "Solar Matters" is one of four Solar Energy curriculum units developed by FSEC, a nationally recognized center of UCF. "Solar Matters" is aligned to the national science standards from the National Research Council, and the Florida State Sunshine Standards for science and math in Grades 4-8.

Currently, "Solar Matters" is pages of static text; participants will develop ways to improve the curriculum, based on current research they have just reviewed on effective educational technology strategies. Teams will develop, create, and integrate interactive components, a Frequently Asked Question (FAQ) section, word problems, and activities to the text-based curriculum to make it more learner-centered, interesting, and user-friendly for teachers and students. Participants will also learn how to make Web sites accessible for all students, such as creating audio files for blind students, or ensuring that all cultures are represented in graphics of students and teachers.

Participants will learn how to use software programs such as QuizPlease or Hot Potatoes, which are user-friendly ways to add interactive quizzes to the Web sites. They will be instructed in using presentation software (such as PowerPoint and Kid Pix) which allows you to draw and animate models, and to add slides to Web sites. They will also gain experience in searching the Web for the many freeware/shareware resources available to enhance Web sites (such as clip art graphics, sign-in guest books, counters, puzzles, chat areas, bulletin boards, and more).

In addition to advancing their knowledge of technology and science, participants will increase their math skills as they create original math word problems for "Solar Matters" which includes integrated curriculum that aligns with state math standards. They will also perform math while working with "Solar Matters" activities that require calculations of time, temperature, angles, and population demographics.

DAY 3: Participants will develop a Sun Kids Web site, appealing to all levels from elementary to secondary. Participants will learn to use Microsoft FrontPage or Publisher for Web site creation, which are ideal for beginning Web authors. (They are also the two Web design programs that come with versions of Microsoft Office 2000, which was one of the top programs Brevard elementary schools requested training in). Web site highlights will include a Guest Scientist section, FAQ's, Learning Centers, a Discussion Forum for students to exchange ideas with others around the world, an Ask Professor Soleil column, solar experiments, and activities for home or school use.

DAY 4: This instruction is at The Astronauts Memorial Foundation. Participants will choose a solar energy activity/experiment from "Solar Matters" to perform. Having participants perform the experiments they will teach their students is crucial to their development as teachers. One study notes that 19% of third graders never perform experiments in science class; that many pre-service elementary teachers have misconceptions about science; and that many elementary are reluctant to teach science due to an inadequate science background (Sutton). Teachers who model scientific inquiry and technology use are more effective in the classroom.

Participants will rehearse and then videotape each other's presentations using digitized video cameras, or they will take a series of still photographs with Mavica digital cameras. (98% of elementary schools in Brevard County have digital cameras and/or video editing equipment).

DAY 5: At AMF, participants edit their videos on iMac computers (Macintosh computers outnumber PC computers at Brevard elementary schools 2 to 1). Participants will use iMovies digital editing software, which turns the series of digital still photographs into a motion picture. Final presentations will have participants exhibit their movie and then burn it onto a CD for use in a resource library. At the end of Day 5, there will be a "graduation" ceremony where participants receive a Certificate of Completion and a Sun Academy T-shirt. Each school represented at the Academy will receive a curriculum unit and a "Solar Matters"

Kit composed of enough materials and supplies to recreate Academy experiments.

b. Follow-Up Activities During the School Year. Learning is more meaningful when placed in a context with practical applications; learning technology is no exception. Once participants have completed the summer academy, they are Sun Academy graduates. It is expected that 90% of graduates will continue with follow-up activities throughout the following school year; several will continue to be involved with *Project Sun* for the full three years of the project. They will remain involved in *Project Sun* due to a comprehensive plan of project retention, which includes academic support, mentoring relationships, electronic conferencing, and workshop opportunities. The project expects to compensate for the estimated 10% of Sun Academy graduates (five) a year who choose not to follow up. Five pre- and in-service teachers a year who are interested in participating in some of the school-year activities may do so with a colleague who attended Sun Academy; they will be recruited for the next Sun Academy.

All education, math, science, and technology faculty at BCC will be involved in helping Sun Academy graduates who are BCC students to build on the knowledge gained at Sun Academy. Education students at BCC take the core courses Introduction to Education, Teaching Diverse Populations, Teaching with Technology, and Introduction to Special Education—all of which are available as distance education online as well as in a traditional classroom. Particularly in the EME 2040 Teaching with Technology course, students will reinforce the technology skills learned at Sun Academy. Specifically, they have assignments that require them to make PowerPoint presentations, practice with digital cameras and digital video cameras, use the Internet extensively, and evaluate educational Web sites.

Participants are encouraged during Sun Academy to find a mentor and also be one themselves throughout the school year. Mentoring relationships do not necessarily have an in-service teacher as mentor and pre-service teacher as protégé. A pre-service teacher needs an in-service teacher as a role model for pedagogy, but may be more technologically literate and can act as a mentor as well. A national study found that teachers with three or fewer years of experience were more likely to feel well-prepared to use computers than teachers with 20 or more years of experience (Rowand 1999).

BCC education students are required to go into the schools for classroom observations. In the past, this has been simply observing pedagogy. *Project Sun* participants, with the cooperation of the supervisor teacher, will do their observations in classrooms supervised by in-service teachers who allow the student take a more active role. During their in-school time, participants will use technology to support innovative assessment of students, as described by Sheingold and Frederiksen (91-108). Participants will use An Educator's Guide to Evaluating Use of Technology in Schools and Classrooms (Quiñones et al. 1998), which describes benchmarks, indicators, and methods of collecting information with nine worksheets that cover topics such as "Why am I evaluating?" "What questions should I ask?" and "How do I communicate my results?" Participants will fill out these worksheets as they observe students going through Solar Matters and Sun Kids. To develop reflection on their progress, participants will add to the journals they began at Sun Academy. Participants can decide to keep the journal private, submit it to project directors, or post it on the Web site.

To promote awareness of technologies and the teaching career, participants will create an Inquiry Group among themselves, with support from project directors and education faculty. The Glenn Commission recommends Inquiry Groups because "however well they may have been prepared to teach, and whatever knowledge they may have gained in Summer Institutes, all teachers need continuing, collegial contact, peer reinforcement, and input from experts to sharpen their skills and deepen their subject knowledge." Participants will make a field trip to the Instructional Technology Resource Center at UCF in Orlando to increase their knowledge of current teaching technologies. They will also visit FSEC to learn about the origins of the solar energy curriculum, and to meet scientists who are conducting research on renewable energy for commercial and non-commercial use globally.

The Inquiry Group will set up an electronic discussion group (also known as a listserv), develop their mentoring relationships by E-mail, arrange real-time chat sessions to discuss a variety of topics, take electronic field trips, and post lessons (in-service teachers) or notes from their observations (pre-service teachers) on the Web site. The listserv and chat sessions will help participants organize a Renewable Energy Community Forum featuring a variety of guest speakers. This will be an opportunity for *Project Sun* participants to gain experience organizing and disseminating results of an educational forum, increase their knowledge of solar energy, and meet working scientists, government representatives, business and industry leaders, and other educators.

c. Increasing Enrollment and Diversity. Increasing the number and diversity of prospective K-12 teachers at BCC is a key concern of *Project Sun* (Objective 3). It is crucial to the future of teaching to be more inclusive, and teachers should reflect the diversity of the students they teach. While minorities comprise only 13% of our teachers, almost 30% of our students are from minority populations (NCTAF, 1996). The *Project Sun* Director (Principal Investigator), Dr. Krupp, will create recruitment materials that explain the AA degree and how to make a smooth transition to UCF. Other materials will be created for BCC students in math, engineering, science, and technology classes, encouraging them to consider a career in teaching. This effort is aided by a new incentive by Brevard Public Schools to give teachers in math, science, and special education $1,000 sign-on bonuses. Participants from Sun Academy who want to expand their experience producing and editing video will make a video of Brevard Public School teachers describing the rewards of a teaching career, and current BCC and UCF education students talking about how much they enjoy their major.

In addition, thc PI will work with BCC Minority Recruitment and Retention and the Office for Students with Disabilities to create materials to encourage the enrollment of those traditionally under-represented in elementary education, such as males (only one out of ten elementary school majors is male), and those from minority, low-income, and disabled populations. As role models are an important factor in deciding a college major, BCC elementary education students who are from an under-represented population will be available at career fairs and on the video discussing their background and why they chose to pursue a teaching career. This effort will work hand-in-hand with Brevard Public School's recent efforts to increase minority teaching candidates. The Project Director will also work closely with the local One-Stop Center to develop materials to specifically target career changers. Materials will show, among other information, that the Brevard average teacher's salary is above the Florida average (Gonzalez, 2000).

The *Project Sun* PI will also visit high schools to talk about the education major, to promote *Project Sun*, and to encourage seniors to attend Sun Academy when they graduate. At Rockledge High School, students are enrolled in a new "Exploratory Education" course where they get training and then teach children at Hoover Middle School with reading. The 30 students in the program will be the focus of recruiting efforts. Retention of current students in the BCC education program will be improved by *Project Sun* as well as by the establishment of a Future Teachers of America chapter at BCC.

Pre-service teachers will be tracked through the duration of the project to determine their progress toward graduation, certification, employment, and preparation. Project directors will cooperate with longitudinal studies to track students beyond the grant period, in order to follow them through their first year of teaching (which may be five years after entering the project) and see that they demonstrate successful performance in the classroom.

d. Articulation Partnerships. Currently in Florida, students who are awarded an Associate of Arts degree are guaranteed complete acceptance of the community college credits toward their Bachelor's degree. Articulation agreements exist between BCC and UCF on the prerequisites necessary for a teacher education degree program. The Articulation Committee, consisting of administrators and instructors from BCC and UCF, will be responsible for reviewing the current articulation agreements and course requirements to determine what modifications are necessary to ensure that: 1) courses are aligned with state and national requirements; and 2) students have a smooth transition into an upper-division teacher education program. The Committee will survey UCF students who transferred from BCC to determine their satisfaction with the information, academic counseling, and services received during their transfer. The survey will elicit suggestions for improvement from students, and use the results to improve the transfer process.

Conclusion

Project Sun intends to be a statewide and nationwide model for improving teacher preparation. The results of the project will advance knowledge in the fields of technological literacy for teachers, theme-based science teaching, alternative energy education, mentor relationships between pre-service and in-service teachers, and the transfer process from a two-year college to a four-year university.

References

Gonzalez, Zenaida A. (1999). Teachers need more training to get most from computers, *Florida Today*, A1, September 23.

Gonzalez, Zenaida A. (2000). Brevard prepares for teacher shortage, *Florida Today,* A1, October 14.

Leopold, G. (1997). Commerce adds voice to claims of IT shortage. EDTN Network Online (available at http://www.eetimes.com/new/97/974news/commerce.htm.)

National Commission on Teaching and America's Future. (1997). State-byState Report Card Indicators of Attention to Teaching Quality, October.

National Science Foundation (1998). Investigating in Tomorrow's Teachers: the integral role of two-year colleges in the science and mathematics preparation of prospective teachers.

Quinones, Sherri, and Kirshstein, Rita. (1998). An Educator's Guide to Evaluating the Use of Technology in Schools and Classrooms, December, prepared for the U.S. Department of Education.

Roland, Cassandra. (1999). National Center for Education Statistics Fast Response Survey System. "Survey on Public School Teachers Use of Computers and the Internet, FRSS 70.

Sheingold and Frederiksen. (1994). "Using Technology to Support Innovative Assessment, in Means," ed., *Technology and Education Reform: The Reality Behind the Promise.* San Francisco, CA: Jossey-Bass, 91-108.

Sutton, Lynn C.; Watson, Scott B.; Parke, Helen; Thompson, Scott W. (1994). Factors that Influence the Decision of Preservice Elementary Teachers to Concentrate in Science. *Journal of Science Teacher Education*, Abstracts 4 (4), 109-14 .

Educational Technology at the University of Florida

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Abstract: The expansion of educational technologies in the College of Education at the University of Florida has resulted in three interrelated phenomena: (1) the development of educational technology support throughout the College, (2) the integration of technology within our teacher education program and other programs throughout the College, and (3) the expansion and revision of our Educational Technology degree program. This paper explores these three interrelated phenomena in detail.

Introduction

A metamorphosis has been occurring in the College of Education at the University of Florida in recent years. In increasing numbers, faculty and students alike are using technology to create and provide meaningful and engaging learning environments. The expansion of educational technologies in the College of Education has resulted in three interrelated phenomena: (1) the development of educational technology support throughout the College, (2) the integration of technology within our teacher education program (ProTeach) and other programs throughout the College (i.e. educational technology for non-majors) and (3) the expansion and revision of our Educational Technology degree program. Figure 1 illustrates these three interrelated phenomena and the rest of this paper further explains each in detail. Please see our web page for more information: http://www.coe.ufl.edu/Courses/EdTech/ET.html

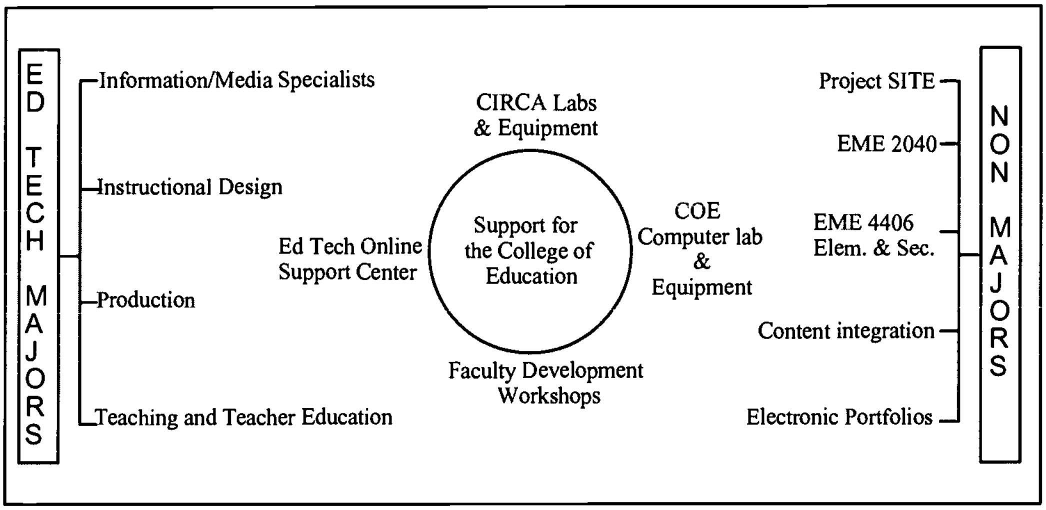

Figure 1: Educational Technology at the University of Florida

Support Structure

The importance of having a support structure for students and faculty cannot be overlooked when infusing educational technologies into the College of Education. Without a robust and changing support system, many, if not all, of the technologies will be underutilized in this learning environment. It is critical that all members of the College of Education community learn not only fundamental skills for using educational technologies but also to develop strategies for seamlessly integrating these educational technologies into the daily learning environment. Currently, the College of Education has four areas of support dealing with access, skill acquisition, and professional development.

CIRCA labs and Equipment

Students have access to the university supported computing labs (CIRCA labs). Located within the College of Education are two labs of 25 G4 Macintosh computers. These lab provide students access to scanners, printers, and numerous specialized application packages. In addition, there is at least one computer consultant on duty in the College of Education labs.

College of Education computer lab and Equipment

The College of Education computer lab is primarily used by the Educational Technology program and for college-wide faculty development. This lab has 15 G4 Macintosh computers, digital video cameras, scanners, video acquisition machines, video editing software, high-level production packages, laser disc players, and a CD ROM burner. Students work in the lab on class projects when the lab is not being used for classes. With the abundance of classes and the popularity of the lab, it is rare to find a time when the G518 lab is not being used. This lab allows students to have access to equipment and also provides a place for skill acquisition and professional development. Educational technology faculty offices are located within this lab so there are always graduate students and faculty around the lab to provide assistance.

Faculty Development Workshops

The Office of Educational Technology, an academic computing group of staff and graduate students, has recently been established in the College of Education to support faculty in the integration of technology into all curricular areas. New faculty meet with the Director of the Office of Educational Technology to determine technological fluency and to provide suggestions for integrating technology into the classroom and work environment. Faculty new to using technology are building skills in workshops and gaining insight on strategies for using technology in their courses. In addition, graduate students serve as mentors/coaches for new faculty members. More experienced computer-using faculty receive instruction in advanced computer applications as well as learning strategies for effectively using technology in the curriculum.

Educational Technology Online Support Center

In 1994, we decided that many of the support documents we were creating for our courses transcended an individual course. As a result, the web-based Educational Technology Support Center was developed. It has undergone several transformations as different groups of students worked on its evolution. We now offer support to new students, school children, teachers, and those interested in developing technological skills. The existence of the support center has had an impact on K-12 schools, where students often use our reference pages to learn how to build web pages, and on our own courses, where we no longer teach web page development directly. Although the Educational Technology web suite is now extensive, we envision a time when institutional resources will be directed at our web presence, allowing us to build a more robust virtual "knowledge community". Since our students are both producers and consumers of information, our web suite should become an interface between the global infosphere and our particular corner of it.

Non-majors in the Educational Technology program

The faculty, staff, and students in the College of Education recognize the need for technological fluency for success in the 21st century classroom. Teachers at all levels must be able to appropriately utilize educational technologies in their learning environments. This thrust in the College of Education has prompted the development of several courses and an alternative certification program. Described below are only a few of the courses and programs available for different audiences within the College of Education.

EME 2040: Introduction to Educational Technology

EME 2040 is an introductory technology course mandated by the state for all declared education majors. With the organizational structure of the teacher education program, this class primarily contains elementary education students. (Secondary education students obtain a baccalaureate degree in their field and declare majors in their area of specialization.) This course is designed to introduce students to current and emerging educational technologies, and frameworks for critical assessment of the changing nature of humankind's relationship to information and knowledge. By examining the influence of specific technologies on education, society, culture, economics, politics and history, the course analyzes human to human communication and our expanding knowledge base. By comparing and contrasting research and instructional models the course addresses innovation diffusion, paradigm shift, and the nature of change at a local, regional, and global level. Simultaneously, students are required to engage in laboratory activities designed to expand their personal horizons with respect to technology. Further information can be found at http://www.coe.ufl.edu/courses/EME2040/2040.htm.

EME 4406: Integrating Technology into the Curriculum (Secondary Sections)

EME 4406 is one of the required courses in the education minor for students in the College of Liberal Arts and Sciences. This is frequently the first computing course that students encounter in their educational experiences. Integrating Technology into the Curriculum is a hands-on and discussion/lecture/group-based course designed to give students experience with the infusion of computers into curricula. Students engage in activities that are based on the idea that a learning concept involves viewing it from multiple perspectives to accommodate different types of learners. Students also gain first hand experience in creating activities that span academic disciplines and address a wide variety of learners. Additional information can be found at http://www.coe.ufl.edu/Courses/EME4406Sec/4406.htm.

EME 4406: Integrating Technology into the Curriculum (Elementary Sections)

EME 4406 is designed to help students think about how technology may be used to enhance and extend elementary teaching. While students learn many technology skills during the semester, the primary emphasis of this class is on teaching and learning in the elementary school. Two very basic questions about how and when to use technology guide the class (Harris, 1998): (1) Will the technology enable us to do things we couldn't do before? (2) Will the technology enable us to do things better than we could before? Other fundamental principles that guide the class include the use of technology to promote content area learning and constructivist teaching principles, alternative assessment strategies, reflection and integration of state-mandated standards. More details are available on the class website: http://www.coe.ufl.edu/Courses/EME4406elem/home.htm.

Content Integration Course for Secondary ProTeach

Students in Secondary ProTeach have classes to learn strategies of using technology in their area of specialization (mathematics, science, and social studies). In this setting, students gain experience in using specialized software for their field and in creating technology-rich learning environments. For example, mathematics students learn methods for using software packages such as Cabri Geometry and the Geometer's Sketchpad as well as various Internet sites to enhance student learning opportunities. Students in the science and social studies classes also learn to use specialized software packages and technology integration strategies for their field.

Electronic Portfolios

In the fall semester of 1999 the Proteach students at the University of Florida began creating electronic portfolios as a way to demonstrate proficiency in the state of Florida's 12 accomplished practices. These are process portfolios which evolve throughout the student's education in the College of Education. Through the development of electronic portfolios students will understand and operationalize an evolving relationship with the accomplished practices. All students in teacher education certification programs create and maintain an electronic portfolio. An extensive support system is currently being created to assist students and faculty in this endeavor. Additional information can be found at http://www.coe.ufl.edu/school/portfolio/index.htm.

Project SITE

Project SITE (Site-based Implementation of Teacher Education) allows students to earn a Master of Education degree in Elementary Education and be eligible for certification. This project is offered jointly by the University of Florida's College of Education and the School Board of Alachua County. The site-based program is an intense 4-semester sequence that includes 48 credit hours of study and classroom teaching under excellent supervision.

This alternative to traditional teacher preparation provides a learning environment in which the graduate student's previous careers and volunteer experiences supplement their classroom instruction. This results in new teachers whose rich experiential backgrounds enable them to relate well to a wide variety of students.

Formal course work is taught at both the University of Florida's College of Education and the Alachua County Schools. Instructional strategies and methods are taught by practicing classroom teachers, administrators, and University of Florida faculty. The theory learned in course work is applied through daily classroom apprenticeship, with the intern working under the guidance of a mentor teacher.

Educational Technology Majors

The Educational Technology program accommodates students with a wide variety of interests and career goals. Although most of our students find positions in K-16 educational settings, some are employed in the private sector as instructional designers, multimedia developers, and content providers. In order to meet the particular needs of our students, we have developed four areas of study or *tracks*. The delineation of the program areas helps students decide which courses are appropriate for their career goals. The four program areas are Information/Media Specialists, Instructional Design, Production, and Teaching and Teacher Education. Following their interests, students often take courses outside of their specified track. Descriptions of the areas of study follow:

Information/Media Specialists

The information/media specialist track is intended to prepare students for service in preK-12 school media centers. Successful completion of courses in this track leads to qualification for Florida certification as a school media specialist. Students in this track take core library/media courses as well as courses in communication theory, video production, and computer applications.

Instructional Design

Students in the instructional design track desire to become instructional developers in various settings including government, business, health, industry, and post-secondary environments. Students focus on topics such as the various perspectives of instructional design and message design.

Production

Students enrolled in the production track investigate the dovetail between theory and practice in instructional technology. They develop a theoretical framework which includes conceptualizations of interactivity, graphical design, animation, video communication, audio communication and new media. While developing software, they gain production and programming skills in a collaborative, situated learning environment. Recent projects may be found at http://www.coe.ufl.edu/webtech/index.htm

Teaching and Teacher Education

Students in this track are interested in ways technology can advance student learning in K-12 and/or post-secondary environments. These students desire to become K-12 teachers, K-12 school technology administrators, K-12 computer resource teachers or teacher educators. Most importantly, teaching and teacher education students are preparing to become educational technology leaders in their respective educational environment. Students enrolled in the teaching and teacher education track focus on topics such as designing technology rich curriculum, communicating using the Internet, and distance teaching and learning.

Conclusion

In conclusion, the College of Education at the University of Florida continues to change and development with respect to the use of educational technologies. This metamorphosis can be seen in all areas of the College: students, faculty and staff, and the support structures. Students and faculty alike are benefiting from the infusion of educational technologies into our learning and working environment. These changes are also allowing students majoring in Educational Technology to gain more breadth and depth in our areas of specialization. We encourage you to watch us as we grow and change to meet the various changes needed in education for the 21st century.

Work-in-progress project aiming at assessing the Faculty Attitudes Toward Information Technology of Universidade Paulista (UNIP) Post Graduation Course in Brazil

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Abstract: This small paper is a report of the work-in-progress project aiming at assessing the Faculty Attitudes Toward Information Technology of Universidade Paulista – Post Graduation Course in Brazil leading to taylor-made training suggestion at identified areas in order to promote inquiry-based learning and effectively integrate the use of technology into existing curriculum thus increasing teacher - student learning and achievements. Assessment will follow Project for the Longitudinal Assessment of New Information Technologies in Education coordinated by Professors Gerald Knezek and Rhonda Christensen of University of Texas- TECET translated into Portuguese.

Introduction

Universidade Paulista is the biggest private university of Brazil, with over 50,000 undergraduate students nationwide and 3,000 on post graduation courses. Being a private school, the vast majority of their campy possess technology infrastructure although other than for the specific courses in which it is integrated into the curriculum, such as Engineering and Computer Sciences, there is little use of technology in class related activities. The Master in Communications course has plans to implement and increase the use of technology in their courses mostly because one of the areas of concentration of the course is on New Technologies and Education. Nonetheless, there is still no formal body responsible for the dissemination of technical assistance nor a milestone plan to be implemented towards this dissemination and relatively few educators know how to use technology in their classes. The level of current faculty is equivalent to those of the best universities worldwide, all 10 teachers are PhDs, over 50% with Post PHD qualifications (Livre Docencia) and awarded several prizes for their academic production.

The Study

The importance of technological literacy is acknowledged by the teachers and is encouraged through students and social pressures. Technological advances are viewed as powerful agents of change and these educators were used to being agents of change themselves. Not so long ago they knew, each in their specific field of expertise, what was the state-of-the-art in terms of teaching and learning. They are now faced with the challenge of reevaluating their modus-operandi and access the implications of using and recommending technology. However beneficial and cost-effective new technologies may be, they are also viewed a potential threat to universities and faculties, once these so called "new technologies" makes the dispersal of universities students possible (Young, 2000).

In accessing these faculty attitudes toward Information technology and computers in general, we aim at gathering all the necessary data in identified areas of need and in compiling these enable a pre-service and in-service taylor made course to effectively integrate the use of technology into existing curriculum and increase teacher - student learning and achievements (Knezek et ali,1998).

Project Goals and Aims

1. Assess trends in faculty attitudes toward information technology in UNIP SP – Masters in Communication Course , using FAIT (TECET, 99) as the assessment instrument
2. Suggest taylor-made pre-service and in-service training for in-house faculty
3. Enable effective use of technology in the classroom
4. Enhancement of learning and teaching through research, communication, and productivity strategies
5. Emphasis on hands-on approaches in alignment with local and international standards
6. Encouragement of teamwork, problem-solving, and peer review
7. Provide the grounds for an in-service and post-service training assessment of faculty and students

Plan of Operation

1. Baseline data will be gathered in Brazil from faculty between 2000 and 2001
2. Post status reports and findings will be placed on our local web site.
3. Plan to present a joint project summary report at WCCE '2001 in Copenhagen with PLANIT Panel (Project for Longitudinal Assessment of New Information Technology Attitudes in Education) from the Texas Center for Educational Technology Telecommunications and Informatics Laboratory .

Recommended Instrument

For College/University Faculty: FAIT - 5-point Likert questionnaire (Knezek et ali,1998) courteously authorized for use in this study by Texas Center for Educational Technology .

References

Anderson, L., Jr. Perry , J.F.(1994). **Technology Planning: Recipe for Success.** National Center for Technology Planning, Mississippi State University.

Fasano, C. (1987, October). **Information technology in education: The neglected agenda**. Paper presented at the Australian Education Conference, Perth, Western Australia, Australia.

Knezek, G., Christensen, R., and Miyashita, K. (1998). **Instruments for Assessing Attitudes Toward Information Technology**. Denton, TX: Texas Center for Educational Technology.

Robertson, Karen (1990) **Texas Higher Education Distance Learning Master Plan.** Murrieta Valley Unified School District, Murietta, CA.

Solomon, Gwen. (1992) **Teacher Training Reaching Out/ Teachers & Technology : Building Interest** School of the Future, New York City

Young, John D., (2000) Distance Learning - **A revolution is occurring in higher education specially in North Carolina**. Division of Continual Learning, University of North Carolina.

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A Collaborative Approach to Integrating Technology and Information Literacy in Preservice Teacher Education

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Abstract: The current focus on technology and Information Literacy (IL) represents an important shift in preservice teacher education from basic skills, which are necessary but not sufficient for students today, toward evaluation, analysis, synthesis, and production. The National Council for Accreditation of Teacher Education (NCATE) recommends infusing IL requirements into undergraduate and graduate programs in teacher education. The NCATE 2000 standards specify that candidates preparing to work in schools must be able to integrate technology appropriately and effectively with IL to support student learning and recognize the importance of using research in teaching. The intent of this study is to observe the complexity of preservice IL processes as they occur in one teacher education program and to describe how one education resource librarian and two professors of education collaborated to provide IL instruction to preservice educators that went beyond the traditional bibliographic instruction lecture format, using active learning methods and constructivist principles to encourage lifelong information literacy.

Introduction

The current focus on technology and Information Literacy (IL) represents an important shift in preservice teacher education. The American Library Association (ALA) defines Information Literacy as the ability to recognize when information is needed and to identify, evaluate, and use information effectively (ALA, 1989; 1998). New knowledge about teaching and learning supports the idea that even though basic skills are necessary, they are no longer sufficient for students today. Schools are now being asked to prepare students who can demonstrate understanding as well as knowledge and skill (Lieberman & Miller, 2000). Because Information Literacy can be transferred across subject areas, improve research, writing, and critical thinking, it helps students interpret and understand the world (Souchek & Meir, 1997).

National education associations are recognizing the need to educate students for lifelong learning in a time of exponential growth of information. In January 2000, the Association of College and Research Libraries (ACRL) adopted new standards for college libraries specifying that librarians collaborate frequently with classroom faculty to integrate Information Literacy into appropriate courses. The National Education Association (NEA) recently introduced Information Literacy into the Teacher Education Initiative Program. The American Association for Higher Education (AAHE) created an action committee to incorporate Information Literacy into their programming. The National Association of Secondary School Principals (NASSP) devoted the March 1998 issue of the NAASP Bulletin to a discussion of Information Literacy.

When reporting on the progress of modifying teacher education to include Information Literacy in March 1998, the American Library Association Presidential Committee on Information Literacy reported that no progress had been made (Progress Report on Information Literacy, March 1998). Their recommendations included developing plans for working with teacher education programs and the National Council for Accreditation of Teacher Education (NCATE) "to infuse information literacy requirements into undergraduate and graduate programs in teacher education." Newly revised NCATE standards reflect this recommendation specifying that candidates preparing to work in schools must be "able to appropriately and effectively integrate technology and information literacy in instruction to support student learning" and "understand the importance of using research in teaching...." (NCATE 2000 Standards).

The Ohio Library Report recommends that library and information literacy instruction be included in the revision of teacher education curricula in order to "ensure that school teachers have the skills needed for effective incorporation of information literacy instruction into the elementary and secondary curriculum" (Jacobsen, 1988, p. 52). In her U.S. Department of Education brochure, Barbara Humes (1999), sites a 1995 study conducted by Rader, listing the following factors as necessary for successful integration into the academic curriculum:

$ The institution has a strong commitment to excellent educational outcomes for the students in the areas of critical thinking, problem solving, and information skills;
$ Library administrators have long-term commitments to integrate library instruction into the curriculum and;
$ Faculty and librarians work together on curriculum development

Purpose

The intent of this study is to observe the complexity of preservice Information Literacy (IL) processes as they occur in one teacher education program. The study describes how one education resource librarian and two professors of education collaborated to provide information literacy instruction to preservice educators that went beyond the traditional bibliographic instruction lecture format, employing active learning methods and constructivist principles (Brooks and Brooks, 1999) to encourage lifelong information literacy skills.

Theoretical Framework

A review of the IL literature provides the theoretical foundation for the study. The areas to be described are IL roles and definitions and critical thinking skill development. Scriven and Paul (1992), define critical thinking as "the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered...as a guide to belief and action." Rasool, et al. (1996), point out that an essential element of critical thinking is creative thinking. Learning is an active process in which learners construct new ideas or concepts based on their past knowledge and construct cognitive structures (i.e., schema, mental models) that provide meaning and organization to experiences and allow the individual to "go beyond the information given" (Bruner, 1973). Bloom's Taxonomy (1956) identifies a hierarchy of levels of thinking that increasingly challenge the student to higher order thinking skills.

This study goes beyond the conventional definitions of IL to point out the influence of contemporary learning theory on IL when engaging student teachers in an authentic learning environment. In contemporary learning theory the student is seen as an actively engaged information user, underscoring the importance of developing information expertise. Learning is defined as the active knowledge building through dynamic interaction with information and experience. The information search process mirrors this description of the learning process when students "actively seek to construct meaning from the sources they encounter and to create products that shape and communicate that meaning effectively" (ALA, 1998).

Constructivism is a philosophy of learning founded on the premise that, by reflecting on our experiences, we construct our own understanding of the world we live in. In a constructivist learning environment, students are encouraged to refine or revise their understanding. Five overarching principles are evident in constructivist classrooms: (1) teachers seek and value their students' point of view; (2) classroom activities challenge students' suppositions; (3) teachers pose problems of emerging relevance; (4) teachers build lessons around primary concept and "big" ideas; (5) teachers assess student learning in the context of daily teaching (Brooks & Brooks, 1999).

Modes of Inquiry

A case study research design (Merriam, 1998), based on the qualitative paradigm is used. Through surveys, stories, and an examination of documents, researchers examined the nature of the preservice IL process with an in-depth look at preservice IL during prepractium methods courses within one teacher education program. Using qualitative methodology, elements found within this case study contributed to the development of an active learning model of IL at the preservice level. The main questions that guide this inquiry are:

$ How does the Information Literacy (IL) program contribute to education courses of one teacher education program?
$ What do student teachers identify as the key influences of IL in the teacher education program?
$ What are the attitudes and expectations of education faculty toward student IL competency?

The participants are two preservice teacher educators, one education resource librarian, and 200 students enrolled in required education courses over a period of two academic years. Contrary to current practice as noted by Collis (1994), that "much computer related teacher education is stimulated and delivered by persons without an academic background in teacher education," the education resource librarian has tenure and is a former classroom teacher. The setting is a state college of 4000 students in the northeast region of the United States, one of nine in the state college system. The Education Resource Center is housed on the mezzanine floor of the college library directly above the main library reference and circulation areas. A collection of over 12,000 items includes children's literature, curriculum guides, textbooks, tests, children's software, compact disks, magazines, kits, posters, games and other multimedia resources. A viewing room for previewing videos and CDs is located at one end of the Education Resource Center. At the opposite end of the Education Resource Center is an electronic instruction classroom used for library instruction classes. Computers on one side of the mezzanine area provide access to the Internet and over 350 electronic databases. Located on the adjacent wall are workstations with children's educational software programs. A number of institutions of higher education maintain similar curriculum libraries to support teacher education programs. *The Directory of Curriculum Materials Centers,* Fourth Edition, edited by Beth Anderson (1996), describes our center along with 277 other curriculum materials centers in the United States and Canada.

Data Sources

Faculty and student survey data, syllabi, reflective journals, prepracticum field experience manuals, integrated thematic units, reflections on the unitary process and cooperating teacher evaluations were all used to examine the nature of the IL process. These extracted materials are the basis for categories and themes drawn from the data.

Preservice Information Literacy Model

The Preservice Information Literacy Model provides opportunities for students to develop critical thinking skills in the context of active research connecting course work and student practicum experiences with hands-on information literacy exercises. The collaborative nature of the model with on-going consultation between faculty and librarian ensures that IL objectives are consistent with course assignments and requirements of the student practicum experience.

After initial discussion and demonstrations of Internet web sites and search techniques in an electronic classroom, students are given opportunities to explore and evaluate resources that are directly connected to their required course work and field work. Information is gathered, analyzed, synthesized, and evaluated and combined in new ways and eventually applied in the prepracticum teaching site by the student in consultation with the cooperating teacher. Lesson plans designed and implemented by students are assessed by the cooperating teacher and teacher educators.

Outreach into the community to facilitate Information Literacy skills for kindergarten through college has been one of the long term goals of this collaborative project. In the spring of 1998, the Education Resource Librarian conducted a series of three (3) full day workshops for twenty-two (22) librarians from the public schools of a nearby large urban district. In September 2000, workshops were offered at elementary school libraries in the local professional development school network for all the public school librarians. The workshops focused on guidelines for library media facilities and personnel, current research on effective use of the Internet, and strategies for assisting student teachers with school-based library resources for lesson plans and integrated unit preparation.

Results/Conclusions

A total of 34 survey forms, based on a questionnaire developed by O'Hanlon (1988), were distributed to education faculty and 21 were returned for a 62% rate of return. Eighty-five per cent of the faculty responding to the survey required their students to conduct research for one or more assigned projects. Lesson plans were the most frequently assigned research project, closely followed by research papers and then book or journal article reviews. Interdisciplinary curriculum units and literature reviews constituted the next most frequently ranked categories. Over half of the education faculty responding to the survey listed the first priority of the teacher education curriculum to be *teach students life-long or independent learning skills* as opposed to teaching specific facts, concepts, and methods. When asked which research skills were essential for future teachers, the ability to synthesize information gathered from many sources received unanimous support. There was consensus that students will need to be prepared to teach Information Literacy in Pre K-12 classrooms and that instruction be shared between the classroom teacher and the librarian. Nearly all faculty surveyed agreed that elementary and secondary teachers are in a better position to help their students become information literate when they receive formal instruction themselves during their teacher education program.

Analysis of the preservice students' course documents and prepracticum field experience manuals revealed that the preservice student teachers had successfully integrated many of the objectives of the IL instructional process. The individually designed and implemented interdisciplinary curriculum units provided a rich source of data demonstrating the effectiveness of library research and technology skills as a result of the active learning Information Literacy model. Some students utilized resources available in the Education Resource Center to a greater extent than others. Students enrolled in methods classes used children's literature, curriculum guides, and electronic databases that could be directly linked to the materials and technology available in the Education Resource Center. The quality of these units created by students who utilized various types of media and technology available in the Education Resource Center was judged to be superior by the education professor and the cooperating teachers. Internet sites identified by students in their bibliographies could be traced to their active learning experiences in the IL program. The cooperating teacher evaluations highlighted the research aspect of the preservice student's work.

Educational Importance of the Study

A Nation at Risk (U.S. National Commission on Excellence in Education, 1983), emphasizes the need to develop critical thinking skills to evaluate the plethora of data produced by the information explosion. Since then, learning how to locate, access, and evaluate information in a variety of formats has become an even greater challenge. The Education Resource Center environment helps students and faculty move beyond the textbook to support critical thinking and inquiry-based learning. Education faculty collaborate with the librarian to ensure access to primary sources and developmentally appropriate materials. The library becomes a research center for students engaged in project- and inquiry-based learning.

The flexible Preservice Information Literacy Model provides opportunities for students to develop critical thinking skills in the context of active research connecting course work and student practicum experiences with hands-on information literacy exercises. The collaborative nature of the model with on-going consultation between faculty and librarian ensures that IL objectives are consistent with course assignments and requirements of the student practicum experience.

The qualitative paradigm further provides the latitude needed to study IL from the participants' perspectives within the context in which this takes place. Information Literacy Programs help to bridge the gap between theory and practice (Furlong & Roberts, 1998). Teacher educators could benefit from this study because there are universal elements which contribute to a systematic integrated model of IL at the preservice level.

References

American Library Association. (1998). *Information Literacy Standards for Student Learning.* Prepared by the American Association of School Librarians and the Association for Educational Communications and Technology. Chicago: American Library Association.

American Library Association Presidential Committee on Information Literacy. Final Report, 1989. Chicago: ALA, 1-17.

Anderson, B.G. (Ed.). (1996). *Directory of Curriculum Materials Centers,* Fourth Edition. Chicago: Association of College and Research Libraries.

Bloom, B. (1956). *Taxonomy of Educational Objectives: The Classification of Educational Goals*, New York: David McKay.

Breivik, P.S. and Ford, B.J. (1993). Promoting learning in libraries through information literacy. *American Libraries*, January 98-102.

Brooks, J.G. and Brooks, M.G. (1999). *In Search of Understanding: The Case for Constructivist Classrooms.* Virginia: Association of Supervision and Curriculum Development.

Bruner, J. (1973). *Culture and cognitive growth, The Relevance of Education.* New York: Norton.

Collis, B. (1994). A reflection on the relationship between technology and teacher education: Synergy or separate entities? *Journal of Information Technology for Teacher Education*, 3(1), 7-25.

Furlong, K. and Roberts, F. D. (1998). If you teach it, will they learn? Information literacy and reference services in a college library. *Computers in Libraries*, 18(5), 22-5.

Humes, B. (1999). *Understanding Information Literacy*, Washington, D.C.: National Institute on Postsecondary Education, Libraries, and Lifelong Learning. ERIC Clearninghouse on Teaching and Teacher Education. ED 430577.

Jacobson, F.F. (1988). Teachers and library awareness: Using bibliographic instruction in teacher preparation programs. *Reference Services Review*, 16(4), 51-5.

Lieberman, A. and Miller, L. (2000). Teaching and Teacher Development: A New Synthesis for a New Century. In R. S. Brandt (Ed.), *Education in a New Era*. Alexandria, VA: Association for Supervision and Curriculum Development.

Merriam, S.B. (1998). *Qualitative Research and Case Study Applications in Education*. San Francisco: Jossey-Bass Publishers.

NCATE 2000 Unit Standards. (May 2000). Retrieved July 6, 2000 from the World Wide Web: http://ncate.org/accred/inital/standards.htm

O'Hanlon, N. (1988). The Role of Library Research in Developing Teachers' Problem Solving Skills. *Journal of Teacher Education*, 39(6), 44-49.

A Progress Report on Information Literacy: An Update on the American Library Association Presidential Committee on Information Literacy: Final Report. (March 1998). Retrieved July 5, 2000 from the World Wide Web: http://www.ala.org/acrl/nili/nili.html.

Rasool, J., Banks, C. and McCarthy, M.J. (1996). *Critical Thinking: Reading and Writing in a Diverse World*, Second Edition. New York: Wadsworth Publishing Company.

Scriven, M. and Paul, R. (1992). *Critical Thinking Defined.* Handout given at Critical Thinking Conference, Atlanta, GA.

Souchek, R. and Meier, M. (1997). Teaching information literacy and scientific process skills: An integrated approach. *College Teaching*, 45(4), 128-31.

Standards for College Libraries 2000 Edition. (January 2000). Retrieved July 7, 2000 from the World Wide Web: http://www.ala.org/acrl/guides/college.html.

United States National Commission on Excellence in Education. (1983). *A Nation at Risk: The Imperative for Educational Reform.* Washington DC: United States Department of Education.

Willis, J.W. and Mehlinger, H.D. (Eds.). (1996). *Handbook of Research on Teacher Education*, Second Edition. A Project of the Association of Teacher Educators. New York: Simon & Schuster Macmillan.

Implementing Technology into Preservice Teacher Courses: PT3 First Year Accomplishments

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Introduction

More than 20 preservice methods courses are currently taught in the College of Education at the University of North Texas. Prior to 1999, fewer than half of these courses made extensive use of information technology, and fewer than one-fourth involved active modeling technology-infusion teaching and learning techniques. Utilizing Funding from a Department of Education, Preparing Tomorrow's Teachers to Use Technology (PT3), the College of Education at the University of North Texas is producing technology enhanced teachers for the 21st century. The preservice teacher initiatives of the PT3 grant have provided:

Technology mentoring programs for senior faculty members
An opportunity for credentialing of technology competent paraprofessionals
An infusion of technology enriched experiences within the preservice teacher education curriculum
The current paper seeks to outline four of the activities sponsored by the PT3 program.

Infusing Technology into Reading/Language Arts Teacher Preparation Programs

Technology is often taught as a separate subject in order for students to learn the basic use of computers. However, preservice teachers' knowledge of technology use should not end with their own achievement of computer literacy (Vannatta & Reinhart, 1999). Even after reaching the point of literacy in technology, students often do not transfer what they have learned to other situations or subject areas (Kinzer and Leu, 1997). In order for preservice teachers to become effective integrators of technology and language arts, it is essential that its uses be modeled for them (Vannatta & Reinhart, 1999) and they must be provided with opportunities to practice what they have learned, as well as develop their own ideas for weaving technology into the language arts curriculum.

In the spring of 1999, two doctoral candidates majoring in reading education worked collaboratively to integrate the use of technology into two reading methods courses for preservice teachers. Planning for the spring semester began in the fall of 1999 with searches for meaningful activities that could be easily implemented to enrich the reading courses. A web site was constructed for each reading course that consisted of the course syllabus, schedule and resources for preservice teachers (see http://www.people.unt.edu/~mlm0012 and http://courseweb.tac.unt.edu/dana). These resources included links to World Wide Web sites pertaining to language arts such as book award sites, professional organizations, lesson plans, government agencies and reading initiatives, ERIC Online, online language arts journals, web publishing for children, web sites belonging to authors of children's books, and a site that created puzzles that could be used in vocabulary activities.

Modeling the use of PowerPoint presentations required hardware in the form of computers and LCD panels for whole class viewing. While these items were routinely used in computer education courses, they were not used at that time for courses in the department of teacher education. Faculty members from the future Institute of the Integration of Technology into Teaching and Learning (IITTL) loaned laptops and LCD panels to the reading instructors for use in the presentations throughout the semester, as well as provided space on a server that enabled the instructors to post materials related to the courses and student work on the World Wide Web.

The curriculum for the reading courses was already in place. No assignments or expectations were changed due to the addition of the technology component. The instructors were in agreement with Niess (1990), who believed that computers must be fitted to the curriculum rather than the curriculum to computers. The intent of the instructors was not to change the reading courses to accommodate the technology, but to infuse technology into the courses to enhance the preservice teachers' experiences and to help them become aware of the exciting possibilities for technology use in the area of language arts.

The technology infused course was an introductory reading course that is required of all students in the college of education at the university. It covers a variety of topics that include knowledge of the reading process, stages of reading and writing development, techniques for teaching reading skills, an overview of reading assessment, and an introduction to various types of reading programs currently in use today. This course was taught on campus at the university, where the students had easy access to computer laboratories and the class was able to meet in a computer education classroom on several occasions. The technology infused course is a prerequisite to the technology enhanced course involved in this study.

Two sections of another reading course, one of which was technology enhanced, participated in this study. It is required for all preservice teachers specializing in elementary education. This course is designed to teach students how to perform reading assessments, conduct evaluations, and provide remedial assistance for elementary level students. Students are required to perform assessments and tutor one child throughout the semester.

The amount of technology present in the three courses varied. Preservice teachers in the technology infused class had a course web site where they could access the syllabus, course schedule, PowerPoints from previous lectures, and many resources. PowerPoint presentations were modeled for them throughout the course. Toward the end of the semester, the students created their own presentations using PowerPoint and presented them to their classmates. They received instruction in web searching early in the semester. Some students indicated an interest in learning to design their web pages as an addition to the required course project. The instructor met with them several times out of class and the students spent many hours on their own time developing the web pages. The preservice teachers in this course participated in an email exchange that focused on reading assessment with students in the technology enhanced course.

Due to the limitations in availability of on-site technology equipment for the students in the technology enhanced course, those preservice teachers were unable to participate in all the activities experienced by the students in the technology infused course. A course web site was provided, the instructor modeled PowerPoint usage each week, and they engaged in an email exchange with the preservice teachers in the technology infused course.

The technology teaching tools offered to the students enrolled in the traditional methods course were limited to an overhead projector and transparencies. No course web site or PowerPoint presentations were provided and they did not participate in the email exchange.

The preservice teachers enrolled in the three courses were surveyed on the first and last day of class. According to survey results, students in the technology infused reading methods course believed they were better prepared ($P < .01$) to integrate technology into the language arts curriculum in their future classroom than did students in the traditional methods class. Students in the technology enhanced course rated their capabilities as somewhere in between those of students enrolled in the technology enhanced class and the traditional class.

Technology Integration Mentoring

CECS 4800, Technology Integration Mentoring was a new course introduced as part of the PT3 Capacity Building plan, during the spring of 2000. The course was designed to allow students who had completed CECS 4100, Computers in the Classroom, to continue to advance in their technology integration abilities. The purpose of this course was to provide an extension of CECS 4100 which would enable preservice educators to focus on technology integration in an authentic classroom environments.

Course Description

Students met together three times during the semester but communicated frequently via a class listserv. The remainder of the class time was spent in a working classroom where they were paired with a classroom teacher. The students were also required to submit assignments such as answering weekly questions via the listserv, finding and turning in the Acceptable Use Policy for the school in which they were working, filling out a technology survey (which required them to find out what hardware and software were available to them in the school/classroom), as well as writing and implementing a plan of action. The students were observed onsite by their instructor, Rhonda Christensen and her team teacher, Theresa Overall.

The Plan of Action differed according to the needs of the classroom teacher, but all of the plans were required to have certain components such as Texas Essential Knowledge and Skills (TEKS) and International Society for Technology in Education (ISTE) technology standards, a rubric for evaluating their plan, and other standard components of an effective unit or lesson.

Distribution of materials for the course was carried out at the first class meeting. These included a handbook for the cooperating classroom teacher, examples of technology integrated units, rubrics and other resources. A class website was developed with links to other technology and curriculum resources. Students' digital pictures were taken and placed on the course website so that when they were communicating with each other via the listserv, they could view the photos to recall the faces of fellow classmates.

Students had the option of selecting their own teacher or being placed in a classroom arranged by the instructor. This resulted in a wide geographic distribution for the students in the course. Two 4800 students were placed in the same school in special instances. This seemed to be very helpful to the students for peer support.

The second face-to-face meeting included a follow up of placement, as well as interaction on how things were going for the students in the course. A model activity of collaborative learning using technology, in which the 4800 students were participants, also took place at the second face to face meeting.

The final face-to-face meeting focused on presentations of student plans of action. This was an impressive display of wonderful work with classrooms of students and their teachers.

Assessment/Evaluation

An anonymous course evaluation was given to the students at the end of the semester. On a scale from 1 to 5 (awful to excellent), all students rated it as a 5.

Open-ended questions included: Please list two stars and a wish. What was the best aspect of the course (two stars) and I *wish* the following would have been different. There was also a place for additional comments.

The cooperating teachers also filled out a more extensive evaluation of both the student and the program. Overall the comments were wonderful. The teachers seemed to think this was a useful course that benefited both the university students and the classroom teachers.

Observation/Discussion

One nice benefit of this type of course is the two-way mentoring that occurs. The undergraduate students were the "technology integration experts" to help the classroom teachers. However these preservice students learned a great deal from these "expert classroom teachers" about classroom management and curriculum.

While there is currently much emphasis on the preservice teacher education technology integration in colleges of education, there isn't a precise plan for how to best improve preservice students' technology integration. In this course, placing preservice students in a real teaching environment was a rich and rewarding experience for both the students as well as the cooperating classroom teachers.

Infusing Technology in Preservice Teacher Preparation in Special Education

The State of Texas lists Special Education as an area with a critical teacher shortage. Interestingly enough, there is not a shortage of Special Education teachers in Texas. Basically, a large number of certified teachers choose not to teach or have left the teaching field for other occupations. The "burn-out" rate for a Special Education teacher in the field is typically four years (Cunningham, 1989). Two of the most common reasons for leaving the field involve discipline problems and the abundance of paperwork required of Special Education teachers. The paperwork problem is often more pronounced for Special Education teachers in testing and administrative position such as the Educational Diagnostician. Although a number of initiatives and incentives have been implemented to attract and keep more teachers in the field of Special Education the critical shortage of teachers remains. It is most important to alleviate areas that contribute to "burn-out." The College of Education at the University of North Texas has attempted to provide strategies to assist teachers with their paperwork and discipline problems through the use of technology. Instructors in the Special Education Program have developed a plan to infuse appropriate technology into teacher preparation courses. Instructors model the use of technology through class lectures and assignments. Instructors also develop a fluency with the aspects of technology which can help teachers reduce paperwork in the field. Instructors expose students to time saving technology such as:

Computer Generated Individual Educational Plans
Interactive CD's depicting students with special needs
Test Scoring Programs
Report Writing Programs
Grade Books
Effective Remedial Software
Computer Generated Behavioral Plans

The goal of the Special Education Program is to not merely produce teachers, but to produce teachers who have the technology skills to facilitate their timely and successful completion of job requirements. Surveys indicate that teachers completing the Special Education preservice sequence of courses improve their technology skills as they progress through the undergraduate sequence of courses. It will be important to monitor these technology proficient special educators to determine if technology training plays a role in classroom success.

Web Based 2 +2 Articulation

During 1999, Dr. Jeff Allen created a web-based 2 + 2 articulation web page for students transferring from six North Texas community colleges AAS programs to the University of North Texas BAAS program. This site can be accessed at: (http://www.attd.unt.edu/Articulation/Index.html).

The State of Texas has a strong community college system that is willing and able to prepare students in their first two years of college. Community college students are representative of their local community populations (urban, rural, religion, race, national origin, gender, age, and disabilities). Eighty-five percent of students in the Bachelors of Applied Arts and Science (BAAS) program at the University of North Texas (UNT) have transferred from a community college Associate of Applied Arts and Science (AAS) program, thus allowing the BAAS program to better represent community populations Central and North Texas.

Utilizing funding provided by the Department of Education, UNT developed computerized (web-based) degree plan templates for *all* of the AAS programs offered at the following six community colleges:

Collin County Community College, Dallas County Community College, Grayson County Community College, McLennan County Community College, Navarro Community College, North Central Texas College, and Tarrant County College.

Community College	*Number of Articulation Agreements*
Collin County Community College	45
Dallas County Community College	79
Grayson County Community College	20
Navarro Community College	32
North Central Texas College	13
Tarrant County College	44
Total	233

Dallas County Community College, the largest of these districts, pilot tested the pages during the Spring 2000 semester. This web site was fully published during summer 2000 for the remaining districts. In addition, during Fall 2000, Hill College, McLennan Community College, Texas State Technical College and Weatherford Community College will be added to the web-based articulation/advising program. These 11 community college districts serve rural and urban populations in approximately twenty-nine counties of Central and North Texas.

The web-based Program articulation is a difficult and time-consuming effort involving many levels of cooperation and discussions. This web-based articulation/advising program provides greater opportunities for community college counselors and faculty to advise their students of UNT technology-based program. Through this local advising process, UNT faculty and staff can act in a resource and support role rather than a marketer for students exploring degree plan pathways options from community college programs. This program provides students a two-tier support/advising system to finish their four year degree program at the University of North Texas.

References

Cunningham, B.R. (1989). The burnout rate for special educators, Educational Researcher, 3, 2-5.

Kinzer, C., & Leu, D. J. Jr. (1997). The challenge of change: Exploring literacy and learning in electronic environments. Language Arts, 74, 126-136.

Niess, M. (1990). Preparing computer-using educators for the 90s. Journal of Computing in Teacher Education, 7(2), 11-14.

Vannatta, R. A., & Reinhart, P. M. (1999). Integrating, Infusing, Modeling: Parparing Technology Using Educators. (ERIC Document Reproduction Service ED 432 275.

It's a Small University After All - Reducing Distances Between Colleges Via Web CT

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Abstract

This paper describes a Web-CT based project between foreign language education majors in the College of Education and foreign language students in the College of Arts and Sciences at a large metropolitan university. Thousand-level Spanish and French students responded weekly in the target language to instructors' queries posted on Web CT class accounts. Foreign language education majors, as a form of formative assessment, provided constructive feedback to these students by means of comments posted to them on WebCT. At the end of the semester, student reactions to this project were obtained via surveys. Education majors responded favorably to the assignment. Reactions of the language students, however, were mixed. Many of these students, most of whom were taking the course to simply fulfill a graduation requirement and were resentful of this requirement, expressed negativity toward the WebCT assignment. Others appreciated being able to correspond with a peer.

At a large metropolitan Central Florida university, the Foreign Language Department and the Foreign Language Education Program are housed in different colleges. The Foreign Language Department is contained within the College of Arts and Sciences, while the Foreign Language Education Program is part of the College of Education. As interdisciplinary projects are growing in prominence nationally, colleges are seeking ways by which to integrate curricula cross-college.

Last year, a collaborative relationship was established between the Foreign Language Department and the Foreign Language Education Program by means of a WebCT assignment. The author, Coordinator of the Foreign Language Education Program, had recently developed a course entitled "Technology in the Foreign Language Classroom" and sought a way by which to tie in course requirements with those in foreign language classes. During course development, the author participated in a summer faculty institute in which additional stipends were awarded for interdisciplinary project development and implementation. It was during this institute that foreign language faculty and the author met frequently to share syllabi and brainstorm ways to integrate assignments in their respective courses.

Foreign language faculty decided to begin cross-college collaboration within the context of their 1000-level Spanish and French classes since those classes already had a WebCT assignment in place. Students in these classes were required to respond on a weekly basis to questions posed by their instructor on WebCT. The questions necessitated student response in the target language and provided the students with additional practice in reading comprehension and writing. Questions typically asked the students to elaborate on topics that had been discussed in class, thus providing further reinforcement of the material as well as additional communicative opportunities. An example of a question is the following: "Tell me about yourself. What is your name? How old are you? Where do you live?" Instructors then commented on the students' responses by providing linguistic extensions, contributing constructive grammatical feedback, and/or continuing the conversation in a natural way. Given the large number of students in these introductory level classes, which are a requirement for graduation, provision of this feedback became very time-consuming.

Students in Technology in the Foreign Language Classroom were education majors who needed as much exposure as possible to the different areas of competency required in the field of education. One such competency is in the area of assessment. Upon comparing course syllabi for the entry level foreign language courses and Technology in the Foreign Language Classroom, faculty found a natural fit between the need for the provision of feedback to the language students' written productions and the need for practice in different modes of assessment for the foreign language education students. Thus a collaborative relationship was formed between both sets of students and their respective faculty. Thousand-level students would continue to respond to queries posed by their instructors. However, instead of the foreign language instructors addressing the written productions, students in Technology in the Foreign Language Classroom replied to them weekly. This afforded a number of different opportunities: language students communicated with peers in another class and received prompt feedback, education students received practical experience in a very different mode of assessment, and instructors were relieved of the time constraints of responding to their large numbers of students. In order to monitor their students and the education students' continuance of their respective roles in this assignment, faculty from both programs accessed the Website weekly to determine the frequency and quality of the students' writings and feedback.

This assignment ran the course of the entire semester. At the end of the semester, both sets of students completed surveys that were geared toward their particular group. In other words, education majors were provided with a survey that addressed their observations/concerns from an educator's standpoint. The survey administered to the language students queried them from a student viewpoint. Overall, education majors' responses were overwhelmingly positive, although they did express a desire to have some face-to-face interaction with the language students. They found the unique mode of assessment to be challenging, yet intriguing. They also appreciated being given the opportunity to become familiar with the typical types of errors they will encounter in second language learners progressing through the natural stages of language acquisition.

To the contrary, language students' reactions to the collaborative assignment were very mixed. A number of the foreign language students appreciated feedback from a peer. However, several students expressed the preference for one-on-one interaction rather than asynchronous written communication. A number of students resented the entire university foreign language requirement; the overall negative evaluation they accorded the assignment may have been a generalization of this resentment.

Faculty in the Foreign Language Department and the Foreign Language Education Program at the University of Central Florida plan to further analyze the responses of the two groups of students to determine means by which to enhance the experience so that both groups realize equal benefits from the collaborative assignment. They also intend to develop other intercollegiate projects that will strengthen the growing relationship between the respective faculties and students.

Technology and Problem-Based Learning: Connecting Students, Teachers, and Student Teachers

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Abstract: The investigation reported in this paper strives to bring technology and problem-based learning into the student teaching experience through an integrated, collaborative mathematics task. The project presented is based in data collection and analysis. It supports the National Educational Technology Standards (International Society for Technology in Education [ISTE], 2000) and the latest standards for school mathematics (National Council of Teachers of Mathematics [NCTM], 2000). Students from several schools collected and analyzed data for a task on an 2000 Summer Olympic project. Technology was vital to data collection, data sharing among schools, and data analysis. This project served as a stimulus and prototype for projects for the 2002 Winter Olympics. Presenters

Introduction

Tom Carroll of the United States Department of Education states that technology has the potential to be a tool in the re-invention of education (1999). If this re-invention is to occur in ways that are meaningful to students, preservice teachers need to experience innovative uses of technology in their instructions. Integrating technology into teaching can be enhanced when problem-based learning is used (Albion 1999). Hannum (1999) describes the ways in which technology can be implemented into the *Seven Principles of Good Practice in Undergraduate Education* (Chickering & Gamso, 1991). The technology Hannum recommends includes but is not limited to listserves as a tools for communication between several students and the instructor, email for student-to-student collaboration, websites as a source for data, and hyperlinks for students to access webdata efficiently. The investigation reported in this paper strives to bring technology into the student teaching experience in innovative ways through a problem-based learning task. This task helps student teachers understand and attend to relevant technology and mathematics standards as they plan and implement lessons. The lessons support the National Educational Technology Standards (International Society for Technology in Education [ISTE], 2000) and the latest standards for school mathematics (National Council of Teachers of Mathematics [NCTM], 2000).

The Olympic Task

This investigation has as its context an event that is both rich in content and likely to be of high interest to elementary, middle, and high school students—the 2002 Olympic Games. During the 2000

Summer Olympics several teachers were invited to begin a 2-year problem-based project that would continue through the 2002 Winter Olympics in Utah. They defined several problems or questions that would require students to gather data before, during, and after the games. They set up listserves to share data among schools. Their students used Internet sites to explore both the 2000 and the 2002 Olympic Games. They gathered data about medals, participants, viewers' preferences, and TV scheduling. They used spreadsheets to analyze their data. They created WebPages at their schools to display their data analyses. Student teachers participated in these projects and reported their experiences in their electronic portfolios.

The first activity completed during the 2000 Games was to plan a schedule for prime time Olympic coverage for the 2002 games. Students posed relevant questions regarding scheduling, then engage in collecting, organizing, representing, and interpreting data from the 2000 games to build their 2002 schedules. They plan to compare their completed schedules with the schedules actually followed by major channels during the Olympics 2002 games. The following is an outline of the first problem-based task presented to the students:

Student Assignment

Plan a schedule for prime time Olympic coverage during the 2002 Games. Discuss **population, sample**, and **sampling methods.** Discuss data collection procedures, e.g., **surveys.** Generate questions that you might need to investigate to complete the task.

- What kinds of coverage do most people like to watch?
- What age levels watch the Olympics the most?
- How are the 2000 games covered by the TV networks?
- What other kinds of information will be needed?

Data organization

What will your categories of information be? How many categories will you need? Will you need to design a chart or some other recording device to organize the information you collect?

Data representation

What ways of summarizing and representing your data will help you make sense of your information? Possible strategy: Using a spreadsheet program such as Excel, students compile the data collected by their class. They represent the data with percentages and a circle graph.

Data interpretation

What do the data show regarding the most popular events? Based on the data, how much time each evening should be devoted to each event? Possible product: Students generate a prime time television schedule for a week of the Olympics using the data they have studied.

Technology Standards

The International Society for Technology in Education (ISTE) National Educational Technology Standards (NETS) (2000) defined technology competencies for teachers and students. The standards for teachers include (1) operations and concepts, (2) planning and designing learning environments and experiences, (3) teaching, learning, and the curriculum, (4) assessment and evaluation, (5) productivity and professional practice, and (6) social, ethical, legal, and human issues. Standards for students include (1) basic operations and concepts, (2) social, ethical and human issues, (3) technology productivity tools, (4) technology communication tools, (5) technology research tools, and (6) technology problem-solving and decision making tools.

These standards support the development of new learning environments for students. Classrooms using technology appropriately are less teacher-centered and more student-centered. Instruction moves from single sense stimulation to multi-sensory stimulation. Students progress through multiple paths rather than single paths to the completion of their learning goal. Instruction utilizes multimedia not single media. Students work collaboratively, not in isolation. Students and teachers engage in information exchange, not just information delivery by the teacher. Learning is more active, exploratory, and inquiry-based, less passive. Students do not lcarn facts through literal thinking. They use critical thinking to make informed decisions. Their work is authentic based in real world context.

Content Area Standards

The National Council of Teachers of Mathematics (NCTM) has defined several principles and standards for the teaching of mathematics (2000). The principles are equity, curriculum, learning, teaching, assessment, and technology. The technology principle states that "technology is essential in teaching and learning" and that "technology influences the mathematics that is taught and enhances students' learning" (p.24). The project described in this paper requires data collection and analysis that would not be feasible without the use of technology. Student learning was enhanced through use of real world data collection that led to an authentic understanding of graphing, charting, and decision making.

The NCTM standards include both content and process standards. The content standards are (1) number and operations, (2) algebra, (3) geometry, (4) measurement, and (5) data analysis and probability. The process standards include (1) problem solving, (2) reasoning and proof, (3) communication, (4) connections, and (5) representation. This project addresses content standard (5) data analysis and probability and all five of the process standards. The project involves problem solving and reasoning by asking students to develop and use a variety of strategies in their mathematical thinking. Students are asked to communicate their analysis of data with other students. The project requires students to make connections among several mathematical concepts and learn about mathematics from real-world contexts. Finally the Olympic project requires students to create representations of data collccted, primarily in the form of charts and graphs.

Student Work

Students, teachers, and student teachers from across the state participated in this project. They collected data on the television coverage of the Sydney Summer Games for information to help them create the schedule for the Salt Lake City Winter Games. Data was entered into a spreadsheet. Students at different schools represented their data in various ways. As they shared their data and analyses with each other, their range of strategies for creating a TV schedule increased. Table 1 shows the data collection sheet and sample data summaries. Figure 1 and Figure 2 show two different data representation, one as a bar chart and the other as a pie chart. Figure 3 shows a minute-by-minute summary of the events during one hour of TV coverage. This was used as a model of minute-by minute coverage for the TV schedule for the Winter Games.

Minute	Day	Time	Sport Event	Athlete Story	Athlete Interview	Story about Australia	Commercial	Other
1	Mon	6-7	1					
2	Mon	6-7	1					
3	Mon	6-7		1				
4	Mon	6-7		1				
5	Mon	6-7					1	

	Mon	6-7	32	10	2	0	14	2
	Mon	8-9	26	13	1	0	20	0
	Sun	8-9	34	12	0	0	14	0
	Total		**92**	**35**	**3**	**0**	**48**	**2**

Table 1: Summary data from survey of Summer Olympic TV coverage.

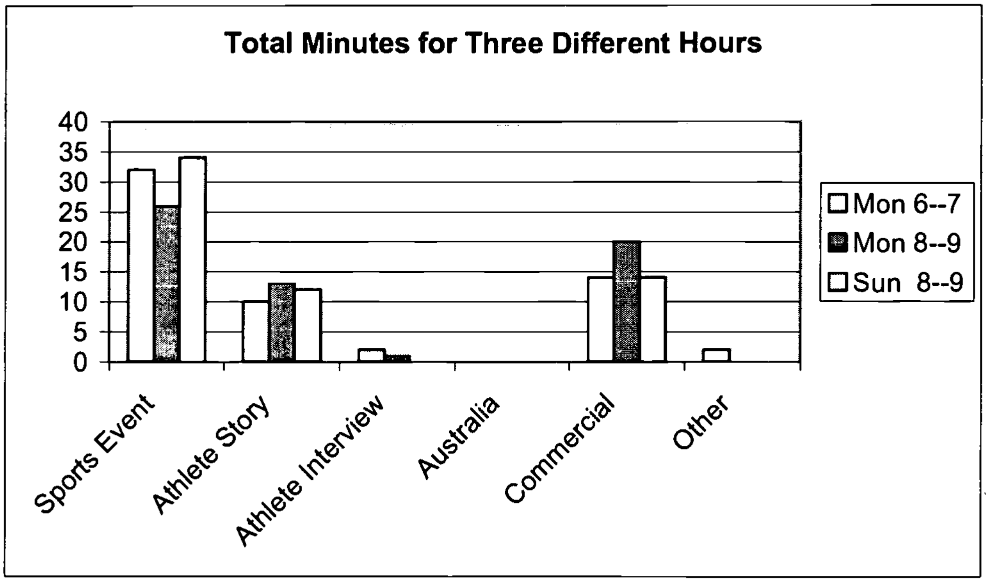

Figure 1: Data Representation of total minutes for three different TV hours.

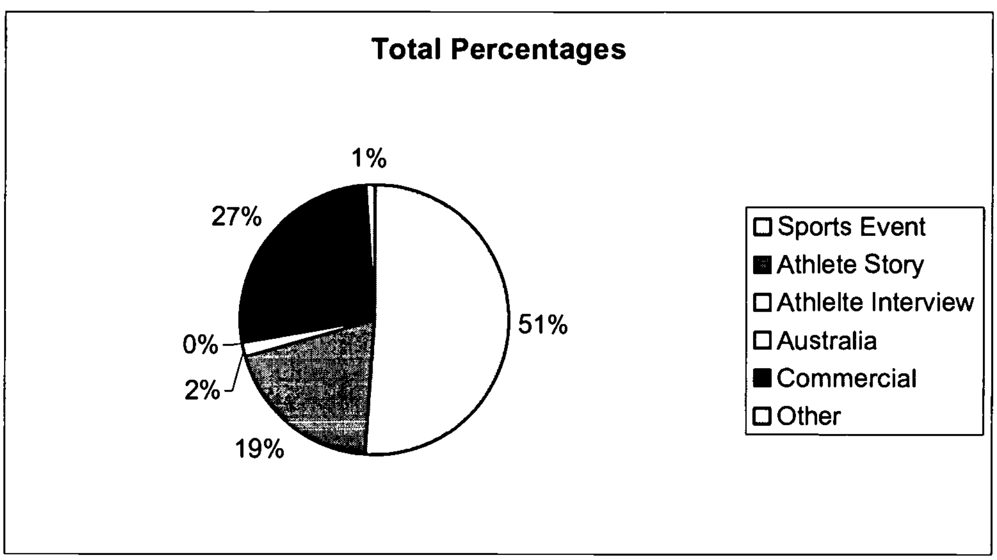

Figure 2: Data representation of the percent totals for all TV coverage.

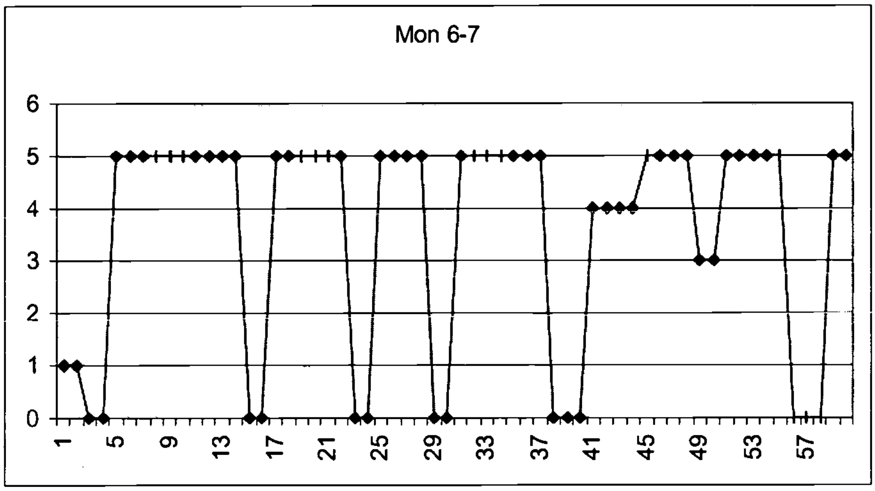

Figure 3: Data representation of minute-by-minute TV coverage.

Data from Figure 3 allowed students to think about how to plan TV coverage for the 2002 Winter Games. Students visited the www.saltlake2002.org/sloc/event_schedule/index.htm Internet site to choose a day to schedule. The students were directed to have some coverage of every event, but to strive to have the most time allocated for the most popular events. They wrote a survey asking classmates to indicate which event from the assigned day they would be interested in viewing. The survey results were used to determine how much time each event should be given during 4 hours of prime time TV coverage. The scheduled amount of time for each event matched the percents of popularity from the student survey. Table 2 is a summary of one survey for a day of the 2002 Winter Games. Students were asked if they were VERY LIKELY (3), SOMEWHAT LIKELY (2), or UNLIKELY (1) to watch the event on TV. The tallies were averaged to determine how much time to schedule for each event during the prime time TV coverage. As of the date of this paper submission, the students were still building their final TV coverage.

Curling	Luge	Downhill Skiing	Snowboarding	Biathlon	Speed Skating	Ice Hockey	Figure Skating
2	3	2	2	2	3	1	3
1	2	3	2	2	3	3	3
2	3	3	3	3	3	3	3
2	2	3	2	3	3	1	3
1	3	3	3	1	2	3	3
1	2	3	1	2	2	2	3
1	3	3	2	2	2	3	3
1	3	2	2	3	3	3	3
1	3	3	2	3	3	1	3
1	3	3	2	2	3	2	3
1	2	3	1	3	3	3	3
1	2	3	3	1	3	3	3
2	3	2	3	2	3	2	3
2	3	3	2	2	3	2	3
1	2	3	1	1	3	3	3
2	3	3	2	1	3	2	3
2	3	3	3	2	2	3	3
3	2	3	3	3	3	2	3
2	3	3	2	3	3	2	3

1	3	3	2	2	3	3	3
2	3	3	3	1	2	1	3
1	2	2	3	1	3	2	3
1	3	3	3	3	3	3	3
1	2	2	2	2	2	3	1
2	3	3	3	2	3	3	3
1.458333	2.625	2.833333	2.291667	2.083333	2.75	2.416667	2.916667

Table 2: Likelihood of Winter Olympic Event to be watched on TV

Future Work

Preservice teachers who will be student teaching during the 2002 Winter Games are preparing learning activities in current methods courses. Teachers from across the state are planning additional problems for the months before, during, and after the 2002 Winter Games. These problems include a study of restaurant prices during the games, cost of planning a trip to the games from several places around the world, housing and food costs for the athletes while at the games, transportation issues to and from venue sites, etc. Participating schools are working to design the projects and share information electronically with each other. Comparisons will be made of results in different areas based on distance from venue sites. We are hoping to invite schools from across the country to have electronic pen pals with students in venue sites. Student teachers from this year's project will be teachers around the country next year and can continue in the project with their students.

References

Albion, P. (1999) PBL + IMM = PBL2: Problem-based learning and multimedia development. *Technology and Teacher Education Annual*, Association for the Advancement of computing in Education, Charlottesville, VA. 1022-1028.

Carroll, T. (2000). Preparing tomorrows' teachers to use technology. Paper presentation at the PT3 meeting. Atlanta, GA.

Chickering, A. W. and Gamson, Z. F. (1991). New directions for teaching and learning: Applying the seven principles for good practice in undergraduate education. San Francisco: Jossey-Bass.

Hannum, W. (1999). Creating Internet based learning. *Technology and Teacher Education Annual*, Association for the Advancement of computing in Education, Charlottesville, VA. 1844-1848.

International Society for Technology in Education, (2000). *National educational technology standards for students: Connecting curriculum and technology.* Washington, DC: Author

National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics.* Reston, VA: Author

Collaboration and Integration: Technology in a Pre-Service Elementary Education Foundations Course

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Abstract: Changes in State regulations and National Standards have resulted in Colleges of Education redesigning their teacher preparation programs. During this redesign, many programs are eliminating their "technology course" in favor of integrating technology throughout all teacher preparation courses. This redesign has often resulted in concerns that many teacher education faculty are not well prepared to provide teacher candidates with the technology skills and knowledge needed to insure the effective integration of technology into K-12 curriculum. This paper focuses on one teacher preparation program's efforts to address this concern. Faculty members at George Mason University in the Elementary and Instructional Technology Programs paired up and team-taught an Introductory to Elementary Curriculum course, providing students with the needed foundational knowledge and technology skills.

Overview and Background

The inclusion of technology into elementary teacher preparation programs has become a necessary and important component in most, if not all, teacher education programs. In the past five years the integration of technology into teaching methods courses has been suggested as an effective model for helping teacher education candidates develop a vision of the role of computers in an integrated curriculum (Willis, 1997). Typical models for integrating technology into teacher preparation courses include the use of e-mail, on-line databases, WebQuests, software, spreadsheets, and word processing (Maeers & Brown, 1999; Willis, 1997). Other technology uses typically found in coursework include the incorporation of electronic portfolios and the creation of video presentations with film clips from CD-ROM encyclopedias (Kovalchik, 1997; Willis, 1997). Specific barriers to successful integration of technology into teacher preparation courses have also been identified in the literature. These barriers include limited access to technology resources, technical problems, and time to experiment and learn (Falba et al., 1999). In addition, Roberts and Ferris (1994) indicate that faculty who teach the courses may not see technology as important, may believe that there are too many course changes required at one time, may be unfamiliar with available hardware and software or find that it is hard to take risks using technology. Robert and Ferris (1994) recommend that a team teaching model be used to successfully integrate technology into teacher preparation courses.

The purpose of this paper is to describe teacher education faculty efforts to develop and implement an introductory and foundations course in elementary education that integrates technology into the course content. During the 1998-99 academic year, George Mason University redesigned its teacher preparation programs in response to changes in State Licensure requirements. During this redesign, the

Elementary Program faculty decided to eliminate the Introduction to Educational Technology course, the only course in the teacher education program that focused on technology, and integrate technology throughout all courses. The faculty expressed the belief that technology should be infused into the program and were committed to modeling the effective use of technology to support teaching and learning. To help the faculty accomplish this goal a member of the Instructional Technology Program (Dr. S) accepted an affiliation with the Elementary Program. Dr. S had expertise in integrating technology in the K-12 curriculum and was responsible for the Introduction to Educational Technology course that was being eliminated.

An immediate concern the faculty faced was to ensure that the Introduction to Elementary Curriculum course (the first course in the program sequence) provided students with the technology skills needed to complete assignments across the other teaching methods courses. The faculty spent time examining each of the methods courses and determined that the preservice teacher candidates would need to learn the following technology skills: how to use e-mail, how to evaluate websites, how to conduct Internet and ERIC searches, how to use the university's threaded discussions tool (TownHall), and how to use Microsoft's PowerPoint software for presentations. In addition, students needed to understand the basic tenets of elementary curriculum and a variety of instructional strategies and related topics (i.e. direct instruction, cooperative learning, authentic assessment, and inclusion). Students also needed to develop an understanding of historical influences and school laws in elementary schools.

The merging of introductory technology skills and a foundational knowledge base presented a challenge for the Elementary Program faculty. Two sections of this course were to be taught in the spring of 2000 for the first time. It became apparent that none of the faculty members had expertise in both of these areas. It was decided that the best way to handle this was for the technology faculty member (Dr. S) and the foundation faculty member (Dr. W) to team-teach the two sections together. To accomplish this the two sections were scheduled to meet at the same time in two adjacent computer labs.

Preparing the Course

During the semester prior to the spring 2000 semester, Dr. S and Dr. W met weekly to co-design the course. The two faculty members collaborated on choosing the textbooks and materials and on developing the class assignments. As the course was developed Dr. S spent time determining the best way to integrate the technology skills into the course. For example, when students were ready to begin working on their research paper, they needed to learn how to conduct an ERIC Search and develop search strategies for finding resources on the Internet. The use of e-mail and TownHall should be presented the first and second week of classes.

Several issues and questions related to course design and scheduling emerged. It became apparent that the integration of some of the technology skills required creative thinking and problem solving. For example, while learning foundation topics, should students learn how to evaluate websites and also perform Internet searches? Trying to cover three topics at once could be too much for the students. Teaching PowerPoint should be included when students were required to do a presentation, but what were they going to present? To solve these problems, it was decided that Dr. S would create a WebQuest as a way to integrate content about U.S. laws and how they influence elementary teachers in schools (see http://mason.gmu.edu/~dspragu1/lawquest.html). The WebQuest would include the evaluation of websites and result in the students preparing a presentation using PowerPoint software.

Several other topics addressed in the course allowed the introduction of software programs not typically included in an introductory elementary education foundations course. For example, when the class discussed direct instruction, students could spend time previewing some drill-and-practice programs. When the class discussed cooperative learning, students could spend time using one of Tom Snyder's Decisions, Decisions programs. Exposing students to software popular in K-6 classrooms provided an opportunity for meaningful integration of technology into course content. The course syllabus can be found at htttp://mason.gmu.edu/~dspragu1/educ542.html.

The other major decision that had to be made was how the team-teaching would be accomplished. Since the two sections were scheduled at the same time and were in adjoining rooms, it was possible for Dr. S and Dr. W to move back and forth between the classes. It was also possible for the students in the two sections to collaborate with each other on assignments. It was determined that Dr. S and Dr. W would switch mid-way through each class session. Dr. S would ensure the students had the technology skills needed for the methods courses while Dr. W would provide students with the content knowledge. Students would be provided with opportunities to collaborate on the completion of the WebQuest and the resulting presentations.

Implementing the Course

During the first few weeks of the course the instructors became aware of four issues that needed to be addressed. These four issues were time, communication, consistency, and instructor expertise. In terms of time, the instructors realized that switching mid-way through each class session took additional time and it was often difficult to coordinate the timing of the activities each instructor was responsible for. For example, when the lesson on PowerPoint took longer than predicted, Dr. W had to extend a discussion on significant individuals in educational history with the group he was teaching. Consequently, the second part of the class session was shorter for both instructors when they had to modify the planned experiences for their second group.

In the team teaching model used, each instructor was responsible for evaluating and assigning grades for a particular group of students. Consequently, communication between instructors and between students and instructors emerged as an issue. Students from one group would periodically ask the instructor of the other group questions about an assignment he or she had not originally explained. For example, Dr. W had to discuss and clarify particular details of the WebQuest assignment with Dr. S so that he then could discuss it with students in both groups. Similarly, the importance of consistency in communication between the two instructors emerged as a critical issue. The teacher education students in both groups frequently discussed assignments and expectations with each other. If any inconsistencies in expectations or grading criteria were apparent to the students, they would ask both of the instructors for clarification.

The two instructors met weekly to review and discuss the content to be taught in the next class session. These meetings served as an opportunity for the instructors to "mentor" each other on specific aspects of the content that was to be taught. For example, since Dr. S was more of an expert in technology, she explained the concepts and procedures involved in the WebQuest so that Dr. W could address any questions that students might have while working on that assignment. Similarly, in an activity on instructional strategies, Dr W assumed responsibility for explaining how to conduct a cooperative learning strategy used to teach concepts underlying Direct Instruction.

Student comments in a formative evaluation conducted in the middle of the semester reflected the issues identified by the instructors. Students indicated through their comments that 1) they felt certain activities were rushed because there was not enough time, 2) one class may get more information on a particular topic than the other class, and 3) at times the classes seemed to be disorganized. The student feedback also indicated that students had varying comfort levels with technology. For example, one student stated, "I don't always feel comfortable with the technology section of the class. Many times I find myself behind the rest of the class". In contrast, another student stated, "too much time was spent on PowerPoint, I already knew how to use it." After reviewing the student feedback in the middle of the semester the instructors decided to change the way they moved back and forth between the two classes. Rather than move back and forth during each class session, the instructors tried to work with one group for an entire class period as much as possible. In addition, both instructors worked on communicating the same expectations for the remaining assignments.

Course Evaluation and Conclusions

The formative evaluation administered at the end of the course and shared reflections by both instructors served as the basis for course evaluation. The student feedback indicated that the change in the organization of each class session (one instructor teaching one group for an entire session) was more effective than constantly switching back and forth. Student feedback indicated that most students perceived the course to be a "little disorganized at the beginning." In addition, student feedback indicated that: 1) the students would like more discussion on technology; 2) there were specific technology activities that were valued while others were not (for example a specific videotape on the uses of technology was not valued); and 3) there was not enough time to cover all of the material (the foundations content as well as technology applications).

Instructor reflections focused on how to effectively integrate technology into the foundations content in practical ways while still including thc kcy contcnt components of the course. The instructors have also worked on how to accommodate students with varying levels of previous experience with technology. The instructors decided to continue to work together in planning and preparing specific activities. However, for the next course implementation in 2001 both instructors will teach all of the content. That is, each instructor will be responsible for the technology and elementary foundations content. This change will require more mentoring for Dr. W who is not an expert with technology. Since the elementary program is currently involved in a Preparing Tomorrow's Teachers for Technology (PT3) grant, Dr. W will be working with both Dr. S and a mentor from the public schools who is considered to be an expert in technology use in elementary classrooms (Sprague and White, 2001).

Based on our experiences with integrating technology into an elementary education introductory/foundations course we pose the following recommendations: 1) organize each class session so that there is enough time for the technology experiences; 2) infuse technology into the program gradually and incorporate technology into assignments that are relevant to realistic education settings (Siegel, Good, & Morre, 1996); 3) seek student feedback through formative and summative evaluations as well as weekly reflections on both the class experiences and understanding of the technology applications and related course content; and 4) emphasize how technology can be used in every day classroom settings .

References

Falba, C.J., Strudler, N., Bean, T.W., Dixon, J.K., Markos, P.A., McKinney, M., & Zehm, S.J. (1999). Choreographing change one step at a time: Reflections on integrating technology into teacher education courses. Action in Teacher Education, 21 (1), 61-76.

Kovalchick, A. (1997). Technology portfolios as instructional strategy: Designing a reflexive approach to preservice technology training. TechTrends, 42 (4), 31-36.

Maeers, M. & Brown, N. (1999). Pedagogically appropriate integration of informational technology in an elementary preservice teacher education program. (ERIC Document Reproduction Service No. ED 432 271)

Roberts, N. & Ferris, A. (1994). Integrating technology into a teacher education program. Journal of Technology and Teacher Education, 2 (3), 215-225.

Siegel, J., Good, K, & Moore, J. (1996). Integrating technology into educating preservice special education teachers. Action in Teacher Education, 17 (4), 53-63.

Sprague, D. and White, C. S. (2001). High touch mentoring for high tech integration. Society for Information Technology in Teacher Education, Proceedings, 2001, Association for the Advancement of Computing in Education, Charlottesville, VA.

Willis, E.M. (1997). Technology: Integrated into, not added onto, the curriculum experiences in pre-service teacher education. Computers in the Schools, 13 (1-2), 141-153.

Effectiveness of an Exemption Exam for an Introductory Educational Technology Course

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Abstract: The need for teachers who are proficient in the use of technology in the classroom has increased dramatically over the past few years. Professional and regulatory organizations with direct and indirect influence on teacher education programs have issued reports, recommendations, standards, and accreditation criteria all aimed at increasing the technology competencies of beginning teachers. The College of Education at the State University of West Georgia established an introductory technology course for all teacher education majors to meet this demand. This survey course provides students with a background in various instructional technologies as well as classroom integration strategies. At the time the course was created, many of the faculty involved believed that many students entering the program would be sufficiently competent in technology to enable them to exempt the course. Those exempting the course would be able to take an additional class in their content area. This presentation will provide an overview on how the exemption exam was created and implemented, as well as a measure of its effectiveness in identifying technology competent students. Additionally, the results of the exam will be viewed in relation to the students beginning the course perceived level of technology expertise.

Introduction

The need for teachers who are proficient in the use of technology in the classroom has increased dramatically over the past few years. Professional and regulatory organizations with direct and indirect influence on teacher education programs have issued reports, recommendations, and standards all aimed at increasing the technology competencies of beginning teachers (CEO Forum on Education & Technology, 2000; ISTE, 2000; Solomon, 1998).

The College of Education at the State University of West Georgia established an introductory technology course for all teacher education majors to meet this demand. This survey course provides students with a background in various instructional technologies as well as classroom integration strategies.

At the time the course was created, many of the faculty involved believed that many students entering the program would be sufficiently competent in technology to enable them to exempt the course. Those exempting the course would be able to take an additional class in their content area. This presentation will provide an overview on how the exemption exam was created and implemented, as well as a measure of its effectiveness in identifying technology competent students. Additionally, the results of the exam will be viewed in relation to the students beginning the course perceived level of technology expertise.

Why the Exam Was Created

The College of Education at the State University of West Georgia had felt the pressure, as many institutions have, to both reduce the total number of semester credit hours to 120 while also being required by the Board of Regents to increase the number of content courses in its various programs. The Introduction to

Instructional Technology course was developed by merging two existing courses in an attempt to reduce the total credit hour load.

Although deemed a very necessary component of the curriculum, many faculty believed that students entering the college would possess many of the technology skills covered in the course. It was decided to create an exam that would evaluate a student's technology competencies. If the students met the basic criterion of the test, they would be exempted from taking the course. However, they would not be given the credit hours so that they could be required to take a different course in its place. The faculty wanted to utilize the opened space in the program created when the technology course requirements were satisfied.

How the Exam Was Developed

Media and instructional technology faculty teaching the technology courses were asked to develop the new introductory course and the exemption test. Meetings were held to review the new course objectives and content based on the ISTE technology standards. It was agreed that the knowledge, skills, and attitudes to be conveyed in such a course were not only to help the students to succeed in their future profession, but also to provide support in their other courses in their teacher training program. This would be particularly important since it would provide a base level of understanding that would enhance the ability of the students to understand the integration of technology infused in their advanced content and methods courses. The test, consisting primarily of performance and some written test items, would evaluate the students' mastery of the objectives set by the course.

The test covered the same topic areas as the course. These are operating systems, email, list servers, on-line resources, word processing, data base development, spreadsheets, presentation software, and technology integration. Test items are designed to emulate projects assigned in the course that require the students to create a product (e.g. newsletter, budget, presentation, etc). The final draft of the exemption test was reviewed by the dean of the College of Education, selected CoE chairs and faculty, adjunct instructors teaching the course, and a business education professor to insure face validly.

How the Exam is Administered

The exam is offered twice a semester during the Fall, Spring, and once in the Summer terms. The selection of the dates corresponds with advisement periods to allow students to use the results in planning their schedules. It is always given on a Saturday to avoid conflicts with students' classes and courses that use the college's computer lab. The exam is widely publicized by posted flyers, recommended by student's advisors and announced in classrooms. In addition, criteria for each section of the test is made available to potential test takers in the college's resource library.

Students are given four hours to complete the exam to allow enough time to complete the various projects. All necessary materials are provided including two disks on which to save the exam's projects. One disk is used while working on the exam and the second is used to create a final back-up, a requirement under the operating system section.

Since the exam is entirely performance based, the number of students who can sit for the exam is limed by the number of computer stations in the lab. To insure that all examinees will have a workstation, students are required to register for the test with the Media & Instructional Technology department. Contact information is used to remind prospective test takers of the date, time, and location of the exam.

How the Exam is Graded

The exam was designed to follow as closely as possible the projects assigned in the course. Each section is evaluated as a separate project and assigned a grade based on the number of correct responses and/or actions. Because each individual project must be evaluated on its own merits, each exam requires approximately 20 to 30 minutes to grade. Although this requires a large investment in time, it is deemed necessary to effectively evaluate the student's capabilities in using the technology. The section grades are then averaged to establish a final grade.

A measure of reliability has not been established primarily due to the four hour length of the test. Since the exam is not in multiple choice format, common statistical methods for calculating reliability are not appropriate. A test-retest or multiple forms method would suffice but the small number of participants as well as the length of the test has prevented their use.

The passing score for the exam was originally set at 85%. The rationale for this decision was that students needed more than a minimal score to show enough competence to exempt the course. After administering the exam twice, this minimal score was lowered to 80% to better reflect the passing rate of students in the course.

Outcomes

At the outset, it was anticipated that a large number of students would take advantage of exempting the course. However, this has been far from the case. Although the test is well publicized, few sign up to sit for it, and of those that do, only a small percentage actually show up.

Feedback from those who failed to participate revealed that some, after reviewing the published criteria, decided that they did not have the necessary knowledge to pass the test. This is supported by the results of a survey given to 259 students enrolled in the introductory course on the first day of class. The students had a high to moderate perceived knowledge level of the Windows operating system, word processing, web searching, email and the GALILEO online library catalogue system. However, perceived knowledge level of spreadsheets, data base development, presentation and multimedia software, and technology integration was dramatically lower (see Table 1). Results of a similar study at Appalachian State University were consistent with these findings (Green & Zimmerman, 1999).

Response to Perceived Level of Technology Knowledge (%)

	Low 0	1	2	3	4	High 5
Windows OS	4.6	15.4	22.4	32.0	20.1	5.4
Mac OS	52.1	23.9	13.1	8.5	1.9	0.4
Microsoft Word	8.5	10.4	16.2	27.8	24.3	12.7
Web Searching	6.2	10.8	23.9	27.0	23.6	8.5
GALILEO	13.9	18.1	23.2	24.3	14.7	5.8
Email	10.0	14.3	13.5	21.6	28.6	12.0
Microsoft Excel	52.5	18.5	15.1	9.7	3.1	1.2
Microsoft Access	62.2	18.5	10.0	6.6	2.7	0.0
Microsoft PowerPoint	62.5	17.8	8.5	5.4	3.9	1.9
HyperStudio	90.3	4.6	3.5	1.2	0.4	0.0
Technology Integration	49.0	18.5	17.4	12.4	1.5	1.2

Table 1: Response to a survey on perceived level of technology knowledge at the beginning of the course. Shaded areas illustrate the higher percentage of responses.

Another important factor seems to be the requirement that the students take an additional course to replace the credit. They feel that knowledge of technology will be beneficial and if they have to take a course anyway, it should probably be in instructional technology.

To date, 33 students have taken the exam, twenty undergraduate and thirteen graduate. The overall passing rate is 48% with 55% of the undergraduates passing and only 38% of the graduates. An examination of the passing rates by topic shows results similar to the perceived ability level of the students enrolled in the course. Scores are higher on operating systems, word processing, on-line resources, and email and lower on spreadsheets and data base development (see Table 2).

Exemption Exam Results by Program Level & Technology Area									
	Number of Examinees	Operating Systems	On-Line Resources	Spread-sheets	Word Processing	Email, Listserves, & Integration	Data Base	Power Point	Number Passing
Total Tested	33	21	16	12	21	19	13	22	16
Undergrad. Tested	20	15	11	10	12	14	8	14	11
Graduate Tested	13	6	5	2	9	5	5	8	5
Undergrad. Passing		75%	55%	50%	60%	70%	40%	70%	55%
Graduate Passing		46%	38%	15%	69%	38%	38%	62%	38%
Total Passing		64%	48%	36%	64%	58%	39%	67%	48%

Table 2: Exam results by program level and technology area.

Conclusions

At the time the course and exam was created it was anticipated that a large number of students would attempt to exempt the course. To date, 942 students have enrolled in the course since its inception in the Fall of 1998, while only 33 have taken the exam. This low participation rate (3.5%) can be attributed primarily to the requirement that students who pass the exam must still make up the credit hours by taking an additional course. If students have fundamental skills in technology, it is a more attractive option to take a course in which they have some knowledge than one that would require additional effort and a possible lower grade. The exam is not providing the anticipated option for students to open their class schedule to take additional subject area courses.

The review of the perceived level of technology knowledge from the students beginning the course does show that many have an introductory skill level in the basic use of computers and associated communication software (e.g. email and word processing.) They do not have knowledge of the more advanced analysis, presentation, or multimedia software. Although this knowledge level may have prevented them from passing the test, there is an apparent sufficient level of knowledge that there should have been a greater number attempting the exam.

The 48% overall passing rate indicates that the exam is sufficiently difficult to insure that those passing have an understanding of the subject matter and skills covered in the course. Inspection of the passing rate by technology area supports the data on the perceived level of technology knowledge of students beginning the course. The passing rate is higher for use of the operating system and communication technologies and lower for the more advanced programs. The only exception to this is the passing rate for presentation software (e.g. PowerPoint) which is higher than word processing at the undergraduate level but was rated low for students beginning the course.

The higher passing rate for undergraduate students over graduates tends to support the perception that students entering college are beginning to bring in a higher level of technology skills. Information on the number of years since the graduate students had been awarded their undergraduate degrees was not available so that it is difficult to conclude that the lower passing rate is related to them not having access to technology while they were in secondary and post-secondary programs. However, graduate students are only required to enroll in the introductory course if there is no indication that they have completed a technology course in their undergraduate studies.

The data also tends to support those advocating the continued use of an introductory course in the curriculum. Although education programs are quickly moving toward the incorporation of technology into content and methods courses it is questionable whether it is a best use of time in these courses to teach technology fundamentals. For the immediate future, it would be more expedient to provide students with a strong technology base so that content and methods courses could focus on integration strategies and not the upgrading of basic skills.

References

CEO Forum on Education & Technology. (2000). *Teacher preparation STaR chart: A self-assessment tool for colleges of education.* Washington, DC: Author.

Green, M.W. & Zimmerman, S.O. (1999) The development of technological competence in an undergraduate teacher education program. *Proceedings of the Tenth International Conference of the Society for Information Technology & Teacher Education*, San Antonio, Texas.

International Society for Technology in Education. (2000). *National educational technology standards for teachers*. Eugene, Oregon: Author.

Solmon, L.C. (1998). Progress of technology in the schools: Report on 21 states. Santa Monica, CA: Milken Exchange on Educational Technology.

Tomorrow's Teachers and Tomorrow's Technology—
The T4 Project

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Abstract: Educators in northeastern Oklahoma have collaborated on a special three-year project entitled "Tomorrow's Teachers and Tomorrow's Technology (T4) Project". The focus of the project will be to deliver a three-year comprehensive professional preparation program for prospective teachers from the northeastern region of Oklahoma for the purpose of empowering these future educators with the technological skills necessary for effectively teaching in twenty-first century schools. The purpose of this paper is to document the goals and objectives of the T4 Project, the elements involved in Phase I, and detail the benefits of this project to Langston University / Tulsa elementary education majors.

Educators in northeastern Oklahoma have collaborated on a special three-year project entitled "Tomorrow's Teachers and Tomorrow's Technology (T4)" Project. The focus of the project will be to deliver a three-year comprehensive professional preparation program for prospective teachers from the northeastern region of Oklahoma for the purpose of empowering these future educators with the technological skills necessary for effectively teaching in twenty-first century schools. Funding was provided by the United States Office of Education. The purpose of this paper is to document the goals and objectives of the T4 Project, the elements involved in Phase I, and detail the benefits of this project to Langston University / Tulsa elementary education majors.

The overall goals and objectives to support the full-scale implementation of a comprehensive program to development technology-proficient prospective teachers includes the following:

(1) implement a comprehensive professional developmcnt program in the use of technology for prospective pre-service teachers;
(2) implement a sustained service learning component for prospective teachers that focuses on technology connections and applications;
(3) implement a coherent professional development program focuses on the use of technology for higher education and teacher education faculty who will be active in the preparation of prospective teachers; and
(4) implement a rigorous evaluation plan for assessing program effectiveness and technology-proficiency levels of pre-service educators.
(5) implement a comprehensive professional development program in the use of technology for prospective pre-service teachers.
(6) implement a sustained service learning component for prospective teachers that focuses on technology connections and applications.
(7) implement a sustained service learning component for prospective teachers that focuses on technology connections and applications.
(8) implcment a coherent professional development program focuses on the use of technology for higher education and teacher education faculty who will be active in the preparation of prospective teachers.
(9) implement a rigorous evaluation plan for assessing program effectiveness and technology-proficiency levels of pre-service educators.
(10) implement a follow-up consultative support network and listserve for pre-service educators to access as a resource in sustaining their professional technology-proficient careers.

The primary prohibitive factor for the full development of technology-rich instructional environments in American schools is the lack of teachers prepared in the use of technology. The need for technology-proficient educators entering the teaching profession is paramount. Employable teachers for the 21st century will be those graduates who display technology-proficient portfolios. The T4 Project attends to this need by incorporating specific tools and strategies in the preparation of prospective teachers via technology-rich portfolios, presentations, and lesson plans.

Members of this partnership consortium include Tulsa Community College, Langston University / Tulsa, Tulsa Public Schools, the Tulsa Chamber of Commerce, Oklahoma State Department of Education, Tulsa area school districts, and local businesses in the Tulsa, Oklahoma area. This project is an alliance, which includes a wide variety of interest groups all focusing on common goals to help benefit future teachers.

Tulsa Community College (TCC) and Langston University / Tulsa are the primary institutions involved in the T4 Project. TCC is a "feeder" college, transferring students on to Langston University / Tulsa to receive a Bachelor's Degree in Elementary Education. Just as TCC is the "feeder" institution, Langston University / Tulsa is the "receiving" institution. Many of thc students at Langston University / Tulsa take courses at both LU / Tulsa and TCC concurrently in order to complete general requirements.

In Oklahoma almost two-thirds of the education majors begin their study at community colleges. TCC (Tulsa Community College) is the largest two-year college in Oklahoma and the second largest college in the state with an enrollment in excess of 20,000 students located on five campus sites within Tulsa County. TCC serves over 1,000 pre-service education majors each semester.

Langston University / Tulsa serves only upper division undergraduate education majors and has been the primary receiving institution of TCC education associate degree students for the past ten years. The commitment of Langston University / Tulsa to the development of a seamless program for the technology preparation of prospective teachers is evidenced in the willingness of LU / Tulsa to utilize the TCC campus sites, to request professional development programs for LU / Tulsa teacher education faculty via TCC course offerings and faculty expertise, and by the LU / Tulsa expressed need for education majors to have more extensive experiences with technology before entering teacher education programs.

The three-year project has been divided into the following components: (1) Phase I: Participant Recruitment and Curriculum Restructuring; (2) Phase II: Implementation and Evaluation; and (3) Phase III: Follow-up and Consultative Support. Phase I project milestones included the following: (a) conduct participant recruitment activities, (b) provide incentives for education majors, (c) provide incentives for increased enrollments in technology education courses, and (d) provide incentives for higher education faculty professional development, (e) upgrade and modify existing general education curriculum, (f) upgrade and modify existing teacher education curriculum, (g) restructure education curricula to include a greater focus on technology, and (h) select sample pre-service education students for evaluation focus.
Teacher Education faculty at Langston University / Tulsa have participated in the areas of recruitment, higher education faculty professional development, upgrading the teacher education curriculum to include technology use for both the students and the professor. Teacher Education faculty also have been able to participate in a Faculty Grants for Technology Innovation program. Two Langston University / Tulsa faculty members have received grant funding for the Spring semester of 2000.

In conclusion, educators in northeastern Oklahoma have collaborated on a special project benefiting prospective teachers from the region. The purpose is to empower these future educators with the technological skills necessary for effectively teaching in the twenty-first century schools.

The Computer Endorsement Program: Examining Expectations as a Catalyst for Change

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Abstract: This paper examines attitudes and perceptions associated with instructional technology programs offered by the School of Education at Indiana University South Bend. I chose to examine instructional technology programs offered by the School of Education. The School of Education currently offers a computer endorsement, which may be added to an initial area of certification. It is expected that teachers holding this endorsement will be sufficiently competent to incorporate computers into instruction in various contexts. It was therefore my intent to determine the level to which our students are meeting school expectations. An appropriate instrument was developed to investigate prevailing attitudes and expectations, and the survey was conducted. While technological skill expectations of the School of Education and P-12 schools were similar, disparity was observed in two areas. The results of this survey will be used as a catalyst for change in the School of Education's instructional technology programs.

Introduction

Changing state and national standards as well as the changing needs of schools served by the School of Education at Indiana University South Bend (IUSB), have made it necessary to examine the instructional technology programs offered by the School of Education. The School of Education at IUSB currently offers a computer endorsement, which may be added to an initial area of certification. It is expected that teachers holding this endorsement will be sufficiently competent to incorporate computers into instruction in a variety of contexts. The IUSB computer endorsement program has been in existence for six (6) years, and has produced approximately twelve (12) graduates with a computer endorsement. There are currently a number of students pursuing this endorsement as well. As these graduates enter the workforce they hope that the endorsement will qualify them for a broader range of positions than they would have been qualified for without the endorsement. Through discussions with these graduates it has come to our attention that human resource personnel and school administrators may be uncertain about the computer endorsement, and its implications. While the number of computer endorsees is not large, it was decided that this matter warranted further investigation. It was therefore my intent to conduct a survey of school corporations in the IUSB service area to determine the level to which our students are meeting school expectations.

Context

Created in 1820 by an Act of the General Assembly, Indiana University is one of the oldest state universities in the Midwest, and with more than 97,000 students on eight campuses, one of the largest institutions of higher education in the United States. The campus of Indiana University South Bend (IUSB) serves the greater Michiana area (northwest Indiana southwest lower Michigan.) IUSB strives to meet the needs of local employers by educating potential future employees in the region. The social environment of the School of Education at IUSB consists of one thousand three hundred seventy-eight (1378) students. This number includes undergraduate, graduate, certification and degree seeking students. Traditional and non-traditional students are represented in equal proportions. The School of Education places approximately two hundred (200) student teachers in area school corporations each year. In addition to student teachers IUSB's School of Education assigns two hundred fifty five (255) students in field experience placements in area schools as well. The relationship between the IUSB School of Education and area schools continues to be one of shared responsibility and respect.

School corporations in the IUSB service area were surveyed to discover attitudes and expectations relating to instructional technology in general, and the School of Education's Computer endorsement specifically. Schools participating in the survey represent a wide range of size, settings, socioeconomic status and financial resources. All school corporations represent P-12 schools. An appropriate instrument was developed to investigate prevailing attitudes and expectations.

The Survey

Forty-one (41) school corporations were contacted for the survey. Forty-six percent (46%) of school corporations contacted answered the survey. The survey was administered in two formats. All school corporations served by IUSB were placed on a contact list. All school corporations on the contact list were initially contacted by telephone. Some of these contacts resulted in telephone interviews. In school corporations where the appropriate contact person was unavailable, surveys were mailed. Respondents include superintendents, technology coordinators, principals and human resource personnel. The survey was conducted in early August of 2000, with mailed responses arriving intermittently through the early fall. The survey is comprised of six open-ended questions. The open-ended format provides respondents freedom in answering the questions as well as allowing for a varied depth of response.

The first area addressed was skills and abilities in instructional technology. School corporations in the IUSB service area vary greatly in the degree to which technology is utilized, and technological expertise is expected of teachers. Some schools in the IUSB service area include a technological skill component as part of the hiring process. This survey item addressed educational technology expectations for any beginning teacher. Respondents were to address four categories: general, software, peripherals, and platform. In the general category respondents indicated that the use of the Internet and integrating technology into the curriculum were key issues. The Internet has emerged as an invaluable source of information for classroom teachers as well as an essential research tool for students and teachers alike. Knowledge of Internet technology and proficiency in its use are crucial for the classroom teacher. Proficiency with basic applications such as personal productivity software was stressed by survey participants. Expertise with productivity applications enables the teacher to be more efficient in the management of data related to students as well as the planning and implementation of learning opportunities. When asked about peripherals, respondents indicated that scanners, digital cameras and printers were the essential items with which beginning teachers needed to be familiar. Respondents also indicated that familiarity with Zip® drives and the use of video projectors was an asset for a beginning teacher. The reduced cost and widespread availability of a variety of peripherals, enables schools and teachers to access a greater amount of technology. This provides an increased application of technology across the curriculum.

When asked which platform our students and beginning teachers should be comfortable in, the majority indicated that their computer applications operated in the Windows platform. The remaining respondents said that it would be beneficial for beginning teachers to be equally comfortable in the Mac and Windows platform. Elementary schools in the IUSB service area operate mainly on the Mac platform, while high schools operate in Windows. Middle schools in the area however, typically use both platforms. IUSB School of Education students interested in middle school teaching are encouraged to become familiar with both platforms. All students in the School of Education at IUSB are required to take a course that serves as an introduction to microcomputers in education. This course addresses all software, peripheral and platform issues considered essential by respondents, with the exception of digital imaging and the use of video projectors.

While the debate concerning the standards movement is ongoing, standards are currently a reality that many teacher preparation programs must face. Technology standards have been set at national and state levels for P-12 education. These new standards create a need for teacher education programs to provide students with skills that will allow them to integrate technology throughout the classroom curriculum. The Indiana University South Bend School of Education is accredited by the National Council for Accreditation of Teacher Education (NCATE). NCATE standards now expect accredited schools of education to provide adequate access to computers and other technologies, and expect faculty and students to be able to use it successfully. Programs offered by the School of Education must also meet the standards developed by the Interstate New Teacher Assessment and Support Consortium (INTASC), as these standards have been adopted by the state of Indiana. According to the Indiana Academic Standards for P-12 schools each student who participates in technology education will acquire an understanding of technology as a component of the global context. Teachers must be prepared to provide students with instruction that will accomplish this goal. Survey participants were asked to address future directions for instructional technology delivered by the IUSB School of Education in light of changing standards. Participants indicated that the IUSB School of Education should offer instruction in the use of technology as a tool for curriculum integration to all education students in the future. It was suggested that this offering begin as soon as possible. The integration of technology into and across the curriculum is vital. Many teachers feel unprepared to face the challenges this integration presents. Participants strongly felt that the School of Education should offer instruction in routine cleaning, maintenance and repair (Fig.1). While some schools employ individuals whose central responsibility is to maintain, clean and repair technological equipment, often these responsibilities fall upon school personnel who are ill prepared for the task. Providing basic instruction in these areas would be beneficial. It was also suggested that the ability to communicate technological knowledge and act as staff developers be encouraged in our students. In addition, instruction in the use of the Internet as a research tool was stressed. Aligning curriculum, instruction and assessment with the use of technology was stressed as well; as was the use of technology to align school curricula with various standards. Alignment of curriculum, instruction and assessment helps to ensure equal access to an educational experience of high standards for all students. This process is also a crucial step in fulfilling requirements of various state and national standards.

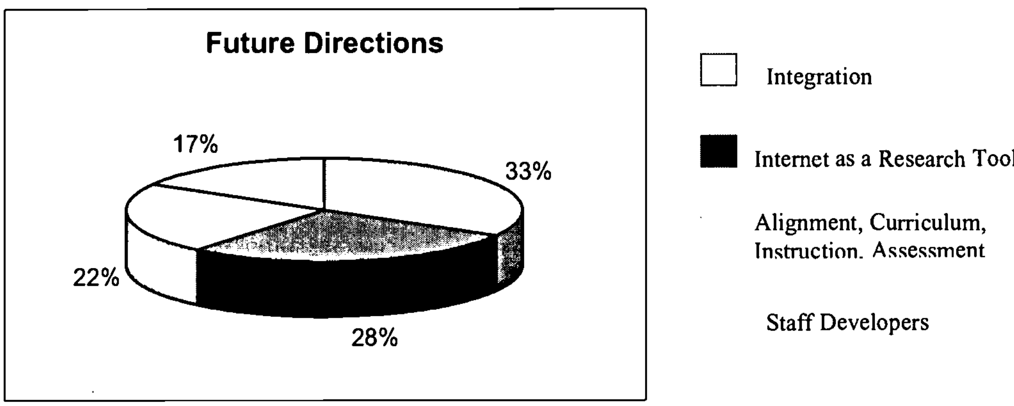

Figure 1: Future Directions for School of Education Instructional Technology

In an effort to examine existing notions, survey participants were asked to describe their expectations of potential employees who have a computer endorsement. Respondents expressed the expectation that students with a computer endorsement should be prepared to assume a leadership role in technology. It was also expected that these individuals would lead staff development sessions on the use of technology in educational settings. It was further revealed that the ability to integrate technology into the classroom and teach others to do so was expected of individuals holding a computer endorsement. In the area of technological skills, expectations of the School of Education and P-12 schools were quite similar. Disparity was found to exist between the expectations of P-12 schools and the IUSB School of Education in two areas. One area of disparity is that some respondents have expectations that an individual with a computer endorsement should be able to maintain and repair computer equipment. At the present time this is not an element in either the School of Education's instructional technology course, or the computer endorsement program. Changes are underway that would incorporate more hands-on experience in this area into existing courses. Another area of inconsistency is the issue of computer endorsement holders as staff developers. The intended purpose of providing a computer endorsement option is to provide added levels of knowledge and experience with educational applications of technology to enhance a teacher's performance in the classroom. School of Education students are given instruction in, and opportunities to practice, the teaching of computer applications but emphasis has not been placed on large-scale staff development.

As the instructional technology offerings of the School of Education were examined, respondents proposed possible additions to existing course offerings. It was again suggested that there should be instruction on routine maintenance cleaning and repair of common hardware. This issue has been raised throughout the course of this study. Respondents suggested that instruction in web page design be included in required technology courses for IUSB School of Education students. The introduction to microcomputers course mentioned earlier does not contain a web page design component, while the computer endorsement program includes web page design. Respondents also stressed that the average teacher should possess the ability to troubleshoot classroom technology and common software applications. While troubleshooting has been included in the introductory course, it has not been emphasized. It was again stressed that students should be provided instruction in the integration of technology into the curriculum. Some respondents indicated that instruction in networking be a priority.

To conclude, survey participants were asked if there were any other issues that needed to be addressed. Most respondents replied that there were not. One issue that did arise was concern on the part of schools concerning teachers who have been in the classroom for a number of years. School administrators are searching for ways to get more experienced teachers to become enthusiastic about technology. The possibilities technology presents for teachers are limitless. Sadly, either lack of knowledge or fear of technology causes many teachers to avoid using the valuable resources available. Many teachers lack confidence in their ability to teach their students how to use technology, or to use it themselves.

Christopher Moersch has constructed a conceptual framework that measures the level of technology implementation or LoTi™. Moersch asserts that there are "seven discrete implementation levels teachers can demonstrate, ranging from nonuse (Level0) to refinement (Level 6). As teachers move from one level to the next, a series of changes to the instructional curriculum are observed" (Moersch, 1995, p41.) The challenge faced by schools is to move teachers from the level of nonuse along the continuum towards refinement. In an effort to bring this about, many schools have attempted to provide technological training with limited success. Many staff development programs are based on the assumption that participants in such sessions are easily able to make the connections between the technology available and their instructional curricula; as well as the assumption that the individuals are ready and willing to initiate changes in their instructional practices. Frequently neither assumption is valid, and staff development sessions result in nonuse or low levels of technology use by classroom teachers (Moersch, 1994). "The use of technology does not guarantee a fundamental change in the teaching-learning process and consequently in learning outcomes" (Dwyer, 1991). In order for schools to successfully move reluctant teachers along the technological continuum, emphasis must be placed on linking technological gains with long-term instructional objectives.

Conclusions and Implications

In keeping with the School of Education's commitment to continuous program improvement, the IUSB School of Education has initiated the process of changing the instructional technology program, and the computer endorsement program to more accurately address the needs of the P-12 schools in our service area. It is intended that more hands-on opportunities be available to our students, to learn routine maintenance and repair procedures. The process of change presents many challenges. One such challenge is formulating a plan to add requirements to a program that is already very rigorous. Some School of Education students at IUSB, depending on the specifics of their program of study, require five years to obtain a bachelors degree. Another challenge is the time factor. IUSB is one campus in a very large university system. Even though the changes are to be made only on the South Bend campus, certain changes will require not only campus-wide but perhaps system-wide approval. This requires more time. Currently in the Indiana University system, it takes one to two years to change requirements for an existing program of study on a single campus.

The issue of computer endorsement holders as staff development leaders will be examined in further detail. Although there are some components of staff development in the computer endorsement program , at this time, it is not intended to provide P-12 schools with staff developers, but rather teachers with an above average level of technological expertise. Efforts will be concentrated at this time to ensure that instructional technology offerings by the Indiana University South Bend School of Education are as effective as possible in meeting the needs of the P-12 schools, which we serve.

It is the intent of the Indiana University South Bend School of Education to prepare students to serve as effective teachers. It is our belief that the effective teacher must master both a significant body of content knowledge, as well as demonstrate myriad effective teaching skills, one of which is proficiency with instructional technology. Instructional technology goes beyond any single media, or device, the classroom computer for example. It is a systematic way of planning, implementing and evaluating the entire teaching-learning process. It is a way of combining human and non human resources to bring about more effective instruction. In order to ensure that the instructional technology offerings of the IUSB School of Education meet the needs of students who will in turn meet the personnel needs of area schools; it is necessary to periodically examine those needs as well as prevailing attitudes and expectations and make appropriate changes.

The results of this study will be used as a valuable source of data as well as a catalyst for change in the School of Education's required instructional technology courses, as well as the computer endorsement program. It is possible to bring about change in existing courses with relative ease, in a short amount of time; changes such as incorporating experiences in routine maintenance for example. Program changes, however, require more time. This process may be expedited by the fact that precedent exists in the Indiana University system to support the proposed changes to be made on the South Bend campus. Bringing about change in a program, which is part of a large university system requires time and documentation. The need for change as well as the potential benefits of such a change must be carefully and thoroughly examined. Only through periodic examination and evaluation of changing needs, can the Indiana University South Bend School of Education continue its proud tradition of excellence in teacher preparation.

References

Anderson, R., (1983). Selecting and developing media for instruction. New York, NY: Van Nostrand and Reinhold.

Dwyer, D.C. (1991). Changes in teachers' beliefs and practices in technology-rich classrooms. *Educational Leadership*, 48 (8), 45-52.

Moersch, C. (1995). Levels of technology implementation (LoTi): a framework for measuring classroom technology use. Learning and Leading with Technology, 23 (3), 40-42

Computer Endorsement Needs Assessment Survey

Interviewee	Date
Affiliation	**Position**
1. What skills and abilities in instructional technology do you expect a beginning teacher to possess?	
General	**Peripherals**
Platform	**Software**
2. (for HR people) When an applicant comes to you with a computer endorsement, what positions do you consider them qualified for?	
3. **Given the changing standards, where do you feel we need to be taking our students 3 or 4 years from now?**	
4. When an IUSB graduate comes to you with a computer endorsement, what does that mean to you? What skills and abilities do you expect that student to possess?	
5. **What do we need to offer in the area of instructional technology?**	
6. **Is there a question that we should have asked, but did not?**	

Learning to teach with technology – From Integration to Actualization.

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Abstract: The purpose of this paper is to highlight technology infusion within a unique professional development school (PDS) context. Emphasis is placed on teaching interns (preservice elementary teachers in their final year of preparation) who were introduced to applications of technology through their university coursework. Opportunities to explore technology use in the classroom were afforded through a year-long and school based internship. These preservice teachers experienced multiple ways integrate a wide range of technologies that were designed to enhance and support student learning. The following aspects are highlighted in this paper: program context, approach to technology integration in university coursework, five case studies of technology infusion in the context of elementary classrooms, and implications for learning to teach with technology. The case studies include: Grade 1 – Prehistoric Life with the Dinosaurs using Kid Pix; Grade 2 – Exploring the Seasons; Grade 3 – Where do Insects go during the Winter? Grade 4 – Representing Nutritional Information through Electronic Graphing; and last, Grade 5 – How can the Internet be used effectively to enhance Human Body instruction for Fifth Grade Students?

In their review of literature on information technology and teacher education, Willis and Mehlinger (1996) purport that, "most preservice teachers know very little about effective use of technology in education and leaders believe there is a pressing need to increase substantially the amount and quality of instruction teachers receive about technology" (p. 978). This is not surprising given the United States Office of Technology Assessment (U.S. Congress, 1995) report that found technology was not a central component of teacher preparation programs in most colleges of education. A summary of the key findings states, "Most technology instruction in colleges of education is teaching about technology as a separate subject, not teaching with technology across the curriculum. Seldom are students asked to create lessons using technologies or practice teaching with technological tools" (p. 165). Clearly there is a need to integrate technology into teacher preparation.

Attention to technology integration alone, however, may be insufficient for assisting preservice teachers in learning how to effectively infuse technology into their classroom teaching practice. A common problem reported in the literature is the decontextualization of elements of teacher education (Zeichner, 1992). In light of the potential to provide unique opportunities to integrate university coursework and field experiences (Darling-Hammond, 1994, Levine & Trachtman, 1997), professional development schools (PDSs) offer a possible means of addressing this issue. Some of the underlying elements of PDSs include developing collaborative relationships between members of the school-university partnership, engaging in authentic problem-solving in light of a shared vision, and nurturing a common vocabulary and knowledge base (Rosaen & Hoekwater, 1990). School-university partnerships foster contexts in which school-wide and classroom-based environments offer preservice teachers multiple opportunities to develop skills and understandings to effectively use instructional technology. Technology infusion in such settings stands to be a powerful approach to fostering changes with respect to instructional technology in preservice teacher preparation.

The purpose of this paper is to highlight technology infusion in the context of a particular PDS, the school-university partnership between The Pennsylvania State University and the State College Area School District (PSU-SCASD PDS program).

Program Context

Based on the definition and historical development of the PDS movement nationwide, the State College Area School District and The Pennsylvania State University joined in partnership to create four Professional Development Schools. These four schools are a result of a six-year effort to collaboratively plan and open Professional Development Schools that achieve three goals. The first goal is to enhance the educational experiences of all children. The second goal focuses on ensuring high quality field experiences for prospective teachers. The third and final goal is to engage in furthering the professional growth of school and university based teachers and teacher educators (Dana, Silva, & Colangelo, 1999).

Today, Penn State students are selected to complete the yearlong internship program through an extensive application and interview process in which mentor teachers play a major role. The students begin the experience during the second week in August with an intensive two-week campus-based preparation experience, termed "Jump Start." Interns then join their mentors for orientation, classroom preparation for the school year, and district meetings. At this point, interns abandon the university calendar to teach alongside their mentors.

Through seminar and teaching alongside a mentor each day of the school year, interns earn 30 credits, the equivalent of the Penn State's Elementary Education Discipline Inquiry Block Courses (three credits each in math methods, science methods, social studies methods, classroom management, and clinical experience) and Student Teaching. Teams constituted by mentor teachers and Penn State teacher educators structure the experience to ensure that course objectives are met, within the rich context of spending a full school year in the field.

Technology infusion in university coursework and the PDS classroom

Identified as a goal of the PSU-SCASD PDS program is to find ways to support the development of interns' skills and understandings of ways to effectively use technology to enhance and support children's learning. To achieve this goal, interns are given initial experiences that are supported by the university method instructors. During the first phase, interns experience activities that are designed to help them explore and make sense of teaching with technology. Individually, interns are asked to reflect on these experiences. Class and on-line discussions (using CourseInfo through the website www.blackboard.com) focus on the students' emerging ideas about teaching with technology.

In the second phase, the interns engage in additional scientific investigations using the technology tool. As some of the instructor support is removed, interns experience setting up the technological tool. For example, they explore how to use individually selected software such as Tom Snyder's Graph Club, Claris Home-page for designing web pages, and Kid Pix for presentations. Interns practice with such technological equipment as heart monitors, and electronic microscopes. While they 'played' with digital cameras, scanners, and video equipment for recording and digitizing, interns explored technological tools that were available for teacher use in their schools. In conjunction with their mentor teachers, interns figured ways to have the hardware available for daily use in their classrooms. They negotiated some of the practical dilemmas that arise when trying to make technology effectively usable in a classroom.

During the third phase, PDS interns examine and modify existing exemplary curricula to effectively infuse technological tools. Interns consider in-depth the plausibility of using a particular piece/s of technology. Mentor teachers, interns, and university faculty are involved in discussions that help the intern to conceptualize what the process of technology infusion might look like in the classroom. The goal is to integrate technology into planning classroom activities that support and enhance children's learning, rather than designing and implementing some 'cute' motivational activity. Consequently, the children's experiences with technology fosters further learning experiences that are open-ended.

In the last phase of the technology infusion process, interns move from the role of learner about technology to that of teacher with technology. Interns write and enact technology-enhanced lesson plans. Lesson may be co-planned and co-taught with other interns and mentor teachers, and the process is supported by university faculty. The interns reflect on these individually, and are asked to post their lesson plans and reflections on their web pages. The latter two phases emphasize the planning and teaching aspects of learning to teach with technology. Further, central to this process, is the building of interns' confidence as they learn about technology and how to use it, and how to be a teacher who can effectively infuse technological tools to enhance the curriculum and support student learning.

Case Studies in the Elementary PDS classrooms

Five case studies are described as examples of technological infusion in the context of PDS elementary classrooms.

Grade 1 – Prehistoric Life with the Dinosaurs using Kid Pix Studio

In designing a culmination activity for a first grade science unit, Prehistoric Life, a team of two interns and two mentor teachers brainstormed ideas that integrated technology. They sought ways to construct a report-writing task as the final activity. Such a task would allow children an opportunity to present gathered information in a way that was supported by technology. Creating a slide show using Kid Pix Studio to highlight the children's experiences with discovering their mystery dinosaurs was the agree upon task for each group of children. Support was offered by university faculty members in the PDS community to facilitate this process in conjunction with the teachers, parent helpers, and the first graders.

A planning time was organized to familiarize the children with Kid Pix Studio. Digital photographs were taken throughout the unit as the children engaged in activities that sought to identify their mystery dinosaurs. Each child selected the background for at least one slide, the transition from slide to slide, and the appropriate photograph. In order to access enough computers to allow 46 children to work in groups to construct a slide show, five computers were relocated into one of the first grade rooms for one day. Teams of children, each facilitated by an adult, worked over a four-hour period to complete the slide shows. Every child wrote and recorded (using a microphone device) reflections underneath the photograph on the slide.

Parents were invited to attend the Slide Show presentations on the final day of the unit. Teachers, university faculty, parents, and other audience members were very impressed with the children's explanations that highlighted how they designed their slide shows. Shared comments from the witnessing adults expressed surprise that first grades were capable of using such technology to create slide shows.

Grade 2 – Exploring the Seasons at Acorn Pond

The software program, Sammy's Science House was integrated into a second grade science unit that facilitated student understanding of the weather characteristics of the four seasons. The objectives of the unit focused on how students identified the four seasons, and explained the effects of each season on people, plants, and animals. The instructional plan was framed.

Before: The station area was arranged to accommodate a computer work area. The computer software Sammy's Science House was installed. Construction paper was prepared for students' drawings.

During: The computer software Sammy's Science House was explained and demonstrated to the children. The children were instructed to go to Acorn Pond. In this area the children rotated through the seasons at Acorn Pond. First, they folded their paper into four sections. In each section, they drew and labeled each scene at Acorn Pond. Second, they explained what was occurring to the plants and animals at Acorn Pond. They included in their picture what happened to the pond, the tree, and the animals each season. Third, the children included the temperature at Acorn Pond during each season. Last, they clicked on the animals and

listened to what the animal was doing to prepare for life at Acorn Pond. This interactive activity focused the children's learning on this ecosystem and its inhabitants throughout each season.
After: The children discussed what they saw occurring at Acorn Pond. Ask volunteers described their drawings. Questions were pondered: What happened to the tree, the animals, and the pond during each season? What were some of the animals you learned about during each season?
Closure: The children identified how they relate to each season. How do they change throughout the seasons? What in their lives changes? What are some real life problems that they encounter within each season?
Assessment: The assessment for each child's work was based on the drawing completed and the explanations given about Acorn Pond's adaptations for each season. The children included the changes occurring to the tree, pond, and animals at Acorn Pond; the temperature averages at Acorn Pond; an explanation about the weather characteristics of each season; and labeling of each season.
Reflection: The children depicted through drawings and text the effects of the seasons on plants and animals. They also learned the attributes of each season. The computer program was very effective in helping the children understand the concepts. The students were excited about the computer software. The students arrived at the station in groups of 4 to 5. They cooperatively shared two computers with their partners. Conversation and discussions were held around the computers about the animals and scenes at Acorn Pond. The children liked the interaction of the computer. This allowed the children the freedom to converse and make decisions on their own about what they wanted to depict in their illustrations of each season. Throughout the lesson the children verbalized their findings to the adults and their peers.

Grade 3 – Where do Insects go during the Winter?

In Andrea's third grade classroom, there were a number of students who demonstrated an interest in the outdoors. Considering the constraints of curriculum and the interests of these students, Andrea lead a small group of children into the woods for a science investigation. She chose to use a guided type of inquiry and framed the investigation with the question: Where do insects go during the winter?

As she searched for books on insects in the school library, and browsed the net for sites (Topics in insect ecology, and Insects Winter) on insect galls and over-wintering, Andrea realized how important it is for a teacher to have a good understanding of content before trying to teach it to children.
After venturing into the woods the previous day, Andrea led a class discussion that focused on what the students had observed on their field trip. She asked the students why they had not found any insects in the woods. One suggested 'it was too cold.' Some students indicated that the insects were buried deep under the ground, and 'we didn't dig far enough.'

At this point the intern stopped the discussion and introduced a plant gall that her mentor teacher had brought in. Andrea let them look at it with microscopes and make conjectures as to what it could be. Some students thought it might be a cocoon that hardened on a seed pod from a tree. At this point, Andrea divided the group in half. Three children found a seat around a computer with her, and the other half of the group wrote further question down in their journals. Books on insects were available for the students to browse after they finished writing. This part of my lesson was aimed at showing the students sources of information about insects in particular, and science in general.

Andrea shared a series of web sites (Insect Galls, Butterfly Farm, and Ants) that included pictures of galls, information about various insects, and pictures of the insects in their many habitats. The students analyzed the detailed images of the galls. They identified galls that they had seen in their yards or on pine trees as well as maple and oak trees.

This intern concluded that finding ways to infuse technology with scientific inquiry is an important process for supporting children's learning. In particular, guided researching of the Internet provides information that children can use to expand their knowledge and generate further questions for scientific inquiry.

Grade 4 – Representing Nutritional Information through Electronic Graphing

In his efforts to familiarize students with constructing graphs using technology and connect these with the Pennsylvania Science Standards, an intern facilitated fourth graders exploration of foods on the basis of protein content. In searching for a developmentally appropriate task, students were given opportunities to explore and implement the Graph Club software, designed by Tom Snyder. Initially, the workings of the Graph Club were explained to groups of students. Time was given for these groups to investigate the software and explore its capabilities. The task was outlined to each group, and roles were set for each member of the team. Two students spent some time exploring the program, while the other two identified information from the labels of the two foods to be compared, and recorded this onto a worksheet. The information was used to construct the graphs.

The task was designed to provide the four students with a job each: one at the keyboard, one at the mouse, one providing the information from the worksheet, and one student to serve as a "proofreader"- assessing the groups progress, making sure that the information was assigned correctly to the graph's columns. The roles of the students were exchanged. In this context, student learning was assessed as they constructed the graphs. Focus questions were provided by the intern to guide the students in a comparison of the content of two different foods. For example, How are the axes to be labeled?

Questions were asked that promoted student involvement in predicting and comparing. For example, In what ways are these foods different? How do you know? Students were asked to make predictions, using their current experiences with their knowledge about their foods and the graphs they designed. For example, If we graphed information using Graph Club, what foods are similar in content? Students asked insightful questions. For example, How can two apple sauces contain such different amounts of sodium? Printed graphs indicated the graph's accuracy in comparison to the recorded information on the worksheet, and each group's progress with the task.

Grade 5 – How can the Internet be used effectively to enhance Human Body Instruction for Fifth Grade Students?

As she became more responsible for planning lessons, an intern explored ways she could use technology to support instruction in her fifth grade classroom. With all the information allowed by the Internet, this intern felt that there must be useful ways to incorporate this technology into more of the instruction, particularly to give students access to artifacts and images that they would not normally have the opportunity to see firsthand.

As they embarked on the science, unit, The Human Body, Sara figured ways she could present an explanation of the human cell. She contemplated an in-depth analysis of a cell model, showing different organelles to the students and explaining the functions of each. As she did not feel particularly comfortable using a photocopied image of a cell, Sara searched the Internet for a suitable website. As part of an introductory lesson, Sara used the site: http://www.cellsalive.com that featured many actual microscope images of various types of cells. There was an option to watch a real time video of cells undergoing mitosis. In her exploration of this site, Sara found a model of a cell – a detailed, color representation that allowed the user to click on a desired organelle. It linked to a page that gave a more in depth explanation of the organelle along with more photographs and a few animations that simulated various functions. Sara showed these pages to the students and talked through the important points. The students were instructed to draw a model of the cell, and list the names and functions of the organelles in a chart format.

From earlier experiences using the Internet as part of instructional practice, Sara anticipated the students' many questions about spellings. Although the organelle names were on the web pages, these were only legible for the students nearest the television monitor. Sara used the computer as a chalkboard by taking advantage of its multitasking capabilities. As she used Netscape to navigate through the cellsalive page, Sara opened two windows within AppleWorks – one was for word processing and the other for painting. From here she dragged these windows into positions that would allowed her to click on the edges of the windows and easily switch applications. After introducing a new organelle, Sara clicked on the word processing window and typed its name in a font which was large enough for the students furthest from the monitor to read and copy. Once the students had an opportunity to copy this information, she clicked on the painting window and drew an example of a model cell, adding organelles to the drawing. This reinforced what the students were learning – first, students looked at the web page and discussed the organelle, then they saw the words and copied them down, and finally they labeled their drawings of the cell.

The next computer-based lesson focused on the skeletal system. Sara located a web page through the Penn State biology department that showed a full skeleton alongside the names of all the bones. When the user clicked on a bone name or part of the body, a real picture of that bone was seen. Sara's intent was to use this as a guide to talk through the parts of the skeleton and look at the different features of bones and joints by examining individual bones

The final Internet based body lesson related to the muscular system. Sara located two sites with short movies about types of muscles and their functions. Since the first animated movie had a pause button, Sara was able to stop it at certain points to reinforce, question, or check for understanding. After the introductory movies, Sara moved to another site that had a large diagram of the muscles of the human body. Here, a user can move the pointer over a muscle and the muscle name popped up. Sara worked through this from the head to the toes, highlighting important muscles, while the students recorded these on their own diagrams. Again, the words on the screen were small and unfamiliar, Sara used a large font on AppleWorks to ensure that students recorded the information accurately.

Conclusion

As we figure ways to facilitate the development of preservice teachers' skills and understandings about how to use and infuse technology into curriculum, teacher educators are faced with 'better problems.' Negotiating our better dilemmas leads us to ask questions such as: How do our philosophies of teaching and learning with technology impact the way preservice teachers understand using technology? How do we keep up with the changing technology? How can we further evolve our own understanding and skills about using technology? In what ways can we sustain classroom learning environments that facilitate preservice teachers understandings of technology? How we support and enhance inservice teachers in their efforts to model the effective use of technology in classrooms?

References

Almquist, Corinne. (2000). http://www.personal.psu.edu/users/c/m/cma137/

Barley, Sara. (2000). http://www.personal.psu.edu/users/s/l/slb213/

Bugai, Matthew. (2000). http://www.personal.psu.edu/users/m/j/mjb116/

Dana, N. F., Silva, D , & Colangelo, L. (1998). *The mentor teacher research guide*. Program documentation submitted to State College Area School District - Penn State University College of Education Professional Development School.

Darling-Hammond, L. (Ed.). (1994). *Professional development schools: Schools for developing a profession.* New York: Teachers College Press.

Hosfeld, Andrea. (2000). http://www.personal.psu.edu/users/a/l/alh176/

Levine, M., & Trachtman, R. (1997). *Making professional development schools work: Politics, practice and policy.* New York, NY: Teachers College Press.

Rosaen, C. L. & Hoekwater. (1990). Collaboration: Empowering educators to take charge. *Contemporary Education, 61* (3), 144-151.

Shockey, Deborah. (2000). http://www.personal.psu.edu/users/d/s/dss167/

Snyder, Amy. (2000). http://www.personal.psu.edu/users/a/m/ams361/

Willis, J.W., & Mehlinger, H.D. (1996). Information technology and teacher education. In J. Sikula, T. Buttery & E. Guyton (Eds.). *Handbook of Research on Teacher Education* (2nd ed., pp. 978-1029). New York: Simon and Schuster.

Zeicher, K. M. (1992). Rethinking the practicum in professional development school partnership. *Journal of Teacher Education, 9,* 1 - 13.

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PT3 PAPERS

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The year 2000 continued the unprecedented trend toward stakeholders from PreK-16 education, the community, business, and government joining forces to reconfigure teacher education to include the intelligent use of technology by our future teachers. Sparked in large part by the Preparing Tomorrow's Teachers to Use Technology (PT3) grants awarded by the Department of Education, this trend was additionally supported by national initiatives in standards, reform, and research with an eye toward sustained change through the use of technology in teaching and learning. Traditional educational methods and structures are being been challenged: past era practice is not sufficient for 21st century learners.

In the first two years, the PT3 program awarded over 250 grants to consortia nationwide. Along with the groundbreaking innovations and organizational changes that grantees undertake, they are further charged to disseminate findings and practices to fellow grantees, peer institutions, and the general public. A dedicated PT3 section in these SITE Proceedings, representing over 60 institutions, is a testament to the diligence of these consortia to share their knowledge, successes, and challenges so that others may learn.

The initiatives highlighted in this section describe more than successful courses or innovative individuals. Experience has shown that such isolated change will wither in the long term without transformed assumptions about learning, shared visions of success, and committed wholes, from the top administrator to the novice student. Due to the exceptional volume of entries in this section, individual papers will not be introduced; rather, general trends have been used to organize the selections into categories: Design of Model Programs, Restructuring Existing Technology Courses, Faculty Professional Development, K12/University Partnerships, Electronic Portfolios, Online Tools, and Video-Based Resources.

Design of Model Programs

A great number of the PT3 grantees are progressing through their first year of funding, while the rest are well into their second year. Not only are the authors of these papers able to describe the components of their model designs, but many can now also give advice on early implementation. One project, for example, details a training model for preservice teachers. Another utilizes the three components of faculty development, technology-enabled field experiences, and a digital portfolio system. A third makes use of four tools: classroom mentoring, mini-grants and stipends, innovative training formats, and K-6 to university modeling. A field-based model that provides preservice teachers with supported opportunities to use instructional technology in authentic classroom settings is detailed. At least one paper focuses on efforts to incorporate technology proficiencies into teacher preparation, and two in particular describe the elements of systemic change spurred by their projects. Other grantees present strategies of modeling and mentoring for effective technology use. A final paper in this section comments on the larger implications for such program improvements in teacher education programs across the country.

Second-year projects have submitted papers that address their first-year evaluation results. Authors describe faculty attitudes toward the inclusion of technology within teacher education courses, qualitative and quantitative results demonstrating positive results gained over the first year, the components of program implementation, including pre-planning, roles and responsibilities, and management tools, and the processes, instruments, data collected, and lessons learned on the way toward a technology-rich and sustainable teacher education program. Clear in many of the papers in this section is an honest appraisal of the difficulties inherent in the technology training process, with practical suggestions for project implementation in other settings.

Restructuring Existing Technology Courses

How to best prepare preservice teachers to meet the challenges of technology-integrated learning stands as one of the major concerns within the PT3 grant program. Many grant recipients have agreed that the traditional educational computing course seems to no longer suffice. Accordingly, universities have developed innovative approaches to restructuring the traditional course format. New models, successes, and student responses to these changes are shared in these papers.

Faculty Professional Development

A clear theme emerging from this selection of writing is the focus on developing the technology skills integration abilities of faculty, although the strategies for faculty development are broad in range. The four broad categories of faculty support cited in one report are reflected throughout this section: faculty release time, frequent meeting to share successes and challenges, workshops and training sessions, and ongoing support. One project used data from a questionnaire to design and evaluate computer support services and training workshops, as well as to help individual professors to design professional development plans. Another provided resources for methods faculty to revise courses and model technology integration, while a third used a mini-grant process to enable faculty to change syllabi, take training courses, and collaborate with technology-trained K-12 faculty. Supporting faculty for the long term in their efforts to experiment with ways to use technology to change and enhance their teaching was key in the majority of papers.

The methods of instructing faculty on technology skills described in these papers come in all forms, from a three-day technology camp for faculty, K-12 teachers and teacher education students to a week-long "technology chalkboard" program within a smart classroom to four month intensive faculty training period to develop technology-enhanced lessons. Faculty work with technology fellows or coaches in two projects to provide "just-in-time" instruction, and even taught one another technology skills in another.

PreK-12/University Partnerships

The end result of all PT3 efforts is to see technology being successfully integrated in schools. To further this effort, many universities have used their grant monies to fund partnerships with school districts. Benefits are reaped by all participants; preservice teachers have the opportunity to implement their technology skills in a real world environment, school districts receive equipment, training, and other resources from universities, and in-service teachers have access to the latest technologies and teaching strategies for their classrooms. The main benefactors, however, are the students whose needs are met by the collaboration and cooperation of so many on their behalf.

Electronic Portfolios

As artists use portfolios to select and demonstrate the best products of their craft, teachers can use electronic portfolios to demonstrate their proficiency to a far greater degree than is allowed by a single observation. In addition to being used as evaluation tools for pre-service and in-service teachers, portfolios are also used as a self-assessment tool. Reaping the greatest benefits from this powerful technology requires intense planning and learning from others' experience. Provided within these papers are discussions of necessary technologies, advantages and disadvantages, and various models of portfolio implementation which will guide the broader application of these tools.

Online Tools

The projects described in this section not only position technology as the focus of instruction for their preservice teachers, but also utilize technology tools for data management, communication, and curriculum design. A university-based project using an online data collection system reports on the pros and cons of the system. Another partnership tells of the use of a technology-based curriculum design software used by faculty and teachers to quickly align curriculum with state accountability guidelines. Two groups describe online communication tools, one using course-related online discussions to gauge students' learning and disciplinary thinking, and another building community and facilitating group problem solving among preservice teachers and faculty through participation in online discussions. The development of an interactive website for faculty and teacher education students is the focus of one paper, although the majority of papers in this section describe some extent of web presence.

Video-Based Resources

Advanced technologies such as streaming video are being developed to bring authentic classroom experiences into the college methods course and serving as the instructional medium for students at a distance. Visual communications artifacts for teacher education are detailed in one paper. Another project discusses the challenges of developing a streamed video collection of teachers using technology to be used online by teacher education students as examples of technology incorporation into content areas. Other papers in this section also make mention of efforts to develop video-based materials.

As evidenced by the variety of topics addressed in these papers, the PT3 grants have engendered innovative plans and creative responses from universities and organizations across the country. A forum such as SITE 2001 allows solutions to be shared, ingenuity to be recognized and partnerships to be formed. Recognizing that we stand at the threshold of promising developments and understandings within a complex topic, the papers contained in this section serve as foundations upon which the larger goal of technology integration will be based.

Modeling Instruction with Modern Information and Communications Technology: the MIMIC Project

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Abstract: This paper describes the MIMIC Project a U. S. Department of Education Preparing Tomorrow's Teachers to Use Technology implementation grant. In this project colleges of education at five Ohio universities are collaborating to increase the modeling of technology in pre-service teacher education. The underlying premise of the partnership is that teachers teach as they were taught. As such, the partner institutions have developed a variety of processes where technology proficient educators mentor university faculty on the integration of technology into undergraduate teaching. The faculty in turn model best practice with technology in pre-service teacher education programs. Students enrolled in the pre-service teacher education programs encounter further technology modeling from cooperating teachers who have received technology training and the pre-service students are provided with opportunities to implement technology in field placements and student teaching.

Introduction

Teachers who integrate technology into their K-12 teaching on a regular basis are still in the minority (OTA, 1995). Despite considerable cost and effort the potential of technology remains unfulfilled in the classroom. This unfulfilled potential is a major concern as questions regarding the efficacy of educational technology intensify (Stoll, 1995).

What makes the current situation increasingly untenable is that twenty years of inquiry into the barriers to technology use in K-12 classrooms have led to an understanding of many of the key obstacles. Dias (1999) has identified resources, teacher time, training, and support as critical to technology integration. As more school districts equip facilities with computers, software, and Internet access, issues regarding resources (hardware, software, and accessibility to technology) have given way to questions regarding the nature and quality of professional development (teacher time, training, and support) (Ohio SchoolNet, 1999).

Recent research has identified attitudinal impediments to technology implementation in K-12 classrooms. Prominent among these are teacher beliefs (Ertmer, Addison, Land, Ross & Woods, 1999), and their relation to the adoption of instructional reforms (Neiderhauser, Salem, & Fields, 1999). Technology integration as a component of instructional reform requires that teachers change beliefs and practices. Neiderhauser et al concluded that traditional beliefs about schooling remain strong and stable. The question remains whether many classroom teachers are experienced enough with educational technology to alter their beliefs, and embrace the potential for technology in the classroom.

Historically, the call for higher education reform related to technology has emphasized the need for hardware and software, the development of basic technology skills, the creation of instructional materials and, more recently, connectivity to online resources. Indeed considerable funds have been expended in these arenas. However, the sufficiency of this approach to impact overall change is open to question as the teaching methods modeled in typical teacher preparation programs have changed little over the years. Faculty modeling of technology integration is crucial, but the probability of increasing technology modeling is low as incentives to reexamine methods of instruction are haphazard and resistance to change in higher education is extensive.

Why has teacher education reform been so difficult when the investment in and promotion of technology integration has increased dramatically? In part, it is because prior reforms discount the importance of what Lortie (1975) documented twenty-five years ago, "that teachers teach as they were taught." Despite the addition of equipment, instructional materials and basic skill development, novice teachers do not use technology appropriately because informed models of technology use are lacking or absent in their learning experiences. At best, there is little within teacher preparation programs to systematically encourage novice teachers to embrace technological innovations. More often, the unknowns associated with technology use discourage novice teachers from integrating technology into their teaching repertoires.

Possession of technological skills though necessary does not guarantee technology integration. Novice teachers must also have appropriate experiences and instruction throughout their pre-service preparation (Thompson, Hansen, & Reinhart, 1996). Teachers must also understand how to apply technological skills in a pedagogically sound manner. This pedagogical capability is a key premise for integration. According to Handler (1992) teachers must observe the use of technology in the instruction they experience if they are to perceive technology as an instructional tool.

The current task is to provide instruction in pre-service teacher education that models the integration of technology. With this approach novice teachers will have experiences that will encourage them to effectively integrate technology into their teaching – to teach as they were taught. To this end, the MIMIC project is based on the premise that faculty mentored in the use of technology will be more likely to demonstrate the integration of technology to their students.

Prior Efforts

There was a precedent set at Cleveland State University (CSU) for mentoring faculty during the 1980s when the College of Education (COE) initiated the Visiting Instructor Program (VIP), a practitioner guided mentoring program. This popular and successful program recruited master teachers from area schools. The teachers were afforded COE faculty status during a one-year appointment and team-taught methods courses with COE faculty. The unanticipated consequence of this mentoring program was that the COE faculty was led to reevaluate the teacher education program and to revise it to reflect the realities of the classroom of the 1980s. Co-mentoring associations developed during the VIP program are still in existence today.

Design of the MIMIC Implementation project was also influenced by experiences gained from a one year Capacity Building grant (Abate, 2000). Practices that proved successful during the Capacity Building year were continued in the Implementation project. Primary among the successful practices were the use of classroom professionals as mentors for higher education faculty, the involvement of both College of Education and College of Arts and Sciences faculty, local decision making, and the application of standard evaluation materials.

Five Cleveland area colleges of education (Cleveland State, Baldwin-Wallace College, John Carroll University, Notre Dame College of Ohio, and Ursuline College) participated in the Capacity Building project. Acknowledging that each of the participating teacher preparation programs faced different technology integration challenges, the partners developed a plan to facilitate autonomous and flexible local management by each institution while promoting an exchange of ideas and solutions across institutions. Despite programmatic differences, all of the partner institutions were guided by a commitment to prepare education students to integrate technology in K-12 teaching.

As a result of the partnership plan, each institution recruited individuals best suited to meet its specific educational technology challenges. The majority of recruits were classroom teachers, but some were retired classroom teachers, school administrators, and even pre-service teachers with technology backgrounds, to mentor their higher education faculty and cooperating teachers. All mentors were designated Master Classroom Teachers (MCTs). They held Ohio SchoolNet training certification, or the equivalent, and were regarded as outstanding classroom teachers or potential teachers. They provided the higher education faculty with a host of technology integration experiences through one-on-one personalized mentoring. The influence of such able mentors in educational methods and selected Arts and Sciences courses increased pre-service teachers' awareness and understanding of technology use in the context of their teacher preparation courses. Technological solutions were modeled that reflected the kinds of technology problems faced by teachers in today's classrooms. Furthermore, in their role as mentors to the faculty, the MCTs had direct input into the ongoing shape of the courses and related field experiences. Several of the MCTs participating as mentors have indicated a willingness to serve as cooperating teachers for pre-service teacher field experiences, thus extending the impact of the project to future students.

Having someone to interact with that successfully uses technology in the classroom proved advantageous to both higher education faculty and the pre-service teachers. The curricular modifications and the development of technology-infused teaching strategies that the MCTs sparked during the Capacity Building year led to major modifications in higher education classroom instruction.

We just burned a CD-ROM of pictures I had from Antarctica and tropical rain forests for my Geology 101 class. I can now present to the whole class with out having to deal with slide trays and projectors. My mentor is encouraging me to make duplicate copies of the CD-ROM so we can make them available for student use. (Heather Gallacher, The College of Arts and Sciences, Cleveland State University)

The benefits of course modifications will remain on the campuses for future student populations. As such, even in the Capacity Building year the MIMIC Project was institutionalizing the integration of technology into teacher preparation courses. Applying the ISTE standards the MCTs were encouraging the higher education faculty and pre-service teachers to model learning strategies that involve more student interaction, more connections among schools, more collaboration among teachers, and more emphasis on technology as a learning tool.

My MCT teaches English/language arts in an urban setting. We view technology as a means for supporting best practice in integrated English/language arts methods. Careful revision of my syllabus has resulted in technology -supported assignments including use of the Internet for exchanging teaching ideas and establishing local and national professional collaborations via learned society Teacher Exchanges. I consider my MCT a teaching partner, and with her support I am changing my vision of meaningful technology implementation in integrated English/language arts. (Kathleen Benghiat, The College of Education, Cleveland State University)

In addition to the work of the higher education faculty and their MCTs, assistance provided by the MIMIC educational technologists helped teachers implement technology in their classrooms. This mentoring and support had a profound impact.

This year, our pilot program is bringing technology assistance to 14 teachers at St. Thomas Elementary School, an urban, Catholic school in the Hough area. Without the support of the capacity grant, the faculty would not have the ability to prepare the classroom teachers to model technology for their students. Jennifer Merritt, The College of Education John Carroll University

Overall the Capacity project provided a foundation for a full implementation. Students at all levels benefited from the effective modeling of technology in the classroom

Implementation Project Design

A consortium consisting of faculty from Cleveland area colleges of education including Cleveland State University, Baldwin Wallace College, John Carroll University, Notre Dame College of Ohio, and Ursuline College, developed the MIMIC implementation model. Three interrelated activities serve as the foundation for this model:

- Higher education faculty members are mentored in the meaningful integration of technology into their teaching. The higher education faculty in turn model this instruction for pre-service teachers;

- Professional development in basic technology integration in specific content areas is provided to K-12 schools identified by partner institutions. In particular, schools which routinely accept and support pre-service teacher field placements receive support; and
- Materials produced by the project are disseminated to local, regional, and national audiences.

Implementation Mentor and Faculty Format

As in the Capacity Building projcct, each of the MIMIC partners is recruiting the assistance of technology proficient MCTs. Local needs at each partner site, including the individual needs of each faculty member being mentored, dictate the recruitment of MCTs. The goal remains the same at each site: to mentor higher education faculty and advance practical insight into the integration of technology in pre-service courses. The mentoring relationships are markedly different from traditional training in educational technology. In MIMIC mentoring, each faculty member has a partner to interact with on specific needs and areas of interest. The mentor, who is typically a classroom professional, affords a bridge between theory and practice. The MCTs bring authenticity to pre-service programs by introducing solutions to "real world" technology problems faced in today's classrooms.

In their role as mentors to faculty, the MCTs have direct input into the ongoing shape of the courses and clinical supervision of related field experiences for teacher preparation. The curricular revision and the development of technology-infused teaching strategies that the MCTs introduce lead to modifications in university classroom instruction. The benefits of those modifications remain on campus for future student populations. As such, the influence of the Implementation Project extends beyond the individual mentor pairs.

The MCTs apply ISTE standards to further what research supports about how students learn best. The MCTs encourage the higher education faculty and pre-service teachers to model learning strategies that involve more student interaction, more connections among schools, more collaboration among teachers, and more emphasis on technology as a tool for learning. On their return to their classrooms, these teachers provide the project with a unique pool of educators who will then participate on a continuing basis as supervising teachers.

Faculty Participants

Across the five participating campuses there are many college of education faculty members interested in augmenting their teaching repertoire with the integration of technology. Since the inception of the Capacity Building grant, numerous faculty members have become involved in the project. Recruiting college of education faculty is a straightforward task as the number of volunteers exceeds the number of available openings. One limiting condition for selection is that college of education participants must be responsible for teaching pre-service methods or foundation courses. In addition, a limited number of positions are reserved for faculty indicating a desire to participate for more than one year of the project. The logistics of recruiting Arts and Sciences faculty is more complicated. In order to have the greatest impact on pre-service teachers, only faculty members responsible for teaching Arts and Sciences courses required within general pre-service programs are recruited for the MIMIC implementation project. Target numbers for Arts and Sciences faculty involvement are set by each institution.

Together with the MCTs the Faculty assume the following responsibilities:

- Review best practice with technology in their content area with the educational technologists;
- Examine the syllabi of courses to detail technological activities suitable for inclusion;
- Work with MCT mentors to integrate technology into the identified courses;
- Review the ISTE NETS with educational technology faculty;
- View videotaped technology-rich lessons for use in methods courses;
- Where necessary learn the basic use of specific technologies;
- Team teach in undergraduate courses;
- Participate in the development of instructional resources; and
- Develop descriptive accounts of processes for dissemination.

Cooperating Teachers

Every year hundreds of northeast Ohio K-12 teachers serve as cooperating teachers, opening their classrooms and providing guidance to pre-service teachers fulfilling their field experience requirements. In the Capacity building MIMIC Project, educational technology faculty from the participating institutions mentored small numbers of cooperating teachers to assist them in the development and implementation of technology in their teaching. Creating a widespread impact on teacher modeling with technology via this approach, though successful, is not feasible. For example, even though these cooperating teachers may receive student teachers, practicum placements, and field observations, the total number of students they will encounter is very low when compared with the time and effort expended in mentoring. In addition, all of the cooperating teachers who were mentored across all of the institutions entered the mentoring activity at a very basic technology skill level. The majority of the time spent mentoring was geared to developing basic technology skills. More traditional inservice workshops can achieve the same results with a greater number of cooperating teachers serviced. For this reason, the Implementation project replaced mentoring with cooperating teachers with professional development workshops. The professional development differs slightly from traditional educational technology training in that it is offered to content based teams rather than school based teams. As content based technology training it focuses on Implementation details as well as basic skill development.

Project Evaluation

Implementation project evaluation activities address both formative and summative evaluation questions that examine the validity and impact of the project. A comprehensive sequence of evaluation activities is implemented to insure that the goals proposed by the MIMIC Project are addressed satisfactorily. A monthly review is used to track project activities and to verify that planned activities occur as scheduled. Progress notes are recorded and used to modify planned activities. Surveys are administered to identify the technology proficiency of higher education faculty and supervising teachers. Information collected from the survey is used to tailor mentoring and instructional activities. End of the year surveys comparable to previously mentioned surveys will be administered to furnish a pre-post picture of faculty and supervising teacher skill development.

Mentors prepare an implementation plan for each faculty member and maintain notes on support provided. This qualitative data is used to modify mentoring plans. A pre-post review of syllabi developed by participating faculty members and supervising teacher logs of technology activities implemented offers qualitative data that will document technology use by participants.

Dissemination

A prototype web site (http://mimic.ed.csuohio.edu) dedicated exclusively to the implementation of technology by novice level technology using teacher educators was developed in the Capacity Building year. Content on this site is revised periodically, and selected outside reviewers are currently testing the site.

One of the primary roles of the MIMIC project coordinator is to increase dissemination of the MIMIC Project by reporting project efforts, editing papers for submission, and assisting in the development of faculty presentations. This added attention and support by the project coordinator dramatically increase the availability of information on modeling technology in teacher education programs.

To encourage involvement in the project faculty participants are provided travel funds to report on lessons learned the MIMIC Project at regional and national conferences. During the spring of each year the MIMIC project will host an Urban Colleges of Education Technology Summit. The focus of the summit is on preparing pre-service teachers who will teach in urban settings to integrate technology into their teaching. Proceedings from this summit will be disseminated through the Internet and traditional publication sources.

Conclusion

The MIMIC Project began in the fall of 1999. To date the project has recruited Master Classroom Teachers, paired these MCT's with university faculty, and together they have developed individual mentoring plans. Monitoring and evaluation of participant interactions is ongoing and feedback has been provided to participants. E-mail has been used extensively to promote community and to serve as an example of modeling of technology integration. A web site designed by the MIMIC team and local classroom teachers is currently under development. K-12 teachers who model technology in their classes have been recruited for the purpose of developing videos that exemplify the integration of technology in the classroom. The long-term success of the MIMIC project is dependent on the active participation of the mentor-faculty dyads. As such, emphasis has been placed on supporting participant control over project activities and minimizing administrative requirements. To this end, the project team has simplified recorded keeping, provided technical support, and kept physical meeting to a minimum.

As participant interactions increase, the mentor-faculty dyads will document the successes and failures of the school-based learning, work-based learning, and connecting activities implemented. Management of the project will be revised based on this documentation. Finally, indications at this point are that both classroom teachers and university faculty are reacting favorably to the mentoring arrangement and more importantly that the university faculty are starting to integrate technology into their teaching.

References

Abate, R. J. (2000). Modeling instruction with modern information and communications technology: the MIMIC project. In B. Robin, J. Price, J. Willis, & D. Willis (Eds.), *Technology and Teacher Education Annual* 2000 (pp. 495-498) Charlottesville, VA: Association for the Advancement of Computing in Education.

Dias, L. B., (1999). Integrating Technology – some things you should know. Learning and Leading with Technology, 27(3), 10-13.

Ertmer, P. A., Addison, P., Land, M., Ross, E. & Woods, D. (1999). Examining teachers' beliefs about the role of technology in the elementary classroom. Journal of Research on Computing in Education, 32(1), 54-72.

Handler, M. (1992). Successful strategies for increasing technology in preservice programs. In D. Carey, R. Carey, D. Willis, & J. Willis (Eds.), *Technology and Teacher Education Annual* 1992 (pp. 327-328) Charlottesville, VA: Association for the Advancement of Computing in Education.

Lortie, D. C. (1975). The hand of history. In D.C. Lortie, *Schoolteacher* (pp. 1-24). Chicago, The University of Chicago Press.

Neiderhauser, D. S., Salem, D. J. & Fields, M. (1999) Exploring teaching, learning, and instructional reform in an introductory technology course. Journal of Technology and Teacher Education, 7 (2), 153-172.

Office of Information, Learning and Technology Services (Ohio SchoolNet). (1999) The Ohio SchoolNet Learner Technology Profiles. Columbus OH: Author.

Office of Technology Assessment (OTA). (1995). Teachers & Technology: Making the Connection. Washington, DC: U.S. Government Printing Office.

Stoll, C. (1995). Silicon snake oil: second thoughts on the information highway New York : Doubleday.

Thompson, A., Hansen, D., & Reinhart, P. (1996). One-on-one technology mentoring for teacher education faculty: case study reports. In B. Robin, J. Price, J. Willis, & D. Willis (Eds.), *Technology and Teacher Education Annual* 1996 (pp. 495-498) Charlottesville, VA: Association for the Advancement of Computing in Education.

Transforming the Face of Computer Coursework for Pre-Service Teachers – A Working Model

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Abstract: Prior to Fall 2000, the College of Education at the University of Houston, required its undergraduate education majors to enroll in a three-hour course, CUIN 3312, "Information Technology for Young Children." The original one semester course was divided into three one-hour courses spanning three semesters. The elimination of prescribed assignments is a major change in the requirements for the newly structured technology course. In the new model, technology assignments support required education course activities, thereby demonstrating through practical applications how technology should be integrated into classrooms. Education professors are beginning to restructure their course requirements to allow for increased technological use. Students are searching out ways to meet course requirements using technology even when they are not specifically required to do so by their professors. Early indications arc that this model may in fact fulfill the intent of the restructuring effort.

Like most universities, prior to Fall 2000, the College of Education at the University of Houston, required its undergraduate education majors to enroll in a three-hour course, CUIN 3312, "Information Technology for Young Children." This class taught instructional technology applications through pre-determined assignments that focused on learning basic computer applications. This course was generally effective; however, some faculty perceived a need for the technology course to be integrated with the students' required education courses. Handler and Strudler (1997, p.16) assert that pre-service teachers "often do not have the opportunities to apply what they have learned in their other classes and field experiences." There was a shared value among our faculty that the classroom training of pre-service teachers should use technology that was aligned with methods instruction and include active self-directed learning experiences. The vision was for students to learn technological skills and apply to the assignments required in their education classes. It was thought that this approach would better prepare them to use technology both in the performance of professional tasks and as a teaching and learning tool in their future classrooms. The faculty in the Instructional Technology program applied for and received a grant through the "Preparing Tomorrow's Teachers to use Technology" (PT3) program. The grant provided funds for changing the way technology was taught and applied in the undergraduate education program at the University of Houston.

Following the proposed project design, the original one semester course was divided into three one-hour courses spanning three semesters. This provides students with technological support throughout their upper-level coursework and student teaching experience. The new model allows for a continuous learning process over a longer period of time, intended to result in students developing stronger skills and having more opportunities to apply those skills in real world scenarios.

The elimination of prescribed assignments is a major change in the requirements for the newly structured technology course. In the new model, technology assignments support required education course activities, thereby demonstrating through practical applications how technology should be integrated into classrooms. Objectives for the new technology course are based upon the International Society for Technology in Education (ISTE) National Educational Technology Standards (NETS). Course objectives require that students demonstrate mastery of at least eight of the twenty-four ISTE indicators during each of the three semesters. Grading criteria for the new course includes attendance, demonstration of at least eight ISTE indicators, and participation both in class and in regular on-line discussions. In order to implement these revisions to the technology course format, lab instructors meet with education professors to learn about their course assignments and investigate how those requirements can be met through the use of technology.

On the first class day, the new course model was introduced to the pre-service teachers, and they began brainstorming class assignments that could satisfy ISTE indicators. The students also recognized how course assignments using technology would enhance their teaching portfolios, a requirement for graduation and an important asset during interviews. Supported by the findings of Hirumi and Grau (1995, p.14) that "teacher education programs that cover a limited number of prescribed computer proficiencies at a set pace and sequence may leave many educators unsatisfied and frustrated with their training," the new class format is driven by students needs and is based on individualized learning activities. The technology instructors pre-assess students on their basic computer and Internet skills in order to plan effectively. Currently, instructional formats include large group presentations, small group workshops, and independent learning activities. Participating pre-service teachers have collaboratively developed a reflection format that accompanies their individual projects and allows them to articulate their mastery of ISTE indicators. In addition, students have developed a grading rubric that instructors use to assess the reflections and finished projects. Lab instructors have provided assistance to students in locating resources necessary to meet those ISTE standards that are not evident through part of required tasks in their education classes. These include the investigation of such materials as online grade books, forms of assistive technology, and information on copyright issues and acceptable use policies.

During the first semester, stakeholders have responded favorably to the changes in the course. Education professors are beginning to restructure their course requirements to allow for increased technological use. Some professors have actually changed their syllabi to incorporate more technologically based assignments. Lab instructors are developing workshops to strengthen application skills for both students and professors. Students are searching out ways to meet course requirements using technology even when they are not specifically required to do so by their professors. The online hypergroup, a format for ongoing communication and collaboration, is supporting the evolution of a learning community among the participating pre-service teachers. Through this medium, students share ideas regarding their course assignments and research efforts. While applying new technological skills in their class presentations, students inspire their peers to learn new applications. Early indications are that this model may in fact fulfill the intent of the restructuring effort. Future study of implementation and outcomes will continue to better determine the impact on the skills of pre-service teachers in the use of technology as an integrated instructional tool.

References

Handler, M.G., & Strudler, N. (1997). The ISTE foundation standards: Issues of implementation. *Journal of Computing in Teacher Education*, 13 (2), 16-23.

Hirumi, A., & Grau IV, I. (1995). A review of computer-related state standards, textbooks, and journal articles: Implications for preservice teacher education and professional development. *Journal of Computing in Teacher Education*. 12 (4), 6-17.

Trek 21: A PT3 Project to Facilitate Teachers' Design of Engaging Learning Environments

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Abstract: The goal of Trek 21 is to prepare educators to use and integrate instructional technologies (IT) for teaching and learning. This paper reports on outcomes resulting from the first-year implementation of a 3-year model of IT integration – a collaborative process for developing sustained, systemic changes in teaching, using a year-long cycle of on-going professional development and analyses of data designed to inform these changes. Baseline findings profiled K-12 participants as preferring a teacher-centered approach, providing minimal written details in lesson plans, and depicting themselves with a low level of computer use, and low use and integration levels of instructional technology. Teacher change from 3-week summer institutes included (1) improvements in skill, comfort, and confidence with ITs; (2) increased awareness on how IT use changes student and teacher participation; and (3) increased motivation in IT integration after seeing improvements in students' own motivation to a different teaching approach and involvement.

Introduction

Current instructional technologies afford student and teacher access to information and multiple modes of knowledge construction. By design, these new technologies make this method of knowledge construction largely individualistic and demand changes in the teaching and learning environments where they are truly integrated into the instructional process. New teachers (pre-service) cannot develop new perspectives on instructional design and new instructional technology skills outside of settings and environments in which these approaches are modeled. Students exiting teacher preparation programs must include experiences to integrate new and future instructional technologies and develop the skills necessary develop appropriate teaching environments where limited technology infrastructure and capacity exists.

Recent recommendations by the National Commission on Teaching and America's Future claim that the single greatest likelihood of impact on student learning is the education and professional development of pre-service teachers. The report's assertion that pre-service teacher education has the potential for the greatest influence in enhancing the learning opportunities of children requires bringing together the contexts of schools with the preparation of teachers. This preparation must be adequate and sustained in the professional practice of teachers such that schools become the leader of this transformation rather than merely a participant, or worse a trailing, incidental, disaffected subject of the transformation.

Technology integration must be embedded in the work of teachers and in the preparation of teachers (Darling-Hammond, 1994). Technology becomes not just a tool, but an engine in the transformation of schools. To insure such transformation, teachers must be the agents, not the recipients, of the technological shift. The integration of teacher education must be an endeavor located in the complete system that affects the quality of teacher preparation. This partnership requires that we view teacher education as more than a linkage of partners who use technology in isolation. Teacher education would be a "place" that engages all contexts vital to successful teachers in one shared, professional culture. Public school and university professionals at the in-service and pre-service levels would provide the knowledge base for technology integration critical to successful teacher practice and the highest quality learning for children. The goal is not just a set of experiences, but rather the creation of a professional culture where pre-service students are engaged in settings at the university and in schools where the best integration of technology in teaching practice is modeled *systemically.*

Teacher Preparation Program

The Benedum Collaborative at West Virginia University is a 5-year teacher education Professional Development School-based program that is attempting to build a professional culture in a partnership. This partnership includes 5 West Virginia school districts, University partners and 21 Professional Development Schools in an effort to renew public schools and teacher education. A core element of the new program is a technology strand, developed to help university faculty and PDS faculty in the integration of instructional technology as they participate in the pre-service teacher education process. These teaching and learning environments engaged in instructional technology provide pre-service teachers opportunities to experiment with technology integration and to re-examine their roles as teachers in a technologically enhanced classroom.

Project Design

The Trek 21 model of teacher preparation and professional development includes *Host Teachers* in West Virginia's statewide Professional Development Schools (PDS), faculty from the College of Human Resources and Education (HR&E), and student interns in their 5th year of WVU's teacher preparation program. Trek 21 looks to impart lasting change in the culture of teacher practice. When effective modeling and integration of instructional technologies occur, new teachers entering the profession meet with success. To accomplish this, the design of the Trek 21model includes the following series of professional development events.

Summer Institute: Three-week technology integration summer institutes for PDS Host Teachers and a two-week technology integration summer institute for university faculty initiate each year of the *Trek 21* project cycle. These institutes address genres of instructional technology applications (Harris, 1998), targeted technical training, and the preparation of instructional technology materials and resources necessary for immediate integration into classroom instruction. Teachers develop a web-based instructional unit, which they implement in the fall with the pre-service student intern.

Continuity Meetings/Site Visits: Following the summer institutes, *Trek 21* holds site-based continuity meetings with PDS faculty each semester to address issues related to the successful integration of instructional technologies at their location. Site visits occur throughout the year to provide continued support.

Semi-annual Mini Conferences: Each semester a mini-conference is held in partnership with the West Virginia "Technology, Teacher Education, Tomorrow" (T3) non-profit organization to share best practices, receive technology enhancement training, and to deliver presentations of activities related to the integration of instructional technologies.

Assessment

Project assessment uses multiple forms of data, multiple roles and levels of participants, and at developmental stages that assess the impact of technology integration during and after project completion. This assessment strategy also provides formative assessment information to help the teacher education partnership meet national standards for teacher preparation and practice, including NCATE, INTASC, and the National Board for Professional Teaching Standards. Both quantitative and qualitative methods of data collection are used for assessment, and serve as the foundation for evaluating the impact of this initiative to integrate technology into teacher education. All instruments and assessment of knowledge products are thematically consistent in evaluating the changing nature technology integration within classrooms, across schools, across faculty groups, and within the outcomes of the teacher education students' learning experiences and teaching practices.

Findings

The baseline assessment of this project incorporates multiple instruments that will assess the impact of technology integration after the project has completed. These instruments along with others described below will serve as the foundation for assessing the impact of this initiative to integrate technology into teacher education. All of these instruments are thematically consistent in assessing the changing nature of how technology is integrated within classrooms, across schools, across faculty groups and within the outcomes of the teacher education students' learning experiences and teaching practices.

Schools Climate Education Survey: This survey assesses four factors of change in school climate related to national standards and shared partnership beliefs. Two of these factors, "Professional Development Activities" and "Classroom Teaching/Learning Activities", are critical to our assessment strategy and will reflect the use of technology in PDS classrooms. Data gathering for this assessment is scheduled for May, 2001.

Pre-Service Teacher Survey: This survey assesses three factors of student teaching and other clinical experiences with reference to partnership standards and beliefs. Quantitative results from the instruments administered indicate K-12 and Higher Education faculty alike are predominantly at low use and low integration levels (42% and 47% respectively). Approximately 30% of faculty in each group could be categorized as intermediate, and the remaining split fairly equally between experienced or beginner stages. As these are pre-training assessments, effectiveness of training will not be availablc until the September of 2000 following evaluation of Trek 21 summer institutes.

Concerns-Based Adoption Model: This instrument (Hall & Louck, 1978) describes and assesses teachers' transition through 7 levels of concern that they may experience as they implement a change or innovation in teaching. The survey tracks their levels as they adopt and/or implement the new practice. Findings indicate that the PDS Institutes were effective in addressing participants' internal concerns as reflected in decreases in eight of twelve pre/post-test I comparisons. The Institutes had limited impact on any external stages of concern.

Learning Strategies Survey: The *Learning Strategies Survey* contains items that assess teachers' perceptions of practice in their own classrooms. The Likert-scale ranges from "always" to "never" and applies to questions that ask teachers to reflect on the nature of their teaching practices. PDS participants preferred a teacher-centered approach. Looking at individual factor scores, a small number of participants' scores slightly exceeded the mean norm. For Learner Centered Activities, four respondents exceeded the group mean; for Assessing Student Needs and Climate Building, seven respondents exceeded the group mean; and for Participation in the Learning Process, two respondents exceeded the group mean.

*Self-Evaluation of Basic Computer Use:*This rubric assesses the level of achievement that teachers self-report according to a set of computer competencies. Teachers are asked to rate themselves across three rubrics of computer use: 1) basic computer use; 2) advanced computer use; 3) teacher Internet use. Each of the rubrics has four levels; Beginner, Low Level User, Intermediate Level User, or Experienced User. A total of 44 teachers responded across all three Institutes and rated their level of computer use; 6% (3) of the 44 teachers related their ability to be an Experienced User, 30 % (13) rated their ability as Intermediate Level User, 50% (22) rated their ability as a Low Level User, and 14% (6) rated their ability as Beginners.

Lesson Plan Assessment: Teachers submitted paper-based lessons for IT integration. Complete lesson plans included learning outcomes, state standards, materials, procedures, and assessment. Analysis of these lessons revealed that 38% (18) of the 47 teachers did not submit a lesson plan, 32% (15) submissions included some features of a lesson plan, and 30% (14) of the teachers submitted a complete lesson plan.

PDS Summer Institutes

During each summer institute teachers were asked to respond daily to questions regarding the content and quality of training. Two batteries of questions were asked: Likert-scale, forced choice and open-ended response.

Likert-Scale Items: Overall the summer institute training had a positive impact on understandings of the project, the process of planning for IT integration and the use of the ITs used in the training agenda. The training also had a positive impact on participants' level of confidence that they would use the skills and the ITs would be included in future training. Faculty members from the Professional Development Schools were less likely to be familiar with storyboarding than were faculty from the College. Overall, the impact of the training on the HR&E faculty was less. Sessions where only ITs were introduced without hands-on application did not exhibit significant impact. Participants indicated that they were less confident in using ITs in their units.

Open-Ended Questions: Responses to open-ended questions were categorized as opportunities, expectations and engagement, impacts on intern, and impacts on students.

Teachers stated that it was nice to have time set aside to develop and work on units, as schedules during the school year were often prohibitive to the opportunities afforded by the Summer Institute. Similarly, teachers noted that traditional technology training focused on the development of skills, but the Institute provided strategies and support for integration of the technology into actual units. The majority of teachers mentioned the opportunity for one-on-one assistance and hands-on application.

Most teachers stated that expectations for the Summer Institute needed to be made clear from the outset. How the Institute was to be organized, the level and duration of commitment expected of teachers and what the teachers were to produce were areas the teachers stated needed clarification.

Several teachers emphasized that use of language was a source of confusion with regard to expectations. Teacher and trainer understandings of what constitutes a "unit" and what is a "lesson" appeared to teachers to be different. The use of vocabulary surrounding the technology (lingo and jargon) by trainers raised levels of expectation of computer literacy.

Many teachers commented that their skill and comfort levels with technology and integration had increased throughout the Institute. Teachers noted that the kinds of technology presented were pertinent to their teaching situations in the classroom and therefore the training was motivating. Several teachers also mentioned that the increased integration of technology into units would increase student motivation and engagement. They stated that engagement, not just increased learning opportunities was a worthwhile goal.

A majority of teachers were excited to share with their interns what they had learned. They saw themselves as able to model IT and to "encourage them to use technology as a teaching tool." Citing increased comfort levels with technology teachers also planned to help the interns develop their own units and lessons.

Teachers also stated that they felt "ready" to teach their units and "excited" about what their students will learn. Some said that students would be exposed to new things, motivated and "will definitely benefit" from the IT units. Increased opportunities to use the computer and technology were other impacts that teachers cited.

Overall, teachers felt that the Summer Institute was a positive though "exhausting" experience. Several teachers stated that they were thankful to have the laptop, the training, the one-on-one help and the time to develop the units. "This [was] an intense 3-week institute, with additional work at home. However, the experience [was] really great! And rewarding. I really [appreciated] having this opportunity!"

PDS Site Visits

Generally, teachers reported that the implementation of the units was proceeding as planned, but that modifications based on time, content and student skill level were often needed. Some teachers stated that most difficulties arose from problems with equipment, especially hardware. Most teacher reported that, although more time-consuming, the IT unit had given them an alternative teaching strategy and had increased their own interest and motivation. Nearly all teachers said that students were more engaged, interested and motivated as a result of the technology integration. Other impacts were an increase of collaboration between students, "asking good questions," interest in doing relevant searches at home and increased satisfaction in "the finished product." Some teachers also noted the many new learning opportunities technology afforded students while a few regarded the computer as "managerial and teacher-focused; not items that related specifically to teaching." Teachers stated that intern involvement ranged from complete implementation (in the case of a sick teacher) to "secretarial duties" (e.g., entering rosters into Blackboard.com. Nearly all teachers expressed frustration at the delay of interns receiving laptops. One teacher allowed her intern to take her laptop home every night to work on a new unit while another intern was not afforded any type of "collaborative experience with the computer."

Continuity Meeting

Modifications. Teachers reported that they either had or planned to make modifications to their units (21/34) such as the following:

- Expand or add features
- Need to "fine tune" their units
- Forced to modify the timeline for their unit
- Make their unit more "student-centered"
- Change the types of technologies used
- Modifications based on students' abilities or needs
- Modifications based on "technical difficulties"

A few teachers (3/34) explained that they had not yet run their units and so were unsure if changes would be needed. In addition, several teachers (8/34) shared that they were satisfied with their units and had no immediate plans for modification. A few teachers (3/34) planned to amend other units or classroom activities by integrating technology.

Intern Involvement: Teachers reported that intern involvement (unit modifications and unit implementation) was often dictated by the *timing of placements*. Several teachers (8/34) reported that their intern had either not arrived, had completed placement before the unit was implemented, or had not been in the classroom long enough to participate. Teachers (5/34) also cited the delay in obtaining laptops for intern use as a barrier to involvement. Some (12/34) indicated a *high level of intern involvement* in unit development and implementation. Others (7/34) described a *less active intern role*—observing the host teacher integrating technology or providing one-on-one assistance as students interacted with technology, but not "teaching" with technology. Some teachers (20/34) indicated that interns *developed and integrated technologies at fairly high levels* when they arrived for their placements. "My intern used some parts of the unit, but had designed her own to use prior to starting this year." Teachers (7/34) described instances where they felt interns had *inadequate training* or where interns were not familiar with integration in the classroom.

Impact on Students: The majority of teachers (26/34) described increased *student engagement* as a result of unit implementation, particularly where students had "hands-on" opportunities: Teachers (13/34) described an *increase in learning* as an outcome of technology-supported instruction. In addition the "fit" between content and technology enhanced student opportunities to learn. Several teachers (4/34) commented on the *proficiency and ability of their students* to learn to use technology. However, teachers (5/34) also indicated that the impact would have been greater but for the barriers of lack of access to equipment and their own abilities to provide technology training for students.

Impact on Teachers: Increased confidence and comfort related to using technology personally and professionally was the most often cited (17/31) change when teachers were asked to "describe the impact you think the experience of developing and running your unit has had on you." Related to their increased comfort was a *perceived impact on their teaching*:

- Change in the activities they use
- Improvement in the quality of instruction
- Change in their role in the teaching process
- Increased their own engagement
- Awareness of other IT possibilities
- Increased motivation to learn
- More efficient communication and management
- Sense of themselves as resources

Teacher Units

The PI, IDT specialist and Special Education Specialist evaluated a total of 43 units (Table 1). The PI and IDT specialist passed a similar number of units, while the Special Education specialist assigned a passing score to a higher number of units, but identified only one exemplar unit. The PI and IDT specialist identified nearly the same number of exemplar units, but passed fewer units than the Special Education specialist. Jurors agreed on eight passing units, four failed units, and one exemplar unit.

Juror (units reviewed)	**Passed**	**Failed**	**Exemplar**
IDT (41)	18	13	10
PI (41)	17	12	12
SES (43)	30	12	1
Total Agreement	8	4	1

Table 1: Juror ratings of teacher-developed web-based and IT-integrated units.

The most frequent learning strategies employed by teachers were problem solving, concept scaffolding, and discovery learning (Table 2).

Learning Strategies	**Major IT Applications**
Problem Solving (23)	Information retrieval (8) Desktop publishing (5)
Concept Scaffolding (22)	Presentations (11) Information retrieval (5)
Discovery Learning (18)	Information retrieval (8) Internet searches (6)

Table 2: Juror ratings of teacher-developed web-based and IT-integrated units.

To support problem-solving teachers primarily used information retrieval activities and desktop publishing. Concept scaffolding was supported by the teachers' use of presentations and information retrieval activities. Discovery learning was supported by information retrieval activities and Internet searches. IT applications most utilized by teachers were presentations (32 activities), information retrieval (29), and Internet searches (17).

The most important IDT issue was lack of identifying the purpose and learning outcomes for each lesson on the unit home page. The web-based units were typically structured as teacher sites with a limited number distinguishing between teacher and student activity. Rich learning activities were frequently depicted in those lessons using traditional teacher-centered approaches; this was generally not true of IT-integrated student-focused activities. Some IT-based activities, such as chat rooms and web boards, lacked procedural details.

Web design issues identified included the following:

- Restructuring home page to communicate intent
- Descriptive titles for individual lessons
- A home page to structure the learning activities
- Less scrollable text or separate lessons pages
- Fewer animated GIFs
- Resolve background/text contrast problems
- Consistent use of navigation icons

Conclusions

Baseline findings profiled K-12 participants as preferring a teacher-centered approach, providing minimal written details in lesson plans, and depicting themselves with a low level of computer use, and low use and integration levels of instructional technology.

Results from 3-week summer institutes improved teachers' internal concerns with instructional technology. Limited impact on the external stages of concern may reflect the limitations of a three-week experience and the lack of opportunity for teachers to apply new skills and knowledge in their teaching. Teachers valued the time made available to concentrate on skill development and unit development. Teacher change can be cited as (1) improvements in skill, comfort, and confidence with instructional technology; (2) increased awareness on how IT use changes student and teacher participation; and (3) increased motivation in IT integration after seeing improvements in students' own motivation to a different teaching approach and involvement. Exactly how to design or orchestrate these changes in student engagement within the web-based units was tentative on the part of many teachers, which could have been partly due to learning how to use the software and laptop. Also, teachers' use of ITs were devoted to teacher-based presentations and Internet-based search and information retrieval activities. However, an important finding for this project was the majority of teachers (26/34) who were interviewed after implementation of their units reported that student engagement increased, particularly when hands-on opportunities were provided.

A major deficiency of our design was not being clear as to what we wanted them to bring to the institute, in terms of a "lesson," learning instead that a "unit" made more sense to them. We also learned that we need to be more clear of their role in their own professional development, not only what was expected of them during the institutes but afterwards. This was due to field-testing a new approach and the logistical learning we did during the planning and running of the Institutes as well as what it meant to assist teachers in changing their teaching.

References

Darling-Hammond, L. (Ed.) (1994) *Professional Development Schools: Schools for a Developing Profession.* (New York: Teachers College Press).

Hall, G., & Loucks, L. (1978). Teacher concerns as a basis for facilitating and personalizing staff development. *Teachers College Record, 80* (1), 36-53.

Harris, J. (1998). *Virtual architecture: Designing and directing curriculum-based telecomputing*. Eugene, OR: International Society for Technology in Education (ISTE).

Contextual Levers: An Embedded Approach to Faculty Technology Development

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Abstract: While much has been written about the potential benefits of technology integration for teacher education, not all university faculty members embrace the process willingly. This paper describes efforts at the University of Rhode Island to create a unified approach to teacher education across disciplines that incorporates faculty technology development in routine practice. Through the use of standards of practice, an electronic student portfolio system, and the support of innovative practices through a PT3 implementation grant, the School of Education is attempting to integrate faculty technology training into the key aspects of regular operating procedures.

The School of Education (SOE) at the University of Rhode Island (URI), in conjunction with recent major efforts at the university level, is committed to the exploration of ways in which technology can change the nature of teacher education and classroom instruction. The discovery of potential benefits and innovative practices made possible by new technologies has become an integral part of the URI teacher-training program. While the standards to which teacher education programs are held include some acknowledgement of the potential benefits of educational technology, they focus much more on sound pedagogy and what could be termed the traditional aspects of teacher education. This has presented the faculty with the challenge of integrating technology to enhance the teacher education process while maintaining its more conventional elements.

Several authors (ISTE 1999; Wetzel 1993; Willis and Mehlinger 1996) raise questions about the value of the traditional "introduction to technology" course that is the hallmark of many efforts to include technology in teacher education. In such courses, technological tools are taught out of context. The instruction is skills-based, and is focused on the technology instead of curriculum content. To this end, URI faculty and students in the SOE are not trained specifically on the use of basic technologies in isolation from the teacher education curriculum. Instead, efforts are being made to encourage and support the use of technology by all stakeholders in their administrative, educational, and practicum experiences. The goal is to motivate faculty members to maintain a consistent effort to be knowledgeable about new technologies, as well as practical ways these technologies can be used to make the teacher education process more efficient and effective.

Faculty Participation

It is perhaps no surprise that not all of the members of the SOE faculty have embraced technology integration efforts at URI. Like faculty at many universities, they do not see the necessity of incorporating technology into both institutional and personal instructional systems that have worked for years without it. The focus of efforts to change faculty practice is on the development of a shared vision of how to move forward with the school's instructional program. Gaining group consensus in the process of technology integration is consistent with much of the literature on the adoption of technology in higher education. One basic conclusion of this research is that people are the key to success; both the faculty and the administration must support the integration efforts in order for them to work (Anandam & Kelly 1981; Armstrong 1996)

Higher education faculty members are accustomed to functioning as experts in their particular fields, which can make it difficult for them to accept the role of learner that is often required when approaching new technologies (Brunner 1992). At the same time, forced acceptance of technology is ineffective (Bull & Cooper 1997). A shared vision (Falba 1997) of the role that technology plays in the mission of preparing teachers is crucial to success, and is key to the approach being used to move URI faculty forward in their use of technology. In agreement with Heuer, et al. (1996) and Kozma (1985), the faculty members have played an ongoing and vital role in the development of a revised program of study that embeds technology as an integral part of the teacher education process. This active role is not only key in ensuring that these efforts are more successful and long-lasting than individual labors, but also serves as a point of leverage for convincing professors and adjunct faculty of the importance of learning to use and integrate technology into their teaching and supervision.

Contextual Levers

URI's integrated approach to faculty development combines three elements to address the task from three different perspectives:

Beginning Teacher Standards

In recent years, the state of Rhode Island has moved to increase the rigor of its teacher education programs through the use of standards for all new teachers. The Rhode Island Beginning Teacher Standards (BTS) cover eleven areas of professional practice that one would expect to find as part of standard operating procedure for high-quality teachers (e.g., solid content and pedagogical knowledge, ability to foster critical thinking, classroom management skills, effective communication skills, etc.). In part, the BTS also serve as a quality control mechanism for the state. Institutions such as URI have an agreement with the Department of Education that allows the SOE to indicate when a student has met all eleven standards, at which point the state assumes that he or she is eligible for certification.

The SOE at URI has adopted these standards as a primary guide for the organization and implementation of its teacher education programs. The focus on the BTS has facilitated the coming together of all departments that train teachers under a set of common purposes, tasks, and evaluation criteria. The traditional resistance that is encountered when trying to achieve this kind of group consensus on curriculum (typically dressed in the guise of "academic freedom") represents something of a victory - a confluence that was previously unknown at this institution.

The standards themselves have provided a common element across disciplines and the various tasks that are part of teacher training, which has increased consistency in the way teachers are trained. However, the BTS does not stress technology directly, but implicitly. For example, the standard:

"Teachers create learning experiences that reflect an understanding of central concepts, structures, and tools of inquiry of the disciplines they teach... "

Includes the following sub-standards with implications for being able to use technology-

2.3 select instructional materials and resources based on their comprehensiveness, accuracy, and usefulness for representing particular ideas and concepts.
2.4 incorporate appropriate technological resources to explore student exploration of the disciplines.
2.5 use a variety of explanations and multiple representations of concepts including analogies, metaphors, experiments, demonstrations, and illustrations, that help students develop conceptual understanding.

Prospective teachers at URI are required to complete a portfolio at three separate stages in their program: Prior to admission, prior to commencing their student teaching, and upon completion of all program requirements. The first portfolio is basically a compilation of evidence that candidates are qualified for admission. The second is designed to provide evidence that students have acquired an appropriate understanding of pedagogy through their methods courses. The third contains evidence that they have met all eleven BTS, and are thus qualified for certification. This evidence is compiled on an ongoing basis as they proceed through the program, and culminates as their final task at the end of student teaching.

Electronic Portfolio System

Until recently, the compilation, storage, and organization of this material have been isolated efforts for each student. As part of the technology integration endeavor at URI, this process has been re-designed to allow students to do these tasks electronically. This system is designed with a database structure that allows students to store and organize their evidence for each standard on a server that allows web-based access. Students can view and update their portfolio at any time from any location.

Faculty also have access to communicate with students about their progress, to view work that has been completed, and to grade each element of their students' portfolios. The online nature of this process changes the role of individual instructors to the extent that this interaction that is so vital to new teachers' growth now takes place within a paperless format. Typically, this type of change is one that could be expected to meet resistance, since the move to grading work online is not essential in a paper-based system.

Searching capabilities built into the database also allow outside reviewers and program accreditors to view evidence of the effectiveness of the teacher training programs at the university. This fact has also increased the level of buy-in from both the tenure-track and adjunct faculty, as they are forced to address an increased level of accountability for the program. Accrediting bodies are now requiring specific alignment of tasks and syllabi with standards, as well as more standardized methods for determining whether students have met the requirements and achieved the competencies outlined in the standards. As described above, the online portfolio system has been designed to align SOE curricula with the BTS. This provides a specific and consistent way for the program to address these issues of accountability, and is a powerful lever for motivating faculty to change and to buy in to new procedures.

The process of compiling and reviewing electronic portfolios provides one avenue for enhancing the technological capabilities of both faculty and students. For both groups, the portfolios represent a critically relevant task that requires the use of technologies such as text manipulation, digital storage, digital photography, video, and sound editing. Tying these technologies to one of the core tasks in the credential programs has significantly increased motivation to learn these technologies. The portfolio development process requires each program to carefully reflect on the essential elements of its curriculum and the pieces of evidence to be considered as indicators of the standards. Attainment of any standard requires satisfactory completion of multiple core projects, each of which may provide evidence to more than one standard. Careful planning of these projects and the nature of the technology used is required to assist faculty in planning assignments in specific courses.

In its effort to bring together all departments responsible for training teachers, the SOE is in the process of expanding the training in and use of this portfolio system to all relevant faculty and students. This in turn is helping to expand technology training beyond the teacher education faculty in a way that is consistent with the goal of integration versus isolated skill development. Traditionally, those departments outside the SOE that train teachers (e.g., music, art, foreign language, etc.) maintain a certain level of independence and isolation from the SOE. Accrediting bodies are now requiring the SOE to be responsible for any students who gets their teaching credential from any program within the university. This has created a substantial increase in the desire to work with those programs more closely, in order to help ensure the quality of training their students receive. The electronic portfolio system is serving as a way to bring all departments that train teachers under the SOE umbrella. They are required to meet similar standards of accountability, and the portfolio system will help make that job easier and more consistent for all programs involved.

Preparing Tomorrow's Teachers for Technology (PT3)

While the electronic portfolio system is helping to increase faculty motivation for technology use, it does not specifically address ways that technology can be used to change the nature of their instruction and training of teachers. This is currently being accomplished through the SOE's PT3 implementation grant. This initiative supports Education and Arts & Sciences faculty members in their efforts to experiment with ways to use technology to change and/or enhance what they do at the university. This represents an opportunity to increase the use of technology in content area courses that student teachers encounter in their Arts and Sciences majors (see Bull and Cooper 1997).

Regular meetings between faculty members from multiple departments and K-12 classroom teachers facilitate discussion of innovative technologies and techniques for using them in the classroom. This forum creates an opportunity to increase faculty self-efficacy with technology through the sharing of effective uses that are already in place (Faseyitan, et al. 1996). These meetings have also helped in the formation of partnerships across disciplines that have increased participants' exposure to other methods, issues, and concerns about using technology in education.

While most of the efforts that have been described in this paper are focused on group processes and outcomes, the PT3 project provides the most support for individual endeavors to integrate technology into practice. Technical support is provided for the entire SOE through the grant in the form of knowledgeable faculty and student employees. Individual faculty members are also being encouraged to experiment with technology to change the ways in which they conduct instruction and supervision in the teacher education process. This experimentation is encouraged and supported through the availability of funds for hardware and software, and through individual mentoring and support.

Conclusion

The process of change within any university is unpredictable, given the traditional freedom that is expected by faculty members in their role as experts within their disciplines. Most attempts to mandate change in practice are met with resistance due to a perception of infringement of this freedom. The School of Education at URI has approached the task of changing practice through technology integration as a group process. By achieving consensus on curricular changes that must be made in order to satisfy more rigorous demands from accrediting bodies, the SOE has taken a significant first step in changing teacher training to align the curriculum with state standards for beginning teachers. In addition, the SOE has increased faculty acceptance of the potential that technology holds for cnhancing practice by creating a process of teacher education that fully integrates technology into the key steps of that process. Faculty get meaningful, hands-on experience with technology in teacher education, because it is required to complete key components of the mission of the SOE.

This group process is simultaneously supplemented by support for individual efforts to use technology to enhance practice. Through a PT3 implementation grant, the SOE is encouraging faculty to engage in dialogue across programs and departments, and in experimentation with the ways in which they have traditionally functioned as teacher educators. Through these combined group and individual processes, URI is attempting to get faculty to examine and explore the potential that technology holds for enhancing teacher education and individual practice.

References

Anandam, K. & Kelly, J. T. (1981). Evaluating the use of technology in higher education. *Journal of Educational Technology Systems*, 10 (1), 21 - 31.

Armstrong, G. (1996). One approach to motivating faculty to use multimedia. *T.H.E. Journal*, May, 69 - 71.

Brunner, C. (1992). *Integrating technology into the curriculum: Teaching the teachers* (Tech. Rep. No. 25). New York: Bank Street College of Education.

Bull, G. L. & Cooper, J. M. (1997). Technology and teacher education: Past practice and recommended directions. *Action in teacher education*, 19 (2), 97 - 106.

Falba, C. J. (1997). *Choreographing change one step at a time: Integrating technology in teacher education.* Paper presented at the annual meeting of the American Educational Research Association, Chicago, IL.

Faseyitan, S., Libii, J. N., & Hirschbuhl, J. (1996). An in-service model for enhancing faculty computer self-efficacy. *British Journal of Educational Technology*, 27 (3), 214 - 226.

Heuer, B., Duffrin, N., & Faskowitz, A. (1996). Leveraging learning through mentoring relationships. *Journal of Educational Technology Systems*, 25 (2), 133 - 139.

International Society for Technology in Education (1999). *Will new teachers be prepared to teach in a digital age? A national survey on information technology in teacher education*. Santa Monica, CA: Milken Exchange on Educational Technology.

Kozma, R. B. (1985). A grounded theory of instructional innovation in higher education. *Journal of Higher Education*, 56 (3), 300 - 319.

Wetzel, K. (1993) Teacher educators' uses of computers in teaching. *Journal of technology and teacher education*, 1 (4), 335 - 352.

Willis, J. W. & Mehlinger, H. D. (1996). Information technology and teacher education. In John Sikula (Ed.), *Handbook of research on teacher education* (pp. 978 - 1029). New York: Oxford University Press.

Teaching, Learning and Technology: Providing for Higher Education Faculty Professional Development

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Abstract: Recognizing the need to better prepare teachers in the appropriate and effective instructional applications of technology has not been a difficult task for the faculty at Northern Kentucky University (NKU). The adoption of the ISTE *Recommended Foundations for Teachers* and a five-year *Technology Plan for the School of Education* in 1998 set the stage for increased emphasis on technology education at NKU. While the faculty supported these initiatives, there were many concerns about how best to accomplish these tasks. One of the critical needs identified by faculty in their ability to infuse technology into the teacher education program involved their own technological skills and abilities. Professional Development of faculty became a high priority issue. This paper describes the professional development component of NKU's Teaching, Learning and Technology (TLT) Project.

Introduction

Schools and Colleges of Education must review and revise their teacher education program as needed in an effort to prepare teachers to meet the challenges of current school and classroom environments. As society changes, the educational needs of students change. Technology, today, is a primary problem-solving tool in many aspects of society. Schools must prepare students to use technology effectively, which means that teachers must also know how to use technology effectively. Institutions of Higher Education who do not address the technological needs of P-12 teachers will be unable to provide society with the best teachers.

Robinson (2000) states that changes in the use of technology in the classroom necessitate strategic planning and forethought. He emphasizes the importance in the planning and preparation of the institution's most valuable asset --- people. Hixson and Tinzmann (1990) describe institutional change as both a people and a policy process. They continue to point out that professional development is the primary vehicle through which important educational changes are implemented as one of four overriding principles. Northern Kentucky University (NKU) recognizes the importance of the people within the institution as the developers and implementers of any institutional change.

NKU's School of Education uses a continuous review and assessment model for both student and program evaluation. Strategic planning is an on-going and reflective process. Standing committees make recommendations to the faculty for consideration in revising, refining and updating the teacher education program. Committee recommendations are often based upon standards from learned societies, accrediting agencies, student performance measures or other available data. In 1998, the Technology Committee recommended to the faculty the adoption of the ISTE *Recommended Foundations for Teachers*. Once approved, these standards became the basis of the technology-training component of NKU's teacher education program. With these standards in mind, the faculty approved a five-year *Technology Plan for the School of Education* which included four major goals to help provide better technology preparation of teachers: (1) to provide the students and faculty in the School of Education with the most advanced multimedia teaching and learning environments, (2) to assist faculty in becoming fully competent in using multimedia in their teaching, (3) to develop a plan for maintenance and regular software and hardware upgrades of the faculty and staff computers within the School of Education, and (4) to revise the manner in which the School of Education ensures and verifies that undergraduate and graduate students completing a degree or certification program at NKU have the necessary skills in using technology in the classroom.

Setting the Context

The importance of having teachers within the state of Kentucky who are more technology literate has been supported by several key initiatives. Increased emphasis on the use of technology in P-12 schools began with the implementation of the Kentucky Education Technology System (KETS) during the early 1990s. And, in May 1999, the Education Professional Standards Board in the state of Kentucky implemented a new technology standard for both new and experienced teachers. The statewide technology standard is based upon the ISTE technology standards for teachers. Kentucky teachers are expected to use technology to support instruction; access and manipulate data; enhance professional growth and productivity; communicate and collaborate with colleagues, parents, and the community; and conduct research.

Many teachers, however, do not feel prepared to use technology effectively. The Kentucky Institute for Education Research (KIER) stated in their January 1999 report that 26% of all new teachers in the state of Kentucky felt moderately/very poorly prepared to "use technology as an integral part of instruction". A principal survey conducted by Northern Kentucky University in 1999 found that 25% of area principals felt that their teachers were moderately/very poorly prepared. A 1999 business and education study (Forward Quest) in Northern Kentucky called for effective implementation of technology in our schools and the Northern Kentucky Cooperative for Education Services (NKCES, 1999) *Professional Development Needs Assessment* found that 12 of the 25 priority needs of area educators involved one or more areas of technology.

NKU's faculty addressed the need to better prepare teachers to use technology with the adoption of the *Technology Plan for the School of Education.* Technology standards were already beginning to be included within the teacher education program. However, concerns existed about how to meet these goals and fully implement the new technology standards. An outside consultant interviewed faculty during the 1999-2000 academic year and identified three main concerns in their ability to integrate technology into their classroom: (1) convenient access to the technology, (2) training on how to use technology and (3) time to experiment and redesign their classes to include more technology.

The TLT Project

During the 1999-2000 academic year, NKU was able to begin to build capacity for technology training of new teachers with the award of a one-year PT3 grant from the United States Department of Education (U S DOE). This grant allowed NKU to accomplish major beginning steps in the implementation of the five-year technology plan. The next step to be able to fully implement all components of the technology plan became possible with the award of a three-year PT3 implementation grant from the U S DOE.

The goals for NKU's Teaching, Learning and Technology (TLT) Project are based upon three of the four goals outlined in the *Technology Plan for the School of Education*. The goals for this three-year project are to continue to build upon the successful integration of technology into the teacher preparation curriculum by providing:

- **TECHNOLOGY-RICH ENVIRONMENTS**: providing technology-rich environments for students and faculty, both on-campus and in field placements.
- **FACULTY PROFESSIONAL DEVELOPMENT**: designing and implementing professional development for NKU faculty.
- **STUDENT PROFESSIONAL DEVELOPMENT**: ensuring that students seeking initial teacher certification have the necessary skills and resources to use technology in their teaching and learning.

The professional development of NKU's faculty is a crucial component to the successful implementation of this project. Classrooms can be equipped with state of the art technology. However, if faculty do not know how to use the technology in their classroom, then technology will once again be lost to the students.

Teacher education students can be required to provide evidence of their knowledge and skills with technology. However, they will be unable to demonstrate effective and appropriate uses of technology to support instruction if they have not observed these best practices. It might be possible for teacher education students to become familiar with effective instructional practices with technology if their field placements provide these models. There is no guarantee that this will happen as evidenced by the reports noted above that in-service teachers do not feel prepared to use technology effectively. It is imperative, then, that our faculty model best practices with technology just as they do with instructional strategies, classroom management, evaluation and assessment.

Providing for Professional Development

At NKU, the teacher education program includes faculty from most disciplines across campus. NKU's faculty have a wide variety of technology concepts and skills ---- ranging from leaders in technology use and innovation to those who have yet to turn on a computer or use email. As part of the TLT Project, professional development is provided to our faculty through formal or informal venues. The School of Education's Technology Coordinator works as a "technology mentor" to faculty providing not only professional development but also continuing support for faculty who are working to infuse technology into the teacher education program.

Formal professional development

Each semester, a select group of faculty receives three semester hours of reassigned time for professional development in the area of technology. This reassigned time allows faculty to participate in structured technology training. It also provides the time for restructuring or redesigning their individual courses to include technology.

At the beginning of each semester, the Technology Coordinator meets with the group of faculty who are receiving reassigned time for technology training. During this meeting, each faculty member identifies a list of personal goals/objectives they wish to accomplish in order to infuse technology into their classes. This is similar to a professional growth plan that P-12 teachers may develop as part of their professional development. Faculty also provide "before" samples of course syllabi or other course materials that they expect will be revised/updated as a result of their technology professional development. With the goals of each faculty member in mind, the Technology Coordinator assists in the development of a plan for accomplishing these goals.

A time and location arc identified for regular meetings with the faculty technology group. Based upon the skills and knowledge of the faculty for that semester, the formal meeting times may be weekly or biweekly. Each meeting will focus on one of the goals/objectives of the faculty group. Development of web pages and/or use of the Internet to enhance their classes has been the most requested formal training rcquest. Additional requests have included technology standards, presentation software (such as PowerPoint), spreadsheets, educational software, and technology resources along with individual requests for training with basic computer skills.

Many of the structured training sessions are conducted with the entire group of faculty who has received the reassigned time. One or more faculty members may have specialized or individual needs that others in the group may not require. To accomplish these individualized needs, the Technology Coordinator may work one-on-one with the individual faculty member. In the case where the needs are outside of the Technology Coordinator's realm, the faculty member may work with someone else or do independent research that is later shared with the group. Two examples that reflect this individualized approach: (1) the science and math education faculty wanted structured training on the use of CBL's and their use with graphing calculators. This was provided by a Chemistry professor from the College of Arts and Sciences on campus who had extensive experience with this technology. (2) one faculty member was so new to technology and did not feel comfortable with turning on the computer or using email. The Technology Coordinator met once a week with this faculty member and provided very individualized instruction on basic computer use.

Informal Professional Development

Changes and issues related to technology in the instructional setting are on-going. Even the most proficient technology-using teacher has to participate in some form of professional development just to keep up with the technology revolution. And, often the time within a particular class or single training session is not adequate to explore a technology topic in depth or to expand upon the basic training provided.

Technology seminars are regularly scheduled to provide opportunities for both faculty and students within the teacher education program to learn new technologies or explore beyond the basics of specific technology skills. These seminars are conducted by NKU students, faculty or area educators. Faculty who participated in formal professional development training during the previous year have provided seminars on their current projects or use of technology in their classes. Area educators have provided updates on statewide initiatives in technology education or shared projects from their schools or districts in technology.

As noted above, these seminars are open to all NKU faculty, teacher education students and area educators. One interesting outcome of our project is the interest of the teacher education program staff in these seminars. The staff is invited to these seminars and the Technology Coordinator is working with them to develop seminars specially designed for their needs. The staff serves as an important support system for our faculty and students. A strong technology foundation for our staff will provide our faculty and students with additional resources for technology issues.

On-going Support

Providing faculty with reassigned time and formal professional development for one semester will not ensure that technology will continue to be infused into their classes. Changes in technology, standards in teacher preparation and needs of area schools will require faculty to continually review, revise and update their classes for the current demands. The role of the Technology Coordinator will be to provide regular updates and maintenance of faculty skills and knowledge long after the formal technology training period. Technology seminars will be an important means of providing new and current information to all faculty and students. NKU will also be providing a central location for faculty development of professional materials. Student technology leaders are also being trained to provide technical support to students and faculty in the development of instructional materials.

Concluding Remarks

Faculty who feel comfortable with technology are more likely to infuse technology into their courses. The professional development opportunities provided to NKU's faculty often begin with learning the technology. But, an important component of the training also includes best practices with the technology. As each semester progresses, faculty are becoming more familiar with technology and beginning to use some level of technology in their teacher education courses. Other faculty members are able to find models and ideas from their colleagues about possible uses of technology in their classes. The "after" training samples of course syllabi, web pages and other course materials are already beginning to reflect the increased infusion of technology into NKU's teacher preparation program. The true test will be the long-term evaluation of course materials and the quality of student assessment measures related to technology skills and knowledge.

References

Forward Quest Task Force (March 24, 1999). The future of public schools business focus group. Covington, KY: Forward Quest.

Hixson, J & Tinzmann, M.B. (1990). *What changes are generating new needs for professional development?* [On-line]. Available at: http://www.ncrel.org/sdrs/areas/rpl_esys/profdev.htm

International Society for Technology in Education (1998). *ISTE recommended foundations in technology for all teachers* [On-line]. Available at: http://www.iste.org/Standards/index.html.

Kentucky Department of Education. *New teacher standards for preparation and certification* [On-line]. Available at: http://www.kde.state.ky.us/otec/epsb/standards/new_teach_stds.asp.

Kentucky Institute for Education Research (1999). *The preparation of teachers for Kentucky schools: a longitudinal study of new teachers* (Summary Report for Years 1996-19980. Frankfort, KY

Northern Central Regional Educational Laboratory. *Critical Issue: Providing Professional Development for Effective*

Technology Use [On-line]. Available at: http://www.ncrel.org/sdrs/areas/issues/methods/technlgy/te1000.htm

Northern Kentucky Cooperative for Education Services (April 1999). Region wide top 25 priority needs. Highland Heights, KY: NKCES.

Robinson, E.T., (2000). Strategic planning for technological change: The human component. *Syllabus*, 14 (4), 54-55, 65.

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Infusing Authentic, Content-Based Technology During Teacher Preparation: A Team Approach

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Abstract: Focused teams of professors, K-12 teachers, graduate students and educational technology staff help faculty and teacher candidates infuse technology into academic activities. The faculty integrate technology into instruction, use technology in mentoring candidates in their disciplines, and collaborate with K-12 teachers in technology rich schools. A team is assigned to each certification subject area and has as a high priority the development of interdisciplinary partnerships among faculty in teacher preparation programs and the faculty of arts and sciences. Candidates collaborate with teachers in public and private schools who have been identified for skills in integrating technology into learning. The goal is to ensure that all candidates graduate with a demonstrated ability to provide innovative and authentic technological support for learning. A 3-year cross sequential design has been implemented to evaluate the influence of the project on the abilities and attitudes of teaching candidates.

Introduction

A major theme of current research and of the New Jersey Core Curriculum standards is that students learn from thinking, and thinking is engaged by activities - solving a problem, writing a melody, arguing a point (Jonassen, Peck and Wilson, 1999, p.1). Students gain disciplinary knowledge when they are engaged in problems meaningful to those disciplines, rather than in the more synthetic activity common in school (Brown, Collins, and Duguid, 1989). Students learn any content area best by *doing* it. Since the process of learning is enhanced through authentic, thoughtful activity, integration of technology within the curriculum should itself be active and authentic. Students make the best use of technology when they use it as a tool for thinking, to learn something they want to know, prompted by a problem that is significant to them. Learning is further enhanced when students collaborate to solve problems or accomplish goals, and share memories and strategies (Perkins, 1991). It is important for teachers to be able to understand and use technologies that enhance conversation and collaboration.

Rutgers, the State University of New Jersey, has redesigned its teacher preparation programs as five-year experiences culminating in a baccalaureate degree in an academic content area and a masters degree in education. This reflects the aim that candidates become qualified teachers who are subject area experts, adept at scaffolding learning within their disciplines. The current project is key to the redesign. It originates, implements and evaluates infusions of technology in each discipline. The goal is to ensure that all candidates graduate with a demonstrated ability to provide innovative and authentic technological support for learning.

With initial funding from Johnson & Johnson Corporation, the project worked with academic leaders and educators in the university and school districts to (1) evaluate current use of technology in Rutgers teacher preparation programs, and (2) design system wide changes in the way Rutgers goes about preparing teachers to use technology. During the first semester, the project piloted three specific strategies in literacy, science and mathematics. With additional support through the U.S. Department of Education grant program *Preparing Tomorrow's Teachers to use Technology*, the project is now implementing a plan across all teacher preparation programs.

Weaknesses Identified in the Current Program

A survey of university professors and school district personnel administered at the onset of the project showed weaknesses in the existing program that limit the exposure of teaching candidates to modern technology, and limit their practice of technology-supported learning in academic work and school placements. Professors made modest use of technology in their class presentations and interactions with students. Only a few modeled constructive uses of technology in learning or research. Some assigned students to investigate drills or tutorials available in the school's software collections, reflecting efforts to understand how technology can be used as a teacher substitute, rather than as a tool for investigation and collaboration. Many professors admitted a lack of conceptual and practical knowledge of relatively standard technologies, such as the web, discussion groups, chat, and listservs. They had not used computers extensively in their own academic preparation, and had not yet begun to use them productively in their research and teaching. Some faculty reported they did not have clearly articulated ideas on how they could use technology and wanted guidance from more experienced faculty and staff. Others had some ideas but required additional support to implement them. They asked for educationally grounded technologists who could help them frame issues and design approaches, not pure technicians.

An examination of the existing courses of study revealed a structural weakness. Teaching candidates were intended to gain technology expertise through a technology requirement in their programs, but most students fulfilled it by taking a basic programming class with little regard to pedagogical issues, and no connection to the subject area classes. There was no coordination of assignments between the classes that would, for example, encourage elementary science students to develop web sites with links to important, reliable resources for areas of science poorly represented in their texts. As a result, many candidates in the existing program got little or no systematic exposure to educational technology.

These shortcomings in preparation were reflected in the candidate's skills at infusing technology into learning. Superintendents in school districts agreed that most of the new teachers they hired from Rutgers or other institutions needed significant training before they could use technology meaningfully in their work. Though the new teachers had basic technical skills, they were not equipped to provide leadership in how to incorporate modern technology into the classroom. The districts and professors agreed that there was little collaboration and coordination among cooperating teachers in districts and professors in the university regarding technology. The use of technology by candidates in different academic areas was not compared or coordinated to ensure that it was meaningful, or to exchange ideas about how technology might be used. These and other weaknesses identified through the survey drove the development of the project design.

Project Design

The central feature of the project is the development of focused subject-area teams of professors, K-12 teachers, graduate students and educational technology staff. The teams help faculty and candidates infuse technology into academic activities. They have as a high priority the continuing development of interdisciplinary partnerships between the teacher preparation programs and the arts and sciences faculty. Each team is led by a professor who is committed to the goals of the project.

A team is assigned to each certification subject area and has two responsibilities: (1) to continually evaluate the experiences candidates have with technology throughout their time in the program to ensure that they develop effective skills; and (2) to design meaningful infusions of technology into learning appropriate for that subject area. The teams assist faculty to more fully integrate technology into learning and help them guide candidates as they complete mentored projects. In the process, candidates collaborate with teachers in public and private schools who have been identified for their skill at integrating technology into learning. The teams support the school teachers as they infuse technology into the experience of candidates during their teaching placements. Elementary and high school students participate in these activities. The technology-rich districts that participate in the program have close ties to the university and have well equipped classrooms with good opportunities for hands-on training of candidates. As the teams work with professors who teach the subject area courses and support the cooperating teachers in the districts, they provide curriculum and faculty development on an ongoing basis. The project is continuously assessed to inform future work. The primary objectives are to:

1. Engage teacher candidates in activities during subject area classes and teacher placements that develop the skills they need to use technology effectively in their future classrooms.
2. Provide technical support, instructional support, incentives, and faculty development for subject area professors to help them effectively practice and model technology integration.
3. Develop collaborations among Rutgers professors, teaching candidates, and teachers in technology-rich school districts.
4. Encourage faculty within and between disciplines to collaborate on meaningful instructional uses of technology and to share problems, strategies and solutions.
5. Use assessment information developed throughout the experience to continuously correct flaws, redesign, and replicate successful activities.

A Project Team Example: Encouraging Apprenticeship and Mentored Research

Students learn content areas best when they are engaged in meaningful problems within the discipline, when they are *doing* the discipline in apprenticeship with a mentor (Palincsar and Brown, 1984). When teacher preparation students are in a mentoring relationship with an experienced researcher they can begin to understand contemporary approaches and thought in their field. Science professors in the Graduate School of Education have partnered with professors in the science departments to support teacher preparation students in substantive work in contemporary science. In the summer before science candidates enter their fifth year, they attend either the Rutgers Waksman Student Scholars Summer Institute or the Rutgers Astrophysics Institute for an intensive study in their chosen field. They work with current teachers and high school students, and with Rutgers faculty from the Graduate School of Education and the departments of Genetics, Physics, and Chemistry. In the process of doing real science, candidates learn about emerging technologies, experimental design, research methodology, laboratory procedures, data collection and analysis, and scientific reporting. The science support team guides the candidates using constructivist instructional methodologies that can be incorporated in classroom practice.

As part of the Astrophysics Institute, for example, students use the internet to examine NASA's X-ray photon counts collected by satellites orbiting the earth and perform quantitative analysis of the data using software tools. They construct models of objects that emit photons in an attempt to identify them as white dwarfs, neutron stars, binary stars or other phenomena. During the summer they learn the physics and data analysis techniques needed to conduct research. During the following year they are challenged to solve problems posted on the web and to report their findings there. One important aspect of this program is that the candidates get raw data as quickly as any researchers in the world and do real investigative science. As they use live data, they become part of the internet-based scientific community.

The development of a collaborative relationship between the GSE and the three major science departments in the education of science teachers has been critical to the program's success. All four units have come together to implement an integrated approach to the education of science teachers. A similar model is followed for other disciplines, including literature, history, world languages, and social sciences. The History team, for example, is making good use of the Valley of the Shadow web site developed at the University of Virginia (Ayers, 1999). The site provides rich primary sources from two communities during the civil war, including letters, diaries, newspaper articles, soldier dossiers, and battle plans. The candidates learn history by doing it. They perform historical research from primary sources and practice techniques to scaffold their own student's learning of history.

Criteria for Evaluating Instructional Activities that Infuse Technology

Instructional activities are being assessed according to the criteria shown in Table 1 (adapted from Jonassen, Peck and Wilson, 1999, page 227-231) to evaluate how meaningfully they are embedded in each discipline and teaching placement. The criteria are being further refined for specific content areas.

Table 1. Criteria for Instructional Activities Infusing Technology

1. To what extent is the activity naturally complex and embedded in a real world context?
2. To what extent do candidates observe and reflect upon their actions?

3. To what extent is technology contributing to the attainment of specific goals?
4. Do candidates engage in this because it is required or because it is of intrinsic interest?
5. Do candidates wrestle with new experiences and become expert at identifying problems?
6. To what extent do candidates spend time engaged with other learners?
7. To what extent do candidates improve in their ability to negotiate with other learners?
8. Do candidates simply memorize or do they generate hypotheses, evaluate, assess, predict?
9. To what extent is there one 'right' answer, or does the activity foster generation of multiple complex solutions of varying quality that can be analyzed and evaluated?

The Study

A 3-year cross-sequential (longitudinal and cross-sectional) design has been implemented to evaluate the influence of the project on the abilities and attitudes of the teaching candidates in the program. Data was collected in the first semester of the project from teaching candidates in the junior, senior, and fifth year in the teacher preparation program, and from all post-baccalaureate students in the program. The initial data was collected through a paper and pencil instrument. Performance-based evaluations of abilities will be made later in the year. The paper and pencil instrument was used to collect two types of information: student attitudes about the importance of specific internet and productivity technologies, and student abilities to infuse technology into learning. Students self-rated their competence with various technologies and their ability to develop meaningful learning activities that involve technologies. They also proposed specific ways that technology can be meaningfully used to support learning. Data will be collected each semester over the next three years as students are tracked through their programs.

A total of 458 students were assessed this year, approximately 96% of those in the program. A preliminary analysis has been conducted. While most students rated themselves as competent using email and searching the internet, they assigned themselves lower ratings at using other internet applications such as listservs, chat rooms, and online discussion groups - most rated themselves as not familiar at all with web-based distance education or with interactive TV. Similarly, students rated themselves as competent using word processing software, but assigned themselves lower ratings at using other productivity software, such as presentation packages, databases and spreadsheets. The majority rated themselves as not familiar at all with modeling and simulation software or with data analysis tools. Almost half indicated they had never attempted to develop meaningful learning activities involving technology or could do so only with assistance. This held across program and year. More than half indicated they had a similar weakness in applying current instructional principles, research and assessment practices to the use of computers and technologies. Finally, across program and year, most students were unable to propose specific ways that technology can be meaningfully used to support learning. There were some differences by year: post-baccalaureate students rated themselves as less competent with certain technologies, such as listservs, chat, and online discussion groups than did the students in the five-year program. All groups, however, gave similar high ratings to the level of importance that teachers should hold for internet technologies.

Conclusions

Current and emerging technologies include powerful tools that can be used to spur thoughtful, authentic activities within content areas. Yet professors tend not to model constructive uses of technology in learning or research, and school districts find that the new teachers coming out of teacher preparation programs are not equipped to provide leadership in how to incorporate modern technology into the classroom. Initial assessments from the project study reveal striking weaknesses in the ability of teacher preparation students to apply instructional principles, research and assessment practices to the use of technologies in their disciplines. Students are unable to propose specific and meaningful ways to infuse technology into learning activities, though they recognize their weaknesses and assign a high level of importance to technologies in teaching and learning.

The main goal of the current project is to help students learn to develop meaningful infusions of technology in support of learning. A key element has been the development of focused subject-area teams of professors, K-12 teachers, graduate students and educational technology staff to help faculty and candidates infuse technology into academic activities. It is anticipated that student attitudes and abilities will develop over the life of the project. By engaging students in meaningful technology-enhanced activities during subject area classes and teacher placements, and by providing significant technical and instructional support for faculty who practice and model technology integration, it is hoped that teaching candidates will graduate with a demonstrated ability to provide innovative and authentic technological support for learning.

References

Ayers, D (1999). *The Valley of the Shadow.* Available: http://valley.vcdh.virginia.edu/. [2000, November 23]

Brown, J. S., Collins, A. & Duguid P. (1989). Situated cognition and the culture of learning. *Educational researcher*, 18(1), 32-42.

Jonassen, D., Peck, K., and Wilson, B. (1999). *Learning with Technology.* Prentice Hall, Upper Saddle River, New Jersey. Columbus, Ohio.

Palincsar, A., and Brown, A. (1984) Reciprocal Teaching of comprehension-fostering and comprehension-monitoring activities. *Cognition and Instruction, 1,* 117-175.

Perkins, D. (1991). Technology meets constructivism: Do they make a marriage? *Educational Technology*, 31 (5), 18-23.

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Magnetic Connections: Better Preparing Preservice Teachers to Use Technology in Teaching and Learning

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Abstract: Technology provides opportunities to link students, faculty, partners in education, and the wider communities together to expand, improve, develop, and enhance the learning experience for all. It is this challenge that has led California Lutheran University's (CLU) School of Education to conceive and implement Project MAGNETIC CONNECTIONS. Progress on the project can be measured through five major activities. These activities include development of a teacher/scholar in residence program, use of an electronic portfolio system and other distance learning technologies, faculty development workshops, and revision of the Teacher Preparation Program curriculum. Results indicate that CLU is better preparing preservice teachers to use technology in teaching and learning and they are provided with better models and mentors for integrating technology into the curriculum. As well, preservice teachers are held accountable for meeting state and CLU standards for beginning teachers through the use of a web-based electronic portfolio system and distance learning technologies.

Introduction

The nation's teaching force faces a critical challenge as a record number of students enter our schools. By 2008, schools will need to hire more than 2.2 million teachers to serve growing student enrollments and to replace the considerable number of current teachers expected to retire in the coming years. In California, shortages are particularly acute. Educating nearly 11% of the nation's student population, California's school enrollment is at about five million and growing by more than 100,000 students per year. California will need to hire more than a quarter of a million teachers over the next decade. (Haselkorn & Harris, 1998).

This extraordinary need for teachers comes at a time in which the demands placed on teachers, particularly in California, has never been greater. Already serving the nation's most diverse population, California provides a look ahead to many of the educational and demographic challenges facing the nation in the 21st century. Like many other states, California has embraced the "standards movement" calling for more accountability for teachers, students, and schools. Therefore, at the very time we are asked to produce more teachers through a greater variety of teacher preparation routes, we are also being called upon to prepare a more capable workforce that is well prepared for the challenges and complexities of the next century.

Technology offers promise as a tool and a resource for those of us who prepare teachers, and for teachers themselves who are challenged to provide more and better services and educational opportunities for students. It challenges us to think about new ways to link our students, our faculty, our educational partners, and our wider communities together to expand, improve, develop, and enhance the learning experience for all. It is this challenge that has led the faculty in the School of Education at California Lutheran University to conceive the plan for Project MAGNETIC CONNECTIONS.

California Lutheran University and its school partners have already committed significant resources to developing and supporting our technology capabilities. Yet, technology itself is not pursued as an end in itself but as a vehicle and medium for teaching and learning. The Information Systems and Services unit of our university has articulated a vision statement that reads: "We build community by providing solution oriented, integrated information resources and services. Our graduates are technologically competent and competitive in a global market."

The School of Education has embraced this vision in our own strategic plan, which calls for us to infuse technology throughout all of our programs. Nowhere is this challenge more important than in teacher education.

Teacher education does not occur in isolated classrooms that are disconnected from practice. We believe that making, building, and strengthening connections are vital to the future of teacher education. CONNECTIONS between content and pedagogy, CONNECTIONS between theory and practice, CONNECTIONS across the curriculum, CONNECTIONS between the university and the schools, and CONNECTIONS between teachers and students are only some of the most crucial linkages that must be made. Technology holds promise of being a tool and a resource for making these CONNECTIONS.

There is a natural affinity and powerful draw among the participants in this project; they have common goals and purposes to improve teaching and learning for all. They have already committed to the use of technology as a vehicle for improved instruction. Thesc common purposcs serve as a MAGNET, drawing together all of the players and the resources they bring to the table. In this project, a primary resource for linking with the real world of practice is three MAGNET schools—schools with a special focus on technology. Therefore, we have entitled this Project MAGNETIC CONNECTIONS, in anticipation that we will build on this natural affinity to strengthen these powerful connections through the use of technology.

Many have predicted that technology has the potential to change education in dramatic ways. (Hertzke & Olson, 1994; Kent & McNergney, 1998). However, teachers often report that they are not well prepared to use even the limited technology available in school classrooms. Even though they may know ***how*** to use the computer-based technology they find in their classrooms, they may not know how to use it for effective instructional purposes. This is not surprising, considering the history of teacher preparation program practices. Arthur Wise, President of NCATE (1998) suggests that the models provided for preservice teachers are inadequate for today's technological demands on the teaching profession.

> Despite the technology changes in society, being a teacher in American schools too often consists of helping children and youth acquire information from textbooks and acting as an additional source of expertise. Teachers are provided role models of this approach to teaching from kindergarten through graduate school; their teacher education courses provide hints for making textbook-oriented instruction interesting and productive, and as teaching interns, they both observe and practice instruction based upon mastering information found in books. Teachers may be forgiven if they cling to old models of teaching that have served them well in the past. All of their formal instruction and role models were driven by traditional teaching practices. (p.5)

If teachers in elementary and secondary schools are to use technology well, they must experience its use in their own learning. Sandholtz, Ringstaff & Dwyer (1997) indicate that students learn best about the appropriate use of technology in the classroom when they are provided with models of good practice.

As we take the necessary steps to achieve our vision for teacher preparation in the twenty-first century, our faculty identified five areas related to our human and technological resources that need to be addressed. These areas are:

- providing better teacher training in the selection, access and use of technology in teaching and learning;
- providing better mentors and models for preservice teachers in the form of university faculty, K-12 master teachers, and university supervisors, who integrate and appropriately use technology in their own teaching and learning;
- expanding the Teacher Preparation Program to reach more preservice teachers;
- developing and using new assessment models that incorporate the use of an electronic portfolio system; and
- building better linkages between subject matter and professional preparation and K-12 schools.

The Project MAGENETIC CONNECTIONS

Although prior to beginning this project, many School of Education faculty members already used technology to deliver and enhance instructional opportunities, conduct research, and communicate with students outside of class, our own studies indicated that this use was highly idiosyncratic, largely dependent upon the interests and inclinations of the individual faculty member, course specific, and not well connected to any overall programmatic vision or initiatives. We were poised to take the next step to fully integrate technology into our program and to utilize its power to significantly change the way we prepare teachers for their work in contemporary schools when presented with the opportunity to apply for external funding to help accomplish our goals.

Project MAGNETIC CONNECTIONS is strengthening the links between teacher preparation programs and k-12 schools through live, real-time connections and shared learning opportunities between the partners. The three technology-rich schools have become "laboratories for learning" for CLU students and faculty and are connected via distance learning capabilities to CLU students on the Thousand Oaks campus and to its graduate centers in Woodland Hills and Ventura. All CLU students are developing a web-based electronic portfolio, documenting their progress and accomplishments as they advance through the "benchmarks" of the teacher preparation program. They are taught and mentored in their use of technology by highly trained teacher education faculty and two visiting teacher/scholars (clinical faculty) in residence for the duration of the three-year program.

The project includes conferences and workshops to redesign the teacher preparation curriculum at California Lutheran University to infuse technology into the teaching and learning process. We are developing and implementing an electronic portfolio system that is linked to the six domains of the California Standards for the Teaching Profession. Preservice teachers and education faculty are utilizing the new electronic portfolio system to enhance communication regarding professional expectations and preservice teacher accountability for meeting those standards.

In July 1997 The California Commission of Teacher Credentialing and the California Department of Education adopted the California Standards for the Teaching Profession (CSTP). The standards were jointly developed by the two agencies to facilitate induction of beginning teachers into professional roles and responsibilities. The standards provide teachers and teacher educators a common language and structure to describe the complexity of teaching and are intended to guide teachers as they develop their professional practice.

The standards are organized around six interrelated categories of teaching practice. In summary, they are, 1) Engaging and supporting all students in learning, 2) Creating and maintaining effective environments for student learning, 3) Understanding and organizing subject matter for student learning, 4) Planning instruction and designing learning experiences for all students, 5) Assessing student learning, and 6) Developing as a professional educator. The list is not intended to be sequential, and does not indicate priority or value, but is merely numbered to facilitate identification and discussion. The 6th standard does not describe specific classroom conduct but is more a reminder of the need for ongoing professional development and relationships.

The six categories provide a developmental, holistic view of teaching intended to serve the needs of the diverse student and teacher populations in this State. The overlap that is evident among the standards communicates the interrelationships and complexities of teaching that require continued development of professional judgement. The standards are designed to support work in diverse classrooms in a variety of ways, and not to force a single approach on all practitioners. Use of the standards is intended to stimulate reflection on practice, formulation of goals, and assessment of growth. Therefore the use of these criteria is flexible.

The Department of Teacher Education in the School of Education at California Lutheran University adopted the CSTP's as an organizing principle for its teacher credential programs. Curriculum and assessment approaches are now based on the standards, with an emphasis of providing evidence of progress on the first five. Preservice teachers are held accountable for these standards through the use of a web-based electronic portfolio system. This web-based system allows students, faculty, educational partners, and education employers to expand, improve, develop, and enhance the learning experience for preservice teachers. However, reliable identification and description of student work for purposes of formative growth remains the primary purpose for the use of the state standards and the electronic portfolio system at CLU.

Implementation of a web-based electronic portfolio system throughout the teacher preparation program complements the student-centered approach CLU takes to preparing teachers for the classrooms of tomorrow. The portfolio system is analogous to a relational database that is cooperatively developed by faculty, students, cooperating teachers, supervisors and employers. It enables a grand conversation between these parties, focusing around the student's professional development. The state standards (CSTP's and technology) and the School of Education's conceptual framework of reflective, principled practice serve as a scaffold around which teacher educators and preservice teachers weave their dialog.

This dialog is enhanced through the use of other distance learning technologies, namely Tapped In (a Multi-object Orientation [MOO] for educators) and ClearPhone (an Internet video-phone). These two technologies are used mainly in real-time as teacher educators meet in virtual classrooms with preservice teachers, or preservice teachers tutor k-12 students through video conferencing. The electronic portfolio system tends to be used asynchronously as students respond to teacher educators' assignments and deposit artifacts supporting their growth and accomplishments as a beginning teacher. Only recently have the two technologies merged, where teacher educators are able to converse in real-time with students about artifacts in their electronic portfolio, either in the MOO or through video conferencing. There is much potential for mentoring preservice teachers online while holding them accountable for the standards through demonstrations and artifacts deposited in their electronic portfolio.

In order to meet the new performance standards and to integrate these technologies throughout the program, the teacher preparation program curriculum needed to be revised. This revision is ongoing and over a three-year period, the goal is to modify course goals, objectives, and assignments to reflect the vision of our teacher preparation program and ensure that all beginning teachers have met rigorous state standards for teaching and technology. Faculty curriculum revision efforts identified four major considerations that will shape the revised program. These include the School of Education's conceptual framework, the state standards for the teaching profession (CSTP's), the state technology standards and the cross-cultural and language development (CLAD) foci. Any curriculum revision must include, address and hold students accountable for meeting these state standards as well as realizing the School of Education's vision that strives to prepare principled, reflective educators. Hence, faculty and administration expect that the final revision will articulate the relationship between course goals and objectives, the School of Education's conceptual framework and the other program and state standards for teaching and technology.

Evaluation Design:

The MAGNETIC CONNECTIONS Project uses a *participatory evaluation* design. This evaluation model, described by Cousins and Whitmore (1998) and Rossi, Freeman and Lipsay (1999) views program participant stakeholders as partners in the evaluation process. The stakeholders define the evaluation purpose, create research questions, design instruments, collect data and interpret and report findings. Cousins and Whitmore (1998) and Greene (1988) suggest that such participation keeps the evaluation relevant and increases utilization of findings without sacrificing technical quality or credibility.

As a result, the evaluation seeks to change the organization or solve a problem, rather than simply collect programmatic information.

At CLU, the participatory evaluation used a formative/summative design recommend by Stevens, Lawrenz, Sharp and Frechling (1997), examining five formative and one summative goal. Participants included a sample of 17 full and part time higher education faculty, all preservice teachers and K-12 teachers at three technology rich partner schools. Instruments included document analysis of course syllabi, portfolio contents and training materials; pre-post technology use surveys of faculty and preservice teachers; observation of faculty and preservice teachers, focus groups conducted with faculty and preservice teachers and analysis on on-line transcripts. Each goal was examined with at least two data collection techniques, allowing for triangulation of findings.

Initial Results:

Preservice teachers, k-12 partners, and education faculty are conducting action research on the implementation strategies and distance learning ideas embedded in the project. The action research findings identify and amplify successful strategies for curriculum development, implementation and assessment.

Progress on the project has been achieved within five major activities:

- Teacher/scholars hired in January 2000. These teacher/scholars support the implementation of the project objectives and support preservice teacher education within the School of Education and k-12 partner schools.
- Electronic portfolio system implemented throughout the teacher preparation program. The system is based on the State standards for professional teacher development and provides a self-assessment tool for students as well as an opportunity for k-12 teachers and higher education faculty to mentor and advise preservice teachers throughout their teacher preparation program.
- Higher education and k-12 faculty workshops. Various sessions conducted in 1999-2000. Two 3-day and numerous 2-hour workshops. Topics include curriculum revision, web page construction; use of chat room software "Tapped In;" using Internet search resources; electronic portfolios; technology to connect schools; program evaluation and technology tools.
- Initiated use of distance learning technologies, including the use of "Tapped In" for teacher preparation methods block seminar discussions and "ClearPhone" videoconferencing through the Internet.
- Curriculum revision of Teacher Preparation program. Established curriculum revision teams consisting of School of Education faculty, k-12 teachers, undergraduate faculty and administrative support personnel.

All indicators suggest that California Lutheran University is:

- better preparing preservice teachers to use technology in teaching and learning.
- providing preservice teachers with better models and mentors for integrating technology into teaching and learning.
- maintaining State and School of Education standards for preservice teachers through the use of a web-based electronic portfolio system and distance learning technologies.

References

Ayers, T. D. (1987). Stakeholders as partners in evaluation: A stakeholder-collaborative approach. *Evaluation and Program Planning, 10*, 263-271.

Cousins, J. B. & Whitmore, E. (1998). Framing participatory evaluation. *New Directions for Evaluation,* no. 80, 5-23.

Garaway, G. B. (1995). Participatory evaluation. *Studies in Educational Evaluation, 21*(1), 85-102.

Greene, J. G. (1988). Stakeholder participation and utilization in program evaluation. *Evaluation Review, 12*(2), 91-116.

Hertzke, E. & Olson, W. (1994). *Tqe, technology, and teaching*. Thousand Oaks, CA: Corwin Press.

Keirns, J. (1999). *Designs for self-instruction: Principles, processes, and issues in developing self-directed learning*. Boston: Allyn and Bacon.

Kent, T. & McNergney, R. (1998). *Will technology really change education?: From blackboard to web.* Thousand Oaks, CA: Corwin Press

Haselkorn, D., & Harris, L. (1998). The essential profession: A survey of public attitudes in California toward teaching, educational opportunity, and school reform. Belmont, Massachusetts: Recruiting New Teachers.

Pursley, L. A. (1996). *Empowerment and utilization through participatory evaluation*. Unpublished doctoral dissertation. Department of Human Services, Cornell University.

Quiñones, S. & Kirshstein, R. 1(998). *An educator's guide to evaluating the use of technology in schools and classrooms.* Washington, DC: U.S. Department of Education. Available: http://www.ed.gov/pubs/EdTechGuide/title.html

Reineke, R. A. (1991). Stakeholder involvement in evaluation: Suggestions for practice. *Evaluation Practice, 12*(1), 39-44.

Rossi, P. H., Freeman, H. E, & Lipsey, M. W. (1999). *Evaluation: A systematic approach* (6th edition). Thousand Oaks, CA: Sage.

Sandholtz, J., Ringstaff, C. & Dwyer, D. (1997). *Teaching with technology: Creating student-centered classrooms*. New York: Teachers College Press.

Stake, R. E. (1967). The countenance of educational evaluation. *Teachers College Record, 68*, 523-540.

Steven, F., Lawrenz, F., Sharp, L., & Frechtling, J. (ed.) (1997). *User-friendly handbook for project evaluation: Science, mathematics, engineering, and technology education.* Washington, DC: National Science Foundation.

U.S. Department of Education (1998). *An educator's guide to evaluating the use of technology in schools and classrooms.* Washington, D.C.: Office of Educational Research and Improvement.

Weiss, C. H. (1998). *Evaluation* (2nd edition). Upper Saddle River, NJ: Prentice Hall.

Wise, A. (1998). A message to NCATE institutions, board members, constituent organizations and friends. http://www.ncate.org/projects/tech/TECH.HTM

Worthen, B. R., Sanders, J. R. & Fitzpatrick, J. L. (1997). *Program evaluation: Alternative approaches and practical guidelines* (2nd edition). New York: Longman.

Wyatt & Looper (1999). *So you have to have a portfolio: A teacher's guide to preparation and presentation.* Thousand Oaks, CA: Corwin Press.

Preservice and Inservice Teachers Collaborate To Integrate Technology into K-8 Classrooms

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Abstract: Preservice teachers graduating from education programs feel unprepared to integrate technology into their classrooms due to lack of modeling by university faculty and limited opportunities for observation of exemplary technology practices in internship classrooms. The Arizona State University West faculty, through a PT^3 Grant, is addressing this issue by providing workshops on integration of technology in instructional planning for cohort teams of ASUW preservice teachers and inservice mentor teachers. During the workshops, teams collaborated on developing Units of Practice integrating technology, which were jointly implemented in field placement classrooms. Workshops provided teams a variety of technology and technology resources that could be incorporated into unit and lesson planning including the Internet, digital cameras, Inspiration software and PowerPoint applications. Results indicated participants benefited greatly from the information and practical applications of the workshops. Teams demonstrated considerable skill growth for using various applications and substantial success in developing Internet skills.

Introduction

Many colleges and universities are attempting to improve teaching and learning with technology throughout their colleges of education. Nationwide, most recent teacher education graduates do not feel prepared to integrate technology in their curriculum (U.S. OTA, 1995). Arizona State University West students report that, despite taking a course about using technology in the classroom, they do not feel prepared to teach effectively with technology (Wetzel, Buss, Zambo & Arbaugh, 1996; Chisholm, Carey, & Hernandez, 1998). This lack of preparation is due to two major factors that we are addressing in a Preparing Tomorrow's Teachers to Use Technology Implementation Project. First, our students do not see consistent or extensive modeling of the use of technology by our faculty in their preservice classes (Chisholm, Carey & Hernandez, 1998). Second, we lack school sites for field placements where preservice teachers can observe exemplary technology practices in K-8 classrooms (Carlile, 1998).

In this paper, we evaluated our Practicum Plus Program that directly influences field placements for our preservice teachers in required practicum experiences. In the Practicum Plus program, preservice teachers and their K-8 mentor teachers received training together in technology integration just prior to and during the practicum experience. This is a critical intervention because practicum students are often most influenced by what they observe their mentor teachers do, or by their own school memories (Darling-Hammond & Ball, 1998). Further, cohorts of beginning teachers receive a richer, more coherent learning experience when they are organized in teams to study and practice with veteran teachers and with one another (Darling-Hammond, 1995). The PT^3 Practicum Plus Program provides technology integration workshops for preservice teachers and their mentors. During the workshops the preservice-teacher-mentor-teacher pair developed a curricular Unit of Practice (UOP), which they implemented in the K-8 practicum classroom.

Overview of the Program

The Practicum Plus Program offered collaborative, hands-on training in technology to K-8 preservice teachers and their mentor teachers to prepare them to integrate appropriate technology with grade level curriculum, incorporate state and national standards into their lessons, and practice new technologies and instructional strategies. The preservice teacher-mentor teacher teams attended workshops together prior to and during the semester. These workshops were offered at each of six partner school districts and at the Child Development Center at Arizona State University West. Each workshop was geared to a specific program area: Elementary Education, ESL Education, Bilingual Education, and Early Childhood Education. Preservice teachers were recruited during class at the end of their junior year. Summer workshops lasted 6.5 hours per day over a 6 day period; the three Fall workshops were 2 hours each.

Mentor teachers were recruited through their districts and invited to apply for the Practicum Plus program. Both the preservice teachers and the mentor teachers received three graduate credits at no cost for attending the summer and fall workshops. A total of eighty-two mentor teacher and sixty-eight preservice teachers participated in the seven cohort groups. Additionally, fifteen ASU West faculty assigned to the site-based district locations attended the Practicum Plus training with participants. ASU West faculty played a key role in defining the particular curriculum for each major program.

The workshops provided each preservice teacher-mentor teacher team the opportunity to assess the available technology at their school and district, explore and evaluate various hardware and software, locate relevant Internet sites and bookmark them, evaluate websites, use a listserv to share ideas, strategies, resources, and develop two Units of Practice (UOP) that address state and national standards. In addition, teachers presented technology-integrated activities that they have used successfully in their own classrooms. Invited speakers also introduced district standards, local technology resources for teachers and examples of their own UOPs. One of the intangible benefits of these workshops was the opportunity for preservice teachers and mentor teachers to get acquainted before the beginning of the school year and to work collaboratively as a team in developing technology-integrated UOPs that they would jointly implement in the K-8 classroom.

On the first day of the workshops, the participants were introduced to the UOP and its seven components: Standards, Invitation, Tasks, Situations, Interactions, Tools, and Assessment. On subsequent days, participants deepened their understanding of one or more components per day identifying the standards they would incorporate in their unit, developing the Invitation, and collecting on-line resources for their UOP. As pairs worked together, mentor teachers and preservice teachers became equal partners in the endeavor and learned from each other. Additionally each preservice teacher-mentor teacher cohort was introduced to the listserv that serves as a vehicle for collegial sharing.

The Study

The investigators sought answers to the following research questions. Question 1--How effective was the Practicum Plus program in preparing mentor teachers and their university practicum students to create a curriculum unit of practice in their K-8 classrooms? Question 2--How did the mentor teachers and practicum students use the cohort listserv to support the community of learners?

Method

Multiple measures were used to examine the research questions. In each of the following sections, the instruments employed and the procedures used to gather data are presented briefly.

Faculty Reflections

Faculty attended the Practicum Plus Program summer classes from each program area along with mentor teachers and preservice teachers. Twelve faculty members attended the 3 credit hour classes while four attended the 1 credit hour classes. At the end of the intensive classes faculty were asked to reflect and provide the program staff with written comments. Eight faculty members completed a reflection providing program staff with written comments. Faculty members were also invited to discuss the written reports and provide additional feedback to the program staff at a later meeting.

Daily Participant Exit Tickets

At the end of each workshop day, participants completed an Exit Ticket consisting of five prompts: One thing you learned or relearned today; one positive comment about today's activities; one idea you learned or saw today that you can use with your students; suggestions for improvement; and general comments and questions about today's topic. Content analysis procedures were applied to responses and themes were extracted.

Technology Checklist

Preservice teachers' and mentor teachers' technology skills were evaluated using a Technology Skills Inventory that assessed skills in eight areas. The eight skill areas were: General computer, equipment, Internet, HyperStudio, Inspiration, PowerPoint, Claris Works/Apple Works Slide Show; and Netscape Composer. Example skills from the Internet list included: Subscribe to a listserv; send and reply to a listserv; send an e-mail attachment; create, organize and save bookmarks; and use a search engine to conduct research. Participants had to actually demonstrate proficiency on skills in these areas.

Unit of Practice

A rubric was used to identify proficiency levels for each category of the UOP, Standards, Invitation, Tasks, Situations, Interactions, Tools, and Assessment. Each was evaluated on a scale of Accomplished, Developing, or Emerging (http://www/asu/pt[3]).

Listserv

The seven cohorts in the Practicum Plus workshops enrolled in listservs. The purpose of the listservs was threefold: To provide the participants with skills of electronic communication; to encourage collegial sharing, and to create a community of learners who could interact beyond the time and place of the actual workshops.

With respect to analyzing the data, a number of procedures were used. Generally, qualitative techniques such as content analysis was employed. Emerging themes were noted and formed the basis of subsequent analysis and interpretation.

Results

Generally, results showed the overall effectiveness of the professional development activities, which took place during the PT3 workshops. Increased levels of skills for the use of applications and the Internet were demonstrated. Specific details about the results are provided below.

Faculty Reflections

Faculty members' reflections suggest that the activities presented in the program helped mentor and preservice teachers learn how technology could be incorporated into their curriculum. Suggestions from faculty included informing mentor and preservice teachers earlier of training dates for planning purposes and to facilitate more preservice teacher-mentor matches; introduce technology and hands-on computer activities on the first day; limiting lectures; and that a model of an UOP be given to participants at the beginning of the program. The faculty also observed that the UOP template did not ask teachers to make accommodations for students with special needs. The faculty recommended that for ESL and bilingual mentors and teachers a presentation on the Teaching English to Speakers of Other Languages (TESOL) standards be made and that these standards be incorporated into the UOP. The faculty also noted how helpful it was to have direct links to state academic standards since teachers are not always familiar with the state documents that actually drive district decisions about curriculum and assessment. The faculty also commented on the teamwork that developed between the mentors and preservice teachers. The classes provided the mentors and preservice teachers with an opportunity to work together before the school year started. The mentor teachers provided the expertise in pedagogy and content while in some cases the preservice teachers provided most of the expertise in technology. The faculty also remarked positively on the incorporation of technology into their classes such as the use of a digital camera and PowerPoint presentations.

Daily Participant Exit Tickets

Several themes emerged from the Exit Ticket responses. First, participants appreciated the exposure to a variety of technology and technology resources including Internet use, digital cameras, Inspiration, and PowerPoint. Additionally, they valued the time that was allowed to work with the technology while practicing and improving their skills including developing PowerPoint presentations, Inspiration and other applications for their classrooms. Participants especially appreciated ideas that worked with small groups in situations where limited numbers of computers were available. Finally, they particularly valued opportunities related to using Internet resources including website evaluation procedures, and connections to educationally relevant websites.

Technology Checklist

Evaluation of the preservice teacher-mentor teacher Technology Skills Inventory indicates most participants demonstrated 90% proficiency on the majority of skills listed.

Unit of Practice

Results from analysis of the Unit of Practice clearly show participants strengths in the Invitations, Tasks, Interactions, and Situations components. The weak areas were in the Abstract, Standards, and Assessments components. For example, participants failed to include appropriate academic standards. Additionally, ESL education teams failed to include TESOL standards.

Listserv

Participants surpassed expectations in use of the listserv. Examples of activities are sharing teaching ideas and resources, staying abreast of current events that impact their classrooms, sharing information about websites, information about how to accomplish assignments, and support for each other on how to complete their work at the university.

Discussion

It is apparent from the results that while there needs to be more emphasis placed on the importance of infusing standards throughout the UOP, participants benefited greatly from their experiences in the workshops. Results indicate teams had considerable skill growth and success in developing Internet skills. Participants routinely subscribed to listservs, sent e-mail attachments, created and saved bookmarks, and used search engines in research on the Internet. Additionally, participants developed skills in the use of Inspiration, PowerPoint, and Netscape Composer. For example, they used Netscape Composer to create and save a new page, add a hyperlink, and add a graphic from the Internet to create a curriculum homepage for their students.

Three important components of the Workshops facilitated skill development and subsequent application to the classroom setting by the preservice-mentor teacher teams. First, transfer of learning from the professional development setting to the classroom by participants was facilitated by providing learning opportunities that reflected those that would be used in subsequent classroom settings. Such "situated" learning opportunities allowed participants to engage in activities that they could use directly with their own classroom students, later. Second, the Workshops provided participants with significant amounts of time to learn how to use technology through practice with a variety of applications. Third, and importantly, participants were given ample time to *adapt* technology skills, materials, and techniques for classroom instruction. Specifically, participants were provided with large amounts of time and support to adapt technology for their own classroom use through the UOPs, which each team developed. Frequently, professional development focuses on the former, skill instruction and development without providing sufficient support for *adaptation*, which is essential to ensure subsequent application to the classroom. Fourth, participants then implemented the units in their K-8 classrooms.

References

Carlile, B. (1998). Conversation with ASUW Director of Field Placements.

Chisholm, I. M., Carey, J. M., & Hernandes, A. (1998). University minority students: Cruising down the superhighway or standing at the on-ramp? *Society for Information Technology and Teacher Education Annual,* 187-190.

Darling-Hammond, L (1998). Teacher Learning That Supports Student Learning. *Educational Leadership, 55* (5) 6-11.

Darling-Hammond, L. (1995). Changing Conceptions of Teaching and Teacher Development. *Teacher Education Quarterly, I* (4) 9-26.

U. S. Congress, Office of Technology Assessment. (1995). *Teachers and technology: Making the connection* (OTA-EHR-616). Washington, D.C.: U.S. Government Printing Office.

Wetzel, K., Zambo, R., Buss, R., & Arbaugh, N. (1996). Innovations in integrating technology into student teaching experiences. *Journal of Research on Computing in Education, 29,* 196-214.

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Hypergroups as a Community-Building Tool

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Abstract: For anyone restructuring their undergraduate technology course for pre-service teachers, an important consideration should be the inclusion of a communication tool that promotes positive peer interactions. Using their recent award of a PT^3 grant the University of Houston has implemented many changes in the teacher education core technology course including the offering of a hypergroup, a web-based communication tool. By the second month participation in the hypergroup was going strong with future teachers sharing ideas, posting resources, and communicating common concerns. The hypergroup, originally intended as an example of a mode for teacher communication, has turned into a true community-building tool. The hypergroup will stay intact for these pre-service teachers throughout their teacher education program and into their first year of teaching where it is hoped that these teachers will become a part of other online peer resource groups.

Introduction

The inability to communicate with peers concerning one's subject area, classroom management, and other educational issues, is often cited as a negative in the teaching field. Pre-service teachers in the Pedagogy for Urban Multicultural Action (PUMA) program at the University of Houston are changing this negative into a positive. With the recent award of a Preparing Tomorrow's Teachers to use Technology (PT^3) grant, the Instructional Technology program in the University's College of Education has restructured its required undergraduate three-hour technology course into three one-hour courses. One of the major changes in the restructuring of the technology class was to implement a mode of communication for all enrolled pre-service teachers.

Important to note is the fact that the University of Houston is a medium-sized, urban, multicultural university whose students are largely commuters. There are many nontraditional students from the Houston metropolitan area who attend the University on a part-time basis while working full-time jobs as they pursue their degrees. Many students are on campus only to attend classes. As a result, it is difficult to develop a strong sense of student community throughout the University. The PT^3 grant implementers recognized this problem as one similar to professional teachers in general.

Application

The College of Education has long used a web-based newsgroup application in its graduate distance learning and face-to-face classes appropriately named Hypergroups, developed by a former doctoral student. Found in the NETS Professional Performance Profile is a category that focuses on peer communication;

Teachers "participate in online professional collaborations with peers and experts" (Number 18). To assist pre-service teachers in satisfying this technology requirement for their educational portfolio, one hypergroup was set up for all six sections of the first semester technology course.

Because this was a new mode of communication for many of the students, it was decided that students would learn to use the tool effectively if they were required to participate by posting to the hypergroup a minimum of 5 times within the semester. No restrictions on types of postings were given, however the idea of professionalism and the goal of the hypergroup as a resource for communication and sharing of ideas was reinforced by the technology fellows in the six sections of the course. The students were initially reticent about participating. The technology fellows initialized the group by posting welcome messages and demonstrating its use in class. Within a month, students had taken ownership of their hypergroup, posing questions, asking about assignments, posting ideas for topics and projects that will satisfy course requirements, and requesting help in other classes. For the most part, the comments shared on the hypergroup have been relevant and positive. The pre-service teachers are getting to know each other across sections through the hypergroup and are actively supporting one another.

The long-term effects of the hypergroup will begin to be apparent during the Spring 2001 semester when students are enrolled in the second semester of the technology three-course sequence. At this point they will already be familiar with their new in-class classmates and technology fellows having met them in the hypergroup and in other education classes this semester. The same hypergroup used this semester will be used in the second semester technology course. In the third semester, pre-service teachers will be out in various schools in the metropolitan area, the hypergroup will be available to them though the students will not be on the University campus. It has been decided that the hypergroup will stay intact for the students' duration through the PUMA program and into their first year as professional teachers.

Pre-service Teacher Reactions

Throughout the semester, for evaluation purposes, students have been periodically interviewed concerning their thoughts on various aspects of the new technology course. Overwhelmingly the response by hypergroup participants has been positive. Comments, such as, students are able find and share "a lot of ideas," and their ability to access "all the tech fellows," not just their section technology fellow, who were able to provide helpful advicc and information, is considered a great resource. Students also reported that the hypergroup was a place for inquiring about their other education classes, that the large network of pre-service teachers all at various stages in their class work preparation, provided answers to their questions.

Conclusions

The technology fellows continue to participate by answering questions, developing mini lessons that are linked to the group, and supplying links to on-line tutorials and references for student use. The hypergroup is often referred to as a reference tool in class discussion. Originally, some of the students referred to the technology fellows as the experts, but as the semester commences students are realizing at times they are or other students can become the expert in a given topic area. The activity has been a great leveler for the group; the students and technology fellows interact as peers.

Hypergroups in the PUMA program are now not only seen by pre-service teachers in their technology course but due to their effectiveness they are becoming widely used throughout the college for many professors have now implemented a hypergroup in their educational methods courses.

The hypergroup, although a tool originally selected to assist students to meet a technology competency, will hopefully have a lasting effect on these future teachers, that of showing how technology can turn a negative, lack of communication among peers, into a positive.

An Assessment of Technology Skills and Classroom Technology Integration Experience in Preservice and Practicing Teachers

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Abstract: This study comprised the initial phase of a Preparing for Tomorrow's Teachers to Use Technology (PT3) funded investigation into the effects of integrating technology skills acquisition and preservice teacher methods courses on preservice teachers' use of technology during subsequent student teaching experiences. Two versions of a Technology Beliefs and Competencies Survey were administered, one for preservice teachers and one for practicing teachers. The results of baseline data on preservice and practicing teachers' technology skills and beliefs are identified and discussed. Also examined are preservice teachers' perceived technology barriers, and classroom teachers' technology integration practices.

Over the past decade, rapid advancements in technology have created expanding possibilities for enhancing instruction. As a result, there is a growing need for augmenting the instructional technology skills of both practicing and preservice teachers (Hill & Somers, 1996; Northrup & Little, 1996). Meeting those needs, however, has proven to be quite a struggle for many (Strudler & Wetzel, 1999). Siegel (1995) reported that most K-12 teachers are generally not receiving sufficient time, access, and support to become comfortable with computers, while others have found that although some teachers have positive attitudes toward technology, many do not consider themselves competent to teach with technology (Office of Technology Assessment, 1995; Schrum, 1999; Strudler & Wetzel, 1999).

Researchers have advocated integrating technology training throughout the preservice teacher education program (Brush, 1998). Although most teacher preparatory programs offer stand-alone technology courses for preservice teachers, many have not developed courses or curriculum that meet the International Society for Technology in Education (ISTE) standards. This is especially true in states lacking specific computer competencies for teacher certification. Therefore, many preservice teachers are still entering the classroom with minimum exposure to technology (Strudler & Wetzel, 1999).

With the support of a three-year Preparing Tomorrow's Teachers to Use Technology (PT3) grant, Arizona State University is investigating means for changing the way it prepares preservice teachers to meet current ISTE standards. This effort is focused on increasing both technology skills and technology-related instructional practices. Preservice teachers enrolled in the existing program are required to complete a one-credit, stand-alone technology course; the curriculum thus remains isolated from the environment in which it is to be applied. One goal of the PT3 grant is to investigate means for integrating the acquisition of technology skills with authentic teaching experiences. To achieve this goal, the stand-alone preservice teacher course addressing both technology skills and technology-related instructional practice is being eliminated in favor of integrating this content into three field-based courses covering instructional methods for teaching reading, math/science, and language arts/social studies. This field-based model, also known as job-embedded learning (Loucks-Horsley, Hewson, Love, & Stiles, 1997), is designed to provide preservice teachers with a combination of field-based technology workshops and authentic teaching experiences in real classrooms prior to their official student teaching assignment. A second goal of the project focuses on expanding the instructional technology skills and practice of teachers responsible for supervising the field-based, preservice teachers' classroom experiences. This is to be accomplished through the participation of practicing teachers in the field-based technology workshops.

This initial component of the PT3 funded project focused on collecting baseline data from preservice and practicing teachers regarding their technology skills and integration practices. This data will be used to inform the development of curricula designed to support more effective technology integration with preservice and practicing teachers, as well as serve as a baseline to assess change in preservice and practicing teacher skills and attitudes over the course of the grant. The data collection process was aimed at addressing the following research questions:

1) What is the current state of technology experience and skills of preservice and practicing teachers?
2) Are there any significant differences in technology experience and skills between preservice and practicing teachers?

Method

Participants

Participants were 111 preservice teachers and 13 practicing teachers serving as supervising teachers within the field-based, preservice teaching program.

Procedures

Data collection occurred during November of 2000. Preservice teacher surveys were completed during methods course regular class sessions. Practicing teacher surveys were completed on an individual basis.

Instruments

Instruments consisted of two versions of the Technology Beliefs and Competencies Survey, one for preservice and one for practicing teachers. The preservice teachers' version consisted of the following four sections: Background Information, Technology Skills, Technology Beliefs, and Technology Barriers. The Background Information section contained five items covering such things as future teaching goal, academic year, frequency of computer use, and basic demographic information. The Technology Skills section included 32 Likert-style items ranked on a four-point scale from "I Can't Do This" to "I Can Teach Others How To Do This" covering the following six categories: basic computer operation, productivity software use, electronic communication skills, use of electronic references, World Wide Web utilization, and use of multimedia software and hardware. The Cronbach Alpha reliability for this section of the survey was 0.95. The third section, Technology Beliefs, asked participants to rank 11 Likert-style items regarding the integration of technology into classroom instruction on a four-point scale from "Strongly Disagree" to "Strongly Agree." This section had a Cronbach Alpha reliability of 0.86. The final section, Technology Barriers, contained nine Likert-style items asking participants to rank their perception of the importance of a variety of factors relating to successful technology integration in classrooms on a three-point scale from "Not a Barrier" to "Major Barrier." Cronbach Alpha reliability for this part of the survey was 0.78.

The practicing teachers' version of the survey also consisted of four sections. The first section, Background Information, contained 10 items regarding grade level assignment, years of teaching experience, school characteristics, frequency of computer use, and home Internet availability as well as basic demographic information. Sections two and three, Technology Skills and Technology Beliefs, were identical to the version used for preservice teachers. For the practicing teachers' version of the survey, the Cronbach Alpha reliability of the Technology Skills section was 0.96, while the value was 0.82 for the Technology Beliefs section. The final section, Technology Integration, included 10 Likert-style items asking participants to assess their use of technology to support lesson design and presentation on a four-point scale from "Strongly Disagree" to "Strongly Agree." The Cronbach Alpha reliability for the final section was 0.94.

Results

The reported results for this investigation are separated into four sections: Technology Skills for Preservice and Practicing Teachers, Technology Beliefs for Preservice and Practicing Teachers, Technology Barriers for Preservice Teachers, and Technology Integration for Practicing Teachers.

Technology Skills for Preservice and Practicing Teachers

Means and standard deviations of the responses for the six subscales of the Technology Skills section of the survey are reported in Table 1. Both preservice and practicing teachers identified Basic Operations (preservice M=3.04, SD=.61; practicing M=3.10, SD=.52) and Communications (preservice M=3.31, SD=.63; practicing M=3.15, SD=77) as the technology skills with which they felt most comfortable. There was also general agreement between the two groups on those technology skills with which they felt least comfortable. Multimedia was ranked lowest by preservice teachers (M=2.45, SD=.79) and next to lowest by practicing teachers (M=2.74, SD=.84), while World Wide Web technologies were ranked lowest by practicing teachers (M=2.56, SD=.74) and next to lowest by preservice teachers (M=2.73, SD=.65).

Within the Basic Operation subscale, preservice teachers felt most confident in their ability to print cither selected pages, the current page, or complete documents (M=3.75, SD=.56), while they felt least confident in using anti-virus software (M=2.38, SD=1.00). Practicing teachers felt most confident in their ability to cut, paste, and copy information within and between documents (M=3.85, SD=.78), while they also identified using anti-virus software (M=2.31, SD=1.07) as the skill they felt least confident about.

On the Productivity Software subscale, preservice teachers felt most comfortable with basic word processor functions for text formatting, as well as spelling and grammar checking (M=3.84, SD=.45). They felt least comfortable in their ability to use graphics, transitions, animation, and hyperlinks within presentation software (M=2.23, SD=1.10). Practicing teachers felt most comfortable using advanced word processor functions such as headers, footers, tables, and inserting pictures (M=3.00, SD=.82), while also identifying use of advanced presentation software features as the thing they felt least comfortable with (M=2.15, SD=1.21).

On the Communication subscale, preservice and practicing teachers' rankings were in agreement, with both groups feeling most confident concerning the sending, receiving, opening, and reading of email (preservice M=3.85, SD=.45; practicing M=3.77, SD=.60), while subscribing to and unsubscribing from a listserv received the lowest confidence rankings for both preservice (M=2.77, SD=1.03) and practicing teachers (M=2.54, SD=1.13).

Preservice and practicing teachers' rankings on the Electronic References section were in agreement as well, with both groups feeling most comfortable performing keyword searches (preservice M=3.39, SD=.74; practicing M=3.00, SD=.91), while feeling least confident using advanced search features with Boolean operators (preservice M=2.68, SD=1.03; practicing M=2.54, SD=.88).

Concerning use of the World Wide Web, preservice teachers felt most comfortable using a web browser (M=3.75, SD=.50), while feeling least comfortable uploading webpage filcs to a server (M=1.81, SD=.95). Practicing teachers gave equal confidence rankings to using a web browser (M=3.38, SD=.77) and locating information on the Web using a search engine (M=3.38, SD=.96), while feeling least comfortable formatting web pages with tables, backgrounds, and links (M=1.62, SD=.87).

The final subscale of the Technology Skills section of the survey asked participants to rate their confidence with multimedia. Using basic features of a drawing program to create simple shapes was rated highest by both preservice (M=3.24, SD=.96) and practicing teachers (M=3.54, SD=.78). Preservice teachers felt least comfortable using authoring tools such as Hyperstudio (M=1.82, SD=.84), while practicing teachers felt least comfortable with photo editing of digital images (M=2.38, SD=.96).

Table 1: Technology Skill Survey Sections Reponses for Preservice and Practicing Teachers

Technology Skills	Preservice Teachers (N = 111)		Practicing Teachers (N = 13)	
	M	SD	M	SD
Basic Operations	3.04	.61	3.10	.52
Productivity Software	2.84	.66	2.80	.73
Communication	3.31	.63	3.15	.77
Electronic References	3.03	.75	2.77	.73
World Wide Web	2.73	.65	2.56	.74
Multimedia	2.45	.79	2.74	.84

Note. All responses ranged from 1 (I can't do this) to 4 (I can teach others how to do this).

Technology Beliefs for Preservice and Practicing Teachers

Technology Beliefs means and standard deviations are reported in Table 2. The numbers represent responses on a four-point Likert scale ranging from one (Strongly Disagree) to four (Strongly Agree). Both preservice and practicing teachers most strongly agreed with the statements, "I support the use of technology in the classroom" (preservice M=3.64, SD=.73; practicing M= 3.85, SD=.38) and "A variety of technologies are important for student learning" (preservice M=3.58, SD=.68; practicing M= 3.77, SD=.44). Both groups also gave the lowest ranking to the same statement, "Teaching students how to use technology isn't my job" (preservice M=1.80, SD=.73; practicing M= 1.62, SD=.65).

Table 2: Teacher Beliefs Reponses for Preservice and Practicing Teachers

	Statement	Preservice Teachers (N=111)		Practicing Teachers (N=13)	
		M	SD	M	SD
1	I support the use of technology in the classroom.	3.64	.73	3.85	.38
2	A variety of technologies are important for student learning.	3.58	.68	3.77	.44
3	Incorporating technology into instruction helps students learn.	3.52	.66	3.69	.48
4	Content knowledge should take priority over technology skills.	2.94	.79	3.00	.58
5	Most students have so many other needs that technology use is a low priority.	2.09	.66	2.23	.83
6	Student motivation increases when technology is integrated into the curriculum.	3.10	.63	3.38	.51
7	Teaching students how to use technology isn't my job.	1.80	.73	1.62	.65
8	There isn't enough time to incorporate technology into the curriculum.	2.08	.75	2.15	.99
9	Technology helps teachers do things with their classes that they would not be able to do without it.	3.15	.73	3.31	.48
10	Knowledge about technology will improve my teaching.	3.25	.78	3.46	.52
11	Technology might interfere with "human" interactions between teachers and students.	2.16	.70	2.08	.76
12	Technology facilitates the use of a wide variety of instructional strategies designed to maximize learning.	3.19	.76	3.31	.48

Note. Reponses ranged from 1 (Strongly Disagree) to 4 (Strongly Agree).

Technology Barriers for Preservice Teachers

This section of the preservice teacher survey included 10 Likert-style items ranging from one (Not a Barrier) to three (Major Barrier). Items perceived to represent significant barriers to technology integration included "Lack of or limited access to computers in schools" (M= 2.50, SD=.65); "Not enough software available in schools" (M= 2.49, SD=.63); and "Lack of knowledge about technology (M= 2.45, SD=.65). Preservice teachers identified the following statements as not representing barriers: "There isn't enough time in class to implement technology-based lessons" (M= 1.89, SD=.62); "Technology-integrated curriculum projects require too much preparation time" (M= 1.80, SD=.64); and "Lack of mentoring to help me increase my knowledge about technology" (M= 1.96, SD=.66).

Technology Integration for Practicing Teachers

In this portion of the practicing teacher survey, participants responded to 10 Likert-style items ranging from one (Strongly Agree) to four (Strongly Disagree) concerning their technology integrating practices. The practicing teachers most strongly agreed with the statement "I use technology to assist me with classroom management and record keeping activities" (M= 3.46, SD=.78). They gave an equal ranking to the statements "I integrate computer activities into the curriculum" and "Technology helps me meet the individual needs of a variety of students in my classroom" (M= 2.92, SD=.49). Practicing teachers identified the following two statements as least representative of their teaching practice: "I use technology to support project- and problem-based learning activities in my classroom" (M= 2.54, SD=.52) and "I encourage my students to use technology to demonstrate their knowledge of content in non-traditional ways (e.g. web sites, multimedia products)" (M= 2.62, SD=.77).

Discussion

Currently, technology training is a major focus of many preservice teacher education programs. That training is provided through a variety of different models, most of which are stand-alone technology courses that are not aligned with ISTE standards. This research describes the first component of a PT3 grant designed to move technology training of preservice teachers from the university classroom to a field-based model incorporating ISTE standards. This initial survey was designed to assess the current state of technology experience and skills held by preservice and practicing teachers.

Examination of overall subscale results for the Technology Skills portion of the survey revealed that both preservice and practicing teachers felt confident in their ability with electronic communication, a likely reflection of the increased use of email. Additionally, both groups were fairly confident in their mastery of basic computer operations.

Minor differences between preservice and practicing teachers were evident on two subscales: Electronic References and Multimedia. Preservice teachers rated their skills with Electronic References moderately higher than practicing teachers, which may represent students' greater familiarity with electronic databases commonly used within university libraries. Practicing teachers rated their Multimedia skills somewhat higher than preservice teachers which may reflect the long-standing availability of Hyperstudio in many elementary schools

Evaluation of individual survey items within the Productivity Software subscale indicated that both preservice and practicing teacher participants felt confident in their skills with word processors. They also felt comfortable using simple search strategies to locate information on the World Wide Web. Beyond these relatively commonplace activities, however, the survey revealed a low overall level of confidence with productivity software use. These results contribute valuable data upon which to base the designation of prerequisite skills for the field-based, preservice teacher experience. Further, by clarifying the technology skills largely lacking within this population, the survey serves to identify critical content for instruction within the field-based model. This baseline data is also useful for identifying baseline skills within the group of practicing teachers supervising the in-class portion of the field-based program. Including supervising teachers in the technology skills training supports their ability to serve as technology integration mentors for the preservice teacher population. Establishing baseline skills for the practicing teachers helps further define the technology related instructional goals and objectives within the field-based model.

Findings from the Teacher Beliefs portion of the survey revealed positive attitudes toward the importance of technology and technology skills in educational settings by both preservice and practicing teachers. Despite the relative lack of confidence identified in the technology skills' portion of the survey, both preservice and practicing teachers indicated a belief that teaching students how to use technology represented a valid expectation for elementary teachers and that there was sufficient time within the curriculum for that instruction. A belief in the importance of technology instruction coupled with a lack of technology skills represents an opportunity to impact instructional practice. By supporting the enhancement of technology skill levels, teachers may be better equipped to act on their beliefs regarding the importance of technology integration.

Preservice teachers completed the perceptions of Technology Barriers section of the survey. They indicated that their university assignments required the use of technology, however, they also indicated that a lack of technology knowledge and technology-integration techniques represented a major barrier to their integration of technology in instruction. This suggests that university student technology use represents low-levels of competence or use of technologies unsuitable for providing preservice teachers with sufficient knowledge to support technology-based instruction. It further suggests that the technology use required of preservice teachers in their university classes failed to demonstrate meaningful ways to integrate technology within a curriculum. This inference is further confirmed by the overall low-level of skills identified in the Technology Skills section of the survey.

Results of the Technology Integration portion of the survey completed by practicing teachers revealed an apparent contradiction with their views expressed in the Teacher Beliefs section. Teachers expressed support for student technology use and the integration of technology into instruction. However, when responding to survey items specifying the nature of technology use in their classrooms, teachers reported their greatest use of technology for managerial and other non-instructional purposes, findings which support those reported by other researchers (Brush, 1998; Strudler & Wetzel, 1999). Participating teachers did indicate moderate use of technology in their instructional practice and by their students. However, the sample in this survey represented only 13 practicing teachers. As such, they are unlikely to constitute a representative sample upon which to base generalizations to the teacher population as a whole. As discussed previously, this apparent discrepancy between teachers' beliefs and behavior potentially represents an opportunity for impacting teacher practice through trainings on technology and integration techniques.

The discussion thus far has focused on the first of the research questions addressing the current state of technology skills and classroom technology integration experiences of preservice and practicing teachers. Overall findings indicate the technology skills of both groups were relatively low, while providing a basis upon which to delineate prerequisite skills and instructional objectives for the field-based model for teaching technology skills and integration practices. Due to the limited data collected from practicing teachers, comparisons between preservice and practicing teachers (the focus of the second research question) were not possible at this point. Additional data is currently being collected in order to make more meaningful comparisons.

References

Brush, T. (1998). Teaching preservice teachers to use technology in the classroom. *Journal of Technology and Teacher Education, 6* (4), 243-258.

Hill, R. B., & Somers, J. A. (1996). A process for initiating change: Developing technology goals for a college of education. *Journal of Teacher Education, 47*, 300-306.

Loucks-Horsley, S., Hewson, P., Love, N., & Stiles, K. (1997). *Designing Professional Development for Teachers of Science and Mathematics*. National Institute on Science Education.

Northrup, P. T., & Little, W. (1996). Establishing instructional technology benchmarks for teacher preparation programs. *Journal of Teacher Education, 47*, 213-222.

U.S. Congress Office of Technology Assessment. (1995). *Teachers and technology: Making the connection*. Washington, DC: U.S. Government Printing Office.

Schrum, L. (1999). Technology professional development for teachers. *Educational Technology Research and Development, 47* (4), 83-90.

Siegel, J. (1995). The state of teacher training: The results of the first national survey of technology staff development in schools. *Electronic Learning, 14* (8), 43-53.

Strudler, N. & Wetzel, K. (1999). Lessons from exemplary colleges of education: Factors affecting technology integration in preservice programs. *Educational Technology Research and Development, 47* (4), 63-81.

A Field-Based Model for Integrating Technology into Pre-Service Teacher Education

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Abstract: While most researchers agree that more technology training is needed for teachers, numerous suggestions exist in the literature regarding the content of the training and the methods for delivering the training. Many researchers believe that technology skills should be integrated with undergraduate methods courses, thus providing students with skills and experiences applying technology to their specific content areas. This field-based model is the basis for new undergraduate teacher education experiences at Arizona State University (ASU). The purpose of this paper is to provide an overview of a field-based model for integrating technology into pre-service teacher education; a model that provides pre-service teachers with opportunities to develop and implement technology-rich instructional activities in authentic teaching situations so that they leave ASU with the ability to integrate appropriate technologies in their future professional placements.

Introduction

There is little argument among leaders in the field of educational technology that teacher training institutions are not adequately preparing undergraduate teacher education students to effectively integrate technology into their teaching. Although the U.S. Department of Education and the National Education Association have stressed the importance of incorporating educational technology in pre-service teacher education programs (Ely, 1996), research continues to show that teachers feel they are not prepared to effectively use technology in their classrooms (Brush, 1998; Schrum, 1999; Strudler & Wetzel, 1999; Topp, Mortensen, & Grandgenett, 1995). Because of this, they continue to use computers for low-level, supplemental tasks such as drill and practice activities, word processing, educational games, and computer-based tutorials (Strudler & Wetzel, 1999; Willis, Thompson, & Sadera, 1999). Some researchers have even gone so far as to state that "...few teachers routinely use computer-based technologies for instructional purposes" (Abdal-Haqq, 1995, p. 1).

While most researchers agree that more technology training is needed for teachers, numerous suggestions exist in the literature regarding the content of the training and the methods for delivering the training. Many researchers believe that technology skills should be integrated with undergraduate methods courses, thus providing students with skills and experiences applying technology to their specific content areas. In a survey of innovative teacher education programs, Strudler and Wetzel (1999) discussed how teacher education institutions such as Vanderbilt and the University of Virginia were focusing on collaboration among methods faculty and educational technology faculty in order to provide pre-service teachers with experiences integrating technology into their teaching. These programs emphasized the need to provide pre-service teachers with technology training in *authentic* teaching situations. This field-based model, also known as *job-embedded learning* (Loucks-Horsley, Hewson, Love, & Stiles, 1997), focuses on providing pre-service teachers with authentic training experiences in real classrooms prior to their student teaching experiences. This model goes beyond the idea of integrating technology training with teaching methods courses; instead, pre-service teachers learn to integrate technology into their teaching as part of field-based experiences in real classrooms. Thus, instead of learning to integrate technology into hypothetical lessons required as part of a teaching methods class, pre-service teachers develop, implement, and evaluate technology-rich lessons during field-based teaching experiences, with modeling and guidance from mentor teachers and university faculty.

This field-based model is the basis for new undergraduate teacher education experiences at Arizona State University (ASU). Based on the concerns discussed above, the College of Education identified three key components of a model designed to provide pre-service teachers with the skills and experiences required to fully integrate technology into their future classrooms. These components include:

1. Providing pre-service teachers with field-based, situation-specific technology training that they are able to integrate into the initial teaching activities they complete as part of their teaching methodologies experiences. These experiences are the major component of their teacher education program, beginning in their junior year (the first year they are in the teacher education program) and continuing until they are ready for student teaching.
2. Emphasizing the importance of technology integration in pre-service teachers' student teaching experiences by providing ongoing, field-based support to help them utilize technology in the activities they design for their classes, and including technology integration as part of the overall evaluation of their student teaching.
3. Providing College of Education faculty and field-based mentor teachers with training, guidance, and just-in-time assistance to both assist pre-service teachers with integrating appropriate technology into their teaching activities, and to evaluate the effectiveness of the integration activities.

The College of Education at ASU is committed to providing future teachers with the most innovative and effective training possible. This commitment includes the belief that technology needs to be infused into all aspects of teacher preparation and applied in authentic situations. This paper will provide an overview of a field-based model for integrating technology into pre-service teacher education; a model that provides pre-service teachers with opportunities to develop and implement technology-rich instructional activities in authentic teaching situations, and provides these individuals with guidance, support, and critical formative evaluation during their experiences so that they leave ASU with the ability to integrate appropriate technologies in their future professional placements.

The Traditional Technology Training Model

Prior to the Fall of 2000, pre-service teachers at ASU were required to participate in two technology experiences in order to graduate. The first experience was a general studies class that provided them with basic technology skills such as word processing, database and spreadsheet manipulation, and electronic mail and Internet usage. This class is required of all undergraduate students enrolled at ASU. The second experience was a series of courses specific to College of Education students. Each course emphasized different aspects of technology (e.g., technology basics, software integration, the Internet) and provided students with opportunities to develop, apply, and evaluate technology-based instructional materials specifically designed to be used in the classroom. Students completed activities relevant to the use of technology in their specific content areas and were evaluated on both knowledge of educational technology issues and selection and integration of appropriate technology resources.

Problems with the traditional model. Previous educational technology requirements for pre-service teachers at ASU were generally typical of requirements for many other teacher education programs. However, this model exposes problems regarding the relevancy of technology experiences students receive to the tasks and activities they will perform in the classroom. These problems include:

• *lack of integration between teaching methodology experiences and technology integration experiences.* Since the technology classes were taught as a series of three stand-alone modules, faculty had difficulty integrating the skills and experiences students acquire in the class with the experiences they are providing in their teaching methods classes. This tends to lead to a de-emphasis of technology integration into classroom activities once the students begin their initial teaching experiences.

• *lack of emphasis on technology integration in student teaching experiences.* Because the use of technology in teaching was not integrated into the overall teacher education program, there was little emphasis placed on the integration of technology into teaching and learning activities during pre-service teachers' student teaching experiences.

• *lack of training among faculty and field-based mentor teachers with regard to effective integration of technology with educational activities.* Since the required technology components of the teacher education program were primarily designed and delivered by the educational technology faculty, there were few opportunities for other teacher education faculty and mentor teachers to utilize many of the innovative technology tools and resources designed for use in the classroom. Thus, it is not surprising that these individuals failed to demonstrate appropriate uses of technology to the pre-service teachers with whom they were working.

The Field-Based Model

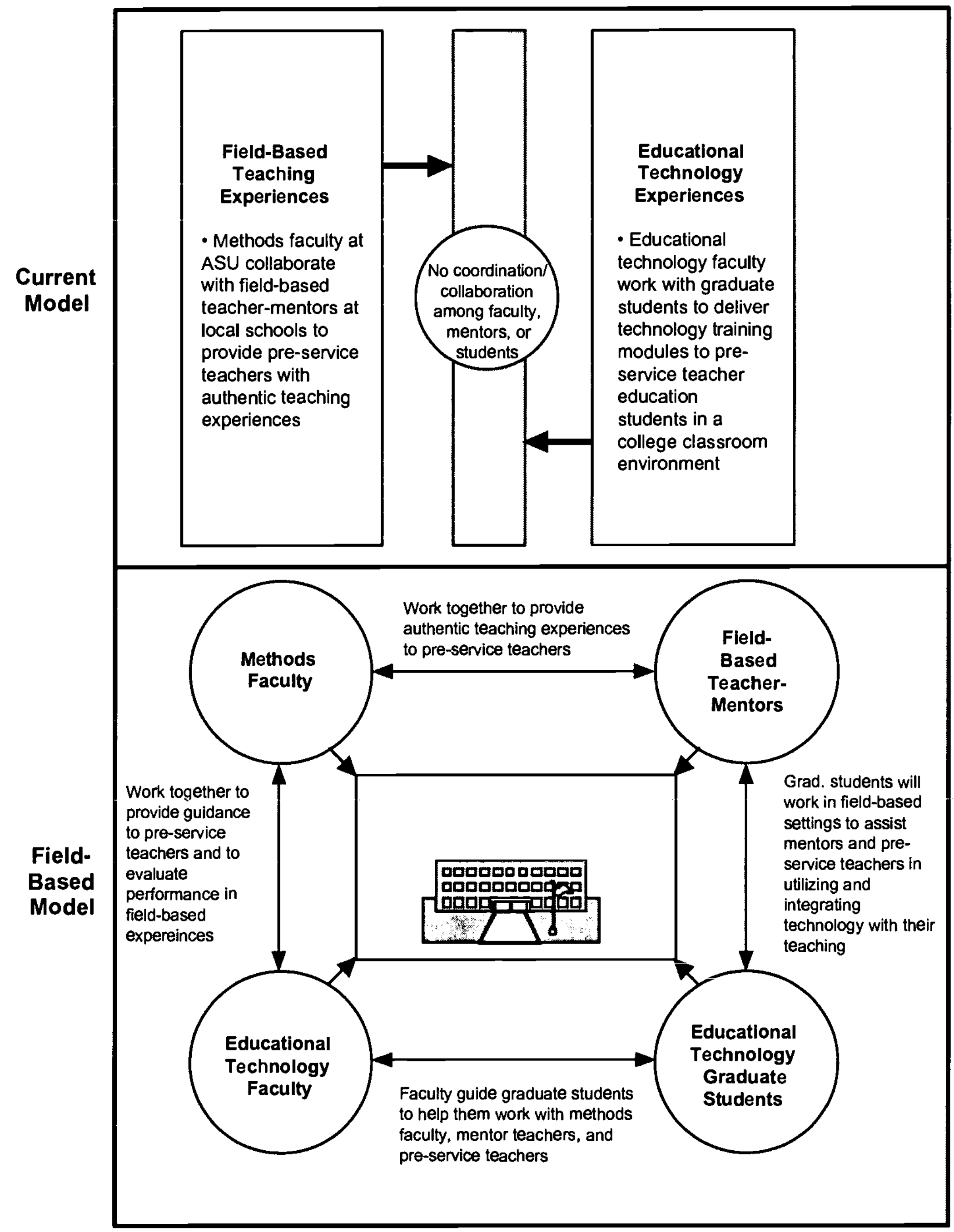
These concerns led to the development of a teacher training model that integrated technology experiences with field-based methods experiences in order to provide students with activities and experiences relevant to the tasks teachers perform in their classrooms. Implementation of this model required new roles for methods faculty, educational technology faculty, field-based mentor teachers, and graduate students (see Figure 1).

New roles for methods faculty and educational technology faculty. In the traditional model, methods faculty worked with field-based mentors to provide hands-on teaching experiences to pre-service teachers in authentic settings. Educational technology faculty, on the other hand, worked with educational technology graduate students to provide limited technology training to pre-service teachers in a less than optimal setting (i.e., a college computer lab). Thus, there was little if any interaction between methods faculty and educational technology faculty, particularly with respect to the types of field-based experiences provided to pre-service teachers. In this new field-based model, methods faculty team with educational technology faculty to develop projects and activities for pre-service teachers which focus on integration of technology into their field-based experiences. Educational technology faculty team-teach with the methods faculty to help pre-service teachers identify and integrate technology resources with activities they are currently completing, and implement and evaluate those resources in authentic teaching situations. Methods faculty and educational technology faculty work together to determine appropriate means for providing students with opportunities to apply technology in their teaching experiences, and collaborate on discussions of effective teaching methods and evaluations of student practice.

New roles for field-based mentor teachers and educational technology graduate students. In the traditional teacher training model, educational technology faculty worked with educational technology graduate students to provide pre-service teachers with minimal educational technology training in a college classroom setting. With the new field-based model, the educational technology graduate students work with field-based mentor-teachers in the local schools. Thus, each mentor-teacher has one to two graduate students with expertise in technology integration and utilization available in their classrooms, providing assistance to the pre-service teacher during the implementation of technology integrated instructional activities. This is the most important aspect of this new role for the educational technology graduate students: they are available to pre-service teachers and mentor-teachers at the point of instruction as opposed to in a classroom on campus. Thus, whenever an issue arises regarding educational technology, these individuals are available to help deal with any problems or provide their expertise. In addition, the educational technology faculty and the methods faculty provide the graduate students in the field with guidance and strategies for assisting pre-service teachers with technology integration activities.

New expectations for pre-service teachers. Through these new roles for key personnel involved in pre-service teacher education, the expectations for the utilization of technology by pre-service teachers have dramatically increased. Through the implementation of this model, pre-service teachers are expected to demonstrate the use of state-of-the-art technology in their teaching, and to understand how this technology can be leveraged to enhance numerous learning activities.

Figure 1. Field-based technology integration model.



Implementing the Model

Providing training and field-based support to pre-service teachers. In order to provide appropriate technology training for pre-service teachers, educational technology and methods faculty collaborated to develop a set of technology competency activities that would serve as a guide for both mentor teachers and pre-service teachers. The competency activities were aligned with the content covered in the field-based methods experiences (or "Blocks") so that the competencies could easily be integrated into the teaching activities pre-service teachers are required to perform as part of their methods experiences. The competencies included for Block I (language arts and social studies), for example, include:

- Drawing and Painting
- Desktop Publishing
- Digital Image Creation and Use
- Database Use and Advanced Searching
- Selection and Use of Computer-Based Educational Materials in SS and LA
- Classroom Management and Technology Integration in SS and LA

The competency guide is used by mentor teachers to provide appropriate activities to pre-service teachers during their field-based internships. In addition, the list of competencies serves as a guide to educational technology faculty and graduate students when determining the types of support pre-service teachers need as they complete required activities. For example, as stated above, one competency area for Block I of the elementary teacher education program is "Classroom Management and Technology Integration in Language Arts and Social Studies." In order to demonstrate this competency, pre-service teachers need to design a classroom-based activity sometime during the semester they are participating in Block I (see Table 1). To assist them with this activity, educational technology faculty and methods faculty present field-based training sessions dealing with effective methods for using technology with social studies and language arts topics. In addition, educational technology graduate students are available in the schools to assist pre-service teachers with designing and implementing their activities with students.

Table 1. Activity/assessment matrix for Block I technology competency.

Competency Area	Activity	Assessment
Classroom Management and Technology Integration in Language Arts and Social Studies • Describe plan for managing student accessibility to computers in the classroom • Design lab-based and classroom-based curriculum activities incorporating appropriate technology	Student will: • Design a classroom-based instructional activity for language arts or social studied incorporating technology. The activity will include: • A description of the activity • A description of the types of technology used in the activity • An educational rationale for using technology in the activity	Management/Technology Integration: ❐ Description of activity ❐ Description of technology used in activity ❐ Rationale for using technology

Providing training and field-based support to mentor teachers and methods faculty. Although many of the methods faculty and field-based mentor-teachers already possess exceptional skills in integrating technology with teaching, there is still the need to provide many of these individuals with additional training regarding effective uses of technology in various teaching domains, as well as available technology resources in those domains. Methods faculty and field-based mentors cannot be expected to possess knowledge of the vast number of resources available to them, and moreover, which of the resources are appropriate for various teaching and learning activities. This is the purpose of our intensive summer institutes. Working in collaboration with the partner schools, these institutes are led by teams of educational technology faculty and methods faculty, and focus on the content areas for each of the methods blocks. For example, instructors responsible for the social studies and language arts methods block participate in workshops that specifically address the technology resources available in those content areas and provide instructors with hands-on opportunities to use the resources and discuss how those resources could be integrated into classroom activities. These institutes serve as opportunities for faculty and mentor teachers to learn about both the strategies for integrating technology into teaching and the vast technology resources available that teachers should be using with their students. With this ongoing training, methods faculty and mentor teachers are able to assist pre-service teachers in making informed decisions regarding effective technology integration during their field-based experiences.

In addition, ongoing support is provided *in the field* to methods faculty and field-based mentor teachers by the educational technology faculty and educational technology graduate students. Educational technology graduate students are continually placed in the schools to assist both pre-service teachers *and* field-based mentor teachers. These students have expertise in both teaching and technology integration; thus, they are able to assist the mentor teachers with activities they would like to attempt with their students, as well as activities the pre-service teachers are planning. This resource and support structure helps methods faculty and field-based mentor-teachers better model effective integration of technology into teaching and learning activities.

Summary

We are currently in the first year of our implementation plan for this new field-based model. During this year, we are implementing this model in three partner schools with 75 elementary education students and 75 mentor teachers. Our goal is to have the model implemented in all 12 of our partner schools (and all 300 of our pre-service elementary education students) by the Spring of 2002. We have already received enthusiastic responses from other teacher education programs at ASU (e.g., Special Education, Secondary Education), and have long-term plans to completely eliminate the stand-alone classroom-based technology classes in favor of the field-based model.

References

Abdal-Haqq, I. (1995). *Infusing technology into preservice teacher education. ERIC digest.* ERIC Document Reproduction Service # ED 389 699.

Brush, T. (1998). Teaching pre-service teachers to use technology in the classroom. *Journal of Technology and Teacher Education, 6*(4), 243-258.

Ely, D. P. (1996, August). *Trends in educational technology 1995. Eric Digest* [Online]. Available: http://ericir.syr.edu/ithome/digests/trendsdig.html.

Loucks-Horsley, S., Hewson, P., Love, N., & Stiles, K. (1997). *Designing Professional Development for Teachers of Science and Mathematics.* National Institute on Science Education.

Schrum, L. (1999). Technology professional development for teachers. *Educational Technology Research and Development, 47*(4), 83-90.

Strudler, N. & Wetzel, K. (1999). Lessons from exemplary colleges of education: Factors affecting technology integration in preservice programs. *Educational Technology Research and Development, 47*(4), 63-81.

Topp, N. W., Mortensen, R., & Grandgenett, N. (1995). Building a technology-using facility to facilitate technology-using teachers. *Journal of Computing in Teacher Education, 11*(3), 11-14.

Willis, J., Thompson, A. & Sadera, W. (1999). Research on technology and teacher education: Current status and future directions. *Educational Technology Research and Development, 47*(4), 29-45.

Models of Technology Diffusion at Public Universities

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Abstract: "Preparing Teachers for the Digital Age: Implementing a Dynamic Model of Pedagogical Change" is funded by a PT3 grant from the U.S. Department of Education. Three public universities in rural Western Pennsylvania are infusing technology into the pre-service core curriculum and several teacher education programs. Together we place 1500 new teachers per year throughout the U.S. and abroad, guaranteeing that technology diffusion here will have significant impact. The obstacles we face are limited support staff, tight budgets, and faculty with little time for training. Appealing topics, incentives, and convenient formats address the lack of time. Incentives buy small technology items that departments cannot afford. The grant helps overcome the limited number of support staff by funding positions and facilitating peer mentoring. To succeed, it is also imperative to gain the buy-in of critical organizations. These strategies are increasing technology integration in teacher education, as intended in the grant.

A PT3 Project: Preparing Teachers for the Digital Age

"Preparing Teachers for the Digital Age: Implementing a Dynamic Model of Pedagogical Change" is a project funded by a $1.7 million PT3 grant (Preparing Tomorrow's Teachers to use Technology) from the U.S. Department of Education to the ADEPTT Consortium (Advancing the Development of Educators in Pennsylvania through Technology Training). The ADEPTT consortium is composed of Indiana University of PA, Clarion University of PA, and Edinboro University of PA—all public universities in rural areas of Western Pennsylvania. The universities provide excellent faculty-student ratios but have limited support staff. Both faculty and non-managerial staff are unionized.

The goal of this grant is to infuse technology into the pre-service teachers core curriculum and several teacher education programs. Technology infusion at these institutions will have a significant impact. Founded as normal schools, they have a tradition of teacher preparation. Together the consortium members graduate some 1500 future teachers per year placed throughout the U.S. and 7 foreign countries. At present, Pennsylvania does not have the demographics to place all of these graduates in state, guaranteeing that many alumni will work across the country. The economic boom of recent years has passed much of this area by, leaving persistent pockets of unemployment, encouraging out-migration, reducing enrollment, and tightening departmental budgets at these state-owned institutions. These recent economic and demographic trends, coupled with the high number of teacher education graduates, mean that many recent graduates must look outside of Pennsylvania for employment. We hope to make our students better prepared to work in all situations, giving them an edge on their competitors.

Three major goals of the PT3 grant are: 1) Instructional Technology will be moved from the periphery to the core of our curriculum. 2) Future teachers will apply and integrate Instructional Technology into the teaching/learning process. 3) Additional faculty, instructional designers, and technical support staff will assist. We aim to help faculty to recognize instructional objectives that can be more readily achieved using technology, to learn enough technical skills to model appropriate uses of technology in teaching, to assign and assess student work that incorporates technology use, and to consolidate these innovations into their syllabi.

In large teacher preparation programs, these goals seem daunting at first. There are many reasons why some college faculty members have been slow to integrate technology into their teaching. Some faculty are exhilarated by the change brought about from integrating technology in their teaching, while others are concerned about how technology impacts their authority, control of students, and their role as teacher (Cuban, 1999). Other reasons include: lack of suitable training, the time it takes to master the required skills (exacerbated by the need for teacher preparation faculty to spend time on the road in student teacher supervision), lack of technical support, lack of incentives, and the lack of hard evidence that technology can make their work move effective (Albaugh, 1997, Freberg, 1995, Olcott, 1999, Oppenheimer, 1997, OTA, 1995, Spotts, 1999). It is clear that getting faculty to use technology remains a challenge (Olsen, 1999).

So how can we succeed in achieving these goals? As we enter the second year of this three-year project, we have tried a variety of approaches and identified what works best at this stage in our educational environment. Five strategies we have been using are 1) classroom mentoring, 2) mini-grants and stipends, 3) innovative training formats, 4) K-12 to university modeling, and 5) gaining buy-in from critical organizations.

Telescoping Stages of Diffusion and Integrating Skills

Classroom mentoring is a multi-step process in which a technology mentor (colleague, student assistant, or technology specialist) first teaches a class while the teacher assists. Then the teacher teaches while the mentor assists. Finally the co-pilot departs, and the teacher can solo, teaching the new or revised unit without assistance. This training model was based on the work of Donald Schoen (1988). It also matches the model of coaching set forth by Podsen and Denmark (2000), where novices and first-year teachers observe and model the experienced teachers' lead as they plan and implement lessons. Structured opportunities to discuss and analyze are provided. The experienced teacher may also coteach a lesson with the novice and then have the novice teach a similar lesson. Coteaching provides guided practice where errors can be corrected before soloing, offers the opportunity to teach parts of a lesson before taking on the whole, and is an excellent device early in the learning process.

We have used classroom mentoring successfully in both the university and the K-12 contexts. For example, at Indiana University of PA and Clarion University of PA, grant faculty, graduate assistants and technology specialists have taught one or more classes within a course, designing them with varying degrees of collaboration from the responsible faculty member. Using this model, a variety of topics has been presented at IUP in many disciplines: PowerPoint for teaching Spanish language lessons in immersion curricula; PowerPoint to support second language writing; web authoring as a portfolio tool for math and art education classes; webquests and technology sandboxes for English and elementary education majors; spreadsheets as grade book and mind tools for introductory technology classes at the College of Education. Similarly, at Clarion, a technology specialist taught hands-on classes, with faculty members following up with an assignment requiring use of the same software. Classroom mentoring has given faculty members the chance to learn or review a technology in the context of their specific discipline and courses, empowering them to teach it themselves later.

At the IUP University School, a laboratory school, grant faculty have taught units integrating technology into the school curriculum. One long-term project has been the teaching of spreadsheets in fifth grade—they have been used not only in the obvious units on budgeting but also in social studies units on states and elections and science units on such topics as weather. Moreover, spreadsheets have been integrated with other software such as Inspiration and PowerPoint to teach organizational and communication skills. Here the master teachers, who have faculty status at IUP, as well as student teachers, observers, and pupils, all have the opportunity to learn and apply technology as an integral part of the school curriculum. Thus, we can address multiple audiences at one time (Adams 2000). Before Spring Semester 2001, we will apply this lesson in a new context, offering workshops for cooperating teachers and preservice teachers together. We hope to foster a collaborative relationship and lay the groundwork for the preservice teachers to use the same technology in their student teaching as they learn alongside inservice teachers in the workshops.

Best of all, this model makes it possible to address multiple stages of technology training and diffusion almost simultaneously. Basic technology training, application of technology to teaching, and integration into the curriculum were conceived in the proposal as separate and sequential and, therefore, were expected to require an extended time frame (Sherry & Billig 2000). But in this model, they can all be addressed in project-based, integrated units like webquests, electronic portfolios, or newsletters. Moreover, project-based learning also addresses the issue of motivation. The audience has a clear idea of a relevant, appealing or needed objective, which gives them a compelling reason to learn the technical skills.

Similarly, the proposal conceptualized the training and teaching process as sequential: Faculty are trained, faculty model for students, faculty give students appropriate assignments, students do assignments, students go forth and use the skills in student teaching. Several parts of the training, modeling and diffusion process can also be addressed at once, however, in the revised model: e.g., faculty training, modeling to preservice teachers, preservice teachers observing inservice teachers, inservice teacher training, and/or preservice teachers using technology in their field experience can be combined. For example, the IUP faculty member in art education ultimately sat down with his students to learn web authoring skills for electronic portfolios, which will enable him to carry on more independently next semester. For a faculty member, the motivation becomes even stronger in this scenario—my students are learning the skills, so I had better learn them, too!

If You Feed Them, They Will Come!

It is an understatement to say that education faculty members at our institutions are extremely busy. Student teacher supervising, professional activities, a teaching load of four courses per semester, large numbers of advisees, and service obligations leave little time for professional development, not to mention for revamping one's entire approach to teaching. How can we motivate faculty members to learn and try technology in their courses? How can we make good use of the very limited time they are available for training?

At Indiana, Edinboro, and Clarion Universities of Pennsylvania, we sweeten the pot with incentives. Mini-grants are offered for technology related projects. Examples of funded projects included digitizing and editing video for use in social studies classes, using digital photography to record recently discovered paintings for use in art education classes, revising English education courses to use technology, purchasing interactive CD's for anatomy and physiology classes, attending an institute on technology in second language learning, adding the Internet and presentation requirements to courses in a variety of fields, and more.

Stipends are also provided for workshops, but they work best if part of the stipend is paid for attendance and the remainder is paid for demonstrating changes in syllabi and teaching. Prizes and coupons for prizes are given for completing mini-workshops. Food helps! Incorporating a meal within a long workshop or teaching circles provides both a much needed break and a chance to interact informally with peers and instructors.

What's in a Name?

Once we capture the attention of faculty with incentives, we offer a variety of training formats, topics and titles. Our formats range from individual consultation to short workshops, immersion workshops, technology sandboxes, and progressive workshops. (In the latter, faculty members earn coupons for each activity as they move among workstations in a lab. They can come for any part of the workshops, from 20 minutes to two hours, and complete as few or as many activities as they want. Coupons are turned in afterward for increasingly attractive prizes.) The format is adjusted to the time of year, with long workshops and immersion experiences offered during summers and breaks, mini-workshops and classroom mentoring during the semester, and stipends and individual consultation at any time. We rarely attract large audiences to any one event—varied schedules and demands on faculty make this unlikely. So it is we who need to be flexible, offering many formats for help and training. The burden is on us to be supportive and proactive, and to follow up with those faculty that do participate in a training event or incentive program.

Workshop content is another important factor. Although our faculty and K-12 teachers do attend generic workshops on individual software programs and their application in teaching, they show a far greater interest in workshops that are project based. For example, workshops on webquests or electronic portfolios are inherently related to teaching, meeting standards, and satisfying NCATE requirements. With NCATE accreditation reviews just completed at Edinboro and starting shortly at IUP, the need for electronic portfolios has struck a chord among teacher preparation faculty. The most effective topics and titles are descriptive and concrete with clear outcomes, such as "Putting Technology in Your Syllabus." Catchy titles that are obviously relevant to schools also help, such as "Technology Sandbox" and "Technology Chalkboard."

At first glance, project-based teaching and learning seem more complex. They often require that multiple skills be taught and learned, which may appear confusing. Nevertheless, this very multiplicity can make them more effective. They inherently go beyond learning one limited skill to the creation of a product that can immediately be used. How many times in an application-by-application training program does the trainer long to teach how the various skills and applications can be integrated? How many times does the trainer actually get the chance to do so? Time often runs out at the end of the session or program, and integration is relegated to an afterthought. One key to success is to teach only basic, foundational concepts for each application or piece of equipment needed in the multi-skill project. Another strategy is to provide a set of generic templates that enable students to create the final product more quickly, but that can be modified and expanded so that students still learn all major aspects of creating the product themselves.

K-12 Models

Thanks to the presence of lab schools at two of our campuses, it is possible to have modeling not only by faculty to preservice teachers but also by inservice teachers to faculty and preservice teachers. Our laboratory school classes encourage such observation. Faculty, students and other teachers merely have to sign up to observe during a particular time slot.

In addition, the three universities have started teaching circles where faculty, inservice teachers and preservice teachers learn from each other about infusing technology into curriculum. Success is being achieved particularly where the local intermediate unit is actively involved, and where the event has both a professional and social dimension (e.g., dinner). The first IUP teaching circle appealed to multiple audiences by featuring a faculty member talking about using technology in early childhood classrooms and a K-12 teacher who spoke about certification as a technology resource person. Following the presentations were question-answer sessions and dinner. The second offered a panel of faculty, teachers and administrators who shared experiences with integrating technology into the curriculum. The catchy, concrete title "Putting Technology in Your Classroom" is the theme of this year's teaching circles.

You Have to Plug in to Be Wired!

In this grant, it has been critical to find the right organizations through which to publicize and demonstrate what we have to offer—to "plug in" to those existing organizations and networks. With the obstacles cited at our institutions, particularly the lack of time and attention for technology professional development, publicity and organization become essential. If faculty time is at a premium, how do we get their attention and prove that our programs and goals are worthwhile?

For example, as mentioned above, Indiana University of PA has experienced considerable success in establishing teaching circles by working with both its ADEPTT partners and the local intermediate unit (ARIN). Nearly 100 participants attended the first two teaching circles jointly sponsored by Indiana University of PA and the Armstrong-Indiana IU. ARIN already has a program of Academic Alliances, where faculty and teachers in the same discipline gather each semester for presentations and dinner. Building on this format, we created an Instructional Technology Academic Alliance. The first two meetings were of more general interest, but our April 2001 meeting will regain a disciplinary focus with an emphasis on the use of technology in teaching art and music. Publicity for the teaching circles is also a joint effort through ARIN, ADEPTT and the IUP PT3 grant, enabling us to reach all potential audiences.

Similarly, on our own campuses, it has been important to gain buy-in by working through established organizations and channels of communication (Durrington 2000). At Edinboro University of PA, which is smaller than IUP, the PT3 faculty and staff are working chiefly with two departments, which simplifies communication and support. They have made a systematic effort to promote services made possible by the grant, which has been effective in bringing faculty into training programs and securing administrative support. They also have a close relationship with their intermediate unit, which facilitates work with nearby districts.

At IUP, it has been a challenge to coordinate with a widely distributed network of grants, departments, and committees that are involved in teacher education or promote instructional technology. Our College of Education and Educational Technology does not house all the teacher preparation programs; many are housed in the specific disciplines scattered across campus. The need to identify and "plug in" to key organizations is even more critical in such a diverse environment. One such organization with which we have worked is the Teacher Education Coordinating Council. This council crosses college boundaries and includes representatives from all disciplines for which teacher certifications are granted at IUP. Getting these faculty involved in our training and incentive programs, keeping them informed, and discovering the values that will most motivate them to appreciate the use of technology in education has been critical. This is an ongoing endeavor that we are still perfecting as we write this paper. Other vital organizations have been the College of Education itself, through which we can identify and contact all needed audiences, and the ADEPTT Center (Advancing the Development of Educators in Pennsylvania through Technology Training, funded by Verizon), which offers K-12 and faculty training that complements PT3.

Reflections and Conclusions

Why do these techniques work best for us? Are there pitfalls that need to be addressed? In classroom mentoring, we must ensure that the teacher neither becomes dependent on the mentor nor stops trying to use technology. First and foremost, the sequence of observing, coteaching, teaching with assistance, and then soloing allows the faculty member to learn and take over gradually. While the mentor is teaching, we make sure that faculty members leave the role of teacher long enough to learn the skills and create some of the products themselves. Most of our mentees have already taken at least one technology workshop, which yields the same result. Further, it is useful to mentor or assist with the classes more than once so that the faculty member receives the benefit of repetition and review. The combination of repetition and co-teaching allows the mentee to assume increasing responsibility for the technology-enhanced unit. Some students can also be mentors (Gonzales et al. 1997; Beisser et al. 1997). Encouraging students to demonstrate their own expertise, since no one knows everything in the fast-changing world of technology, opens the door to another resource available in class. Providing materials, files, lesson plans, and templates gives faculty members a quick start when they are ready to coteach or solo. Finally, it is helpful to supply a safety net of resources and help after the faculty member has started soloing.

As stated, lack of time is a significant obstacle to technology diffusion in our environment. Busy faculty naturally want to know, "Why should I bother?" Thus, buy-in from faculty must be won. The more distributed the technology environment, the more important it is to identify and win over the key organizations that will need to buy into the project. Relevant and appealing topics and demonstrations, incentives and prizes, and convenient formats can also help to gain buy-in and overcome the obstacle of lack of time.

Incentives are especially helpful in our environment because departments and colleges at these public universities have extremely limited budgets. This lack of funds makes it difficult to acquire even small items like scanners and webcams or to travel for professional development. Our incentives help fulfill these needs. The grant has also helped to overcome the extremely limited number of support staff on these campuses, by funding additional positions, by putting student expertise to work, and by facilitating peer mentoring. These strategies are helping us reach our goal of infusing technology in teacher education courses, as intended in the grant.

The ability to telescope the anticipated stages of training and diffusion will be a key factor in reaching our goals within the limited timeframe of the PT3 grant. If we truly had to teach faculty, then have them model technology use for students, next make technology assignments to students, and only then hope to see graduates take the lessons with them into their student teaching and careers, three years would not be an adequate length of time. If we really had to wait for each skill, piece of equipment, or application to be mastered before applying them to teaching or integrating them with each other or into curriculum, time would again be an insurmountable obstacle. The realization that these "stages" can be telescoped is a vital timesaver that will make success feasible.

Our final challenge is to see that technology continues to be infused after the PT3 grant ends. Apart from seeking other grants, what assurances can we offer? We hope that by making faculty comfortable with technology, providing basic skills, and illuminating compelling reasons to use them, we will have changed the faculty sufficiently to carry on when the grant is complete. Their technology foundation will already be established, and the permanent staff will need only to maintain and update this foundation. Even more importantly, the syllabi of record for many teacher preparation courses will be changed as a result of the grant. By coordinating with established organizations that will remain after the grant, we hope to have a continuing influence. Finally, the institutions in the consortium have made a clear commitment to stay in the technology mainstream, which will ensure an environment in which technology plays a prominent role. All of these factors will make it possible for the PT3 grant to have a lasting impact.

References

Adams, E. C. (2000). Transparent Training and Technological Intuition. *T.H.E. Journal*. 27 (9), 115-117.

Albaugh, P. (1997). *The role of skepticism in preparing teachers for the use of technology*. (ERIC Document Reproduction Services, ED 406 339).

Beisser, S. et al. (1997). The Teacher as Learner: An Undergraduate Student and Faculty Mentor Success. http://www.coe.uh.edu/insite/elec_pub/HTML1997/fd_beis.htm.

Cessna, M. A. et al. (2000). The Benefits of Teaching Circles. *NEA Higher Education Advocate,* 17(6), 5-8.

Cuban, L. (1998). High tech schools and low tech teaching. *Journal of Computing in Teachers Education,* Vol. 16, Winter, 6-7.

Durrington, V. A. et al. (2000). Using Social Network Analysis to Examine the Time of Adoption of Computer-Related Services Among Faculty. Journal of Research on Computing in Education, 33 (1), 16-27.

Freberg, L; and others (1995). Faculty attitudes towards distance learning. *Journal on Excellence in College Teaching*, 6(2), 145-159.

Gonzales, C. L. et al. (1997). Faculty from Mars, Technology from Venus: Mentoring is the Link. http://www.coe.uh.edu/insite/elec_pub/HTML1997/fd_gonz.htm.

Hutchings, P. (1996). *Making Teaching Community Property: A Menu for Peer Collaboration and Peer Review.* Washington, D.C.: American Association for Higher Education.

Olcott, D. (1999). Balancing Academic Tradition and Technological Innovation in R1 Institutions. *Syllabus,* Vol. 12, No. 8, April 1999.

Office of Technology Assessment. (1995). *Teachers and technology: Making the connection.* Washington, D.C: Office of Technology Assessment.

Olsen, F. (1999). Faculty wariness of technology remains a challenge, computing survey finds. *Chronicle of Higher Education,* October 29, 1999, Section A, 65.

Oppenheimer, T. (July, 1997). The computer delusion. *Atlantic Monthly*, 35-56.

Podsen, I. J., & Denmark, V. M. (2000). *Coaching and Mentoring First-Year and Student Teachers.* Larchmont, NY: Eye on Education.

Schoen, D. (1988). *Educating the Reflective Practitioner*. San Francisco, CA: Jossey-Bass Publishers.

Sherry, L., & Billig, S. (2000) New Insights on Technology Adoption in Schools. *T.H.E. Journal* 27 (7), 41-46.

Spotts, T. H. (1999). Discriminating factors in faculty use of instructional technology in higher education. *Educational Technology & Society*, 2(4), 1999. http://ifets.ieee.org/periodical/vol_4_99/spotts.html.

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Technology Standards for Preservice Teachers: Where are We Headed?

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Abstract: This presentation is a discussion of the implications for preservice teacher education programs of (a) the new National Educational Technology Standards for Teachers (NETS), (b) the Commitment to Technology indicator within the NCATE 2000 Standards, and (c) the new Colorado Technology Standards for Preservice Teacher Education Students. The standards will be discussed from the national perspective and from the perspective of the responses of one institution to the standards through a Preparing Tomorrow's Teachers to Use Technology (PT3) grant.

The use of technology in K-12 classrooms has received a great deal of positive praise in several recent reports. Technology is presented as a means to improve schools and to raise student achievement. Federal policies and many state policies have lead to an infusion of technology into school classrooms across the country. A National Center for Educational Statistics (2000) study showed that 95% of public schools had Internet access in 1999. Although there has been a major investment in technology for K-12 schools, the actual utilization of this technology has been somewhat disappointing. Although 65% of teachers had Internet access only 20% were using advanced telecommunications in their teaching (NCES, 1997). A study by Persichitte, Tharp, and Caffarella (1997) showed that although the technology is readily available in teacher education programs, only 45% of faculty members regularly use technology during class and only 40% of the students are required to design and deliver instruction incorporating various technologies.

Technology Needs of Preservice Teachers

The National Educational Technology Standards for Teachers (NETS) were created under the direction of the International Society for Technology in Education (2000). There are six standards including (a) Technology Operations and Concepts, (b) Planning and Designing Learning Environments and Experiences, (c) Teaching, Learning, and the Curriculum, (d) Assessment and Evaluation, (e) Productivity and Professional Practice, and (f) Social, Ethical, Legal, and Human Issues. The six standards are presented for various stages in a preservice teacher education student's program as a development process with full proficiency for the first year as a classroom teacher. The developmental profiles are (a) General Preparation Performance Profile, (b) Professional Preparation Performance Profile, (c) Student Teaching/Internship Performance Profile, and (c) First-Year Teaching Performance Profile.

The new National Council for Accreditation of Teacher Education (NCATE) 2000 Unit Standards indicate that technology should be a significant part of the conceptual framework for all teacher education programs. "A conceptual framework(s) establishes the shared vision for a unit's efforts in preparing educators to work in P-12 schools" (p. 3). The Commitment to Technology within the conceptual framework

> . . . reflects the unit's commitment to preparing candidates who are able to use educational technology to help all students learn; it also provides a conceptual understanding of how knowledge, skills, and dispositions related to educational and information technology are integrated throughout the curriculum, instruction, field experiences, clinical practice, assessments, and evaluations. (p. 4)

As teacher education programs undergo NCATE reviews, they are required to show how technology is integrated throughout courses and programs.

The needs reflected above on a national level are indicative of the needs within the State of Colorado. The Colorado Legislature recently passed Senate Bill 99-154, *The Standards-Based Teacher Education Act of 1999.* This act includes a provision that "each candidate for a provisional teacher license shall have and be able to demonstrate . . . the ability to integrate technology into instruction at the grade level for which the teacher expects to be endorsed."

In response to Senate Bill 99-154, the Colorado State Board of Education enacted eight standards for licensing of teacher education candidates. The seventh standard is, "Knowledge of Technology" and is defined as, "The teacher is skilled in technology and is knowledgeable about using technology to support instruction and enhance student learning." The standard requires that the teacher has demonstrated the ability to (a) Apply technology to the delivery of standards-based instruction, (b) Use technology to increase student achievement, (c) Utilize technology to manage and communicate information, (d) Apply technology to data-driven assessments of learning, and (e) Instruct students in basic technology skills. This standard and the five indicators are focused on the effective application and utilization in K-12 classroom settings.

Response by One University

The convergence of these national and state recommendations and requirements provided a window of opportunity at the University of Northern Colorado (UNC) to make technology a central component of the preservice teacher education programs. The availability of support under the U.S. Department of Education Preparing Tomorrow's Teachers to Use Technology (PT3) provided the resources to facilitate the changes.

There are three overarching goals of the UNC PT3 project that will guide the project over the next three years. The goals are as (a) Graduates of the UNC teacher education programs will effectively utilize technology for instruction in their classrooms when employed as full-time teachers, (b) UNC student teachers will effectively utilize technology for instruction in the partner school classrooms, and (c) UNC teacher education faculty members will effectively utilize technology for instruction and model appropriate technology use for the preservice teacher education students.

These three overarching goals will be achieved through five initiatives designed to bring about systemic change within the teacher education programs of the University of Northern Colorado. The five initiatives are (a) Enhance the required educational technology courses for students in the professional teacher education programs, (b) Model appropriate technology use and integrate technology utilization in the general education and content area discipline courses, (c) Model appropriate technology use and integrate technology utilization in the general education and content area discipline courses, (d) Integrate technology use by preservice teacher education students in partner schools, and (e) Build a model for the effective use of technology in preservice teacher education programs. The project has been underway for five months with activities under all five initiatives that over time will change the way technology is used in the preservice teacher education programs.

The need for well prepared, technology proficient teachers who know how to infuse technology into the curriculum has been identified at the national level and also exists at the Colorado level. To effectively utilize technology in the classroom, preservice teacher education students must know both how to operate various technology systems and how to integrate that technology into their classrooms.

References

International Society for Technology in Education. (2000). *National educational technology standards (NETS) and performance indicators for all teachers*. Eugene, OR: Author.

National Center for Educational Statistics. (2000). *Internet access in U.S. public schools and classrooms: 1994–99.* (NCES Publication No. NCES 2000-086) Washington, DC: U.S. Department of Education.

National Center for Education Statistics. (1997). *Advanced telecommunications in U.S. public elementary and secondary schools, fall 1996.* (NCES Publication No. NCES 97-944). Washington, DC: U.S. Department of Education.

National Council for Accreditation of Teacher Education. (2000). *NCATE 2000 Standards.* Washington, DC: Author.

Persichitte, K. A., Tharp, D. D., & Caffarella, E. P. (1997). *The use of technology by schools, colleges, and departments of education 1996.* Washington, DC: American Association of Colleges for Teacher Education.

PT3: Changing the Climate for Technology in an EdSchool

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Abstract: This paper describes the results of efforts to enhance the technology components of the undergraduate teacher education program at Georgia Southern University. Preparing Tomorrows Teachers to Use Technology (PT3) provided incentive to faculty through increased access to hardware and software, faculty support and mentorship by technology proficient teachers, release time to assist in the course and curriculum development process, technology training for pre-service teacher education faculty and demonstration teachers in K-12 schools, and mini-grants to pre-service teacher education faculty to enable significant change to the pre-service curriculum. Results showed that these efforts could increase the quantity and quality of the technology use in pre-service teacher training.

Background

Pre-service teachers will be the teachers of the 21st century. As such, they must develop the necessary technology knowledge and skills to prepare the next generation of students. Pre-service education systems have struggled to keep up with the rapidly changing pace of technology development (Moursund & Bielefeldt, 1999). Willis and Mehlinger (1996) while reviewing the literature on information technology and teacher education found that, "Most pre-service teachers know very little about effective use of technology in education ... the virtually universal conclusion is that teacher education, particularly pre-service, is not preparing educators to work in a technology-enriched classroom" (p. 978).

National, state, and local analyses all come to the same conclusions concerning the use of technology in teacher education (Carlson, et al., 2000). Overall these studies recommend that:

- Technology should be integrated into all courses that pre-service teachers take.
- Institutions of higher learning should identify examples of technology integration for all courses that pre-service teacher take.
- College faculty, that teach pre-service teachers, should model effective uses of technology in their classroom.
- Pre-service teachers need more opportunities to apply Instructional Technology during their field

experiences under qualified classroom supervision.

Research Goal

This paper describes the results of efforts to enhance the technology components of the undergraduate teacher education program at Georgia Southern University. One of several goals of the College's participation in the Preparing Tomorrows Teachers to Use Technology (PT3) grant funded by the U. S. Department of Education was to recommend revisions of the pre-service curriculum and the course content by integrating technology into the learning process. Educators agree that engaging students in learning experiences that are inquiry-based, problem-centered and integrative, enable students to understand concepts much more deeply than mere memorization. PT3 provided incentive to faculty through increased access to hardware and software, faculty support and mentorship by technology proficient teachers, release time to assist in the course and curriculum development process, technology training for pre-service teacher education faculty and demonstration teachers in K-12 schools, and mini-grants to pre-service teacher education faculty to enable significant change to the pre-service curriculum. Additionally, an expectation for technology use and integration was established throughout the college.

Research Design

This study was designed to determine if the PT3 project would increase the infusion of technology in the courses taught in the pre-service teacher-education program. The research design used in this study was both qualitative and quantitative. The qualitative method used was content analysis (Patton, 1990). In this method the researchers identify, code, categorize, and classify the primary patterns in the data. The primary purpose is to simplify the complexity of reality into some manageable classification scheme. Once the content was codified, quantitative analysis was conducted using a pre/post design. The population for this study included all syllabi used for instruction during Fall 1999 and Fall 2000. Course syllabi were analyzed for technology use and integration in Fall 1999, before the project was implemented, and in Fall 2000, after project implementation. First, the number of references made to Instructional Technology in each syllabus was determined. This provided the researchers with a sense of the awareness of technology in each syllabus. Second, the researchers wanted to know how technology was used in the classroom. Each syllabus was carefully analyzed for instances where the use of instructional technology was required or included. Each instance was then classified into one of three categories: teaching, learning, and research. Finally, the researchers wanted to determine the quality of technology integration demonstrated in each syllabus. Using The Apple Classrooms of Tomorrow (ACOT) research findings that the introduction of technology into classrooms can significantly increase the potential for learning, especially when it is used to support collaboration, information access, and the expression and representation of student's thoughts and ideas. ACOT developed a taxonomy of technology integration to clarify those ideas (http://www.apple.com/uk/education/acot/acotresearch.html). These criteria were used to classify each syllabus

Results

As a means of defining the current status of the integration of technology in the instruction of pre-service teachers, course syllabi were analyzed. Copies of course syllabi used for instruction with pre-service teachers were obtained from three departments (Early Childhood Education and Reading (ECER), Middle Grades Education (MGED), and Secondary Education (SCED). Table 1 lists the number of syllabi that were analyzed by department and semester. Twenty-one courses were analyzed both in Fall 1999 and 2000. Only when the exact course (identified by course number) was taught in both semesters was there a matched pair that. There were courses taught in the Fall 1999 that were not taught in the Fall 2000 and visa versa.

Department	Fall 1999	Fall 2000
Early Childhood Education & Reading	12	20
Middle Grades Education	6	5

Secondary Education	7	6
Total	25	31

Table 1: Number of Course Syllabi Analyzed

References to Technology

The number of references made to Instructional Technology is presented in Table 2. There were 121 references made to technology use in the 25 syllabi analyzed during the Fall 1999. After implementing the PT3 project, 298 references were made in 31 syllabi.

Department	Fall, 1999		Fall, 2000	
	N	n	N	n
Early Childhood Education & Reading	33	2.8	152	7.6
Middle Grades Education	14	2.3	53	10.6
Secondary Education	74	10.5	93	15.5
Total	121	4.8	298	9.6

Table 2: References To Instructional Technology in Course Syllabi;
N= total references n= references per course

There was a 59% increase in the number of references made to Instructional Technology after the implementation of the PT3 project. These were not evenly distributed among the three departments. Early Childhood Education and Reading and Middle Grades Education made the greatest gains in terms of total references – an increase of over 70%, while Secondary Education posted a 20% gain. The percentage gains in total references were somewhat misleading, however, because Secondary Education had the most references to technology in the Fall 1999. A modest percentage gain of 20% in total technology references boosted the references per course to a substantial 15.6, while ECER and MGED had lower per course averages.

The Paired-Samples T-Test procedure was used to determine if there were statistical gains for the combined pre-service teacher programs. The result of the t-test, as shown in Table 3, revealed that there was a significant difference between the number of references in the Fall 1999 as compared to references in the Fall 2000 (p= .000).

	Mean Differences	Std. Dev.	Std. Error	t	df.	Sig. (2-tailed)
IT References – Fall, 1999	-6.52	5.94	1.30	-	20	.000
IT References – Fall, 2000				5.035		

Table 3: Paired Samples Test Between IT References during Fall 1999 and Fall 2000

Instructional Technology Use

Using content analysis, each syllabus was analyzed to determine how Instructional Technology was used. Technology use was classified into three categories:

1. **Technology used in teaching –** Applying computers and related technologies to support instruction in the classroom. For example, using technology for planning and delivering instructional units that integrate a variety of software applications and learning tools; and develop technology lessons that reflect grouping and assessment strategies for diverse populations.
2. **Technology used in learning** – Using computer-based technologies such as telecommunications and the Internet to enhance personal and professional productivity. For example, using software application packages to solve problems and assist in decision-making, collect data, manage information, make presentations, and develop an understanding of how technology is used to improve education.
3. **Technology used in research** -Using computer-based technologies such as telecommunications and the Internet for research.

Table 4 reports how technology was used in the Fall 1999 and 2000. Totals differ slightly from those in Table 2 because there were occasions in which references to technology could be counted but the context was insufficient to classification the intended use of the technology. For example, a URL could have been listed in the syllabus but it could not be determined exactly how the URL was to be used. Thus the number of references is greater than the number which was classified. Applying computers and related technology through teaching was the most frequent use of technology, while using technology for research was the least frequent use.

Of the 117 references made to using Instructional Technology in the Fall 1999, seventy-two percent were references to using technology in teaching, eighteen percent were references to using technology in learning and ten percent were references to using technology in research. After the implementation of the PT3 project 273 references to Instructional Technology were made. Sixty-seven percent of the references were made to using Instructional Technology in teaching, twenty-seven percent in learning, and six percent in research.

Department	Categories of Use						Total	
	Teaching		Learning		Research			
	99	00	99	00	99	00	99	00
ECED	19	84	8	27	8	10	35	121
MGED	9	37	4	15	1	0	14	52
SCED	56	62	9	31	3	7	68	100
Total	84	183	21	73	12	17	117	273

Table 4: Technology Used in Pre-Service Training in Fall 1999 and 2000

The use of Instructional Technology both increased and shifted after the implementation of the PT3 project. While the overall use of instructional technology increased from 117 to 273, an increase of 57%, the results of the paired sample t-test revealed that there was a significant differences between the use of technology in teaching (p= .001) and in learning (p=.046) but not for research (p=.526). The use of technology in teaching increased from 84 to 123 (54%) and the use of technology in learning increased from 21 to 73, a seventy-one percent increase. The use of technology for research did not increase significantly but it did increase from 12 to 17, a 29% increase. After the PT3 project was implemented, one can conclude that the use of instructional technology in teaching and in learning increased significantly.

	Mean	N	Std. Dev.	Std. Error Mean
Teaching 1999	3.62	21	5.62	1.23
Teaching 2000	7.90	21	5.89	1.29
Learning 1999	0.86	21	0.91	0.20
Learning 2000	2.57	21	4.12	0.90
Research 1999	0.52	21	0.81	0.18
Research 2000	0.67	21	0.97	0.21

Table 5: Paired Samples Statistics in Fall 1999 and 2000

	Paired Differences Mean	Std. Dev.	Std. Error Mean	T	df	Sig. (2-tailed)
Teaching 1999 Teaching 2000	4.29	5.03	1.10	-3.903	20	.001
Learning 1999 Learning 2000	1.71	3.69	.81	-2.129	20	.046
Research 1999 Research 2000	0.14	1.01	.22	-0.645	20	.526

Table 6: Paired Samples Test between Teaching, Learning, and Research Fall 1999 and 2000

Integration of Technology

Using content analysis, each syllabus was analyzed and assigned a level of technology use according to a criteria adapted from the ACOT Study (http://www.apple.com/uk/education/acot/acotresearch.html). The criteria used were:

Entry	Little or no evidence of use of technology
Adoption	Some evidence of technology being incorporated into the teaching, primarily to teach **about** technology and as a means of delivering traditional instruction.
Adaptation	Evidence of integrating technology into the traditional teaching methods, however, classroom instruction is still primarily traditional.
Appropriation:	Pervasive use of technology. Integration of a variety of types of technology.
Invention:	Evidence that teacher and students are experimenting with new instructional technology. The entire teaching/learning experience is transformed with the use of technology being almost transparent.

Of the 25 syllabi analyzed in the Fall 1999, 92% indicated little evidence of technology use. These were divided into forty-eight percent that showed little of no evidence of technology (e.g. Entry Level) and forty-four percent that showed some evidence of technology being incorporated into teaching (e.g. Adoption Level).
After the implementation of the PT3 project, 31 syllabi were analyzed using the same ACOT criteria. Twenty-one of the syllabi were for the same courses used in the proceeding fall. The remaining ten were different courses.

While twenty-two percent of the syllabi showed little or no evidence of technology use (e.g. Entry) after the implementation of the PT3 project, eighty-eight percent of the syllabi showed evidence of using technology. Thirty-six percent of the syllabi indicated some evidence of technology being incorporated into teaching (Adoption), although most of the technology was used primarily to teach about technology and was used as a means of delivering traditional instruction. Twenty-nine percent of the syllabi were judged to have integrated technology into the traditional teaching method (e.g. Adaptation). Thirteen percent of the syllabi were judged to have pervasive use of technology indicated by the integration of a variety of types of technology (e.g. Appropriation).

ACOT Level	Fall 1999		Fall 2000	
	N	%	N	%
Entry	12	48	7	22
Adoption	11	44	11	36
Adaptation			9	29
Appropriation	2	8	4	13
Invention				
Total	25	100	31	100

Table 7: Changes According to the ACOT Study Criteria

SUMMARY

This study focused on the infusion of Instructional Technology in the pre-service teacher training courses. First, the study examined the number of references made to Instructional Technology in course syllabi before and after the implementation of the PT3 project. There was a fifty-nine percent increase in the number of references made to technology. A paired t-test revealed that this difference was significant (p=000).

The references to instructional technology were further analyzed to determine how technology was designed to be used in each syllabus. Each reference was classified into three categories according to its use of technology. The categories were (1) technology in teaching; (2) technology in learning; and (3) technology in research. Overall, the use of instructional technology in teaching increased fifty-four percent; the use of technology in learning increased seventy-one percent; and the use of technology in research increased twenty-nine percent. A paired samples t-test determined that there was a significant differences between the use of technology in teaching (p=.001) and the use of technology in learning (p=.046); however the differences for the use of technology in research was not significant.

Finally, the study assessed how Instructional Technology was being infused into the pre-service teacher training courses. A careful content analysis of each syllabus was completed and a level of technology integration was determined. The criterion for determining technology integration was derived from the ACOT studies. Before the implementation of the PT3 project, 92% of the syllabi were determined to have little of no evidence of technology integration (e.g. Entry or Adoption). After the PT3 project this percentage dropped to fifty-eight percent. In addition, technology infusion was judged to have improved as indicated by the number of syllabi that demonstrated evidence of tcchnology use: Adaptation-29%; Appropriation-13%. While these results are far from ideal, significant improvement in technology integration was demonstrated is a relatively short period of time.

Conclusions

According to the SEIR*TEC study (1998), pre-service education students often do not know how to integrate various technologies into their teaching. One place to help remedy this problem is in the pre-service teacher training classroom. This PT3 project demonstrated that pre-service teacher training courses could infuse more technology into the course syllabi. By the end of the project there was a 59% increase in the references to technology, a 57% increase in the uses of technology and an overall improvement in the quality of technology infusion in course syllabi.

The PT3 project brought about some measurable improvement in the use of technology, and an awareness of the need for technology infusion in the pre-service teacher training program. This study provides the following observations:

1. This project showed that an organized program with definite goals and a systematic approach could increase the quantity and quality of the technology use in pre-service teacher training.
2. ECER showed greater numerical gains because of a program-wide approach to technology addition to the syllabus. The other programs did not show the great percentage or numerical gains because they were working with smaller numbers of syllabi or started with a higher use of technology.
3. Teaching is by far the largest technology integration activity.
4. Research is not something that is utilized much in pre-service teacher training syllabi. Faculty may consider that as a way to increase technology integration in their courses.

References

Carlson, R. D., Clark, K. F., Hosticka, A., Kostin, M., & Schriver, M. (2000). Infusing technology into the pre-service curriculum: How are we doing?. In D. A. Willis, J. D. Price, J. Willis, J. Willis (Eds.) *Technology and teacher education: Society for Information Technology and Teacher Education (SITE) 2000 Annual* (pp. 1280-1285). Chancellorsville, VA: AACE.

Moursund, D. A. & Bielefeldt, T. (1999*). Will new teachers be prepared to teach in a digital age?* Milken Exchange on Education Technology.

Patton, M. Q. (1990) Qualitative Evaluation and Research Methods. Sage Publication, Inc. Newbury Park, CA

Southeast and Islands Regional Technology in Education Consortium (1998, Janury). *Integration of Technology in Preservice Teacher Education Programs: The SouthEast and Islands Regional Profile.* Instructional Technology Resource Center, College of Education, University of Central Florida: Orlando, FL.

Willis, J. W. & Mehlinger, H. D. (1996). Information technology and teacher education. In J. Sikula, T. J. Buttery, & E. Guyton, (Eds.) *Handbook of Research on Teacher Education* (2nd edition). New York: Simon & Schuster Macmillan, 978-1029.

Working Side by Side: Preservice Teachers & Children Meet at the Computer

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Abstract: This paper describes the effects of an after-school program where preservice teachers and elementary school children play and work together using computer games and other technologies and then complete activities based on those games. The program, based on the 5th Dimension, a project developed at the University of California, San Diego, is designed to give preservice teachers experiences using and evaluating a variety of technologies. It also, of course provides preservice teachers with opportunities to get to know children, learn to interact with them and guide their learning. The enthusiasm of the children often helps sometimes technologically-reticent college students. The paper will describe the project and highlight how this experience can help preservice teachers begin to meet national standards for new teachers.

Introduction

It's 3:00 ... and just as most of the school empties, one classroom comes alive. Two dozen youngsters rush in, anxiously looking for their buddies from St. Bonaventure. The college sophomores and juniors greet the elementary school students, and each buddy team immediately picks up from where they left off a couple of days ago. The partners check to see what they have completed and then decide what activity they will do today. Most choose a computer activity, so they find the right CD, read the activity card to find out what they must accomplish, and then get to work. The software is installed (often it's the fourth grader leading the college student in this effort), directions are read, and play begins. One pair traverses the *Oregon Trail*, while another tries to design products in a *Factory*. Others are taking digital photos for the web site or a *PowerPoint* presentation.

This is an afternoon in the *WOLF Den* an after-school program that is running at East View Elementary School in Olean, NY, as part of the PT[3] (*Preparing Tomorrow's Teachers to Use Technology*, www.pt3.org) project at St. Bonaventure University (SBU). (The wolf is the University mascot, and of much interest to local children.) College students who run the program are just starting courses as elementary education majors. SBU's School of Education Conceptual Framework emphasizes that preservice teachers learn best in realistic and practical settings where theory is developed in context. That belief holds true not only for traditional methods courses, but also for helping preservice teachers learn about using technology to support teaching and learning. We have integrated experiences with technology across the entire undergraduate teacher education program – across all courses and field experiences – rather than situating learning about technology in a single course.

The WOLF Den – Where Outside Learning is Fun – is a local version of the 5[th] Dimension, a mixed activity system of education and play designed to provide a context in which undergraduates have opportunities to connect theory with practice. It also provides contexts for children to master knowledge and skills. The 5[th] Dimension was conceived by Dr. Michael Cole of the University of California, San Diego, and its many varieties are documented in an online Clearinghouse developed by William Blanton at the Appalachian State University (http://129.171.53.1/blantonw/5dClhse/clearingh1.html).

There are several goals for the program. For the children, it provides opportunities to engage in learning-related tasks; it gives them one-to-one attention from adults who engage with them in conversation – on one level about games and activities, but on another level about problem solving; it is a safe, secure environment where the after-school hours can be fun and productive, often providing a haven for children who otherwise go home to empty houses. As with all of our field-based programs, children's learning is most important, but the goals for our preservice teachers drive the design of the program. In the WOLF Den preservice teachers are in a situation where they have to learn software and hardware, where they have to troubleshoot technology problems (printers, disks, cables, system settings, etc.). They have to read cryptic manuals and manage demanding children at the same time.

As a core part of our PT^3 project, the WOLF Den provides an environment where preservice teachers can gain experience using a variety of technologies, where they can interact with children using those technologies, and begin to see the effect on children's learning.

This paper will describe the WOLF Den and the experiences that it provides for preservice teachers. It will look at how experiences in the WOLF Den help preservice teachers begin to meet National Educational Technology Standards for Teachers and INTASC (Interstate New Teacher Assessment and Support Consortium) standards for new teachers. We will report data gathered from the preservice teachers, reactions from the children and ethnographic data collected by observers.

Description of the Program

The WOLF Den is an after-school program that brings college students (whom we call tutors) and elementary school children together in computer-mediated play and learning environment. The central artifact in the WOLF Den is a table-top maze, and the goal for the participants is to complete an activity in each room of the maze. Each maze room points participants to a choice of activities, one of which must be completed before passing through the room. Most activities are computer-based (play a game, create a presentation) or technology related (take digital pictures, make a video), but there are also non-computer activities (board games) that fill the gaps when all of the computers are in use. All activities have task or activity cards at three levels specifying what must be accomplished. (See Figure 1 for a sample activity card.) The beginner level requires players to complete a relatively simple task – play the game at its most basic level, for example. This is important since we have participants as young as seven years old, and they must have success. The good level generally requires more time and effort and a higher level of achievement; and the expert level is really challenging. Each child starts a trip through the maze using a simple token or "cruddy creature" to mark his/her place. One goal (which is extremely motivating for children) is to transform the "cruddy creature" into an "excellent creature" (a fancier, more desirable toy or token) – which requires completion of 11 games at the good or expert level.

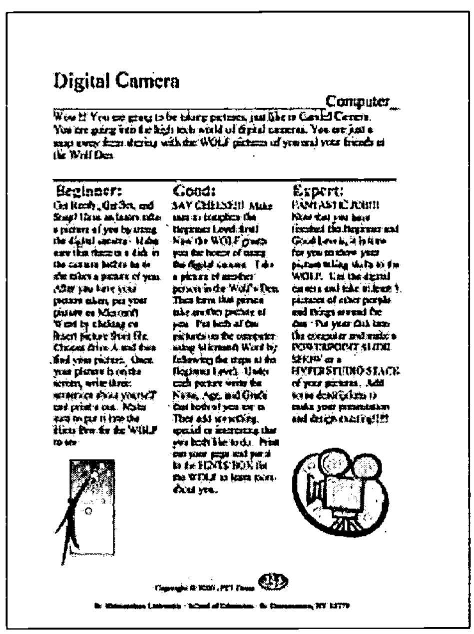
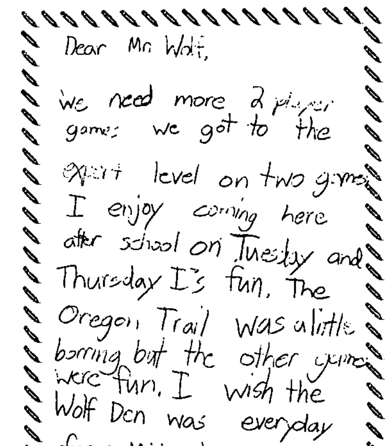


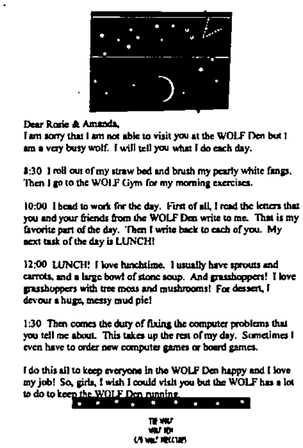
Figure 1: Sample Activity Card

The WOLF Den is run by graduate assistants and a mythic figure – the Wolf, of course. The Wolf is a non-present participant who oversees the program and who is, ostensibly, responsible for upkeep, organization and creation of rules. The children can communicate by mail with the Wolf, expressing pleasure or frustration, or simply conversing or asking questions. Writing to the mythic "overseer" is a characteristic of the 5th Dimension, serving a number of purposes. Since the Wolf oversees the functioning of the program, if a computer is broken or a game will not run, it is the Wolf's responsibility to fix the situation. This deflects blame from the site coordinators and the tutors; it also gives a frustrated child a way to vent – and a few minutes to calm down. A letter is written and a new game is selected. Most often, the problem is solved before the next after-school session. Writing to the Wolf also encourages "backdoor" language development – an underlying goal of the program. Children enjoy writing to the Wolf – and really enjoy getting return letters. See Figure 2 for sample letters to and from the Wolf.


Dear Mr. Wolf,

We need more 2 player games we got to the expert level on two games I enjoy coming here after school on Tuesday and Thursday It's fun. The Oregon Trail was a little boring but the other games were fun. I wish the Wolf Den was everyday

from, Michael


Dear Rosie & Amanda,
I am sorry that I am not able to visit you at the WOLF Den but I am a very busy wolf. I will tell you what I do each day.

8:30 I roll out of my straw bed and brush my pearly white fangs. Then I go to the WOLF Gym for my morning exercises.

10:00 I head to work for the day. First of all, I read the letters that you and your friends from the WOLF Den write to me. That is my favorite part of the day. Then I write back to each of you. My next task of the day is LUNCH!

12:00 LUNCH! I love lunchtime. I usually have sprouts and carrots, and a large bowl of stone soup. And grasshoppers! I love grasshoppers with tree moss and mushrooms! For dessert, I devour a huge, messy mud pie!

1:30 Then comes the duty of fixing the computer problems that you tell me about. This takes up the rest of my day. Sometimes I even have to order new computer games or board games.

I do this all to keep everyone in the WOLF Den happy and I love my job! So, girls, I wish I could visit you but the WOLF has a lot to do to keep the WOLF Den running.

Figure 2: Letters to and from the Wolf

Preparing Tomorrow's Teachers

What are the tutors doing? How does this experience help them learn about technology and push them towards becoming technology-using educators? First, and probably most importantly, they are interacting with the children using technology. Tutors are responsible for organizing activities for their assigned child or children, and they have to be comfortable with the hardware and software. This is no small feat for many of our preservice teachers who still arrive at college with only the most basic experiences involving technology. They can use a word processor and send email, but when faced with installing new software or troubleshooting a printer problem, they blanch. In the WOLF Den they often have to move from computer to computer to find one that will run a finicky computer game. They experience the frustration of computers that will not work; they struggle with software. They learn to deal with that frustration and troubleshoot the problem. More often than not, they get it to work. We think that this is a crucial part of the process of becoming a technology-using educator. The realistic fact is that in most schools there is *not* a computer technician available right when you need help with a piece of software that will not work. Teachers must be comfortable with problems if they are to be successful as they incorporate technology into their classrooms, and we are finding that experience in an informal setting such as the WOLF Den provides opportunities for preservice students to master some of these necessary skills. One tutor struggled with a particular game, and finally turned to the Wolf.

> Today I was not looking forward to going to the tutoring session…This attitude changed, however when R and S arrived. They both seemed excited to be there. This made me look forward to working with them. They also were thrilled because the Wolf had written them back a letter, especially addressed to them. Because R and S have been having computer problems with the Lemming's Paintball, I suggested last week that they write a letter to the Wolf and let it know that there were problems with the game. S wrote the letter notifying the Wolf that that the game would freeze up when they got on an advanced level in the game. R and S were frustrated when once again the computer froze as they progressed through the game. To be honest, I was not surprised that it did because I have a feeling that the lab top causes the problems.

The WOLF Den uses school equipment and a wide variety of educational and edutainment software. The problem of getting software to run on less-than state of the art equipment is one continually faced by teachers.

There are few standards for this software – video requirements, for example are a perennial problem. Novice users are simply stopped dead by a dialogue box stating

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This program requires 256 colors.
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and requiring them to change system settings (and then remember to change them back so that other programs will run correctly). In one interaction, a child was overheard complaining, "I want to play." The tutor replied (with some anxiety), "I am trying to get the game to work…just hold on." Tutors are learning that they not only have to be patient with the computer software, but they must be patient with the children they are working with. Tutors help each other solve problems, engaging in early collegial activity, and learning that, in schools, cooperation is paramount. By the way, children often know how to solve problems, and in settings such as the WOLF Den, the children often teach the college students. That's a learning experience too.

Beyond basic technology-related tasks, tutors have to guide and facilitate interaction between children and computers. For example, in one instance, a tutor and two children were playing *Oregon Trail.* The children were getting too much meat and not enough vegetables (children like to hunt in this program). The tutor attempted to guide them, engaging them in conversation about the need for vegetables to sustain life. She was helping the students with decision-making skills and encouraging them to try different strategies. In fact, she was trying to help them be successful. Tutors help children make decisions, encourage them to try new games, give them positive reinforcement, and intervene during students' conversations when necessary.

Children in the WOLF Den range in age from 7 to 11, and while each room in the maze has activities for children at different ability levels, the range of age and ability levels is an opportunity for preservice teachers to learn how to meet individual needs. One tutor arranged for her two children to use two computers next to each other, while she assisted and played along with each. Such situations mimic what the preservice teachers will face in the classroom, particularly when attempting to teach in new ways: new software, many children, too many questions, impatience with things that don't work *right now.* The support structure of the WOLF Den helps, and preservice teachers are learning to cope, and ultimately to experience success. Tutors also learn that children often know how to do things that they don't. Everyone learns in such an environment.

Over the course of the semester, tutors learn a lot about children. And they learn a lot about the process of learning. It is the serendipitous nature of learning that amazes beginning preservice teachers: you do *not* have to teach everything explicitly. Children will learn when they are in an inviting and challenging environment. When interacting with technology, this can be particularly evident. As one tutor played *Where in the World is Carmen San Diego?* he "saw" a child acquire knowledge as a result of the game. After a couple of rounds, the suspect was again in Zaire, and the child (who had not known where it was earlier in the game) *knew* what the information was referring to and found Zaire immediately on the map. Both child and tutor ended that afternoon with a sense of accomplishment and something learned.

Why will this experience prepare our preservice teachers to use technology? Tutors are using technology in a setting where the focus is fun but learning is occurring. Technology is simply the medium through which tutors interact with children, observe their learning and behaviors, learn to talk with children about problems and problem solving, all while learning to manage the technology itself. They use basic technology skills and develop more advanced ones. They learn persistence and tolerance for ambiguity – one of the known hallmarks of a competent technology user (Harris 1994; Fujieda & Matsurra [no date]; Bailey & Lumley [no date], Dockstader 1999). They begin to see that technology can support teaching and learning.

The tutors start the semester participating in this program because it is a course requirement. Little do they anticipate the powerful effect that they will have on children, nor the effect the relationships they build will have on them. They end the semester humbled about what they have learned – about children, about technology, and about the powerfully difficult profession they have chosen to enter.

> "I was very pleasantly surprised when I was given this opportunity to do this program with this great group of students. I was honestly kind of dreading tutoring a little bit because I felt just sitting down with a student with a book would be so boring and mundane. But this experience has been soooo much better than what I had expected. Not only did I get to have a good time while playing some games, but I also was able to learn how to work with students on a one-to-one basis. Some of the lessons I have learned in this tutoring experience will benefit me for years to come."

Meeting Standards

We are cognizant of the need to provide opportunities for our preservice teachers to develop knowledge and dispositions and to have opportunities to practice behaviors that will allow them to demonstrate that they meet standards for new teachers. We explicit attempt to build those opportunities into our field experiences, connecting preservice teachers with children, environments and experiences where they can begin to master the ISTE Technology Standards for Teachers (NETS·T). SBU also requires that preservice teachers demonstrate mastery of the INTASC (Interstate New Teacher Assessment and Support Consortium) standards for new teachers.

We are in the early stages of aligning our program – courses and field experiences -- with both INTASC and NETS·T standards. Table 1 presents a representative sample of how we see the WOLF Den experiences lining up with NETS·T. (Alignment with INTASC standards is still at a very early stage.) The important aspect of this is that the performances required of the preservice teachers in the WOLF Den are real. They are learning about and using technology not to demonstrate competence in a college course, but to provide children with rewarding, challenging experiences. The children's attendance is voluntary – and there is almost always perfect attendance. That speaks to the tutors' competence.

We are also beginning to examine how participation in the WOLF Den helps children meets the NETS·S (National Educational Technology Standards for Students). Early indications are that children benefit at least as much as the tutors, if not more.

We are extremely encouraged by observations of what tutors are learning. Specifically, it is interesting to note that many of their reflections indicate beginning mastery of knowledge, disposition, and performance indicators for the NETS·T and INTASC standards. One tutor stated, "I have learned the importance of being patient... I have realized not to give them the answers, but challenge them to find the answers. I have learned how much they enjoy the time you spend listening to them." Another tutor's response reflects his ideas of becoming a teacher, "I have learned a lot about what is expected of me as a teacher. I also learned a lot about classroom management and also discipline. I realize the amount of effort and ability that is needed to be a teacher. I have learned I need to continue to learn techniques and teaching strategies."

Finally, in reflecting on his experience in the WOLF Den, one tutor wrote, "I learned that technology is going to be very important in the future of teaching. I feel comfortable using technical equipment and part of the reason why is because of this program."

Experiences that Preservice Teachers Have in the Wolf Den	**Relationship to ISTE NETS.T** **National Educational Technology Standards for Teachers**
They learn to: use a digital camera use a video camera set up laptops and connect peripherals set up hardware install software troubleshoot systems ***use a variety of computer programs*** *All of this must be done in a setting where children are depending on the tutors. This is performance assessment at its best.*	I. Technology Operations and Concepts. *Teachers demonstrate a sound understanding of technology operations and concepts.*
They help children select software or other technology-related activities. They plan how best to accomplish the objectives set forth in the activity cards and keep track (in child's log) of what has been accomplished. They make decisions about how to accomplish goals when software, hardware or other materials are not available or working. While playing games, they guide children's activity and keep them on task: *While one tutor and two children were playing Oregon Trail, the tutor tried to help the children because they were getting too much meat and not enough vegetables...the tutor guided them along with the game ...as well as keeping them on task. She was helping the students with decision-making skills and encouraged them to try different strategies.*	II. Planning and Designing Learning Environments and Experiences: *Teachers plan and design effective learning environments and experiences supported by technology.* Teachers identify, select, and use hardware and software technology resources specially designed for use by PK-12 students to meet specific teaching and learning objectives.

One tutor allows her students to use two computers next to each other to accommodate each student's individual needs. Tutors help children learn to alternate who chooses the game that will be played each day to encourage the students to cooperate.	IV. Assessment and Evaluation: *Teachers apply technology to facilitate a variety of effective assessment and evaluation strategies.* *Teachers identify specific technology applications and resources that maximize student learning, address learner needs, and affirm diversity.*
They reflect on their experiences following each session of the Wolf Den. They must discuss interactions with children and use of technology. Journals are sent via email to course instructors. They contribute to and participate in online discussions about the experiences. Preservice teachers learn to use equipment to keep track of their experiences (digital camera, video, etc.) They help each other when they are learning new games or if they are having a difficult time running a new program.	V. Productivity and Professional Practice. *Teachers use technology to enhance their productivity and professional practice.*
Several of the participating children have special learning needs. Tutors experiment with making accommodations to the program structure to help those children be successful.	VI. Social, Ethical, Legal, and Human Issues: *Teachers understand the social, ethical, legal, and human issues surrounding the use of technology in PK-12 schools and apply understanding in practice.*

Table 1: Experiences in the Wolf Den Aligned with NETS·T Standards

References

Gerald Bailey, G. & Lumley, D. (No date). Technology Planning: A Toolkit for Administrators and School Board Members. [Online]. Available: http://www.netc.org/cdrom/toolkit/html/toolkit.htm#plan (November 28, 2000).

Blanton, W. (No date). 5th Dimension Clearinghouse. [Online]. Available: http://129.171.53.1/blantonw/5dClhse/clearingh1.html [2000, November 26].

Cole, M. (1996). *Cultural psychology: A once and future discipline.* Cambridge, MA: Harvard University Press.

Dockstader, J. (1999). Teachers of the 21st century know the what, why, and how of technology integration. *THE Journal*, 26(6), pp.73+.

Fujieda, M. & Matsuura, H. (No date). Japanese EFL Learners' Attitudes toward CALL. [Online]. Available: http://www.econ.fukushima-u.ac.jp/~matsuura/lla.html (November 28, 2000).

Harris, J. (1994). Teaching Teachers to Use Telecomputing Tools. *The Computing Teacher*,10(1).

Online Discussion as Catalyst for Metacognition by Students and Professors

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Abstract: This session will discuss a variety of online discussion "settings" and present preliminary analyses of discussions in terms of what they tell us about student thinking and professors' responses. We will discuss how the use of online discussion can influence what and how we teach, and how that, in the long run, can affect preservice teachers' development.

Introduction

With the advent of readily available Internet access, online discussions (particularly in the form of live chats) are commonplace for some students. However, for many students, venturing online to discuss course-related issues and content is a completely new experience. Research on the use of online discussion has focused on the effects of online discussions, and the need to develop community in the absence of face-to-face interaction (Ahern 2000; Klemm 1998; Charp 1998) and how to keep discussions going and focused (Ahern 2000; Wolfe 2000). Others have examined how best to prompt and moderate discussions (Scarce 1997; Johnson 1999).

If, as we believe, *teachers teach as they were taught*, and if current preservice teachers have not been taught using technology (which still remains the case), then it is our responsibility to help remediate that situation. We posit that a variety of sustained, positive experiences involving technology in teaching and learning environments during preservice teachers' undergraduate courses will help them see the value of using technology in the classroom. One way that we are doing this is through the use of online discussions to supplement and extend in-class discussions. We are interested in the question of what we can learn about students' thinking as a result of analysis of discussions. We are also analyzing how the use of online discussions affects teaching.

This paper presents a variety of online discussion "models" in terms of what they tell us about student thinking and professors' responses. We will discuss how the use of online discussion can influence what and how we teach, and how that, in the long run, can affect preservice teachers' development.

Implementing Online Discussions: Why and How?

Over the past several semesters, several of us have examined our courses and questioned how technology could be used to support and improve learning, we decided that we would incorporate online discussions in an effort to (1) increase the quality and quantity of student "talk" about course content and related issues, (2) encourage metacognitive reflection about course content, and (3) improve teacher/student communications. Working together and separately, we set up a variety of discussions to meet the needs of several different course structures. We have used several different models and at least two different technology-support structures.

Models for Online Discussions

One approach is to set up a *teacher-led discussion.* Using this model, the professor seeds the discussion on a regular basis; requires students to respond, and encourages them to interact with each other. The advantage of this model is that all students must respond to selected prompts. It can extend or supplement in-class discussion. Because the instructor leads the discussion, students approach the discussion as an obligation or course requirement and their participation has an obligatory tone. This approach is being implemented in one setting where students from a number of sections of the same field-based education course are assigned to small group discussions led by the faculty. The idea is to have students interact around course issues, and to share perspectives gained from different field sites.

Student-led discussions turn the tables, and put the onus on students to start and keep the discussion going. This approach has merits because it requires students to take some ownership of the course material. Each week one or more students are assigned to lead the discussion. This approach is being implemented in an introductory U.S. History course, where the professor hoped to change the classroom dynamic by forcing students to take some responsibility for intellectual leadership in the course.

Open-forum discussions are arguably the most effective if they work, and most closely mimic good face-to-face discussions. This approach is being implemented to connect two groups of preservice students working in two Professional Development Schools. These started as teacher-led discussions, but quickly took on a life of their own as the preservice teachers used the discussions to support their fieldwork experiences. The students want and like professors to engage in the discussions, but this group, at least, exemplifies the real purpose of online discussions.

Observations and Responses

In classroom-based discussion, professors can model higher order thinking, and even when discussions are student-led, professors can mediate the process. As we "listen" to the online discussions (and participate in them), we are struck by the need to help students learn how to ask appropriate questions in order to stimulate discussion. We are aware that students tend to focus on questions at the lower levels of Bloom's taxonomy, and we have learned that we need to model better questioning. On the history discussion, we have found that students who do ask better questions tend to ask counterfactual or "what if" questions.

Using discussions has forced us to think about our teaching in ways that are, ultimately, refreshing. We are forced to think about how we teach, particularly the need to teach *thinking* –disciplinary thinking, certainly, but also general higher order thinking skills. We are finding that online discussions provide opportunities for professors to analyze students' work from a very different perspective.

Student reactions to the discussions vary greatly. Some tend to like the safety of the forum, other find the technology problems overwhelming. Some remain bewildered about the technology, but have taught us that faulty design (even that of the default discussion web in FrontPage) makes a great difference in student's use of a site.

We have found (not surprisingly) that students who do not read textbooks also do not tend to read web sites; and many of those who refuse to participate in class do are not clamoring to be heard online. However, aggressive students cannot dominate in an online environment as they can in face-to-face discussions; quiet students with opinions have equal voice. Moreover, many students acknowledge that they like the opportunity to hear what others have to say. This is particularly true in discussions involving students from more than one class.

Overriding Issues: Usability, Access and Stability

We have been using discussions for several semesters, and each semester new challenges arise. While confident in our abilities to guide discussions and manage the intellectual aspect of the discussions, problems with technology have often proven to be intractable. One semester we used a discussion set up as a newsgroup. Even though more difficult to set up and maintain, it had the advantage that users could attach documents to their comments. We are currently using *FrontPage* to create and manage discussion webs. They are far easier to set up and maintain, but do not allow users to attach files. Every decision is a trade-off.

The major issue on our campus is Internet access. When thc Intcrnet is down, students *cannot* participate. When traffic is so high that access is unbearably slow, they *will not* participate. There have been persistent Internet outages and periods of extreme slowness (for reasonably long times this semester). This has affected both professors and students. For those who are novice users of this type of technology, it has had a definite negative impact. Seasoned users are more tolerant. However, professors can bear only so much disruption of a course; students are not persistent or tolerant. If it doesn't work after a few tries, they give up. End of discussion.

The final word: the technology must support learning, not get in the way.

References

Ahern, T.C. & El-Hindi, A.E. (2000). Improving the instructional congruency of a computer-mediated small group discussion. *Journal of Research on Computing in Education*. 32 (3), pp. 385-401.

Charp, S. (1998). Any Time, Any Place Learning. *THE Journal*. 25 (8), p. 6.

Johnson, D. (1999). Electronic Collaboration: Children's Literature in the Classroom. *Reading Teacher*. 53 (1).

Klemm, W.R. (1998). Eight ways to get students more engaged in online conferences. *THE Journal*. 26 (1), pp. 62-65.

Scarce, Rik. (1997). Using electronic mail discussion groups to enhance students' critical thinking skills. [Online] Available: http://horizon.unc.edu/TS/cases/1997-07a.asp. (November 30, 2000).

Wolfe, J. (2000). Gender, ethnicity, and classroom discourse. Written Communication. 17 (4), pp.491 –520.

Project Learning Links:
A Model for Integrating Technology into Teacher Education

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Abstract: *Learning Links* is a PT^3 project housed at the University of Nevada, Reno. The project uses a four-component model to infuse technology in all aspects of the undergraduate teacher education program: (1) modeling, (2) integrating, (3) enhancing, and (4) applying. University faculty are given technological assistance and incentives to develop the skills and uses for technology within their existing education courses. Data describing the current level of technology use by the faculty, as well as their attitudes toward technology, are shared and the implications for infusing technology in teacher education are discussed.

Introduction

Nevada is not unlike many states when it comes to infusion of technology into the teaching and learning environment of the public schools. Through legislate initiatives and local incentives, strides have been made to improve technology access in classrooms across the state. This initial investment has gone into hardware, software and connectivity in the schools. By the beginning of the 1999-2000 school year, every classroom in the state reportedly had at least one computer connected to the Internet. Many classrooms have more than one computer and many schools have fully equipped computer labs with Internet connections.

What remains a major gap in improving Nevada public schools through technology infusion is the lack of skills and knowledge on the part of teachers to make full use of the technology they find in their schools. According to Mark Knudson, educational technology specialist at the Nevada Department of Education, only an estimated 5% of teachers are at the point of technology infusion in the curriculum. As is commonly the case, the largest gaps and the greatest weaknesses in technology infusion exist in the most rural and low-income pockets of the state

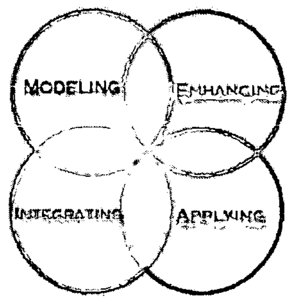
However it is not only in the K-12 system that gaps exist in the infusion of technology in teaching and learning. Similar gaps and weaknesses could be found in the teacher preparation program at the University of Nevada, Reno (UNR), one of only two four-year institutions of higher education in Nevada. The university has programs leading to teacher licensure in the areas of elementary education (grades K-8), secondary education (grades 7-12), and special education. While prospective teachers in each area acquire some technology skills through one required course in technology, few exit the program with the skills, knowledge, and understanding to truly infuse technology into their classrooms.

Like the public school system, a substantial investment has been made to equip university classrooms and labs with state-of-the-art technology. Some faculty have made good use of this technology, but many are still using traditional teaching methodologies to present their course content. Until very recently, the technical support and incentives to enable faculty to redesign their courses using teaching and learning technology have not been readily available.

In the spring of 2000, faculty from the UNR College of Education developed *Project Learning Links* in an attempt to address perceived weaknesses in the infusion of technology into the teacher education curriculum. *Learning Links* is a three-year federally funded PT^3 grant. This paper describes the model used by the project. In addition, university faculty attitudes and expertise in using technology were assessed prior to the onset of project activities. Trends discovered relative to these attitudes and skills are discussed, as are the implications these findings have for the necessary activities of *Learning Links.*

The Learning Links Model

In order to efficiently use learning technology in school classrooms, teachers must think differently about the teaching and learning process, classroom organization, methods of content delivery, and the nature of student projects and assignments. To accomplish this, *Learning Links* makes use of four change components in the UNR teacher preparation program, illustrated in the graphic below.



These four components comprise system-wide changes in the way classes are taught, skills are demonstrated, and performance is assessed. The revision of the UNR Teacher Preparation Program will be a systematic process over the three-year period of *Project Learning Links*.

Modeling

This component of *Learning Links* is an important part of enabling future teachers to understand and appreciate the use of technology in teaching and learning, where learning technology is used both by the instructor and the students. To achieve this change component, university faculty are given opportunities to grow in knowledge and skill in the use of effective teaching and learning technologies. *Learning Links* offers incentives, through a *Faculty Fellows* program, for professors to effectively adapt their courses to model the use of teaching and learning technology.

Faculty in the College of Education apply for the Faculty Fellows program each semester. Applications describe the changes the faculty member proposes to make in a specific course by the infusion of learning technology. Making changes in the way they *model* the use of technology is classified as a Level I application. In the application they specify: (a) what technology will be used; (b) how delivery of course content will be modified; (c) how assignments and projects will use technology; and (d) how the infusion of technology into teaching and learning will be modeled.

From among the applicants, the dean of the college selects five faculty members each semester to participate in a Faculty Learning Fellows program. As Fellows, faculty members are able to get a course release; receive targeted hardware and software upgrades that relate directly to their course modifications; and receive extensive technical support from the *Learning Links* project staff.

Integrating

While it is important for pre-service teacher education students to have learning technology modeled by professors, it is equally important for them to devote part of their learning experience to understanding principles and concepts relating to integrating learning technology into the K-12 curriculum. The change component, *integrating,* emphasizes adapting the curriculum of key education courses. The focus is on providing prospective teachers with the skills and strategies that they will need to modify, organize, and execute technology-rich curricula in their classrooms as they take their places in Nevada's K-12 schools.

The actual changes to the content of key pedagogy or methods courses is accomplished through the *Faculty Fellows* program. Applications from faculty may be designed as Level II, indicating that their course would explicitly teach *integrating* technology into teaching practices. Incentives allow instructors to reconstruct their course content and assignments to incorporate more of an emphasis on methods of technology infusion. Examples of activities incorporated into reconstructed courses could include the following: (1) having students develop and present demonstration lessons that incorporate technology infusion; (2) discussing and demonstrating classroom management differences between a traditional and a technology rich classroom setting; and (3) demonstrating ways to incorporate learning technology into inquiry and problem solving instructional approaches. Learning Links also involves a cadre of Master Teachers nominated by school district superintendents throughout the state for their use of technology in teaching and learning. These teachers give lectures, demonstrations, and conduct discussions within pre-service teacher training courses about their use of technology in the classroom.

Enhancing

The intent of this change component is to move all pre-service teacher education students beyond the basic skills level in using learning technology to a level where they can function more independently in installing, maintaining, trouble-shooting, repairing, and managing classroom, computers, computer labs, and small computer networks. In most schools, teachers have district technology support. However, such support is often spread thin, and in some very rural areas, technology support is almost nonexistent. The so-called digital divide also plays a role in the degree to which technical support is available to teachers. Richer districts and richer schools are often able to find resources to maintain, repair, and manage computers and networks; whereas, in poorer areas, such resources are scarce. The teachers leaving the UNR program should be able to go beyond a "plug-and-play" level of computer expertise. The goal is to have them be as self-sufficient as possible, so that when they are in a school with little or no technology support, they can keep things going and provide stability for other teachers in their schools.

Training for future teachers in this component is accomplished by the re-design of the traditional three-credit course in the use of technology. This course was previously composed of modules presented in a self-paced format. Those modules have been condensed and redesigned, and additional modules were developed. These new modules cover topics such as trouble-shooting, making minor repairs, and management of simple computer telecommunications networks. Delivery of these additional modules of instruction is accomplished through involvement with the lab facilities at Truckee Meadows Community College, a nearby state institution.

Applying

This change component emphasizes field based and on-line experiences between future teachers and students in Nevada's schools. These experiences give prospective teachers practice in using technology effectively with children. One type of experience occurs in practicum courses where future teachers participate in technology rich classrooms in nearby schools. A second type of experience includes interacting with children from rural/remote areas using the *Nevada Bell Student-to-Student Network*. Nevada Bell, the state telephone service provider, has provided dedicated hardware to establish connections by which future teachers may correspond with, provide tutorial assistance for, and share resources with children in rural schools. This gives teachers and students experience with synchronous and asynchronous teaching methods. Video conferencing, chat rooms, bulletin boards, and E-mail also can be used.

Faculty Attitudes and Expertise in Technology Use

Prior to beginning project activities in the fall of 2000, all faculty in the College of Education were asked to respond to a written survey about their use, level of expertise, and attitudes toward technology. The survey was designed to assess the areas of "personal productivity," as well as "modeling", "integrating," and "applying" technology as described in the model above. "Personal productivity" related to faculty skills and uses of technology in their own scholarship, lesson planning, student assessment, and similar activities. The survey used a four-point, Likert-like scale in which the faculty indicated their rating of their skill from (1) "I do not use this technology" to (4) "I use this technology extensively." In addition, faculty were able to check a box indicating, "I would like to learn more about this technology." Attitudes were assessed in a section of the survey in which faculty rated statements about the use of technology from (1) "strongly disagree" to (4) "strongly agree."

Thirty-seven (37) out of 49 teaching faculty in the college completed the survey (75%). Table 1 reports the mean ratings of faculty in their use of technology.

Technology Application	Professional Productivity	Modeling in Classes	Integrating in Curriculum	Applying in Field Experiences

Word processing (Word, WordPerfect, etc.)	4.0	2.44	3.56	1.88
Database (Access, FileMaker, etc.)	2.03	1.34	1.34	1.38
Spreadsheet (Excel, Lotus, etc.)	2.66	1.56	1.44	1.31
Statistical packages (SAS, SPSS, JMP, etc.)	2.34	1.53	1.59	1.34
Internet browsers (Netscape or Explorer)	3.75	2.53	3.19	1.81
Web-page development/personal Web-page	2.16	1.47	1.69	1.34
E-mail	3.75	2.50	3.28	1.87
Scanning and digital camera applications	2.25	1.25	1.22	1.25
Digital image creation and editing	1.47	1.13	1.16	1.19
Audio and video editing	1.28	1.19	1.22	1.16
Research/searching for resources (search engines/electronic databases)	3.34	2.28	2.84	1.18
Presentation software (PowerPoint, Corel, etc.)	2.44	2.28	2.47	1.72
Technology resources in lesson design/related to your discipline	Not asked	2.06	2.28	Not asked
Student assessment	Not asked	1.94	Not asked	Not asked
Course delivery software (WebCT, etc.)	Not asked	1.59	Not asked	Not asked
Electronic discussion groups	Not asked	Not asked	2.03	Not asked
Desktop publishing	Not asked	Not asked	Not asked	1.38

Table 1: Mean response of faculty indicating their level of use of technology in various contexts (1= no use of this technology; 4 = extensive use of this technology)

Overall analysis of the results indicated that faculty rated themselves as using technology more in their personal productivity than in other areas. All faculty responding indicated extensive use of word-processing, e-mail, and Internet browsers. Of those responding, 41% indicated an interest in learning more about Web-page development and about scanning/digital camera applications. There was also interest in learning about audio and video editing (30%). Faculty also indicated that they modeled and integrated technology in their courses and course assignments. The most common applications used in this manner were word processing, e-mail, and Internet exploration, followed by the use of presentation software.

The lowest technology use came in application to field experiences and practica in the public schools. Few faculty used any form of technology in this context. In addition, as reflected in Table 2, few faculty felt that the explicit infusion of technology in these experiences was needed. This is in contrast to the relatively strong acceptance of technology in the areas of personal productivity, modeling, and integrating into the teacher education curriculum.

Attitude Statement	**Mean**
▪ Technology is valuable in my professional productivity	3.72
▪ It is important for me to learn to use new technology	3.78
▪ I am comfortable using technology	3.34
▪ The present trend toward integrating technology into teaching and learning is necessary	3.59
▪ It is important for me to model technology in my courses	3.44
▪ Modeling the use of technology in my courses is important in the development of future	3.38

educators	
▪ I am comfortable modeling technology in my courses	3.03
▪ It is important for me to integrate technology in my courses	3.34
▪ Integrating technology into pre-service education courses is important in the development of future educators	3.19
▪ There are sound educational reasons for integrating technology into my teaching curriculum	3.44
▪ Technology can improve classroom learning	3.41
▪ It is important for me to use technology in field-based experiences	2.65
▪ Using technology in field-based pre-service education courses is important for the development of future educators	2.68

Table 2: Mean attitudes of faculty related to use of technology in teacher education (1= strongly disagree; 4 = strongly agree)

Discussion

The majority of university faculty at this institution have embraced the use of technology to enhance their professional productivity. They have been somewhat slower to infuse technology in their preparation of preservice teachers. The faculty at the University of Nevada, Reno, vary in their attitudes about the importance of technology in teacher education. The value of infusing technology into practicum or field experiences in public schools has yet to be widely recognized. This implies an assumption by faculty that campus-based experiences with technology are sufficient for preservice teachers to be able to infuse technology in their own teaching after graduation.

The results of the survey instrument indicate a willingness on the part of faculty to receive information, support, and tools to make effective use of technology in many aspects of teacher education. However, leadership will be needed in order to influcnce faculty attitudes about the importance of incorporating technology into the preservice teachers' real work with children in school settings.

Although not reflected in the survey, anecdotal comments by faculty may indicate another impediment to the infusion of technology in the teacher education curriculum. Similar to conditions at many other state-supported universities, this faculty has often been asked to accomplish more with fewer resources. Requirements for in-depth performance assessment of students, increased standards for publication and scholarship, and emphasis on teaching effectiveness have not been accompanied by additional faculty, support staff, or material resources. There is hesitation and skepticism about new initiatives. However, there is some enthusiasm about *Learning Links.* This is largely because the project provides three very important and rare commodities: time (through release from teaching one course); support (through the technical assistance of *Learning Links* staff); and resources (by providing targeted software and equipment). It will be interesting to see how faculty skills, use, and attitudes toward technology are influenced by the three-year implementation of *Project Learning Links.*

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The Effects of Web Pages Design Instruction on Computer Self-Efficacy of Preservice Teachers

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Abstract: This study tested the effects of web pages design instruction on improving computer self-efficacy of preservice teachers. A sample of 206 preservice teachers participated in this research. A pretest-posttest design, including a 14-week instruction of web pages design, was conducted. The instruction of web pages design did significantly improve the computer self-efficacy of preservice teachers. Various computer experiences, including weekly computer use, weekly internet use, the use rates of word processing, e-mail, game, presentation software, were significantly related to computer self-efficacy. The use rates of word processing software and computer graph, weekly computer use, and age were the significant predictors of computer self-efficacy. The preservice teachers owning higher perception of computer self-efficacy revealed more confidence on web authoring software self-efficacy. Generally, it is confirmed that most educators' belief to increase the opportunities to learn and use computer may facilitate the confidence and competence of preservice teachers.

Instruction of web pages design has become popular in the courses of preservice teacher preparation due to the establishment of computer network infrastructure and the prevalent www application. However, the learning doesn't guarantee the owning of confidence or efficacy in implementation. According to the report from Milken Exchange on Education Technology and International Society for Technology in Education (1999), the technology related course in preservice teacher preparation did not increase the use of the future teachers in computer application in instruction. There were various issues surrounding that phenomenon including shortage of enough facilities and infrastructure, the inappropriate pace of courses agenda, and lack of the personal confidence and capability of some teachers. The current study aims to explore the last issue mentioned above. Focusing on computer self-efficacy that related to personal belief and perception of capability, this study tested the effects of web pages design instruction on improving computer self-efficacy of preservice teachers in addition to the analysis of correlated factors.

Conceptual Framework

Teachers' self-efficacy has always been a significant concern in teacher education. Research (Bandura, 1997) has verified teachers' self-efficacy would affect their instructional performance and then influence the students' learning outcome. Referring to the increasing application of information technology in education, computer self-efficacy of preservice teacher may affect their future instructional arrangement regarding information technology application. The concept of computer self-efficacy and correlates, therefore, deserve deep exploration.

Derived from Bandura's social cognitive theory (1986), self-efficacy was introduced to computer use and a variety of computer behaviors in late 1980's (Hill, Smith, & Mann, 1987; Gist, Schwoerer, & Rosen, 1989; Murphy, Coover, & Owen, 1989). Most of the early research focused on the identification and measurement of computer self-efficacy. Based on the original concept, computer self-efficacy refers to a judgement of one's capability to use a computer (Compeau and Higgins, 1995, p.192). Compeau and Higgins (1995) defined the dimensions of computer self-efficacy, include magnitude, strength, and generalizability.

However, Marakas, Yi, and Johnson(1998) divided computer self-efficacy into task-specific computer self-efficacy and general computer self-efficacy. Task-specific computer self-efficacy refers to an individual's perception of efficacy in performing specific computer-related tasks within the domain of general computing (p. 128). Conversely, general computer self-efficacy refers to an individual's judgement of efficacy across multiple computer application domain (p.129). And they argue the general computer self-efficacy as a collection of task-specific computer self-efficacy and enactive experiences. A task-specific computer self-efficacy perception is associated with a specific task performance.

According to the literature, the interest in research with regard to the construct of computer self-efficacy has been to understand the mechanisms affecting individual computer behavior or the effect of training related to computer application. At one hand, various research have developed different instruments of measuring computer self-efficacy. On the other hand, the results of empirical research concerning the correlates of computer self-efficacy were equivocal. In terms of computer self-efficacy measurement, most of them are Likert type scale with point range from 3 to 7. Fewer of them use the approach suggested by Bandura (1986) that requires the individual to response dichotomously the questions. Although the computer self-efficacy measurements were almost unidimensional in nature, the strength (confidence), the credibility of the instruments was presented is use (Marakas et al., 1998).

As for the antecedent, consequent, and moderating factors related to computer self-efficacy, Marakas, Yi, and Johnson (1998) have done a thorough review. In the comprehensive analysis about the identified 40 papers, they grouped the various factors and discussed the issues of requiring further exploration. But, none of the cited paper used the preservice teachers as sample. The tasks involved in those studies were few related to the network that prevails in the new era. In the following sections, research factors used in this study will be reviewed.

Computer Self-Efficacy and Web Authoring Software Self-Efficacy

As mentioned above, Marakas, Yi, and Johnson(1998) divided computer self-efficacy into task-specific computer self-efficacy and general computer self-efficacy. They explained general computer self-efficacy is a product of a lifetime of related experiences and closely conform to the definition of computer self-efficacy that is often used in the Information Systems literature, while task-specific computer self-efficacy is associated with a specific task performance. The author accepts the notion of Marakas et al. in this current study. However, the term of computer self-efficacy is still used to indicate the general computer self-efficacy thought as a collection of all computer self-efficacy perception accumulated over time. Further, the term of web authoring software self-efficacy is adopted to refer to the task-specific computer self-efficacy because it more obviously presents the task in this study.

Computer Experiences

Experience is an important factor that affects human learning. Resulted from the interaction between environment and human being, experiences could enforce or decrease our learning. In the past empirical research regarding computer use, computer experience has been the important variable included in studies. In terms to computer self-efficacy, many studies also proved the significant effect of computer experiences (Busch, 1995; Henry & Stone, 1995). Due to the rapid development of information technology, the scopes of hardware, software, and application are quite various. The content of computer experiences needs to be defined more clearly. It could indicate the use period or familiarity degree of specific software, system, or frequency of use. The finding resulted from clear definition of studies would give more value of application. An example as the study of Ertmer, Evenbeck, Cennamo, & Lehman (1994), two kinds of computer experiences, e-mail and word processing, were compared in contrast with computer self- efficacy. They found experience on one system tends to increase computer self-efficacy on other related systems.

Computer Network Anxiety

An extensive amount of research has been done to explore the source and nature of anxieties about the computer-related technology. Generally, computer anxiety indicates the negative attitude toward computer use or the feelings of fear, stress, and worries about interaction with computer. There exists a reciprocal relationship between computer anxiety and computer self-efficacy. That means people with higher computer self-efficacy may experience fewer computer anxiety, while individuals with high computer anxiety could present lower computer self-efficacy and performance in dealing with computer affairs. Empirical studies strongly support for the negative relationship between computer anxiety and computer self-efficacy (Martocchio, 1994; Henderson, Deane, & Ward, 1995). Therefore, George and Camarata (1996) suggested that the increase of the instructor's self-efficacy in use of technology as the pivotal mechanism can eliminate the level of anxiety and then accept the technological change. In this research, computer network related conception was emphasized and added in the measurement.

Web Pages Design

Web pages design involves in a skill set of multiple applications, including text processing, graphic arrangement, and links planning. Due to the web-based instruction getting popular, the teachers have to learn how to post the instructional materials and related information on web site. There are many kinds of HTML web authoring tools available in the market. Some of them are included in the most popular word processing or desktop publishing software packages. The development and trend of context make it desirable and feasible for teachers to learn the simple design and editing of web pages.

Research Questions

Surrounding the computer self-efficacy of preservice teachers, this study attempts to answer the following questions:

1. What are the relationships between computer self-efficacy of preservice teachers and their background variables and computer experiences before instruction?
2. What are the predictors of computer self-efficacy of preservice teachers?
3. Does the web pages design instruction improve computer self-efficacy of preservice teachers?
4. What are the relationships among computer self-efficacy, computer network anxiety, and web authoring software self-efficacy after instruction?
5. Can computer self-efficacy of preservice teachers affect web authoring software self-efficacy?

Method

Sample

In the spring semester of 2000, 206 preservice teachers who registered in five sections of a course related to computer network application in instruction, two hours each section every week, participated in this research. The usable number of sample is 203. The male preservice teachers were 60%, while the female preservice teachers were 40%. The range of age was divided from 25 and under (17.2%), 26-30 (54.3%), 31-35 (21.7%), to 36 and upper (6.4%).

Instruments

The instruments were drawn from previous research and revised. The computer self-efficacy scale consisted of 10 revised the statements that came from the scale of Compeau and Higgins (1995). The 10-item computer network anxiety scale referred many previous computer anxiety scales and added in the conception of network. The statements describe the conditions that may cause anxiety, for example, "use computer network to transfer data to friends". Both the computer self-efficacy scale and the computer network anxiety scale are 5-point Likert type scales.

The web authoring software self-efficacy scale was developed based on the contents of instructional requirement. Ten items are comprised in the measure involving to the various functions of the selected web pages authoring tool and the required integration from the instructor. The subjects were asked to point out the degree of difficulty in the range of 1 to 5.

The reliabilities for computer self-efficacy scale, computer network anxiety scale, and web authoring software self-efficacy scale were alpha = .79, 87, 89, respectively.

The data regarding computer experiences were collected in two parts. The first part included the hours spent in using computers and internet weekly. The second part was 5-point Likert items to ask the subjects to point out the rate of use in specific software activities.

Procedures

Background information, prior computer experiences, computer self-efficacy measure were included in a questionnaire which was completed by each preservice teacher in the first class section. Then a 14-week instruction of web pages design proceeded. Only difference in sections, the same instructor using the identical web authoring software and materials in the same computer lab at the identical pace taught all participants. Computer self-efficacy scale, computer network anxiety scale, and web authoring software self-efficacy measure were processed again at the end.

Design and Data Analysis

A pretest-posttest design was the basic research design. Pearson correlation coefficients were computed for background variables, various computer experiences, and the mean of computer self-efficacy scale in the questionnaires before instruction. To get the answer if the web page instruction improves the computer self-efficacy of preservice teachers, paired *t*-tests were conducted to compare the change between pre-post scores of computer self-efficacy scale. Regression analysis was performed to find the predictors of computer self-efficacy. ANOVA was also conducted to investigate if different levels of subjects in computer self-efficacy measure before the web pages instruction would show significant differences on web authoring software self-efficacy after a semester instruction.

Results

To answer the research questions, statistical results are reported as follows:

Research Question 1:

First, the relationships among background variables and computer self-efficacy before instruction were examined. Background variables included in the correlation analysis with computer self-efficacy were gender, age, computer access, weekly computer use, and weekly internet use. The gender variable showed no significant relationship with computer self-efficacy measure, whereas age appeared significantly negative relationship with computer self-efficacy. Computer access, weekly computer use, and weekly internet use were significantly correlated ($p < .05$) with computer self-efficacy measure.

Relationships among various software use rates and computer self-efficacy were then computed. Significant relationships were found among all of the various software use rates, which include word processing, spreadsheet, presentation, e-mail, computer game, computer graph, and computer self-efficacy, with the exception of the use rate of BBS.

Research Question 2:

Stepwise multiple regression was examined for computer self-efficacy measure before instruction using the significant correlates showed above in background variables and various software use rate. The results represent the impact of ten hypothesized causal variables on computer self-efficacy. According to the results of statistical analysis, the use ratsse of word processing software, weekly computer use, computer graph software use rate, and age were the significant predictors of computer self-efficacy.

Research Question 3:

The comparison of computer self-efficacy measure before and after instruction was conducted to answer this question. The paired *t*-tests indicated that there was a significant difference between the means ($t = -6.679$, $p < .001$). The posttest score (Mean = 38.54, SD = 5.42) was significantly higher than the pretest score (Mean = 35.78, SD = 4.91). Apparently, the instruction of web pages design did significantly improve the computer self-efficacy of preservice teachers.

Research Question 4:

Significant relationships among computer self-efficacy, compute network anxiety, and web authoring software self-efficacy after Instruction were found. The posttest score of computer self-efficacy was reported significantly negative correlation with computer network anxiety score, while positively correlated with the measure of web authoring software self-efficacy.

Research Question 5:

ANOVA was conducted to answer this question. While the subjects were divided into three levels (low, middle, high) based on the score of computer self-efficacy measure before the web pages design instruction, significant difference was found among groups on web authoring software self-efficacy after instruction. A post-hoc analysis using the Scheffe test indicated that the web authoring software self-efficacy (39.64) of the high group was significantly higher than those (36.36) of the middle group.

Discussion

The purpose of this study was to explore the computer self-efficacy of preservice teachers, find out the correlated factors, and test the effects of web pages design instruction on improving computer self-efficacy. From the results, as many previous research findings, age and computer experiences are two important factors in computer self-efficacy. The most notable findings of this study were the indication of computer experiences content. Various software experiences provided more meaning than spending time in terms of computer application research. The frequency of word processing and weekly computer use as the predictors of computer self-efficacy is congruent with the recognition of the experienced trainer. The significant relationships among various software use rates and computer self-efficacy in addition to the effect of web pages design instruction on improving computer self-efficacy confirmed the importance of accumulation of computer experiences. The result is consistent with the finding of Ropp's study (1999) that used the preservice teachers as subjects. One unexpected finding was the use rate of computer graph as the significant predictor of computer self-efficacy. Further research is needed to explain the reason.

The other important result is, based on the conception of Marakas, Yi, and Johnson (1998) who divided computer self-efficacy into task-specific computer self-efficacy and general computer self-efficacy, that general computer self-efficacy indeed enhanced after experiencing more computer learning and using. In terms of specific task related computer self-efficacy, the web authoring software self-efficacy in this study, it showed the effect of general computer self-efficacy. The preservice teachers owning higher perception of computer self-efficacy revealed more confidence on web authoring software self-efficacy. This result proved the finding of the prior research (Ertmer, Evenbeck, Cennamo, & Lehman, 1994) that experience on one system tends to increase computer self-efficacy on other related systems. The result of computer network anxiety negatively related to computer self-efficacy and web authoring software self-efficacy is also consistent with most previous empirical studies.

Generally, this study supports almost all of previous research even with different kind of subjects. It also confirmed most educators' belief that increasing the opportunities to learn and use computer may facilitate the confidence and competence of preservice teachers.

References

Bandura, A. (1986). *Social Foundations of Thought and Action.* Prentice Hall, NJ: Englewood Cliffs.

Bandura, A. (1997). *Self-Efficacy: The Exercise of Control.* New York: Freeman and Company.

Busch, T. (1995). Gender Differences in self-efficacy and attitudes toward computers, *Journal of Educational Computing Research,* 12(2), 147-158.

Compeau, D. R. and Higgins, D. A. (1995). Computer self-efficacy: Development of a measure and initial test, *MIS Quarterly*, 19(2), 189-211.

Ertmer, P. A., Evenbeck, E., Cennamo, K. S., & Lehman, J. D. (1994). Enhancing self-efficacy for computer technologies through the use of positive classroom experiences, *Educational Technology Research and Development,* 42(3), 45-62.

Geroge, G., & Camarata, M. R. (1996). Managing instructor cyberanxiety: The role of self-efficacy in decreasing resistance to change, Educational Technology, July-August, 49-54.

Gist, M. E., Schwoerer, C. & Rosen, B. (1989). Effects of alternative training methods on self-efficacy and Performance in computer software training, *Journal of Applied Psychology, 74*, 884-891.

Henderson, R. D., Deane, F. P., & Ward, M. J. (1995). Occupational differences in computer-related anxiety: Implications for the implementation of a computerized patient management information system, *Behavior and Information Technology,* 14(1), 23-31.

Henry, J. W. & Stone, R. W. (1995). Computer self-efficacy and outcome expectancy: The effects on the end-user's job satisfaction, *Computer Personnel*, 15-34.

Hill, T., Smith, N. D. & Mann, M. F. (1987). Role of efficacy expectations in predicting the decision to use advanced technologies: The case for computers, *Journal of Applied Psychology,* 72(2), 307-313.

Marakas, G. M., Yi, M.Y., & Johnson, R. D. (1998). The multilevel and multifaceted character of computer self-efficacy: Toward clarification of the construct and an integrative framework for research, *Information System Research, 9(2)*, 126-163.

Martocchio, J. J. (1994). Effects of conceptions of ability on anxiety, self-efficacy, and learning in training, *Journal of Applied Psychology,* 79(6), 819-825.

Milken Exchange on Education Technology and International Society for Technology in Education (1999). *Will New Teachers be Prepared to Teach in a Digital Age: A National Survey on Information Technology in Teacher Education.* Oregon: Milken Family Foundation.

Murphy, C.A., Coover, D., & Owen, S. V.(1989). Development and validation of the computer self-efficacy scale, *Educational and Psychological Measurement,* 49, 328-346.

Ropp, M. M. (1999). Exploring individual characteristics associated with learning to use computers in preservice teacher preparation, *Journal of Research on Computing in Education,* 31(4), 402-424.

Change as the Constant in Creating Technology Rich Learning Environments

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As members of the implementation team for the Preparing Tomorrow's Teachers to Use Technology (PT3), we regularly participate in meetings focused on strategies for intensifying and broadening the use of technology rich practices in teacher preparation. Essential to our successful experiences with technology and innovative teacher preparation has been our willingness to participate in ongoing change. This change is multidimensional as it relates to the nature of our classroom, course content, and technological strategies used to accomplish our goals for student learning. If we have come to know anything as a result of our participation with technology integration it is that change is the constant.

Our PT3 grant is based upon the premise that if preservice teachers learn course content in technology rich classrooms, they will be more likely to use technology when they teach in their own classrooms. Those of us passionate about technology integration have sought ways to go beyond the boundaries of the 'classroom' and 'packaged' course content, and a 'particular' set of teaching strategies to an expanded interpretation of the dynamics of the learning environment. We are willing to share our interpretations of the dynamics and processes inherent to the nature of innovative practice. However, the strength of our offerings lie within your interpretation of how you can best generate learning experiences that will be most useful to your own context.

Each semester begins with change and uncertainty as we recognize how the individuality of our learners, uniqueness of our own identities, advancement of knowledge in our chosen fields, and onset of the latest technologies demand new ways of knowing within our learning environments. Freedom and choice are key to promoting exceptional learning opportunities. However, as students exercise their right to choose and their freedom to design more uncertainty emerges. Becoming comfortable with the resulting change and uncertainty stemming from these freedoms and choices takes time for the teacher and the students.

To create a teaching and learning environment that provides students the power to choose, the ability to exercise the freedom to explore knowledge relevant to their lives as future teachers has challenged us. We have critically examined what was needed to transform the traditional college classroom into a learning environment conducive to preparing teachers of future generations without compromising the rigor of a quality education. We called into question the way in which course content was structured, the nature of instructional strategies used to deliver the course material, ways in which we used in/out of class time, and the degree to which our learning experiences truly motivated our preservice teachers to want to learn. The following questions guided us on our journey of change and innovation.

Can course content be predetermined and fixed? We have found that to rely on the most recent edition of a single textbook by a prominent author or a selected list of readings is inadequate. Instead we identify lists of resources and place our students in the role of selecting what is most relevant for constructing knowledge to facilitate a quality learning experience. So by giving students the freedom to choose and the guidance to critically examine and synthesize the available information, instead of relying on a single authored textbook for knowledge, many of our students become authors themselves of authentic projects, presentations, CD ROMs, web pages and papers. As teachers we need to accept the possibilities of what can emerge instead of wanting to control what will develop (Richardson, 1999). Each semester we are surprised by the investment from our students, the quality of the products, and the magnitude of knowledge constructed.

Should the teacher solely deliver instruction? The typical snapshot of the college classroom is the lecture hall filled with students ready to learn from teachers who are the proverbial experts in their field of study. Sharing the responsibility for teaching and learning runs counter to what we have known as instructors and more importantly what students want as learners. To suggest if you give students choices and freedoms that they will automatically embrace these learning experiences without resistance would be remiss. To alter the power structure within a teaching and learning environment requires both parties to learn to share the responsibility and this evolves as each become more comfortable with the changing roles. To make an abrupt change from a teacher directed classroom to a student-centered classroom is not suggested. Keys to a successful transition include taking time to prepare yourself as an instructor and your students for the change, excellent communication throughout the change, and constructing a range of options so that students with different comfort levels have choices that facilitate their learning. As instructors we find ourselves assisting our students by assessing progress, suggesting revisions and engaging conversations to help students negotiates meaning.

One of the features of technology that enables us to alter the learning environment is connectivity. Connectivity allows learners to carry on sustained discourse about their topic and participate in knowledge negotiation with fellow peers and experts. It allows the dimensions of time and space to no longer restrict learning opportunities. Students are able to shape unique projects representing complex authentic tasks, which include knowledge and theory beyond the classroom walls and the capacity of the teacher. The teaching and learning process is not linear. In our classrooms, students share in the construction and dissemination of knowledge. The teacher doesn't stand at the front of the room as the expert but engages in a dialogue with students as a fellow learner.

Technology offers the opportunity for learning experiences to be authentic, which allows students to make meaning of their topics within real world contexts (Perrone, 1998). Technology allows 1) research; 2) interaction with a community of learners such as peers, instructor, professionals and experts; 3) self-assessment; 4) revision; 5) problem-solving; 6) organizing; 7) synthesizing; and these components are repeated cyclically and in a variety of combinations, which demands an extended investment of time from all involved. Technology assists teachers and learners to overcome the barriers and constraints of time and space that a traditional classroom imposes. Table 1 Methods for Integrating Technology demonstrates a few of the ways in which we have integrated technology rich learning experiences into our innovative classrooms.

Table 1: Methods for Integrating Technology

Technologies and Purpose	**Uses**	**Advantages**
• Communication – Class		
o Message Boards	Clarification Share information Collaborate	No time constraints
o Class Listservs		
o E-mail		
• Develop Expanded Learning Community		
o E-mail	Interact with experts and professionals Communicate ideas Validate ideas Research, evaluate information Self-assess and revise	Beyond the classroom Real-time communicatio n Immediate feedback Authentic task
o Chats		
o Desktop videoconferencing		
o WWW for research information and inquiry, investigation for names of professionals and experts		
• Document Discoveries		
o Digital Cameras	Real-life experiences Solving problems	Visual support Immediate Use
o Video Cameras		
• Disseminate Student Learning		
o Create web page	Organize information Synthesize	Multisensory Professional delivery of results
o Video presentation		

All of these conditions help create classrooms full of uncertainty and differentiated learning and from these dynamic learning environments comes unexpected learning. Instead of finding ways to package the products and processes related to infusing technology into teaching and learning we invite you to create your own path and recognize the value in the unknown. We have learned a great deal in our quest to be innovative instructors and know that our future will depend on not whether we change but how we embrace the change.

References

Perrone, V. (1998). Why do we need a pedagogy of understanding? IN M. Stone-Wiske (Ed.), *Teaching for understanding: Linking research with practice* (pp. 13-38). San Francisco: Jossey-Bass.

Richardson, V. (1999). Teacher education and the construction of meaning. In G. Griffin (Ed.), *The education of teachers* (pp.145-166). Chicago: University of Chicago Press.

Maryland Technology Outcomes and Performance Assessments for the Beginning Teacher

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Abstract: A Maryland task force consisting of K-12 teachers and coordinators, higher education faculty, Maryland State Department of Education personnel, and personnel from the Maryland Higher Education Commission convened in April 1998 to begin to develop technology outcomes and performance assessment tasks for beginning teachers in Maryland. The draft outcomes developed by this task force were distributed to schools and professional organizations for feedback. The task force lead by the Maryland State Department of Education applied for and received a PT3 Catalyst Grant to continue its work. Supported by funding from the grant, the outcomes were revised and draft performance assessment tasks were developed for three of the seven outcomes. In fall 2000, these tasks were piloted on several campuses and work began on the assessments for the remaining four outcomes.

In 1995 Maryland's Redesign of Teacher Education became state law. The law instituted a shift from courseware hours to demonstrated knowledge and skills, a move to accountability and assessment. Technology was identified as an area in the redesign that would be assessed. To define Maryland Teacher Technology Outcomes and performance assessment tasks for beginning teachers, a University System of Maryland (USM) task force was convened in April 1998. The task force consisted of K-12 teachers and coordinators, higher education faculty, Maryland State Department of Education (MSDE) personnel, and personnel from the Maryland Higher Education Commission (MHEC). During spring and fall of 1999, the draft outcomes developed by this task force were distributed to schools and professional organizations for feedback.

During this same time, the task force lead by MSDE applied for and received a PT3 Catalyst Grant to continue its work. The purpose of the grant is to ensure that teacher candidates are prepared to use technology in the classroom for teaching and learning. The task force membership was then expanded to create the Maryland Technology Consortium. The consortium included the original task force members, representatives from additional institutions of higher education and additional local schools, more representatives from MHEC and MSDE, and representatives from the Human Resources Research Organization and from the Regional Technology in Education Consortium.

The goals for the Maryland PT3 Catalyst Grant are 1.) curriculum redesign with provision for curriculum and field experiences for teacher candidates, 2.) development of consistent and credible performance standards and assessments to measure technology-related competencies of teacher candidates, and 3.) candidate development of electronic portfolios that incorporate technology-related performance assessments.

Supported by funding from the grant, the outcomes were revised and draft performance assessment tasks were developed for three of the seven outcomes. The revised outcomes address the following areas:

I. Technology Information Access, Evaluation, Processing, and Application,
II. Technology Communication,
III. Legal, Social and Ethical Issues,
IV. Assessment for Administration and Instruction,
V. Integrating Technology into the Curriculum,
VI. Adaptive and Assistive Technologies,
VII. Professional Growth.

As work on the performance assessments progressed, modifications were made to the outcomes.

In development of the performance assessment tasks, each task description was to include form, audience, topic, and purpose. The assessment task materials included the technology outcome, the technology indicators, the knowledge and skills needed to perform the task, a task summary, the scoring tool and criteria for evaluation, benchmarks, instructor notes, and curriculum connections. During year 1 of the grant the performance assessment tasks for outcomes 1, 2, and 7 were developed. The assessment tasks are:

Outcome I Task

Create an electronic research product for an intended audience using a variety of on-line resources related to a specific content question or problem.

Outcome II Task

Use technology effectively and appropriately to communicate information in a selected format. The ultimate goal is to create a web page to publish the information gathered for the selected topic.

Outcome VII Task

Task A. Part 1: Based on established criteria for evaluating quality on-line resources, identify at least three different emerging technologies along with relevant sources of information. Part 2: Select one of the emerging technologies. Write a reflective, analytical paper for your intended audience to describe how and why this technology could impact teaching and learning. *Task B.* Develop a Technology Professional Development Plan for continued growth in the use of technology to promote learning.

In fall 2000, year 2 of the grant, the three performance tasks were piloted on several campuses and work began on the remaining four outcomes. In spring 2001, the results of the pilot will be used to revise the tasks and determine benchmarks for the assessments. The remaining four performance assessment tasks will be completed and the consortium will begin researching and developing a process for creating electronic portfolios.

In fall 2001, year 3 of the grant, the consortium will continue its work on development of a prototype for electronic portfolios. State regional meetings will be convened to disseminate the outcomes and performance assessments and full-scale implementation of the outcomes and assessments within Maryland higher education will begin. Eventually, all teacher candidates will be required to perform at a satisfactory level on the Maryland Technology Performance Outcomes and this will become a part of the state program approval process.

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A Partnership for Training Teachers: Using Technology-Rich Cohorts

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Abstract: Transforming Learning and Teacher Preparation through Technology-Rich Cohorts is a Preparing Tomorrow's Teachers for Technology grant awarded to National-Louis University. This university is working with three school districts, Milwaukee Public Schools, Prince George (Maryland) Public Schools, and Prince William (Virginia) County Schools to train technology-proficient teachers in these districts. NLU recruits the preservice teachers who are provided with laptops and provides the faculty, while the districts provide the classrooms and computer labs. This paper is a description of the program to date working with the Milwaukee Public Schools.

Today's preservice teachers will be teaching the workers of tomorrow. These future workers must be trained for a world where projections indicate that five of the ten fastest growing job areas will be computer related (College Planning Network 1996). However, teacher training institutions are only beginning to respond to the need to train teachers who can provide these technology proficient students. Barksdale (1994), in a survey of graduates of teacher education institutions, found that fifty percent of the graduates felt that their training for technology integration was not adequate. At the same time, the National Council for Accreditation of Teacher Education (NCATE, 1997) estimated that 2 million new teachers will be hired in the next decade, creating an immense opportunity to train these technology-literate teachers. Indeed, to remain accredited through NCATE, teacher training institutions must demonstrate that they are addressing the need to train teachers in the use of technology (NCATE, 1997).

Research by the International Society for Technology in Education (ISTE, 1999) explored several methods of training teachers to use technology. They surveyed teacher education institutions and found that many institutions had separate educational technology courses for their preservice teachers. These institutions did not routinely require the use of technology during field experiences. Yet ISTE research concluded that technology infusion directly into the training program of preservice teachers such as their field experiences, demonstrated more success than separate these separate technology training classes.

In response to the need for training technology-adept teachers, a partnership between National-Louis University and the Milwaukee Public Schools in Wisconsin, Prince George's County Schools in Maryland, and Prince William's County Schools in Virginia was made, with the goal of combining their efforts to train teachers who will be fluent in technology integration for the participating schools districts. Funded by a PT3 grant, *Transforming Learning and Teacher Preparation through Technology-Rich Cohorts*, National-Louis University (NLU) is providing the faculty to teach the courses including technology experts who assist in technology integrated lessons in field experience and is recruiting the preservice teachers who will each be provided with a laptop computer to use. These students become members of a cohort group of students who complete teacher certification in 18 months. The teacher certification program that these NLU students take is the same as the traditional teacher education Master of Teaching program except that these students are required to take a course in educational technology that is an elective course in technology for traditional NLU teacher certification cohorts. This class is integrated into the other teacher education courses, with the content and technology faculty working together to provide optimal relationships between traditional teacher certification content material and the technology requirements of this technology course. The goal of these professors is to offer the technology infusion in such a way that the candidates are provided not only with assignments for their coursework but at the same time, allowed an opportunity to interact with software commonly used in the K-12 schools. This technology infusion is designed to meet those skills identified by ISTE as the National Educational Standards for Teachers. In addition, the assignments for this technology course and the teacher education courses are developed as integrated assignments with a goal of creating artifacts for an electronic portfolio for each student.

The participating school districts are providing the location for the teacher education classes, the necessary computer labs for the training, and the clinical placements in technology-rich classrooms for the preservice teachers. These districts have been selected based on several characteristics. They must be a district with a significant number of minority students who are receiving reduced-price lunches. They must be able to provide networked computer labs and classrooms for training the teacher candidates, as well as district technology personnel who can provide a certain amount of assistance to the grant in setting up the labs for instruction. Finally, to participate, the districts must experience difficulty in filling teacher positions. Each of the three participating districts meets these qualifications.

Many of the teacher education courses are being provided online to the students who will be able to access the courses through their laptop computers. To facilitate this, a Web site is being set up to house the online courses. In addition, this Web site will provide the central location for the maintenance of an online relationship between all the school districts involved in the program, as well as the teacher education faculty and the cooperating teachers. In addition to the interaction among these project participants, the NLU Arts and Sciences faculty who wish to be involved in the project are being invited to become trained to converse online and to provide their expertise to the preservice teachers and their students. This relationship is intended to be a vehicle for exchanging information on pedagogy and on technology infusion, and to provide an avenue for including content area experts who will be available to add their expertise to the online conversations, i.e. suggesting resources to look for when a preservice teacher assigns his or her students a lesson in a relevant subject area.

Program to date

The program began as a pilot program with the Milwaukee Public Schools, starting with a cohort of sixteen students. The original plan was to begin with two cohorts of twenty students, one elementary and one secondary, however, however, due to the date of the awarding of the grant, only the elementary cohort was assembled. A secondary cohort is being planned for and currently being recruited to begin in January. In fact, a third cohort in elementary education is also expected to begin in January, due to the success and publicity of the program to date and the efforts of the NLU recruiters.

The students are currently taking three of the required courses, Introduction to Special Education, Introduction to Technology in Education and Practicum I. These courses are being taught in a face-to-face manner but in an integrated fashion, one evening per week. Faculty meet frequently to plan the integration. An example of the type of integration was one class in which the activity of the technology class was assistive technology while the activity of the special education and practicum classes was the facilitation of inclusion of students with a disability into the regular classroom. All classes met their separate goals on their separate syllabi.

Classes for the second term are being developed. One of these courses will be a foundations course that is being revised to be primarily an online course. This course provides an example of the type of joint assignment between education courses that occurs for this cohort. A goal of the technology integration for this program is that it serve as a tool for the assignments of the teacher education courses, and allow the preservice teacher to interact with software that is used in the K-12 schools. An example of one of the activities that reflects this philosophy is being planned for this foundations course. One of the foundations faculty plans to require that the preservice teachers develop Web pages using two of the software packages provided by the grant that are used in the local public Milwaukee schools. In this project, students will use their laptops to search the Internet for information on educational theoreticians such as Piaget and Vygotsky. Using *Inspiration* and Filemaker *Homepage*, programs used by the Milwaukee Public Schools, the foundations professor is requiring cohort students to develop a concept map of one theoretician that will be turned into a Web page with links to pages describing the concepts of the theory. This project will be used in later courses to develop the preservice teacher's concept of the "ideal" school, a Web-based map of a school that reflects the concepts of their theoretician. As a part of this project, students will be required to create their school's policy handbook. This project became a joint project with the technology course whose instructor required the students to develop a handbook on technology operation and Internet usage. This technology assignment was subsumed to become part of the handbook requirement of the foundations course, the policy handbook of the "ideal" school that the preservice teachers will be developing. The result of these combined projects can be selected by the students as an element of their electronic portfolio.

As part of thc grant program, cooperating teachers are selected who are generally more active in the infusion of technology in their classes. They are frequently invited to attend the cohort class to receive training in the technology usage. Thus far, three of the cooperating teachers have received training in *Hyperstudio* and *Filemaker HomePage*. Future inservices for other teachers is being discussed. In addition, extra meetings of the cohort outside the class time for the purpose of helping them increase their comfort levels with the laptop computers are being held. These meetings also provide an opportunity for the preservice teachers to interact with additional educational software.

Currently, at the time of this paper, the Web site for housing the online courses and the projected discourse is under development. Training for the Arts and Science professors is in the planning stages. The project director is beginning the arrangement of the cohorts in Virginia and Maryland. Publicity for the program continues based on its current success. Indeed, the program attracted the notice of one of the local legislators in Milwaukee who attended the class one night. Expansion of the program and replication for the program with its current success is being planned by National-Louis University.

References

Barksdale, J.M. (1994). New teachers: Unplugged. *Electronic Learning, 15*(5), 39-45.

College Planning Network. (1996, October 16). *Back to school: A guide for adults returning to college*. Seattle, WA: Author. Retrieved October 29, 1999 from the World Wide Web: http://www.collegeplan.org/bcksch/bkschool.htm.

International Society for Technology in Education (1999). *Will new teachers be prepared to teach in a digital age?* Santa Monica, CA: Milkin Family Foundation.

Task Force on Technology and Teacher Education. (1997). *Technology and the new professional teacher: Preparing for the 21st century classroom (1997)*. Washington, DC: National Council for Accreditation of Teacher Education. Retrieved November 29, 1999 from the World Wide Web: http://www.ncate.org/projects/tech/TECH.HTM.

Scoring for Preservice Teachers' Electronic Portfolios: Issues of Feasibility and Reliability

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Abstract: This paper is a progress report on a pilot study investigating the creation of an impartial, reliable, and feasible method of scoring preservice teachers' electronic portfolios. Participants include four preservice teachers participating in intern teaching and the accompanying weekly seminar. Required portfolio components were developed to demonstrate competency of the INTASC standards. A four-point analytic rubric was created, which provides sub-scores on thirteen portfolio components and one overall portfolio score. Two faculty raters were trained and scored each portfolio. Each portfolio was also self-assessed by its creator and peer-assessed by another intern in the class. Quantitative results include interrater reliabilities of faculty, self, and peer ratings. Qualitative outcomes were studied through open-ended surveys of participants and raters.

Introduction

The assessment and evaluation of teachers, at all levels, is an overwhelming task. Typically, teachers are evaluated on the basis of infrequent classroom observations (Acheson & Gall, 1997). But recent definitions of effective teaching include much more than competent lesson delivery. Recent teaching standards, such as those developed by the National Board for Professional Teaching Standards and the Interstate New Teacher Assessment and Support Consortium, emphasize that teaching requires a combination of complex skills. The concern for assessing the entire range of teaching responsibilities was the inspiration for Stanford University's Teacher Assessment Project (Shulman, 1998). The purpose of this project was to develop and test better means of teacher evaluation. Shulman theorized that combining assessment methods into one portfolio could yield a more authentic, valid, and reliable assessment of teachers. Thus, portfolios arose from this investigation as a better, more authentic way to assess teachers than stand alone methods.

Although teacher portfolios are utilized for a multitude of intentions in different contexts, typical goals of teacher portfolios include the following: (1) Improving teaching and learning; (2) assessing teacher effectiveness, (3) evaluating competency for certification purposes; and (4) strengthening educational programs. Research abounds on the benefits of paper teacher portfolios. Such portfolios have been shown to stimulate teachers to reflect on their instructional decisions (Bartley, 1997; Dutt-Doner & Personett, 1997; Dutt, Tallerico, & Kayler, 1997; Mathies and Uphoff, 1992; Richert, 1990; Stahle & Mitchell, 1993). Portfolios have also been found to be helpful in preparing for and participating in job interviews (Berry, Kisch, Ryan, & Uphoff, 1991; Dutt-Doner & Personett, 1997; Mathies and Uphoff, 1992; Winsor & Ellefson, 1995). Several preservice educators have also reported that portfolios allow them to assess teaching abilities not seen in classroom observations (Berg & Curry, 1997; Ekbatani and Pierson, 1997; Johnson, 1999; Stahle & Mitchell, 1993). Finally, it has been suggested that preservice teachers who construct their own portfolios are likely to use portfolios with their own students (Grant & Huebner, 1998; Taylor, 1997).

Several drawbacks exist, however, with using a paper medium for teacher portfolios. Skills such as lesson delivery and communication cannot be assessed with paper and pencil. Additionally, paper portfolios may quickly become huge stacks of paper, which are unmanageable for the reader. Other practical problems such as storage and reproduction can seriously affect the feasibility of paper portfolios.

Many of these disadvantages have been solved with the advent of multimedia electronic portfolios, which allow for easy storage and reproduction of teaching artifacts, and also the inclusion of a variety of media forms (Tancock & Ford, 1996). Electronic portfolios are quickly becoming popular assessment tools for both K-12 students and preservice teachers, and arc showing similar benefits as their paper counterparts. Recent research, for example, has shown that preservice teachers who create electronic portfolios are encouraged to reflect on their teaching (Biddle, 1992; Jackson, 1998; McKinney, 1998).

Although the utilization of electronic portfolios is becoming widespread at both the K-12 and college levels, at the time of this study no research exists concerning attempts to create reliable techniques for scoring these portfolios. If such portfolios are used in high-stakes decision making such as student grading or certification, reliable scoring is essential. This paper will describe one attempt at creating an impartial, feasible, and reliable method for scoring preservice teachers' electronic portfolios.

Portfolio Development

The participants in this study were four preservice teachers participating in their intern teaching experience at Lehigh University during the Fall 2000 semester. Two of the teachers were seeking elementary certification and two were seeking secondary certification. The setting for this study was a weekly intern teaching seminar session, which involved discussion of pertinent instructional topics and instruction in electronic portfolio development.

Student teachers in the seminar were required to create electronic, Web-based portfolios, filled with artifacts from their intern teaching experiences. The portfolio requirement was developed to more authentically assess student teachers, to stimulate self-reflection, to provide a job search tool, and to encourage the interns to use electronic portfolios in their own classrooms. Before the seminar, it was determined that a set of standards was necessary to provide structure to the portfolios and to determine what competencies the interns would demonstrate in their portfolios. Because of their wide acceptance and broad application possibilities, the INTASC standards were chosen to direct the electronic portfolio guidelines. The researchers generated portfolio artifacts that would demonstrate each INTASC standard, and then developed portfolio guidelines based on these artifacts. The following table (Tab. 1) lists the portfolio components and the corresponding INTASC standards.

PORTFOLIO COMPONENT	INTASC STANDARDS TO DEMONSTRATE
1) Introduction, including autobiographical statement, resume, and purpose(s) of the portfolio	N/A
2) Philosophy of teaching and learning	1, 2, 4, 5, 6, 8, 9
3) Interdisciplinary unit	1, 2, 3, 4, 6, 7, 8, 9
4) Classroom management plan	5, 7
5) Family communication plan	6, 7, 10
* 6) Teacher-created student assessment (*May be included in interdisciplinary unit)	1, 2, 3, 4, 7, 8
* 7) Lesson plan designed using student assessment data (*May be included in	1, 2, 3, 4, 7, 8

interdisciplinary unit)	
* 8) Lesson plan that meets the needs of diverse learners with differentiated instruction (*May be included in interdisciplinary unit)	1, 2, 3, 4, 7, 8
* 9) Lesson plan that requires *student* use of technology (*May be included in interdisciplinary unit)	1, 2, 3, 4, 7, 8
10) Video clip of teaching	1, 2, 3, 4, 5, 6
11) Evaluation of teaching resources	1, 2, 4, 6
12) Reflection for each of components #3, 6-10	9
13) Reflection on the entire portfolio Process	9
14) Student self-assessment (rubric)	9
15) Peer-assessment (rubric)	9

Table 1: Portfolio components and their corresponding INTASC standards.

The provision of specific expectations alleviated possible concerns about "what to include," provided the structure necessary for fair scoring, and allowed the interns to concentrate their energy on the quality of their artifacts and the necessary technology-based competency skills.

Based on the guidelines, a rubric to score the portfolios was created by the principal researcher and endorsed by a group of Lehigh University faculty in the Technology-based Teacher Education program. The rubric details all the necessary characteristics for each portfolio component. A score of one (novice), two (developing), three (proficient), or four (exemplary) is possible on each of the thirteen components of the rubric: (1) Organization; (2) Spelling/grammar; (3) Philosophy; (4) Interdisciplinary unit; (5) Classroom management plan; (6) Family communication plan; (7) Teacher-created student assessment; (8) Lesson plan designed using student assessment data; (9) Lesson plan meeting the needs of diverse learners; (10) Lesson plan requiring student use of technology; (11) Video clip of teaching; (12) Evaluation of teaching resources; and (13) Reflection statements. For example, a score of novice (one) on organization is characterized by the following: "No apparent organization was attempted. Large parts are incomplete. Very difficult to follow." A score of exemplary (four) on the same category requires that "organization is clear, well thought out, creative, readily apparent, and easy to navigate. All artifacts are labeled according to required component names." Similar qualifiers are used throughout the rubric in each category. The scoring rubric was introduced and thoroughly explained to the interns in the first seminar meeting. It was emphasized that they should refer to the rubric throughout the portfolio development process.

After the portfolios are submitted, at least three raters will score each of the four portfolios. Additionally, each portfolio will be self-assessed by its creator and peer-assessed by another student in the seminar. Interrater reliabilities will be calculated for the three raters' scores of each portfolio. Percent agreements between rater and self, rater and peer, and peer and self will also be computed. Finally, study participants will complete a survey regarding their perceptions of the electronic portfolio development process, including their general preparedness for creating electronic portfolios, their perceived usefulness, the quality of the rubric, and suggestions for improvements. Study participants will be asked to select true or false to each of several survey statements. They will also be encouraged to provide open-ended responses to questions regarding possible improvements to the development process.

In order to collect data concerning the scoring process, open-ended interviews will be conducted with each of the three portfolio scorers. The interviews will attempt to determine the perceived feasibility, validity, and efficiency of the rubric. Scorers will be asked to provide possible improvements to both the portfolio development and scoring processes.

Initial Findings and Discussion

Initial findings regarding the portfolio development process are emerging. First, similar to findings from other studies (Berry, Kisch, Ryan, & Uphoff, 1991; Dutt-Doner & Personett, 1997), the interns in this study displayed initial anxiety when charged with the creation of electronic portfolios. Questions abounded during many of the weekly seminars; the interns overwhelmingly relied on the instructors to answer their questions, rather than reference the rubric specifications. The instructors had to explicitly remind the students that the rubric described the characteristics necessary for quality artifacts.

The time and energy requircd to complete entire electronic portfolios and simultaneously completing intern teaching was an issue that consistently emerged during the seminar meetings. Three interns agreed that requiring selected components throughout their preservice courses would simplify the final production of their portfolios. One intern, however, expressed that all of his artifacts were of a higher quality because he was now experiencing real classroom life. For example, he shared that although he created an interdisciplinary unit in a previous methods course, he now realized that the unit was not practical and would not be successful in a real classroom. The researchers and the Teacher Education faculty at large intend on investigating the possibility of requiring selected portfolio components throughout the preservice program.

The interns' frustrations with the technological demands of creating an electronic portfolio clearly overshadowed any concerns about time, however. It was intended that the portfolio instruction focus on teaching and learning, but technological trouble-shooting soon dominated class time. The interns unanimously lacked prerequisite technological skills and did not have home access to necessary hardware and software.

It quickly became clear to the instructors that remedial pedagogical strategies were required. Two doctoral students, both well-versed in instructional technology, were enlisted as assistants in the weekly work sessions. The luxury of having four instructors and only four interns allowed for individual tutoring and support. This support was an absolute necessity in this context; it is recognized that such assistance is not available in most situations.

Before the interns could learn about basic web page development, they first had to learn simple computer skills such as organizing, saving, and naming files and folders. Templates including links to each required component were provided to students; the interns were subsequently instructed on basic functions of Dreamweaver. Students had access to the lab computers and Dreamweaver throughout the week. Unfortunately, none of the interns took advantage of this access; the interns all created their documents at home and brought them to class to cut and paste them into the program. As interns made progress on their portfolios, instruction included skills more relevant to portfolio construction: visual concept maps were used to illustrate how portfolios are organized.

One possible way for improving this process is to require interns to acquire an html editor for use at home. Relying solely on campus computers and not having the capability of working at home was a clear shortcoming for the interns. It is also evident that the preservice program must better integrate technological requirements throughout program courses and requirements. This is already being done at the college; the preservice program now includes a mandatory core course, which provides instruction in teaching and learning with technology. This course will include instruction in basic web design; an important prerequisite for electronic portfolio construction. It is hoped by the researchers that future students will therefore be better equipped with the technological skills necessary for creating electronic portfolios.

References

Acheson, K.A., & Gall, M. (1997). *Techniques in the clinical supervision of teachers.* White Plains, NY: Longman.

Bartley, A.W. (1997). Enhancing the validity of portfolio assessment in preservice teacher education. *Alberta Journal of Educational Research, 43* (2-3), 99-113.

Berg, M., & Curry, J. (1997). Portfolios: What can they tell us about student teacher performance? *Social Studies Review, 36* (2), 78-84.

Berry, D.M., Kisch, J.A., Ryan, C.W., & Uphoff, J.K. (1991, April). *The process and product of portfolio construction.* Paper presented at the annual meeting of the American Educational Research Association, Chicago, IL. (ERIC Document Reproduction Service No. ED 332 995)

Biddle, J. (1992). *Portfolio development in teacher education and educational leadership.* Paper presented at the annual meeting of the American Association of Colleges for Teacher Education, San Antonio, TX. (ERIC Document Reproduction Service No. ED 432 732)

Dutt, K.M., Tallerico, M., & Kayler, M.A. (1997). Assessing student teachers: The promise of developmental portfolios. *Teacher Educator, 32,* 201-215.

Dutt-Doner, K.M., & Personett, C. (1997, March). *Using portfolios to assess students in an undergraduate teacher education course: What did the students and instructor learn?* Paper presented at the annual meeting of the American Educational Research Association, Chicago, IL. (ERIC Document Reproduction Service No. ED 410 247)

Ekbatani, G., & Person, H. (1997, March). *Teacher portfolios, vehicles of faculty assessment, reflection, and growth.* Paper presented at the annual meeting of the Teachers of English to Speakers of Other Languages. (ERIC Document Reproduction Service No. ED 409 706)

Grant, G.E., & Huebner, T.A. (1998). The portfolio question: A powerful synthesis of the personal and professional. *Teacher Education Quarterly, 25*(1), 33-43.

Jackson, D. (1998). *Developing student generated computer portfolios.* [24 paragraphs] Available online: http://www.coe.uh.edu/insite/elec_pub/HTML1998/pt_jack.htm

Johnson, J. (1999). Professional teaching portfolios: A catalyst for rethinking teacher education. *Action in Teacher Education, 21*(1), 37-49.

Mathies, B., & Uphoff, J.K. (1992, February). *The use of portfolio development in graduate programs.* Paper presented at the annual meeting of the American Association for Colleges for Teacher Education, San Antonio, TX. (ERIC Document Reproduction Service No. ED 343 855)

McKinney, M. (1998). Preservice teachers' electronic portfolios: Integrating technology, self-assessment, and reflection. *Teacher Education Quarterly, 25*(1), 85-103.

Richert, A.E. (1990). Teaching teachers to reflect: A consideration of programme structure. *Journal of Curriculum Studies, 22*, 509-527.

Stahle, D.E., & Mitchell, J.P. (1993). Portfolio assessment in college methods courses: Practicing what we preach. *Journal of Reading, 36*, 538-452.

Tancock, S.M., & Ford, K.L. (1996). Facilitating reflective thinking: Technology-based portfolios in teacher education. *Journal of Technology and Teacher Education, 4,* 281-295.

Taylor, C.S. (1997). Using portfolios to teach teachers about assessment: How to survive. *Educational Assessment, 4*(2), 123-147.

Winsor, P.J., & Ellefson, B.A. (1995). Professional portfolios in teacher education: An exploration of their value and potential. *Teacher Educator, 31*(1), 68-81.

MU Partnership for Preparing Tomorrow's Teachers to Use Technology SITE 2001 Conference Paper

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Abstract:
This interactive session will describe the processes, instruments, and data collected from the University of Missouri-Columbia College of Education Preparing Tomorrow's Teachers to Use Technology (PT3) grant. The goals of the grant include:

1. Faculty fluency with technology as a tool for themselves as instructors and as a subject for improving and changing methods of teaching in K-12;
2. A revised curriculum for teacher education that utilizes technology (ISTE NETS Standards) and prepares future teachers to be technology users;
3. A set of internet-based tools for enabling the teaching and learning processes of teacher education (ShadowPD netWorkspace);
4. A total quality management (TQM) process modeled after continuous improvement processes that are proving effective in sustaining change and improvements in business and industry.

The expected outcomes of this project are: faculty and teacher education students who are fluent in the use of technology in teaching, high quality experiences with technology in teacher education curriculum, tight integration of the curriculum with exemplary technology-using practices of K12 teachers, and a program that is sustainable, owned by faculty, and continuously improving.

Reference

Jonassen, D.H. (2000). Computers as mindtools for schools: Engaging critical thinking. Upper Saddle River, NJ: Merrill.

Faculty Development Process

Purpose

The ultimate purpose of all PT3 grants is, as the name clearly says, to "prepare tomorrow's teacher's to use technology". What isn't explicitly stated but is clearly implied is that we are preparing them to use technology to enhance learning. The faculty development activities of the MU PT3 grant are all focused on this idea of not just increasing technology use, but increasing a specific type of technology use -- uses that support learning. In this section we briefly describe our activities and results in this grant area for year one, as well as our plan and initial activities for year two.

Participants

The participants for this portion of the grant consist of two cohorts of faculty who teach methods courses in content areas such as educational foundations, literacy, social studies, math, art, music, and early childhood in the undergraduate teacher preparation program. The members of each cohort included approximately 12-14 full-time faculty members teacher educators who participated in the professional development process. In addition to these primary members, other individuals who teach our K-12 pre-service teachers, such as graduate assistants and adjunct instructors, were also included in professional development activities. All cohort members receive a financial incentive as part of their participation in the grant. These incentives varied amongst faculty members but included such things as a one course buy-out, graduate student support, hardware/software, or travel money.

Year One Activities

Our faculty development in year one was based upon an individualized or customized learning philosophy. Most faculty development activities were delivered in a one-on-one setting focusing on that faculty member's current needs and learning goals. We felt this was the best way to create an effective learning environment that would work for these already-busy faculty members.

We developed these activities based upon the results of our first step, a needs assessment. We administered a questionnaire, and conducted individual faculty interviews to identify cohort one's needs. These instruments provided descriptive data that allowed the team to develop individual user profiles, determine needed hardware/software, and identify individual learning needs. The results of these activities showed that faculty in cohort one needed and wanted to work on improved technology skills in addition to then adding effective uses of technology to their pre-service teacher methods courses.

Second, we developed individual profiles for each member of cohort one; these were used to develop individual learning plans. Each faculty member worked with an educational technologist to identify personal learning goals and a plan to attain the goals. Each faculty plan varied in specific learning experiences, but all plans focused on developing fluency with technology and integrating technology tools into methods courses.

Third, to meet the goals of individual faculty, each participant was assigned a technology tutor who was a part-time student hired by the grant to assist faculty in meeting their technology learning goals. The student tutors - Student Wizards Assisting Teaching (SWAT) - were an integral component of the professional development process. The faculty member and the SWAT member met for two to three hours each week of the semester in the faculty member's office for tutoring sessions. Each session was guided by the faculty members learning goals (i.e. learning basic skills, learning to develop web pages etc.). Following the weekly tutoring sessions, the SWAT members met with the educational technologist to review faculty progress, answer SWAT members technical questions, and trouble shoot problems raised by the faculty participant.

Fourth, in addition to individual tutoring sessions, professional development experiences were provided to increase the cohort's awareness of technology uses in a wide variety of areas. We intended these opportunities to build general awareness about technology tools and uses. These activities included luncheon sessions where we demonstrated learning software, field trips to K-12 technology-rich classrooms, a day long seminar where the integration of technology and curriculum was demonstrated, and opportunities to work with K-12 teachers who were interested in helping extend technology use into the public schools.

At the end of the semester of professional development activities, a PT3 co-PI interviewed each cohort member to ascertain their perceptions of the professional development experiences. These results as well as examples of faculty technology activities will be discussed during our interactive session.

Year One Data Sources

Of course, a critical part of this process is assessing and evaluating the effectiveness of the faculty development efforts. To this end, we gathered a variety of data. Data sources included a variety of report forms, reflections, interviews and artifacts. The sources used to create each faculty member's profile included: a) initial interviews that focused on establishing learning goals, curricular revision plans, and technology integration strategies and b) a skills survey that helped to identify current faculty technology skills and uses. Additional data sources included artifacts such as course syllabi from before and after professional development activities and descriptions of course projects. These artifacts were used to identify the extent to which faculty had integrated technology into their courses prior to the professional development semester.

Year Two Activities

Year one of the grant ended in late September. At the writing of this paper, we are just beginning activities with our year two cohort. We are basing our year two activities upon our successes and feedback for areas of improvement for year one. Although we anticipate many things will remain the same (e.g. the support of the SWAT team and individual professional development sessions with faculty and educational technologist), this year we are encouraging faculty to consider adopting uses of technology as "mindtools" or cognitive tools. Mindtools, or cognitive tools, are "computer-based tools and learning environments that have been adapted or developed to function as intellectual partners with the learner in order to engage and facilitate critical thinking and higher-order learning" (Jonassen, 2000). Students cannot use these tools without thinking deeply about the content that they are studying, and second, if they choose to use these tools to help them learn, the tools will facilitate the learning and meaning making processes. Cognitive tools include (but are not necessarily limited to) databases, spreadsheets, semantic networks or concept maps, expert systems, computer conferencing, multimedia/hypermedia construction, and microworld learning environments. The underlying premise is that if our teacher development faculty model the use of technology as mindtools in their methods courses, students will be likely to emulate these uses of tools in their future classrooms -- ultimately the goal of our grant!

As in year one, we began with a needs assessment. Again, we will administer specific questionnaires concerning cohort two's technology skill levels, current hardware and software tools and their hardware and software needs. Based upon year one feedback and observations, we decided we needed an additional type of information from our cohort faculty in order to create an effective faculty development program. Although we still needed to know about their hardware and software skill levels and needs, we also need to understand more about their desired learning outcomes for their students. If we want them to adopt uses of technology to support learning, then we need to understand what types of learning we need to support. To this end we conducted focus groups with cohort faculty. Focus groups consisted of between two and five faculty members from similar discipline areas (e.g. math and science educators). The goals of the focus groups were as follows.

- Determine the desired learning outcomes for the undergraduate teacher development courses in their discipline and grade level areas (e.g. "what outcomes do we want for our middle school social studies pre-service teachers?").
- Determine how technology is currently being used in these classes to support learning (e.g. this course is currently delivered in a web-assisted manner).
- Determine what existing interests faculty have about using technology to support learning (e.g. "I'd like to learn more about how to use spreadsheets to support learning.").

Our analysis of focus group notes resulted in scheduling a suite of five workshops on various ways technology can be used to support learning. The workshops we will offer are:

- Building simulations with spreadsheets
- Representing Complexity by Building Cognitive Flexibility Hypertexts
- Helping Kids Represent What They Know with Concept Maps
- Helping Kids Think Like Experts: Predicting and Decision Making with Expert Systems
- Developing Cases for Case-Based Instruction

At this writing we are in the process of scheduling these workshops. All workshops will be hands on ; faculty will work at a computer to both learn new software, and more importantly, the pedagogical bases for using the software to support learning. Workshops will be open to our cohort faculty, graduate teaching assistants in the teacher development program, K-12 teachers who partner with our faculty, and other interested faculty from the college of education. Our student SWAT team members will also attend and we will conduct follow-up sessions with them on these uses of this software so they can effectively support faculty after the workshops.

Total Quality Management Process

Purpose

TQM dictates that there be ample feedback within the areas of the PT3 grant and the Teacher Development Program (TDP) to determine the advancement of the purpose of the TQM project, and to inform the process for adjustment and achievement purposes. The evaluation for the MU PT3 grant will focus on the following critical control points as feedback and research items as suggested by the Malcolm Baldridge Standards for Total Quality Management for Education. This will ensure that technology is integrated in the TDP, that TDP students will meet ISTE Standards, and that technology integration will be sustained in the TDP.

1. Supporting the annual revisit of the goals of each area of the grant, including all the appropriate sub-areas.
2. Coordinating the collection of data where possible.
3. Identifying data collection points.
4. Releasing data findings appropriately to inform related critical control points.
5. Improvement of Communication within the Grant and between the Grant and TDP.

Data Collection

Data collection is identified as Phase Markers according to the structure of the MU Teacher Development Program (TDP) and aligned with ISTE NETS Standards. Each area represents Entry Level data collection and Exit Level data collection from our students.

Students Entry Level

1. Technology Self Assessment /Attitude & Importance Survey. This survey would be given at the beginning of each Phase and may be revised for the different Phase levels according to feedback and ISTE Standards. Technology skills would include: email, internet browsing/searching, word processing, digital images (scanning), audio editing, web authoring, multimedia presentation software, database, spread sheet, desktop publishing, computer file management, and troubleshooting.
2. Technology Performance Assessment

3. Course Reflection - Topics would include: Reflection as an Independent Learner and Reflection concerning using asynchronous learning methods.
4. Initial Student Feedback Interview

Students Exit Level

1. Classroom Integration Evaluation: Student Level of Use Survey - Students identify alignment of Syllabus Review with technology integration. Purpose to get feedback from students concerning the integrated activities in their coursework. Specific questions can be added to the current feedback surveys used by individual instructors if available.
2. Portfolio Evaluation for Technology Elements. What technology elements are there, and what are the quality of student experiences?
3. Student Interview Feedback

Student Critical Control Points

Phase One	Phase Two	Phase Three	Phase Four
Technology Self Assessment	Technology Self Assessment	Technology Self Assessment	General Integration Feedback CAPS
Phase One Technology Performance Assessment	Phase Two Technology Performance Assessment		Attitude Level of Use and Importance Survey
Feedback Assessment from ED101 Technology Skills for Teachers	Feedback Assessment from ED201 Technology Skills for Teachers	Certification Portfolio Evaluation	
Student Feedback Interview	Student Feedback Interview	Student Feedback Interview	
Flashlight Surveys by Methods Instructors	Flashlight Surveys by Methods Instructors	Flashlight Surveys by Methods Instructors	

Grant Area Critical Control Points

Learning Communities	<u>Mentor Teachers</u>: 1) Attitude, Level of Use & Importance Survey <u>Field Experience Site Evaluations</u>: 1) Technology Availability Survey		
Prism	<u>Instructors & Faculty Cohort 1</u>: 1. Syllabus Technology Integration Identification 2. Attitude Level of Use and Importance Survey 3. Classroom Interviews 4. Focus Group Feedback	<u>Instructors & Faculty Cohort 2</u>: 1. Syllabus Technology Integration Identification 2. Attitude Level of Use and Importance Survey 3. Classroom Interviews 5. Focus Group Feedback	**SWAT Team** 1. Informal feedback and reflections of members 2.Activity and Progress Reports **Reflector Staff:** 1.Level of Support Analysis 2. Informal Feedback
Shadow PD	1. User Feedback	2. Usage Statistics	
TQM	Purpose: To oversee and assist in data collection and analysis in other areas. 1) Maintain the Research Agenda 2) Maintain the Research Outline 3) Technology Self Assessment		

Instructor Evaluations

Award Winning Technology Using Teachers	eMINTS Teachers	Nominated Technology Using Teachers
Attitude, Level of Use, and Importance Survey		Attitude, Level of Use, and Importance Survey
Benchmark Evaluation: Classroom Observations of Technology Integration	Benchmark Evaluation: Classroom Observations of Technology Integration	Classroom Observations of Technology Integration

Description of Data Collection Items

1. Technology Self Assessment: A self-assessment that indicates the level of proficiency on 15 different technology innovations, and the identification of importance of each innovation to the respondents future teaching and learning.

2. General Integration Feedback CAPS: An assessment conducted by the TDP to assess the strengths and weaknesses of the teacher preparation program.
3. Technology Performance Assessment: A performance evaluation to determine skill based competency for a group of technology skills.
4. Feedback Assessment from ED101 Technology Skills for Teachers: This instrument consists of a set of questions for students who are taking a course to learn basic technology skills.
5. Student Feedback Interview: Randomly selected students from each of the three phases in the Teacher Development Program are selected each semester to determine how they are making meaning in their program
6. Flashlight Surveys: These surveys are offered on the Internet. Instructor's customs build an assessment that is particular to their class and teaching situation to determine the impact of technology integration in coursework and learning.
7. Class Room Observations of Technology Integration: Instructors are interviewed and observed to determine their integration strategies and successes.
8. Attitude, Level of Use & Importance Survey: A technology integration survey that determines the integration strategy, the level of use of technology innovations, and how important teachers feel the innovation and integration is to their teaching and students learning.
9. Technology Availability Survey: This instrument is used to determine the kinds of technology equipment, amount of technology availability in field experience classrooms.
10. Syllabus Technology Integration Identification: Teacher development program instructors' syllabi are examined for evidence of technology integration..
11. Focus Group Feedback: Informal interviews are conducted to get feedback that will guide the formation of Learning Communities made up of K-12 teachers and faculty.
12. Certification Portfolio Evaluation: A final evaluation of a teacher development student's Program Portfolio, looking for technology integration success.
13. Level of Support Analysis: An analysis to determine the kind and amount of computer lab support delivered to students.
14. Usage statistics: A determination of the number of hits and degree of use of the Shadow PD project.
15. User Feedback: An informal collection of feedback from users of Shadow PD.

ShadowPD

A set of Internet-based tools for enabling the teaching and learning processes of teacher education is being developed to function within Shadow netWorkspace (SNS) (http://sns.internetschools.org). SNS is an Internet-based workspace designed to support teaching and learning in K-12 schools. The core set of functionality found in SNS forms a flexible foundation for a learning community. The ShadowPD project is assisting teacher education faculty at MU in understand how they can use SNS to enhance learning in their classrooms. A quick and rough analogy of SNS is to imagine the desktop of a preservice teacher's (PST) computer existing on the Internet. Using a browser, such as Internet Explorer or Netscape Navigator, the PST connects via a secure login to the SNS Web site and her personal netWorkspace. Here she finds a desktop for accessing the file system, groups, communication functions, and applications. She also has anytime-anywhere access to her own work and applications, she participates in group work through SNS as well. Additionally, she participates in her class work via SNS, as it provides the core functionality of commercial Web-based instructional support systems (e.g., WebCT and CourseInfo).

Through working with the MU teacher education faculty, sharing ideas with other PT3 grant recipients, and reviewing the teacher education literature, the ShadowPD project has identified three problems that a great number of teacher education programs face. These common problems are: how to create a Web-accessible shareable document archives, how to facilitate the creation and maintenance of electronic preservice teacher education portfolios, and how to harness their network's potential to create better communities of practice into which students can be inducted. In addition to helping the MU faculty use SNS, the ShadowPD project is working to modify SNS to support these three important goals of teacher educators.

National University PT3 Project

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Abstract: In the 1999-2000 school year, National University's PT3 Project staff trained 8 NU faculty members and 14 master teachers in a weeklong training series. The training covered a great deal of information, ranging from databases and word processing to publishing and multimedia. The evaluation data indicate that the majority of participants, both faculty and master teachers, were satisfied with the training (with the exception of three novice teachers from one school site). However, follow-up data suggest that faculty members and teachers have had mixed success in implementing their new skills within their classrooms. Some participants enthusiastically reported using their new skills in both their classrooms (primarily using the Internet to locate resources and lesson plans) and in personal activities such as finance and communicating with friends via email. Other master teachers reported that availability of appropriate hardware and time constraints hindered their implementation of the skills learned. Faculty members also reported using resources found on the Internet to enhance their course content, and others reported integrating PowerPoint presentations into their lectures. A CD-ROM containing trial versions of multimedia software used in the PT3 Grant Training will be distributed to attendees.

In the 1999-2000 school year, National University's PT3 Project staff trained 8 NU faculty members and 14 master teachers in a weeklong training series. The project training covered a great deal of information, ranging from databases and word processing to publishing and multimedia. The project also established a consortium of industry partners to support and model technology outside the university community. Industry partners include: Datel (NU's vendor for computer hardware), Lightspan Partnership (a website development company), Qualcomm, Hewlett-Packard, Sony, Pacbell, Cox Communications, the San Diego Supercomputer Center, and the San Diego Electric Training Trust. The PT3 faculty and master teacher training sessions were conducted at NU facilities in January and May 2000. Faculty members received 36 hours of training and master teachers received 24 hours over the course of one week. It was anticipated that faculty members who were trained in March would assist at the master teacher training; however, no faculty members who attended the initial training participated in the teacher training.

The faculty and master teacher training sessions focused on helping participants integrate information about technology into their pre-service courses and classrooms. Sessions addressed the following topics: How to (1) digitize photos and text on a scanner, (2) build web pages with animation, (3) edit student research papers and essays electronically, (4) send and receive emails with attachments, (5) design and develop online courses, (6) use a digital camera, (7) run a camcorder, (8) design weighted spreadsheets for calculating grades, (9) use adaptive technology hardware and software, (10) digitize voices and music for presentations, (11) understand technology copyright and intellectual property rights laws, (12) participate in chat rooms on the Web, (13) design electronic portfolios, (14) create a database for organizing Web resources, and (15) use the "screen capture" function to add embedded computer screen shots to presentations. The training was "hands-on", enabling participants to practice skills and pursue their own ideas about how to utilize technology in their own classrooms. The training facility had 15 computers and a Proxima projection system. Materials provided to participants included two textbooks, diskettes, CD-ROMs containing trial versions of multimedia, instructional software and an Internet browser. Ongoing support to assist participants in implementing skills learned is provided by the project coordinator via email, phone and in-person, if needed. The 22 NU faculty and master teachers were expected to implement the skills and knowledge gained from the training in their teaching and supervisory activities. It was anticipated that pre-service teachers who take courses offered by trained faculty and those who are supervised by trained master teachers would also increase their ability to integrate technology into their own classroom teaching.

Pretest scores indicate that the majority of participants possessed minimal proficiency in all competency areas. Post-test scores indicate that NU faculty members gained proficiency in all except four competencies. More specifically, eight competencies showed an increase in participants' proficiency; three areas decreased, and spreadsheet competency did not change from the pre to post-test. Teachers reported gains in all areas. The trainer attributed the decrease in the three areas to faculty members' initial over-estimation of their competence in that area; but when faculty received further training, they realized how limited their knowledge of that area actually was. Pre-test scores indicate that master teachers possessed greater proficiency than faculty members in the area of word processing, while faculty members possessed greater initial knowledge in the areas of statistics and networking. The greatest gains from pre-test to post-test were in the areas of presentations and publishing. Faculty ratings in the areas of multimedia and word processing also improved substantially.

Faculty Computer Competency Survey (ratings range from 1 to 4, with "4" indicating "proficient")						
Competency	**Mcan Pre-Test Score**		**Mean Post-Test Score**		**Difference**	
	Faculty	Teachers	Faculty	Teachers	Faculty	Teachers
Presentations and Publishing	1.58	1.68	2.53	2.40	+.95	+.72
Multimedia	1.00	1.13	1.92	1.60	+.92	+.47
Word Processing	2.14	2.83	3.08	3.22	+.94	+.39
Internet Proficiency	2.00	2.20	2.65	2.64	+.65	+.44
Educational Software	1.95	2.12	2.34	2.73	+.39	+.61
Computer Operations	2.17	2.01	2.44	2.49	+.27	+.48
Databases	1.70	2.00	2.40	2.20	+.70	+.20
Spreadsheets	2.19	2.04	2.19	2.63	0	+.59
Programming	1.30	1.30	1.20	1.40	-.10	+.10
Networking	1.95	1.30	1.60	1.75	-.35	+.45
Statistics	2.40	1.40	1.93	1.87	-.47	+.47

Figure 1: Faculty Computer Competency Survey

The evaluation data indicate that the majority of participants, both faculty and master teachers, were satisfied with the training (with the exception of three novice teachers from one school site). However, follow-up data suggest that faculty members and teachers have had mixed success in implementing their new skills within their classrooms. Some participants enthusiastically reported using their new skills in both their classrooms (primarily using the Internet to locate resources and lesson plans) and in personal activities such as finance and communicating with friends via email. Other master teachers reported that availability of appropriate hardware and time constraints hindered their implementation of the skills learned. Faculty members also reported using resources found on the Internet to enhance their course content, and others reported integrating PowerPoint presentations into their lectures. One of the eight faculty members reported modifying her course requirements to reflect a greater emphasis on technology. However, with the exception of one course, the majority of students enrolled in courses taught by trained faculty stated that they were not exposed curricula or strategies that prepared them to implement technology in their classrooms. Based on the evaluation data presented in this report, the first three project goals were partially met. Insufficient data were available to determine whether goal four was met. The following recommendations are made based on the data collected and a review of project activities in relation to GRPA criteria:

1. Participating in a weeklong training series proved prohibitive for many prospective teacher-participants. PT3 staff may wish to consider modifying the training for classroom teachers – one day a week for a month, for example.

2. The training met the needs of moderately experienced users, but less so the needs of novice users. Staff may wish to more carefully select target participants who would most likely benefit from the training, or modify the training to meet the needs of a wide range of proficiency levels.

3. Continue to provide on-site follow-up support to training participants. Some participants expressed the desire for further assistance in implementing the skills and knowledge learned in their classrooms.

4. Further support provided to participants should be aligned with project goals and GRPA criteria. For example, helping faculty members incorporate strategies that prepare their students to utilize technology in K-12 classrooms.

5. The ways in which faculty members and master teachers reported utilizing the training varied tremendously from participant to participant. This variation may be reduced if participants receive explicit information about the kinds of activities in which they are expected to engage in following the training.

EVALUATING THE INCORPORATION OF TECHNOLOGY IN HIGHER EDUCATION IN WESTERN PA

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Abstract: Three Pennsylvania state universities (Indiana, Clarion and Edinboro) successfully obtained a 1.73 million PT3 grant. We developed a plan to infuse technology into teacher education programs. We present the evaluation plan for review and comment. The audience consists of people who have a PT3 grant and/or those who are interested.

OVERVIEW

Three Pennsylvania State Universities (Indiana, Clarion, and Edinboro) successfully obtained a 1.73 million PT3 Grant funded by the US Department of Education. The three universities developed a plan to infuse technology into their teacher education programs. Indiana University of Pennsylvania was responsible for developing the evaluation plan for the three years and for overseeing the grant progress.

It is assumed that technology infusion at the three universities will have a significant impact. All three schools are rural, multi-purposed universities with a background as normal schools. Teacher preparation remains an important part of their missions. Alumni of Pennsylvania teacher preparation programs are employed throughout the country as Pennsylvania produces more teachers than it has teacher positions. It is our belief that a successful outcome for this grant's activities will make our students (the three universities graduate over 1500 new teachers each year) even better prepared to work in school districts throughout America.

The major goals of the PT3 Grant are:

1. Instructional Technology will be moved from the periphery to the core of our curriculum.
2. Future teachers will apply and integrate Instructional Technology into the teaching/learning process.
3. Additional faculty, instructional designer and technical support staff will assist. We aim to help faculty to recognize instructional objectives that can be more readily achieved using technology, to upgrade technology skills to a level where appropriate modeling of technology can take place and to assign and assess student work that incorporates technology use.

AREAS TO BE ASSESSED

The areas of activity by pre-service students, recently graduated in-service teachers, and faculty to be assessed using surveys, interviews, and observations include knowledge, attitudes, application, and integration. Knowledge represents what one knows and can do with respect to the use of technology in the classroom. Attitudes indicate how one feels about the use of technology in the college and K-12 classroom. Application involves the ability to demonstrate the use of technology both in the college and the K-12 classrooms. Finally, integration requires the use of various technologies in achieving the goals of the lesson plan for the college and K-12 classroom. We expect to obtain an overall assessment of each area using a maximum of five self-report items per area.

DEMOGRAPHIC DATA COLLECTION

Demographic data will be collected from all pre-service teachers, recently graduated in-service teachers, and faculty who teach relevant education courses. This will include age, sex, year in school, number of credits, overall grade point average, major courses grade point average, socio-economic background, resident status, major, data available at admission to college, and other relevant information.

INSTRUMENTS

We developed Faculty, Student, Student Teacher, Teacher, Syllabus, and Workshop (both individual and group) assessment instruments. They will be presented for review during the presentation at the SITE 2001 conference. Instruments are also available from the presenters, who welcome e-mail requests.

YEARS AND COHORTS

There will be three years of evaluation with three pre-service teacher groups each year: sophomore, junior, and senior education majors. Each year there will be a faculty group and a recently graduated in-service teachers group. We expect that there will be 2,061 sophomores, 1,927 juniors, 1,898 seniors, 325 faculty, and 1,514 recently graduated teachers.

	YEAR 1	**YEAR 2**	**YEAR 3**
Evaluation	Finding/Developing Instruments Baseline Survey Year #1 Conduct Faculty Surveys Conduct Student Surveys Conduct Teacher Surveys Collect Demographic Data Year #1 Syllabi Year #1 Collect Portfolio Samples Year #1 Focus Groups Year #1	Baseline Survey Year #2 Conduct Faculty Surveys Conduct Student Surveys Conduct Teacher Surveys Collect Demographic Data Year #2 Follow-up Year #1 Faculty Students Teachers Syllabi Year #2 Collect Portfolio Samples Year #2 Focus Groups Year #2	Baseline Survey Year #3 Conduct Faculty Surveys Conduct Student Surveys Conduct Teacher Surveys Collect Demographic Data Year #3 Follow-up Year #1 Faculty Students Teachers Follow-up Year #2 Faculty Students Teachers Syllabi Year #3 Collect Portfolio Samples Year #3 Focus Groups Year #3

Table 1: Evaluation Timeline

BASELINE DATA COLLECTION

Baseline survey data for all cohorts will be collected during the initial year of participation for each cohort. Initial demographic data will be collected during the Fall of each year. All cohort members will be surveyed using the evaluation instruments. Further, we will collect syllabi from the faculty cohort for the education classes they teach. Finally, we will collect copies of portfolios from the senior cohort. Current data analysis in the form of Confirmatory Factor Analysis (assuming the data display the appropriate necessary assumptions) will be done to further bolster the assessment of the validity of the evaluation instruments. Also, Exploratory Structural Equation Modeling (assuming the data display the appropriate necessary assumptions) will be used to examine the factor structure of surveys and possible causal relationships. The demographics of the baseline sample will be compared with the population data from the consortium universities in an attempt to assess the extent to which the baseline sample represents the population.

FOLLOW-UP DATA COLLECTION

Follow-up data will be collected from each cohort during successive years of the project. Further, longitudinal analysis using analysis of variance with repeated measure will allow us to examine the means structure of the cohorts over time. Structural Equation Modeling approaches will allow us to look at the changes in factor structure and possible causal relationships over time. Further, we will collect syllabi from the faculty cohort for the education classes they teach. Finally, we will collect copies of portfolios from the senior cohort.

The demographics of the follow-up samples will be compared with the baseline data and population data from the consortium universities to assess the changing nature of the cohort samples and populations.

Every attempt will be made to incorporate the collection of follow-up data into the standard operating procedures of the consortium universities.

FORMATIVE AND SUMMATIVE EVALUATION

Both formative and summative approaches to evaluation will be used in this project. Formative evaluation will help us understand any success we may have along the way and highlight the need for mid-course corrections to the direction we are taking. Summative evaluation will help us understand the final results of the project and will be a natural precursor to dissemination through presentations and publications.

Formative evaluation will be accomplished through the comparison of baseline survey data and follow-up survey data for each year of the project. Also, we will examine the increases in the use of instructional technology through the evaluation of faculties' course syllabi and graduates' portfolios from year to year. Finally, the qualitative information garnered from the focus groups will be a valuable source of formative evaluation data.

Summative evaluation will be accomplished through examination of the final follow-up survey data for each cohort and the graduates' portfolios. Real proof of the value of the project will be in the level of use of instructional technology by in-service teachers. If, after all of our efforts, the graduates of the consortium universities do not have high levels of instructional technology use in the K-12 classroom, then our efforts will not have had the effect we wanted.

GOALS, OBJECTIVES, AND EVALUATION

Goal 1- Overview

To infuse instructional technology more deeply into the teacher education curriculum in both education core courses and selected majors. Students will be taught technology and it will be modeled by faculty teaching in the college of education core curriculum. In addition, technology modeling and application will occur within subject area courses. To evaluate this goal we will analyze survey data for each year's cohorts and over time, i.e. baseline data for the year one cohorts, follow-up data for year two for the same yearly cohorts, and follow-up data for year three for the same yearly cohorts. We will examine this data using analysis of variance with repeated measures, confirmatory factor analysis, and exploratory structural equation modeling. Further, we will evaluate in-service teachers' portfolios for the use of technology in their various teaching projects and teaching experiences using rubrics for consistent scoring. We will examine the portfolios each year and across years for change. And, we will examine the use of technology for teaching in the syllabi of faculty and look for changes in the syllabi across years. Finally, the information from the focus groups will assist in the evaluation of this goal.

Objective 1

Train faculty to effectively and appropriately use and teach the eleven key competency skills. This objective will be evaluated by basic record keeping of attendance by faculty at workshops. Further, simple workshop evaluation forms will document that faculty believe that they have learned how to utilize the 11 competency skills.

Objective 2

Have university faculty model how to teach effectively with technology in education core courses and elementary education/subject area courses. The collection, collation, and analysis of syllabi by the same faculty for the same courses over time will allow us to evaluate this objective.

Objective 3

Create assignments within education core and subject area courses based upon the appropriate use of the eleven competencies. Pre-service teacher and faculty survey sub-scale data will be used along with qualitative data generated by focus groups.

Objective 4

Revise course syllabi to reflect and recognize the integration of technology into the curriculum. Analysis of syllabi will be used for this objective used along with qualitative data generated by focus groups. Further, pre-service teacher portfolios will be examined across years to look for changes in the kind of assignments students' enter in their portfolios.

Goal 2 - Overview

Integrate instructional technology in the consortium's pre-service observation and field experiences. This will be accomplished by observing the best teachers in public schools through the use of video-conferencing equipment. These observations will include interviews with school personnel, including teachers, administrators, staff, etc. There will also be moderated chat room discussions about these observations. This goal will be evaluated in much the same way that the first goal was evaluated, but by using only the pre-service teacher cohorts and by focusing on the pre-student teaching field experience courses. Also, analysis of syllabi over time for the field experience courses will be used. Further, the level of participation of each student in the moderated chat rooms will be monitored. Lastly, focus group information will provide another way of doing evaluation.

Objective 1

Improve pre-student teaching observations. Using only the pre-service teacher cohorts and focusing on the pre-student teaching field experience courses, we will be able to do the evaluation. Also, analysis of syllabi over time for the field experience courses will be used.

Objective 2

Provide a broader range of field experiences. Analysis of syllabi will be used for this objective along with information provided by focus groups.

Objective 3

Establish web-based services to support the pre-student teaching experience. The participation level of each student in moderated chat rooms will be monitored. Focus group information will provide another way of doing evaluation.

Goal 3 - Overview

Provide a variety of professional support opportunities for faculty and pre-service teachers. These will provide opportunities for peer mentoring and the exchange of ideas and experiences in the effective use of IT in a variety of settings and subjects. To evaluate this goal we will find and possibly modify or develop questionnaires to collect factual participation information and surveys to assess the quality of participation. Finally, the information from the focus groups will assist in the evaluation of this goal.

Objective 1

Develop technology-based teaching circles for pre-service teachers, cooperating teachers and teacher education faculty. Basic record keeping will provide information for the evaluation of this objective. Also, focus group data will be used.

Objective 2

Provide technical support services for faculty and pre-service teachers. Help logs and simple open-ended user evaluation forms will be kept by the instructional technology assistance facility staff and analyzed for evaluation purposes.

Goal 4 - Overview

Enhance the technological infrastructure of the consortium members to better support the project initiatives to evaluate this goal an approach similar to the evaluation of Goal 3 will be used. We will find and possibly modify or develop questionnaires to collect factual participation information and surveys to assess the quality of participation. Further, basic university administration record keeping will be used for evaluation. To finish the evaluation of this goal, information from the focus groups will be used in the evaluation.

Objective 1

Provide modern computing laboratories for pre-service teachers including multi-media capability. The use of logs and simple open-ended user evaluation forms will be kept by the instructional technology assistance facility staff and analyzed for evaluation purposes. Focus group feedback will also be employed.

Objective 2

Develop campus networks that provide students access to modern network technology and that facilitate collaborative work. Simple university administrative record keeping will provide the necessary information.

Objective 3

Implement programs to assure faculty in the teacher preparation program and related subject areas have adequate computers. Simple university administrative record keeping will provide the necessary information. . Focus group feedback will also be employed.

Objective 4

Have teacher preparation faculty actively involved in technology planning. Simple university administrative record keeping will provide the necessary information. Focus group feedback will also be employed.

Summary

The purpose of this paper is to present an evaluation plan for this kind of project. This plan is only the beginnings of a total evaluation. Comment and suggestions will be greatly appreciated.

Using the Course Management System Blackboard 5 with the Computer Algebra System Maple in the Mathematics Classroom

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Putting Mathematics on the Web has become a challenge to say the least. There exist clever applets, "keyboard translations" of mathematical symbols, along with charts of symbols that are available for use as gifs. These methods of putting this discipline on the internet are cumbersome and disjointed. They are simply not user friendly. For mathematics professors whose interests are in mathematics and the teaching of mathematics, the technology has not caught up with the specific needs.

Independent of the web, there are powerful computer algebra systems available that are available for research in mathematics and for the teaching of mathematics. Maple is such a computer algebra system. It is a powerful tool with which to explore, hypothesize visualize and compute. For us, it has a great influence in the mathematics classroom. Students are able to solve realistic problems that were beyond the scope of the course simply because they could not be done by hand or calculator. The use of the computer in the mathematics classroom has evolved from checking the validity of hand calculations to doing difficult calculations and then to visualization and animation of two and three-dimensional graphs. Topics like Riemann sums, linear transformations and Maclaurin series have come alive in animated graphics. After spending some years capitalizing on the potential of the computer algebra system, the web was our next logical step. It was another tool. However, we learned two major things from our experience with Maple. First, avoid the cookbook approach (press this key or type this code etc.). Second, do not use the technology for the sake of using it but rather use it only to further your pedagogical goals. The Internet is a technological tool with the emphasis on the word "tool." We should utilize the web but the student should not be aware that he/she is even using the tool. The student should be concentrating on learning or transporting the mathematics. The student does not consciously think about the pencil and notebook. Similarly, the student should expend little conscious effort in using the technological tool. The professor should also be able to reap the benefits of the web without an inordinate amount of work.

We first began to use technology in the classroom in an organized fashion when the computer algebra system Maple was introduced into our calculus classrooms in 1992. We have learned from the mistakes we made when we introduced Maple to our students. So when approaching the use of the Internet, we started with the question: "How can the web help us in the teaching of mathematics?" rather than "How can we integrate the web into our courses?" With the limitations of the web with mathematical symbols, the answer was not clear. We were already using a powerful tool – the computer algebra system and we had no desire to abandon that tool and start writing java applets so as to "get the mathematics on the web." We wanted to use the vehicle of the Internet but we did not want to have to redesign its chassis so as to enable it to carry our mathematics. We wanted to just hop in it and drive.

In the end what we did was marry the classroom management system Blackboard with the Maple. Forgive the analogy but we figured out how to adapt the generic school bus to transport o mathematics so as not to allow the power of Maple to be lost. This method does have its limitations. We sacrificed the real-time interaction for the power of Maple and the ease of use. In our courses now we have added an Internet component. The student is able to view Maple worksheets with or without animation in a very simple manner with nothing else but a current browser. The student is able to discuss mathematics with other students through a discussion thread. The professor and the student can exchange maple worksheets via the drop box open and then open them up in Maple for manipulation (in this case the student does need to have Maple on his/her machine).

One can create a web page and incorporate many technological features. We chose a classroom management system as our vehicle rather than using our own web pages. We did this to help us get started on the web with a minimum amount of web programming. We think that this is an efficient vehicle for those who want to invest their time in learning how to use the Internet in a sound pedagogical manner. Also we wanted to extend the experience we had in Maple into the online environment. The course management system Blackboard allows us to do this with a minimal amount of web programming skills. While our experience has been with these course management systems, other course management systems have similar properties.

The most important lesson we learned from our Maple experience is that in a mathematics classroom, mathematical ideas must be the driving force behind every use of technology. Technology can certainly make solving problems easier. More importantly, previously unsolvable problems might actually be solved. The graphical capabilities can make mathematical ideas easier to comprehend. But we have to control our enthusiasm. We have to learn from our mistakes. For example, our first Maple labs were overly ambitious. They typically covered too much material and required too much code. We discovered that an overabundance of syntax leads to less comprehension. We decided that "keeping it simple" in terms of the technological tool while challenging the students' mathematical ability was the best way to use any tool. As we began to use the Internet in our classes, we kept these lessons in mind.

We propose to introduce the course management system Blackboard 5 at our session. This software allows faculty members to put course material online. For example, assignments can be created and updated, a grade book can be created, or students can participate in an online discussion. Specifically, our presentation would include:

- Announcements
- Tasks
  - Uploading and downloading documents
  - Uploading Maple HTML files for viewing
  - Uploading and downloading Maple mws files for manipulation
- Grades
  - Creating a gradebook
  - Exporting grades to Excel
- Links
- Forums
  - Creating a new thread
  - Managing a new thread

When using a class management system there are several overriding principles that will make the transition to cyberspace easier. To begin, have a vision of your overall hierarchy before trying to create a new course with a course management system. When you start to create your course, have your syllabus completed. This helps you organize the course into headings and subheadings. From the outset, be specific about your expectations. Explain your grading system thoroughly. If you have an online component, then you should tell the students how many times per week that you expect them to participate. If you post a discussion question, and you expect that students respond to each other's comments, then you should tell them if a statement like "I agree with Nancy" counts as a comment. That is, be specific about your expectations concerning the content of these comments.

Familiarize the students with any online component in a non-threatening way. Give the students a few days to familiarize themselves with this new environment and with each other. Sometimes this can be accomplished by giving an assignment that has little or no credit attached to it. You can begin to establish a classroom community online by asking students to tell the class something about themselves. If you decide to do this, you can set the tone for the rest of the class by being the first one to respond. Let your personality shine through. Give the students the type of response that you would like to receive.

It is extremely important to be specific about your expectations concerning Internet etiquette. If you expect students to use proper grammar, tell them. It may be a mistake to let students post responses anonymously. Students should be held as responsible for their comments online as they would be for their comments in a classroom setting. Blackboard gives the professor the choice to allow anonymous posting or not to allow it. Consider the academic integrity of the classroom when making that decision.

Respond to students' questions in a timely fashion. Whenever possible, use students' names. Questions about class material should be posted to the discussion and shared with the class rather than sent to the teacher by email. Everyone should benefit from the questions of others. Be strict about this policy. If you start to respond to individual questions via email, you can easily get overwhelmed. There is simply not enough time to respond to individual questions. You will find yourself repeating the answers that you have already given to another individual.

Be timely. For example, if you tell your classes that an assignment will be available at a certain time, be sure it is posted by that time. If your course has a traditional classroom component and an online component, realize that any new information published online can have unexpected ramifications. For example, if you post the grades of a test that is being returned to the student the next day, your actions can affect tomorrow's attendance.

If you have an online grade book, keep it up to date. If you have changed a student's grade, change it online too. Expect students to point out any error you have made online. Don't get impatient if they remind you about a mistake that you have not changed. Encourage them to remind you if the error has not been corrected within two or three days. If you have an online grade book, make sure that your grading system has been clearly explained. This will minimize confusion about how the final grade will be calculated.

Incorporating Maple into the classroom management system brings some complications. Users must be aware that browsers have a significant effect on what students see on the screen. Also, students must be aware that if they want to manipulate downloaded Maple worksheets, they have to have Maple on their machines. Putting mathematics on the Web is particularly difficult because of the limitations concerning manipulation of mathematical symbols. We have used the capabilities of Maple to "transport" our mathematics. There are two ways to do this.

First, it is possible to view a Maple worksheet as an html file in Blackboard. The student will be able to view the worksheet, but will not be able to interact with the worksheet. Even animations can be viewed using this method. This can be accomplished in the following way in Version V. When the Maple worksheet is completed, you can choose the options:

File Export As HTML

You then give the file a name. Suppose you give the file the name Animation. This automatically creates three HTML files:

Animation.HTML
Animation1.HTML
AnimationTOC.HTML

If you want to put this Maple worksheet online in Blackboard, attach the file Animation1.HTML to an item under course assignments or projects, etc. When you try to submit this you will be given the message that there are missing images. The names of these images will be provided. You will have to use the browser option to find these images in the images subdirectory. You can then submit this item.

Second, the student can download a Maple worksheet as an mws file and open it in Maple. This is more powerful than the first method because now the student can manipulate and run the Maple worksheet. This is where you may encounter various problems with the browser. Depending on the type of browser, the version of the browser, or the settings of the browser, different computers will display different screens. We have decided to rely on a rather generic way of downloading worksheets. Once the Maple mws file is pointed to via an external link or the drop box option in Blackboard, the student can right click on the link and save the file on the C or A drive. The student can then open the file in Maple. Some computers will open up the Maple worksheet automatically when the student left clicks but many will not. In either case, Maple must be on the student's machine or network. Maple is not being downloaded, only the worksheet is.

Throughout the presentation, we will illustrate some of the difficulties we found while using this software and we will make suggestions as to how we managed to circumvent these problems. We will also discuss the very difficult problem associated with trying to communicate electronically in the language of mathematics. Although the present technology does not support interactive Maple worksheets, we will demonstrate how to upload Maple worksheets into Blackboard courses. The students will be able to view the worksheets and their output, including animation. We will not require previous knowledge of Maple, or of HTML. We are also assuming that this presentation is for people who have not used Blackboard.

Breaking Down the Walls in Teacher Education Programs

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Abstract: Is your teacher preparation "program" really a team of education faculty, content faculty, and K-12 teachers? These groups face the same doubts, promises, and problems related to technology integration. Rather than a frontal assault on teaching technology usage to them, "Project Jericho: Breaking Down the Walls" took a back door approach, getting these groups talking, sharing, and cooperating with regards to technology. Results include professional development and program changes. English/Language Arts, Science, Math, and Social Studies Innovation Teams of nine K-12 teachers, three teacher educators, and three content faculty match up technology skills with state-mandated curriculum, then develop technology-rich units for integration in all parts of teacher preparation. Innovation Teams share on-line and meet monthly to analyze standards, develop a curriculum/technology matrix, work on lesson plans, and work in triads exploring and analyzing websites, lesson plans, and collaborations. Team members share and implement Innovation Team ideas and suggestions.

Technology Integration: A Collaborative Model

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Abstract: The College of Education at California State University, Sacramento designed and implemented a collaborative model for technology integration. The teacher preparation program in conjunction with its school district partners redesigned existing curricula and field placements by simultaneously implementing technology-based lessons into preservice teacher education coursework and K-8 classrooms. These lessons were designed by participants who included teacher education methods faculty, K-8 collaborative teachers, and classroom teachers trained in technology integration. Design teams were formed around content areas and consisted of one university faculty, one classroom technology mentor, and two collaborative teachers from partnership districts. By designing teams around content areas, each course in the preservice program contained a significant unit in which every student teacher participated.

Introduction

The College of Education at California State University, Sacramento (CSUS) in collaboration with the Roseville (CA) City School District developed and implemented a collaborative model for simultaneous integration of technology in preservice coursework and K-8 field placement classrooms. This year long project was aimed at accomplishing the following objectives: 1) testing a model for generating technology-infused curricula which utilized technology leadership within a partner school district; 2) increasing the capacity of CSUS faculty and partnership teachers to integrate technology into their respective classrooms occurred, 3) increasing strong research based skills by student teachers for how technology can be integrated across the curriculum and grade levels. In this paper, we describe the project, its accomplishments and dilemmas, and draw lessons for subsequent improvements in technology use within our teacher preparation programs.

Teacher Preparation at CSUS

The California State University, Sacramento College of Education is one of the largest teacher preparation programs within the California State University System. Last year it granted nearly 700 preliminary credentials to elementary, secondary, and special education teachers. The credential program is a three semester, Fifth year post baccalaureate program.

The College of Education structures its credential program into geographic "Centers" grouping preservice teachers into cohorts of twenty-five to thirty. A Center works within specified local public school districts. Half of the teacher preparation consists of field work (student teaching) that takes place within these districts. The resulting well-developed partnerships with cadres of K-8 field mentor teachers lead to outstanding field placements for student teachers

The Roseville City School District is a member of the Placer County Teacher Preparation Center. Student teachers' field placements are with Collaborative Teachers. A Collaborative Teacher (CT) is an exceptional classroom teacher who serves in place of traditional university supervisors and receives university stipends and training in student teacher supervision. CTs in a Center also have more responsibility in designing and implementing the teacher education program (e.g. co-teaching methods classes).

The Roseville City School District has a strong commitment to the integration of technology and curriculum. Its technology plan, with its underlying philosophical commitment to collaboration, includes a robust technology integration training model for classroom teachers. These classroom teachers bring their curriculum expertise to the newest technology and develop meaningful ways to blend the two. Much of the technology leader training has been based upon Apple Classrooms of Tomorrow (ACOT) methodologies. This training is designed around a Unit of Practice (UOP), a specific process for thinking about and developing a classroom activity. Participants explored technology in the context of working through a sample UOP. Then using one of their own lessons, they developed an original UOP that incorporated technology in a fundamental way. In so doing, the curriculum remains rigorous and technology is not an end in and of itself. This model, of starting with the curriculum and infusing the technology, served as a springboard for this project.

The College of Education has a technology plan that puts much emphasis on the active learning of the student. This plan was in the initial stages of implementation during the course of this project. Recently, the College of Education was mandated by the California Commission on Teacher Credentialing to integrate technology into all of its methods courses. Newly developed statewide standards set criteria for teacher preparation programs. CSUS grouped these standards into three categories: admission requirements, technology skills and integration into curriculum. Admission standards require applicants to demonstrate the ability to use email and search the Internet. Additionally, technology modules are available for student teachers that need basic technology skill training. A third group of standards demand that technology be integrated into preservice coursework. Upon completion of the teacher preparation program, it is expected that all students meet exit criteria for technology based upon the standards. However, to do this in the isolation of a college classroom without coinciding practicum experience in a K-8 classroom results in little long-term capacity of new teachers to continue to use technology. This capacity building project allowed this to be done on two levels: in methods and foundations courses and simultaneously implemented within field placement classrooms.

Model

At the core of this project was the development of design teams. Four design teams were assembled. Each team consisted of one CSUS faculty, one classroom technology mentor teacher, and two Collaborative Teachers. The CSUS faculty was to include one from each content methods area: mathematics, science, reading/language arts, social studies, as well as educational foundations. However, due to scheduling conflicts, reading/language arts faculty was not involved during the academic year project. The five classroom technology mentor teachers were selected from the school district's first cadre of teachers trained in technology integration. These reflected a balance of grade levels and content emphases. Ten Collaborative Teachers from throughout the Center were selected from the pool of experienced field mentors.

College of Education faculty may have the content or pedagogical background while the Collaborative Teacher may have the pragmatic know-how of what really works in an elementary or middle school classroom, and the technology mentor teacher provided the expertise of having been through a similar implementation process previously. This mix provided for powerful and collaborative design teams.

The design teams were to develop two products over the course of the project. The first were K-8 lessons/units that would be posted on district and college websites for use by current classroom teachers and university preservice methods faculty and students. Design teams used model Units of Practice provided by the technology mentor teachers as the basis of their initial work. They also learned how to use rubric criteria to evaluate their lessons. The second product was a redesign of preservice coursework integrating technology into each methods and foundation course.

Timeline

In early fall, design teams were formed around content areas. For example, a fourth grade technology mentor teacher who previously developed a UOP infusing technology into a social studies unit was teamed with the social studies methods faculty and two upper grade CTs. Therefore, this team was expected to develop a social studies unit. By designing teams around content areas, each course in the preservice program would have a significant unit in which every student teacher would participate.

At the initial meeting, the technology trainers facilitated each of the teams working from their expertise in blending technology and curriculum. They shared the UOPs that they previously developed and implemented in their K-8 classrooms. These exemplary units set the standard for the units that the teams were setting out to develop. The lessons in the shared units served as the springboard to connect skills, assessment, content, problem solving, research and standards which needed to be components of the redesigned curriculum.

The teams also reviewed district and college technology plans as well as state and national technology standards upon which much of the work needed to be built. Each participant also took the "Profiler" self-assessment so that the participants could record individual growth.

Throughout the fall semester, teams developed their first integrated lessons and communicated with one another in a variety of ways including listserv and email. As the semester progressed, teams continued to meet amongst themselves to develop their own lessons. The entire project group met every 6 weeks during which time each team shared their work in progress, and specific skills were taught to the participants per participant request. Additionally rubric scoring of the units was done at these meetings. The rubric is available on line at < http://www.classroom.com/edsoasis/>. Due to the variety of skills within each design team, team members assisted one another at their meetings much more than at the whole project meetings.

By the end of fall semester the first lessons were to have been developed and implemented in the K-8 classrooms of the CTs and preservice courses. These completed lessons were implemented in a variety of ways during the spring semester university coursework and in the CT classrooms.

During the spring semester, every student teacher encountered technology-based lessons in their Placer County Center coursework, with the exception of literacy courses. Built into the coursework was a component that had each of the student teachers teaching, planning, and/or observing and evaluating a technology based lesson. For example, as part of the final course project in elementary mathematics methods, the preservice students were to develop a lesson that integrated technology. Additionally, each design team was given an overhead presentation system for use among the team members when their newly designed lessons were taught.

The preservice faculty integrated technology in a variety of ways. For example, in educational foundations, an area in which some of the faculty had difficulty envisioning how technology integration could occur, preservice teachers did webquests based upon Howard Gardner's Theory of Multiple Intelligences. The educational foundations faculty designed an assignment in collaboration with her design team teachers in which the preservice teachers observed their classrooms and evaluated whether or not specific examples of the use of computers in teaching were appropriate or effective. The preservice teachers spent time over the course of two days observing elementary teachers (who were design team member) utilizing computers in the classroom. The documented data was to refer to both the multiple intelligences and effective lesson design with technology. The students were encouraged to refer to the project's rubric. The instructor worked very closely with the classroom teachers in obtaining permission to videotape these lessons and to establish schedules that would work well for all involved parties.

In Science methods, the course now included a means by which students could do some of their coursework on-line and each preservice teacher developed a webquest for a specific science concept for use in their student teaching placements. In mathematics methods, the student teachers learned how to develop algebraic thinking using spreadsheets with students in grades K-8. The student teachers also analyzed a variety of mathematics-related websites: some for teacher use and some for student use. The mathematics design team unit was "Creating a Playground." As the semester progressed, the unit was presented to the preservice students for participation, analysis and evaluation.

Outcomes

The integrated design teams allowed all participants to expand technology use in their respective teaching. As the social studies methods faculty stated,

> "As a result of being involved in this project several observations can be made. First, students have begun talking about how to integrate technology with instruction. I have made it a requirement for students to document at least one lesson that integrates technology and instruction. This was done in addition to going to the partner district's Technology Learning Center; so, in effect, the time allotted to technology integration was expanded this semester. Third, and possible, the most exciting, another member of my design team and I have discussed his coming to The Technology Learning Center and demonstrating His own use of technology in his social studies classes. I asked a student teacher what she thought about this idea. Her reply was, "I think it would be great!"

Clearly one of the strongest outcomes of the design team model was the development of relationships between university faculty and classroom teachers. Here is how one of the technology mentor teachers described the results of this joint, collaborative work:

> " The project has pushed me to explore how to use the Internet with my students. Previously the focus of my teaching revolved around teaching students how to acquire information from the Internet. This year, the focus has been more on teaching them how to transform that information or how to use the information to construct new knowledge. This especially happened with my "Gifted and Talented" students when I asked them to select a topic in history that has changed us. I required that they find primary sources such as documents, journals, pictures, maps timelines and statistics. With the information gathered, I wanted them to analyze and evaluate its validity, and then use that information to draw their conclusions about the topic's impact on history. In other words, I focused a lot on instructing my students how to think and evaluate material found on the Internet. I learned a lot about how I taught the process and ways to improve my approach.
>
> I also read more technology articles. I wanted to explore other people's philosophy about using technology to teach... From my readings, I created two Internet activities/lessons that I feel good about. I wanted to see how the Internet could provide music and visuals to enhance a lesson. I created a lesson on Civil War music, focusing on the songs of the Underground Railroad. Another lesson for 7th grade dealt with comparing art from the Classical period, the Middle Ages, and the Renaissance period. I really liked that lesson. The presentation system/projector from the project is a real blessing that encouraged me to design those lessons."

A Collaborative Teacher participant wrote, "When I started with the project I really didn't know what to expect. I thought we were going to be looking at technology and find ways to get student teachers to use it in their new classrooms. I was pleasantly surprised when I found out we were going to be putting together whole units for the teachers to use. It was really exciting to work with fellow teachers from other districts on a subject that was interesting to me."

The design team model propelled much of the project. This collaborative process was instrumental in the development and implementation of technology-infused lessons and strengthened partnerships for all participants. Teams were self-selected and curriculum chosen by each team. This resulted in a variety of technology-infused lessons and units. Each team chose different times and places to work and develop their units. This occurred with the development of the curriculum and with the implementation.

Summary of Lessons Learned

This was a project that intended to build the capacity of the preservice program partners to infuse technology into coursework and fieldwork. In looking back at the evaluative data and our collective experiences, we have learned the following lessons that will guide the next phase of the Teacher Preparation Program technology components.

Lesson 1: It is possible to build effective partnerships between K-8 and university faculty for technology infusion into teacher preparation and K-8 classrooms. Arts and Sciences participation was minimal as partnerships here are just building, but are anticipated for the future to help develop additional content expertise for the K-8 classroom.

Lesson 2: Leadership for such collaborations can come from the classroom side as well as the university side. What is not yet clear is whether the reversal of the usual hierarchy of leadership could take place without the pre-existing university partnership already existing within the district.

Lesson 3: The design team approach worked will in producing lessons that were implemented in K-8 and teacher education. Strong collaborative relationships were a result of this project. What would have strengthened the design team model was more on-line communication at predetermined times when all members were on –line simultaneously.

Lesson 4: Faculty were more resistant to putting their lessons on the public website than were the classroom teachers. Perhaps this was due in part to the newness of the technology for many faculty members and a reluctance to expose the products of their initial attempts at technology infusion.

Lesson 5: Student teachers were able to focus simultaneously on the quality of technology in the lessons, following the rubric, and on the curriculum. This piece is important because it demonstrated that the technology was not so overwhelming to students that they could not attend to the curricular design elements.

Lesson 6: This preliminary work identified how we need to build future evaluation strategies to create strong formative feedback for lesson and program development.

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Models, Mentors, and Mobility in the Teacher Education Program

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Abstract: This paper is a report on the activities of a PT^3 implementation grant, Project M^3: Models, Mentors, and Mobility. Project M^3 has three major goals: 1) To identify and develop model practitioners and models of practice for teacher education students, 2) To develop a network of mentors to support and train students, faculty, and partner school teachers, and 3) To utilize laptop computers, personal digital assistants, and online support and instruction to improve student access to technology.

Project M^3 reaches out to the university community, private and public schools, and private businesses to maintain a network of models and mentors and to support integration of technology in the college classroom and partner schools. Project M^3 also uses new advances in mobile computing to improve accessibility to technology by creating and modeling the use of wireless laptops and personal digital assistants in the classrooms in the College of Education and in PreK-12 schools. On-line instruction and support are also used to provide better access to learning experiences, training, and support.

Introduction

In the last decade, school districts in the United States have invested billions of local, state, and federal dollars to equip schools with computers and advanced telecommunications equipment. During this same time period, higher education institutions have scrambled to advance their own technology infrastructures. Unfortunately, technological advancement in higher education has proceeded unevenly in many instances, with Colleges of Education (COE) hard-pressed to match the resource bases of such Colleges or Schools as Medicine, Engineering, or Business (National Council for Accreditation of Teacher Education, NCATE, 1998). Even when resources are available in COEs and schools, it is not necessarily the case that the technology is used. This is often the result of untrained faculty and in some instances due to inadequacies in infrastructure (e.g., poor wiring).

The number of schools in the United States having access to the Internet has increased from 35% in 1994 to 89% in 1998 (National Center for Education Statistics, 1999), while classroom teachers in the United States are "least likely to report being very well prepared for activities...integrating educational technology into the grade or subject taught" (NCES, 1999, p. 74).

Wichita Public Schools and Wichita State University's College of Education (COE), generally, have reflected the national trends. Both have some technology, but few trained faculty and limited vision of how technology can be integrated into the curriculum. Both desire to address these issues.

Work in local PreK-12 schools involving technology has progressed steadily in recent years. All schools are connected to the district network. Partner schools for this grant have at least one network/Internet connected computer in each classroom. In their 5-year technology plans, the partner schools have as their goal to integrate technology into their curriculum. Wichita Public Schools are in the process of submitting a bond issue to the public. Electrical wiring is a key component of the infrastructure needs requested.

In the WSU College of Education, early technology efforts resulted in personal computers for each faculty member and a COE 20-station computer lab. Within the past two years the college has focused efforts on increasing the technology access and skills of faculty, staff, and students. As part of this effort, the college completed some major technology initiatives including (a) the development of a technology mission, vision, and commitments document that incorporates recent International Society for Technology in Education Standards (ISTE, 2000) and current and draft standards of the National Council for Accreditation of Teacher Education (NCATE, 1998); (b) completion of three technology needs assessments conducted both by the College of Education and the university, that yielded consistent results; and (c) the development and implementation of a one-year U. S. Department of Education Capacity Building grant, Expanding Curriculum Integration through Technology Education (EXCITE). All have produced forward technology movement in the college.

The needs assessments in the COE indicated that the faculty and staff are self-taught technology users who are quite comfortable with the basics of word processing and e-mail but who do not use technology to any great extent in their classroom teaching. Significantly, it was also apparent that faculty did not expect students to use technology in meaningful ways. However when asked, over 50% of the faculty identified 18 different technologies that they felt had either "somewhat high" or "high" potential for instructional impact.

Even more recently, a partner in Project M^3, the Wichita State University Center for Teaching and Research Excellence, found similar results in an assessment of technology needs of WSU faculty. The Center's assessment made it clear that faculty, university-wide, desire support to add technology resources to their courses.

Finally, a self-assessment of University and College of Education technology readiness, using STaR Chart: A Self-Assessment Tool for Colleges of Education (CEO Forum, 2000) also indicated a need for future technology training for COE faculty. The STaR Chart revealed a composite picture of a university and COE operating in the "Early" and "Developing" levels of readiness but anxious and excited about locating and implementing resources to move to the two higher levels of readiness, “Advanced” and "Target".

During this time, a vision, mission, and goals statement was developed to guide efforts along with the needs assessments. This document states, "The vision for the College of Education at Wichita State University is a technologically astute academic culture... in which students, faculty, staff, alumni, and the community work together ... to enhance learning through modeling and integration of appropriate technologies" (College of Education, 1999).

As a result of a capacity grant, the COE was able to provide professional development for faculty and partner school teachers in on-line instruction, presentation software, multimedia and Internet in the classroom, video-editing, and curriculum integration. These efforts focused faculty members’ attention on the impact technology integration can have on student and faculty performance. The increased awareness and skill level has resulted in a rising number of class activities using technology. Faculty began to request the computer lab for class sessions more frequently, and student use of open lab hours increased dramatically. These changes resulted in further increases of requests for technical and instruction support. The computer lab schedule and check out of equipment became more complicated as usage increased. It became apparent that the COE’s successes in raising the awareness level and adoption level of technology had created the need for more support and better access to the technology. An additional need surfaced as the COE looked for exemplary models of technology integration in field placements. Schools used for field placements were not always those at the forefront of technology integration.

The primary purpose of Project M$^{3:}$ Models, Mentors, and Mobility is to provide better access to technology in classrooms for teacher education students and to increase the number of exemplary models for students. To reach our goals, Project M^3 developed three sets of activities that encourage and support teacher education faculty and students to integrate technology.

Models of Practice

Project M^3 has its first element, Models. Models has two parts: (1) Teachers who model effective use of instruction in their classrooms (model practitioners), and (2) Technology Integration Projects for Students (TIPS) that are designed to be used as models for other teachers who might be struggling to find ways to integrate technology. In an attempt to prepare teachers who model effective use of instruction, WSU has taken a constructivist approach. ATE Standards for Teacher Educators (http://www.siu.edu/departments/coe/ate/atestand.html) require that master teacher educators model professional teaching practices that reflect best available practices in teacher education (Standard 1), systematically reflect on their own practice (Standard 3) and provide leadership in evaluating programs for preservice teachers (Standard 4). Included in the indicators is "regularly revise courses taught to incorporate recent materials, including technology." Teacher educators have an obligation first to model appropriate instructional strategies for the preservice teachers they train, in order that students can participate in activities that they later will use instructing their own students. To this end, our university has attempted to support faculty in their acquisition of needed knowledge and skills as they integrate technology into their coursework.

The integration of technology standards into the teacher education program required breaking the standards into bits and methodically conferencing with individual faculty to see what they were modeling for and requiring of students. Following these initial information-gathering sessions, the curriculum resource specialist and the technology specialist conferenced with individual faculty members where the "relationship between the instructor and the students is one of cognitive apprenticeship, in which the instructor models problem solving, engineers learning experiences, provides scaffolding as students attempt tasks, and encourages reflection." (Bednar & Charles, 1999, p. 1). We worked as a team to examine the course requirements and as "consultants" offered suggestions of ways technology could support these activities. Faculty were left to make decisions about what was best for them and for their students. After a semester's implementation, elements of satisfaction are examined and refinements made. Those activities that are successful become part of a website designed to disseminate Technology Integration Projects for Teacher Education Students (TIPS for Teacher Education) to others for their modification and/or use. In addition systemic change is being made to the Teacher Education program document.

One major project with partner schools involves designing technology integration projects for elementary students that are tied to new text adoptions. The first project, Technology Integration Projects for Students (TIPS) for Science, completed summer 2000, again used an approach which allowed grade level teams of practicing teachers and preservice teacher education students to begin with what they knew and conference with technology and curriculum experts who could guide them to ways technology could support instruction. The resulting website provided two separate sites, one for students and the other for parents and teachers. The student site provides a science activity "card" designed as a technology-based research, analysis, or communication activity to supplement hands-on activities provided in the classroom. Student outcomes and technology used introduce the page and direct links to teacher-reviewed websites are included on the "cards." The parent/teacher page provided connections to district science standards, ISTE NETS standards for students, district benchmarks, and instructions for teachers where additional preparation was needed. As teachers use these TIPS, WSU plans to showcase teachers teaching with technology and student projects developed with technology. (See http://education.twsu.edu/m3/tips/index.htm.)

Mentors

The Mentors component of M^3 involves coordinating the development of a broad-based network of mentors who will provide training and support for teacher education faculty, LAS and Fine Arts faculty, K-12 partner schools, and pre-service teachers. Professional development activities for faculty and student mentors have been supported by EXCITE, a 1999-2000 Capacity Building grant, also part of the PT3 initiative, the university Center for Excellence in Teaching and Research, the college, partners, and M^3. The outgrowth of EXCITE was that faculty increased their skills and comfort level in order to model the use of technology in their classes. As icing on the cake, faculty are now seen mentoring each other and students on technology that they now can use, growing more fearless as time passes and experience is gained. The primary projects for this grant include (a) training of preservice teacher education students as student mentors who work with faculty and partner schools on specific projects (b) identifying and collaborating with businesses in the community.

Student mentors have assisted faculty in media development, presentations, on-line instruction, and "wellness clinics" for desktop computers. Faculty members have requested mentor help in learning how to use a digital camera, video editing, developing Web pages, scanning, and researching and developing graphics. Cooperation and collaboration between faculty has also increased as faculty members develop recognition for their use of technology. One new faculty member became excited about offering her educational psychology course on-line and was so successful that she caught the interest of another faculty member who had shown no interest in on-line instruction. The two teamed up to develop their on-line course to include on-line assessment and began to work with their textbook publisher to develop support materials.

Mobility

The third goal of Project M^3 is to utilize new technologies that provide better access to technology for students, teachers, and teacher educators. WSU COE faculty are motivated to increase their use of technology in classroom curriculum, but the classrooms that house pre-service teacher education courses, until recently, have had only basic technology such as overhead projectors and video players. A portable electronic lectern was custom-built with a Macintosh G3 equipped with Virtual PC, WWW browsers and Microsoft Office, VCR, speakers, video projector, and overhead camera to be used in seven classrooms. However, because of old wiring in the building, even the faculty who are lucky enough to secure the cart sometimes found that they had blown a fuse and couldn't use any type of electrical technology during their class.

It is our assumption that technology will be better integrated into the curriculum if it is where the students and teachers are, not necessarily where the machines and technology experts are. Recent advances in wireless technology have provided the College opportunities to make technology transportable to any classroom or conference room with a single network connection. During the last year, the COE used funding acquired through a PT^3 Capacity Grant (Project E.X.C.I.T.E.) and a PT^3 Implementation Grant (Project M^3) to acquire two airports and five laptops with wireless network cards to allow faculty to move the technology into their classrooms. Separate funding has increased the number of laptops available for instructional use. Faculty use these laptops for a variety of instructional uses such as searching for data on the Web, group problem solving, evaluating educational software, and on-line discussions.

In addition, Project M^3 purchased mini-laptop labs for a middle school and a high school for the same purpose and has plans to purchase mini-labs for three additional schools. The laptop mini-labs may be checked out by individual teachers to be taken into classrooms where technology had previously been limited and/or absent. Project M^3 personnel monitor and evaluate how the teachers in the partner schools use the min-labs in their classrooms. Faculty members in the College of Education use the laptop mini-labs for Web searches, on-line testing, file sharing, developing instructional materials such as crossword puzzles, and brainstorming activities.

Because of the enthusiastic response to mobile computing on campus and in our partner schools, five HandSpring personal digital assistants (PDA's) have recently been purchased for use in classrooms. Physical Education student teachers are currently using PDA's for evaluation and assessment in the field. Faculty interest in handheld computing was strong enough that the grant recently organized a university-wide user group to explore instructional uses.

A grant kickoff highlighted our new wireless capabilities in 10 different subject areas. The kickoff demonstrated the old (slide-rules, tables of numbers, antique texts and globes) right beside the new (computers, software, visual imaging Web sites, robotics). Guests from University Computing, Media Resources, Liberal Arts, partner schools, and university administration were impressed with the technology displayed and we have received numerous requests for follow-up demonstrations from public schools and biology, engineering, and business faculty at WSU. The interest in laptops and PDA's has resulted in expansion of the M^3 Web site to include a section on purchasing, configuring, and integrating mobile technology. (See http://education.wichita.edu/m3/mobility.htm.)

These recent additions to the technology infrastructure allow modeling of technology integration in curriculum and engage the students in experiences that lead to more effective and successful technology integration. With the appropriate models and exposure to technology, students experience a 'hands on' approach to develop the foundational skills and knowledge necessary to appropriately select technology tools for problem solving, research, communication, and collaboration.

Conclusions

With faculty trained, resources available, and creativity unleashed, the process of implementing technology into schools continues. We begin with the conversing and encouraging of faculty to try new things with on-the-spot technology support. As faculty learn more, they seem to want to use technology and to learn more. Second, students and student mentors help faculty implement, reflect, and revise technology activities. At times, faculty learn from their students as the students learn from them. Finally, teacher education faculty make changes in their own behavior and in the teacher education program to assure the continued use of technology in the all schools.

"We are all exploring right now and when you explore new territory, the terrain is always unknown. We are just making it a bit more smooth for those who follow--the second time--and learning to climb the molehills and/or mountains in our way, going around the fallen trees, finding the tunnels, swimming the rivers--all without sinking or crashing in the process" (faculty e-mail, October 5, 2000).

"The road ahead will take us places we've never been before...that's for sure!" (Faculty log entry, June 5, 2000).

References

ATE. (1999). *ATE standards for teacher educators [Standards].* Washington, DC: Author. Retrieved May 22, 2000 from the World Wide Web: (http://www.siu.edu/departments/coe/ate/atestand.html

Bednar, A. K., & Charles, M. T. (1999). *A constructivist approach for introducing pre-service teachers to educational technology: Online and classroom education.* (ERIC Document Reproduction Service No. ED 432 306)

CEO Forum on Education & Technology. (2000). *Teacher preparation STaR Chart: A self-assessment tool for colleges of education.* Washington, DC: Author.

College of Education. (1999). *College of Education technology vision, mission, and goals statement.* Wichita, KS: Wichita State University.

Microsoft in Education. (2000). *Anytime anywhere learning.* Retrieved November 28, 2000 from the World Wide Web: http://www.microsoft.com/education/aal/default.asp

International Society for Technology in Education (ISTE). (2000). *ISTE NETS for teachers.* Eugene, OR: Author. Retrieved November 28, 2000 from the World Wide Web: http://cnets.iste.org/index3.html

National Council for Accreditation of Teacher Education (NCATE). (1998). *Technology and the new professional teacher: Preparing for the 21st century classroom.* Washington, DC: Author. Retrieved November 28 from the World Wide Web: http://www.ncate.org/accred/projects/tech/tech-21.htm

National Center for Education Statistics (NCES). (1999). *Internet access in public schools and classrooms: 1994-1998.* Washington, DC: U. S. Department of Education, Office of Educational Research and Improvement NCES 1999-017. Retrieved November 28, 2000 from the World Wide Web: http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=1999017

Project M$^{3.}$ (2000). *Wireless computing*. Retrieved November 28, 2000 from the World Wide Web: http://education.wichita.edu/m3/mobility.htm

SRI International. (2000). *Palm Pioneering Education grants*. Retrieved November 28, 2000 from the World Wide Web: http://www.palmgrants.sri.com/ideabank.html

Project M$^{3.}$ (2000). *Technology integration projects for students.* Retrieved November 28, 2000 from the World Wide Web: http://education.wichita.edu/m3/tips/science.htm

Electronic Portfolios as a Capstone Experience

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Abstract: The teacher education program at the University of Cincinnati has undergone substantial revision over the past seven years. It now is a five-year program culminating in two bachelors degrees, a yearlong load bearing compensated internship, and a portfolio documenting each student's progress during the year. Our students have reported that their experience with technology has been a deficiency in the program. Steps are being undertaken to increase the role of technology both in their teacher education courses and their arts and sciences courses. In order to give the students a higher skill level with technology, students will begin transitioning over to digital portfolios pressed to CD. The portfolio will serve as a means to self-analyze their growth during the year. In addition, the digital portfolio will give the students confidence in their own technology skills and demonstrate to future employers that they have the necessary technology skills.

The University of Cincinnati has in place a five-year baccalaureate teacher education program culminating in a series of degrees including a Bachelors degree in an Arts and Sciences subject area, a Bachelors degree in Education, and, with an optional additional summer of coursework, a Masters degree in Education. A centerpiece of that program is a 5th and final year of paid internship in a school where the student assumes a load bearing responsibility for half day for the entire year and is compensated by the participating school district. There is no traditional student teaching experience. Instead, existing teachers in the schools who have acquired adjunct instructor status through the College of Education mentor these students.

In the course of this program it has become apparent that technology skills among the students in the program varies widely. Some of the students are extremely skilled in the use of technology in their teaching, lesson planning, and overall teaching behaviors. Others come into the programs with less skill and often have deep anxieties toward the use of technology in their teaching. Complicating matters is the uneven experience of the classroom teachers who mentor our students and the lack of appropriate hardware, software, and teaching skills using technology in the schools. Often the personnel in these mentoring schools have little knowledge themselves about how to improve the situation and display a deep lack of knowledge of the content standards and the ISTE standards toward the use of technology at their respective grade levels.

To correct these deficiencies, the College of Education at the University of Cincinnati, in collaboration with the mentoring schools as partners, applied for and has received a PT3 grant to infuse technology throughout its teacher education program and require its students to develop a technology project as part of its capstone experience, just prior to graduating from the program. The faculty in the College of Education Teacher Education program is undergoing training on how to use and infuse technology in their own subject specific areas. These faculty members are developing technology plans that will explore ways of infusing technology throughout the methods sequence. Our college-based faculty will be paired with school-based faculty in the mentor schools to develop a consistent plan to infuse technology throughout the entire experience.

In addition, the students themselves are expected to create technological solutions to their own teaching in the schools. During the internship year (year five), the students have been required to create a paper portfolio documenting their professional growth through the five years of the program. Typically this portfolio consists of a paper notebook expressing their philosophy of education and teaching, with examples of their work and the work of their own students. The students often include representative examples of their own work (papers, photographs of thcir own teaching, recommendations from mentors, peer evaluations from their own colleagues, statements of their philosophy of education, and written descriptions of their own teaching style) (Loughran & Corrigan, 1995; Wiedmer, 1998; Darling-Hammond & Snyder, 2000).

There are several problems with a paper style portfolio. First, teaching is a visual medium. If one wants to see how one teaches, they either need to see the person teach in a live format or they need to see a video clip of the person in action. Providing videotapes as part of the portfolio has been very expensive. Furthermore, watching an entire lesson is, at best, intellectually tedious. Video editing equipment has traditionally been too difficult for our students to use to extract small vignettes (3 minute segments). The second problem is that it is so difficult to create even a single paper copy of the portfolio that the candidate is unwilling to leave it for the building principal, department head, or human resource officer to view at their leisure. Since many of our students wish to use the portfolio as a selling tool, they are saddled with the cost of making duplicates of a very expensive document.

Our solution to these problems is for our students to create a digital portfolio that they can duplicate on CD-ROM for under 50 cents a copy (Barrett, 1998; Read & Cafolla, 1999). The digital portfolio includes all of the aspects of the paper portfolio (including sample work, philosophy of teaching, resume, examples of student work) and also includes brief video clips (Barrett, 1998; Read & Cafolla, 1999), in a QuickTime format, of their teaching. This solves several problems. First, the viewer is able to actually watch the individual teach. (All of our interns are videotaped several times during the year.) The vignette can be tied to a standard, or as a demonstration of a philosophy of teaching. For example, if the teacher espouses a Constructivist view of instruction, the implementation of that view in the classroom could be the short video clip in the digital portfolio. Secondly, the cost to reproduce a CD is around 50 cents a copy, plus the cost of the label and jacket. Students can make multiple copies of their portfolio for pennies compared to what it would cost to reproduce a paper portfolio (Weidmer, 1998). Digital portfolios are also more navigable. Searches on portfolios based on a thematic organizational model can yield specific outcomes much more quickly in digital as opposed to paper format (Niguidula, 1997).

An additional benefit is that building principals under pressure to hire technologically competent teachers are more inclined to hire someone who hands them a CD and says, "here, put this in your CD-ROM and learn all about me and my teaching style, oh, and by the way, I created this myself" than someone who simply comes in and discusses what they may do with technology in the classroom (Waugh et al., 1999).

A final benefit of the digital portfolio is that lessons that utilize the technology show very well in this portfolio environment. This makes it more likely that our students will use the technology in their own teaching, recognizing that it will be a better demonstration of their own technological capabilities within the digital portfolio (Niguidula, 1997).

Currently we are developing a model of what these portfolios will look like. Several prototype examples have been created. The technology to scale this into an environment that graduates over 200 teacher education students per year is being scoped and acquired. Over the next three years of our PT3 grant we hope to make significant improvements in the approach and plan to collaborate with other PT3 grantees developing similar approaches.

References

Barrett, H.C. (1998). Strategic Questions: what to consider when planning for electronic portfolios. *Learning and Leading with Technology*, 26, 6-13.

Campbell, J. (1992). Laser disk portfolios: total child assessment. *Educational Leadership*, *49*, 69-70.

Darling-Hammond, L., & Snyder, J. (2000). Authentic assessment of teaching in context. *Teaching and Teacher Education,* 16, 523-545.

Loughran, J. & Corrigan, D. (1995). Teaching portfolio: a strategy for developing learning and teaching in preservice education. *Teaching and Teacher Education,* 11, 567-577.

Niguidula, D.A. (1997). Picturing performance with digital portfolios. *Educational Leadership,* 55, 26-29.

Read, D. & Cafolla, R. (1999). Multimedia Portfolios for preservice teachers: from theory to practice. *Journal of Technology and Teacher Education,* 7, 97-113.

Waugh, M., Levin, J., & Buell, J. (1999). The technology competencies database: computer support for assessment, teaching, and portfolio management. *Journal of Technology and Teacher Education,* 7, 351-363.

Wiedmer, T.L. (1998). Digital portfolios: capturing and demonstrating skills and levels of performance. *Phi Delta Kappan,* 79, 586-589.

Focusing on the Learner: Interactive Environments for University Faculty, Inservice and Preservice Educators

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Abstract: The impact a World Wide Web (Web) site may have on any community may be either of two extremes, integrated into the daily activities or barely tolerated, or somewhere in between. The impact a Web site would have if focused specifically upon university faculty, inservice and preservice teacher educators could be beyond the hopes of the creators; however, the usefulness of the Web site must be extremely user-friendly and directly impact the user's daily experiences.

Introduction

The impact a World Wide Web (Web) site may have on any community may be either of two extremes, integrated into the daily activities or barely tolerated, or somewhere in between. Obviously, the positive impact of a Web site within the community is preferable, which is why the thoughtful design, development, testing and revision of such a site must occur in a considerate, painstaking manner. The impact a Web site would have if focused specifically upon university faculty, inservice and preservice teacher educators could be beyond the hopes of the creators; however, the usefulness of the Web site must be extremely user-friendly and directly impact the user's daily experiences. The design and development of a Web site for a Department of Education Preparing Tomorrow's Teachers to Use Technology three-year grant for the University of Houston – Clear Lake is focused upon the preservice teacher candidate, the inservice teacher and the university faculty; further, this Web site must be developed as a self-sustaining environment.

Interactive Environments

Interactive environments aid a Web site in offering useful elements that may be used on a daily basis. For example, chat rooms and discussion lists that are created for specific schools' use makes available the opportunity for ownership and integration into the preservice teacher educator's, inservice teacher educator's, and university faculty's daily harried schedule. The chat rooms and discussion lists would offer innumerable possibilities, such as virtual chats in which the preservice and inservice teacher educators meet to discuss possibilities for future technology-rich activities. Or perhaps the university faculty members would like to integrate weekly chat sessions with groups of preservice teacher educators who are supported at three separate schools through out two districts on either side of a county; instead of the students driving an hour to meet the university faculty member, an online chat room makes available a virtual meeting place where all meeting members will be available for discussions and opinions. This is just one example of interactive environments that focuses upon the learner.

Numerous interactive elements are integrated into a technologically rich Web site that offers innumerable possibilities to the teacher education community. Interactive environments for university faculty, inservice and preservice teacher educators are imperative towards a successful cooperative experience that focuses the energies and attention on the learner.

Web Site Design Elements

There are numerous elements associated with the design of a Web site. Along with these imperative elements are the desired aspects that are to be included within the Web site. Focusing upon the desired aspects, following is a list of areas that are to be developed within the Web site:

- Schedule of Professional Development Opportunities or Events for First-Semester Teacher Educator Candidates
- Schedule of Professional Development Opportunities or Events for Second-Semester Teacher Educator Candidates
- Technology-Integrated Lesson Plans
- Online Professional Journal
- Online Professional Development Opportunities
- Listserv Area
- Discussion List(s) Area
- Chat Session(s) Area
- Site Navigation Structure
- Background Information of the UHCL Professional Development Opportunities Web Site

Each aspect of this Web site will take on a life of its own, with sub-categories within each developing area. The self-sustaining elements that are imperative towards the fulfillment of the Web site vision are integrated into each area of the Web site. For example, the listserv will have form areas to subscribe, unsubscribe and post messages to the listserv, without the added difficulty of moving between digital environments (such as from an Internet browser to the e-mail environment). A second example would be the Online Professional Journal section, where users may upload their developing manuscript and make it available for all users to review. Once the manuscript is uploaded to the server, the reviewers will have the ability to add their comments to a discussion list that will be available at the bottom of the manuscript's Web page; this offers the manuscript author the ability to obtain relevant feedback from the professional community, as well as offers the professional community the opportunity to discuss evolving theoretical and application-focused manuscripts.

The development environment for this Web site is a Cold Fusion server. The decision to develop this Web site within a Cold Fusion environment was elemental; the design and development team desired a database structure underlying the visual display area, to ensure the seamless integration of information and ease of use. The underlying database structure enables the swift employment of uploaded information within the Web site, without the constant maintenance of a Web site or server administrator. Therefore, the decision to build a Web site around a database structure, specifically Cold Fusion, was an appropriate decision.

Conclusions

The design and development of a Web site creates an environment that impacts the community in either a positive or a deficient manner. The thoughtful inclusion of useful elements within a Web site that is focused specifically upon the needs and desires of preservice teacher education candidates, inservice teacher educators and university faculty can create an interactive environment that focuses upon the learner. Designing interactive environments within the Web site design elements is imperative towards the success of the Web site's inclusion within a learning environment and its sustainability.

Balancing on shifting sands: Teaching in the Information Age

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Abstract: Teachers trying the Internet for the first time can get the feeling that all they've based their career on is suddenly wildly shifting. The growth and development of the Web allows us the vision of a community of learners who are literate in information access and use. Can this vision be accomodated in a classroom environment which embraces student-centered inquiry learning and communication?

Introduction

Teachers trying the Internet for the first time can get the feeling that all they've based their career on is suddenly wildly shifting. As pressure is exerted upon educational systems to implement instructional technologies, teachersÕ abilities to accept change and adopt innovations become key factors for success. The growth and development of the Web allows us the vision of a community of learners who are literate in information access and use. Can this vision be accomodated in a classroom environment which embraces student-centered inquiry learning and communication?

Teachers adopting the Web into their teaching toolkit are presented with a large set of possible teaching techniques. The Web with its clements of text, hyperlinks, graphics, photographs, sound, animation, and video generally allows nonsequential or nonlinear access to the elements providing for flexibility and interactivity (Levin & Matthews, 1997.) With its multimodal presentation, Web-based instruction can be effective for accomodating thc nceds of different learners in learning cognitive and procedural information (Ayersman, 1996). Computer technology in general has not had the impact expected in the schools because of inadequate preparation of teachers (Dupagne & Krendl, 1992; Ingram, 1994). Will the same findings prevail with the innovation of the Web?

Preliminary research has begun to reveal whether professional development can be designed to help teachers find a starting level with the Web within their comfort zone. There is a wide range of entry points for methodology. Introducing the Web as a teaching and learning tool is an innovation that needs a supportive social environment in order for diffusion to occur. (Rogers 1995). Teaching in a high-tech classroom situation involves risk and loss of control for teachers. This may be explained by MacArthur et al.Õs (1995) findings that an unexpected obstacle to success in implementing technology was that the teachers became competent with computers but were overwhelmed by a fear of their studentsÕ misbehavior. Alleviation of the concerns this loss of control causes may spring from observations of good experiences of peers.

Web Methods

The point of entry for methods for using the Web can start at various levels. A teacher can provide guidance for students by printing a list of websites on paper. A next step might be organizing personal bookmarks and loading them on the students' machines to use. Going further, a Web page with links for students can be made with a template (such as Filamentality, Geocities, or School Notes). Research for students can also be guided by making a Web page with an editor (such as Composer, Dreamweaver, or Front Page) or going even further by building a Web page using html code.

Other methods for using the Web for instruction can include printing material from the Web for display or transparencies, using lesson plans found on Web, or writing lesson plans and putting them on Web. In addition, a teacher may use search websites (such as Google, Dogpile, or Hotbot) to find content or teach students effective methods for search sites. Good teaching about search methods will include teaching students proper Web reference citation style. In addition, design of instruction can include downloading data from Web, submitting data collected by students to a website, students making Web pages for presentations, using the Web as a source for PowerPoint presentations, and downloading images.

Examples of Classroom Practice

Describing examples of classroom practice with the Web may help teachers find a way to bridge from their tried-and-true teaching methods to incorporating new technologies. These can range from online scavenger hunts to virtual field trips to interaction with Java simulations or be as simple as printing Web pages to hang on the bulletin board or use with the overhead. Other examples in use are free student research, guided research as in building a webzine or WebQuest (Dodge 2000), and online quizzes. Communication examples include online discussion boards, cooperative experiments between distant classrooms, and talking to an expert online. This technological environment in classrooms can serve the needs of many types of learners and can be an asset for the teacher willing to approach students as a facilitator (Heller, 1990).

Early Results

Results of workshops taught by the MentorNet project at NC State (Park & Grable 2000) and the Science House (Grable 1999) may serve as an outline for designing workshops for teachers and may suggest further avenues of research. In an exploratory study a group of 50 teachers from three high schools in a rural eastern North Carolina school district were given access to the Web (in classrooms and the media centers), received two days of training with the Web, and were asked to incorporate the Internet in their teaching. The teachers responded to surveys and were observed teaching after six months of computer and Internet availability. When listing the skills and concepts used in teaching on a free response item, 45% of the teachers had used searching in the media center, 5% had made a Web page, and only one teacher had used the Internet in the classroom.

The teaching methods most often used were students searching (14%), downloading data (13%), printing Web pages (13%), finding lesson plans (12%), and teaching the students proper Web citation (10%). The least used methods involved contributing to the Web, i.e. writing Web pages, submitting lesson plans, etc.

The Web activities most often used were research projects, printed Web pages, and online worksheets. The Web activities most often never used were WebQuest, online discussion, and encouraging the students to talk with an expert.

These results indicate that teachers may need more instruction and modeling in areas of Web use where interaction and communication are involved. To encourage more use of the Web in the classroom may involve providing observation opportunities or videos of teachers who are successfully using these techniques. To encourage teachers to produce their own content to contribute to the Web, or to encourage Web page writing by students may mean finding quick and easy page building methods and demonstrating the learning gains possible with these techniques.

References

Ayersman, D. J. (1996). Reviewing the research on hypermedia-based learning. *Journal of Research on Computing in Education, 28,* 500-523.

Dodge, B. (2000, November 17). The WebQuest Page. San Diego: San Diego State University. Retrieved November 29, 2000 from the World Wide Web: http://edweb.sdsu.edu/webquest/webquest.html

Dupagne, M., & Krendl, K. A. (1992). TeachersÕ attitudes toward computers: A review of the literature. *Journal of Research on Computing in Education, 24* (3), 420-429.

Grable, L. L. (1999). Bringing science on the Web to K-8
teachers: The Science House professional development model. *Proceedings of Presentations at the Summer 1999 American Association of Physics Teachers.* College Park, MD: American Association of Physics Teachers.

Heller, R. S. (1990). The role of hypermedia in education: A look at the research issues. *Journal of Research on Computing in Education, 22,* 431-441.

Ingram, J. K. (1994). A model curriculum to promote teacher-centered use of technology. *Peabody Journal of Education, 69* (4), 113-130.

Levin, B. B., & Matthews, C. E. (1997). Using hypermedia to educate preservice teachers about gender-equity issues in elementary school classrooms. *Journal of Research on Computing in Education, 29* (3), 226-247.

MacArthur, C.A., Pilato, V., Kercher, M., Peterson, D., Malouf, D., & Jamison, P. (1995). Mentoring: An approach to technology education for teachers. *Journal of Research on Computing in Education, 28* (1), 46-62.

Park, J. C., & Grable, L. L. (2000, July 26). *MentorNet technology how-to guides: Summer Web workshop.* Raleigh, NC: NC State. Retrieved November 29, 2000 from the World Wide Web: http://www.ncsu.edu/cep/mentornet/mnworkshops.html

Rogers, E.M. (1995). *Diffusion of innovations* (4th ed.). New York: The Free Press.

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Technology-Rich Education for Tomorrow's Teachers

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Abstract: "Preparing Teachers to Deliver Technology-Rich, Problem-Based Learning Experiences" is a PT3 catalyst grant for the state of Mississippi. The project is a collaboration between the Mississippi Research Consortium members, partner community colleges, and local school districts. The main goal of the project is to infuse technology and hands on science practices in the Mississippi Educational System. This is being accomplished by training elementary education candidates in a technology rich environment. Training is provided to elementary education candidates as well as their faculty and the teachers with whom they complete their field expereince.

Preparing Tomorrow's Teachers

The goal of providing a technology-rich learning environment for elementary education candidates in Mississippi has been accentuated by a grant funded by the U. S. Department of Education. The grant "Preparing Teachers to Deliver Technology-Rich, Problem-Based Learning Experiences" is made possible through the Preparing Tomorrow's Teachers to Use Technology (PT3) Program. The Mississippi Research Consortium, made up of Mississippi State University, Jackson State University, the University of Mississippi, and the University of Southern Mississippi, provided the basis for the promotion of the project.

Consortium Training

Consortium members are providing training for university and community college faculty, mentor elementary (Grades 1-8) schoolteachers and elementary education candidates. Training includes the GLOBE protocols for elementary schools, assistive technology, and training concerning the use of technology in the classroom. The consortium members are collaborating with community colleges and school districts in infusing the technologies.

In an effort to better prepare education professionals for the diverse classroom we are providing opportunities for them to become familiar with the need to address accessibility issues. We have also provided avenues for increasing awareness in addressing these issues.

Elementary Education Candidates

The elementary education candidates are being introduced to the GLOBE (Global Learning and Observations to Benefit the Environment) protocols. Candidates are learning to collect scientifically viable data, how to report them to an international database, and how to use the database to visualize data and to conduct experiments. They are using hands-on activities and technology-rich content in preparing lessons. Working with mentor teachers, they will learn how to implement these techniques in their field placements.

Training for participants in the use of various presentation and productivity software has been initiated. Topics covered include: the use of office products (word processing, spreadsheet...), classroom specific products (grade books, lesson planners...) and research specific products (encyclopedias...). Special training has been conducted in the use of the Internet and other software for teaching. A Project Learning Tree Workshop was held last summer for elementary teachers.

Summary of Accomplishments

- Held workshops for faculty (topics included: Productivity Tools, Adaptive Technology, Internet Resources and Searches, Power Point, WebCT, Arcview GIS, Global Positioning System (GPS and Remote Sensing) and in-service teachers (topics included: Productivity Tools, Adaptive Technology, Internet Resources and Searches, GLOBE, and Project Learning Tree) during the summer.
- Presented topics on Web searches and Adaptive Technology to pre-service classes in March and April.
- Put technology pre survey on the web for use by all 4 sites to collect baseline data for faculty, teachers, and candidate teachers.
- Compiled and submitted IRB for human subjects approval for all 4 sites.
- Coordinated schedule for training pre-service teachers in the fall.
- Presented "GPS and Plastic Recycling" at the Jackson Public School Environmental Learning Center summer camp on July 19, 2000. Graduate assistants helped forty summer camp students (grades 1-10) learn how to use GPS hand Held receivers.
- Collected data on student and teacher technology needs.
- Assembled Teacher Education Council and Faculty support committee (PT3 Advisory Council).

Significance

Over the last several years educators across the Mid South, including Mississippi, have made a concerted effort (a) to develop and disseminate K-12 curriculum guides in mathematics and science that are aligned closely with associated national standards and place heavy emphasis both on the use of constructivist-based, "hands on" and "field-based" (NCATE 1996) learning activities; (b) to look closely at, if not adopt, the new standards for instructional technology proficiency prepared by the International Society for Technology in Education (ISTE 1999), and (c) to allocate hundreds of millions of dollars to facilitate LEA-level development of technology plans and related implementation strategies directed toward ensuring that every school district has the hardware, software, and level of connectivity needed to integrate technology into their K-12 instructional offerings. This focused effort of reform and technology infusion occurring in public schools across the Mid-South is taking place in an educational environment made up of many very poor, rural school districts that are striving to improve the educational offerings of needy students (Stone 1989; The Annie E. Casey Foundation 1997; Mississippi Department of Education 1998). This challenge is further exacerbated by a narrowing field of well-qualified teachers, who have much needed experience in the areas of mathematics, science, and special education (Mississippi Public Education Forum 1998).

While there has been a significant commitment to reforming mathematics and science education in K-12 public schools as well as enhancing the utilization of technology in instruction, no comparable, parallel initiative has been undertaken to ensure that teacher education faculties or the faculties in Arts and Sciences responsible for providing the subject matter expertise to teachers

- Have kept abreast of the significant changes occurring in grades K-12,
- Have acquired the requisite background and skills needed to use the array of new technologies in their own teaching (i.e., to concretely demonstrate how those new technologies can be effectively integrated into their respective subject areas), or
- Modified their teaching strategies to reflect the content, procedural, or technological changes that are occurring.

Thus faculty in Teacher Education and Arts and Sciences are becoming generally unfamiliar with the new technologies and their applications to instruction.

Purpose

With this in mind, the purpose of this project is to strengthen the teacher preparation programs in the partner institutions. The associated goals are: (1 to provide professional development opportunities for both Teacher Education and Arts & Sciences faculties across Mississippi, particularly with regard to the infusion of (a) different technologies, including the array of adaptive technologies available to help serve special needs learners, and (b) an inter-disciplinary, problem-based perspective into the post secondary curricula for which those faculties are responsible, and (2) to initiate a programmatic pre-service teacher preparation effort focused on helping elementary education candidates learn how to effectively create and integrate technology-rich content and to use constructivist-based, "hands on" teaching strategies in mathematics and science.

In order to achieve the preceding purpose, the members of the Mississippi Research Consortium (MRC), and a cooperative alliance among the four major research universities in the State, are serving as the primary partners for the project. This arrangement builds upon existing linkages among consortium members (e.g., their ongoing commitment to having faculty certified as GLOBE trainers who have subsequently been involved in training K-12 teachers to use the environmental education curriculum) and capitalizes on the partners' ongoing efforts to enhance the quality of their respective teacher preparation programs in accordance with Mississippi Department of Education (MDE) guidelines and NCATE standards (NCATE 1996 and 1999). At the same time, the Consortium partners are working to address the State's growing teacher shortage – the four partner institutions prepare almost 90% of the new teachers in Mississippi. Additionally, the overall effort is supported by the State's Commissioner of the Institutions of Higher Learning (IHL). This broad base of support, coupled with the intent of the collaborators to involve as many other teacher-training programs in Mississippi and the surrounding states is seen as increasing the probability that the project will result in sustained changes in pre-service teacher preparation across the IHL system in Mississippi.

As presently envisioned, during the first two years of the project the primary consortium partners are initiating the immersion of lower division potential elementary education candidates in a field based experience that is interdisciplinary, problem-based in nature, involves technology-rich content and learning processes, and affords them multiple opportunities to observe and engage elementary students in an active constructivist-based, "hands on" learning environment.

Conclusion

Acquainting the targeted pre-service candidates, from their very first exposure to an "education" course with concrete applications of different interdisciplinary problems/issues, meaningful and programmatic examples of how to utilize technology to foster learning, techniques for helping to address the unique needs of diverse groups of students, and ways to foster active, "hands-on" learning offers a substantial realm for progressive accomplishments. The Teacher Educators and the Education and the Arts & Sciences Faculties serve to reinforce and expand Education and content area courses.

Overall, the project is contributing to major, systemic improvements in the pre-service teacher preparation programs offered by the cooperating partners. The fact that the four MRC universities prepare roughly 90 % of all the new teachers in Mississippi means that the project will directly impact 500 or more pre-service elementary education candidates per year. When those candidates graduate they will represent between twenty and twenty-five percent of the total number of new teachers entering the State's educator workforce every year. Furthermore, the proposed strategy and associated materials will serve as the foundation for a model that can be replicated more broadly across other teacher preparation programs.

Literature References

ISTE. (1999). *Curriculum Guidelines for Accreditation of Educational Computing and Technology Programs.* International Society for Technology in Education, Eugene, OR.

Mississippi Department of Education, MS, Office of Accountability (1998). *Mississippi Report Card.* Jackson, MS.

Mississippi Public Education Forum. (1998). *Educator Pipeline 1996-97.* Jackson, MS.

NCATE. (1999). National Council for Accreditation of Teacher Education. *NCATE 2000 Statdards Revision.* Washington, DC.

NCATE. (1996). National Council for Accreditation of Teacher Education. *NCATE Program Standards.* Washington, DC.

Stone, S. (1989). *Handbook of Selected Data for Mississippi.* Mississippi Institutions of Higher Learning. Jackson, MS.

The Annie E. Casey Foundation. (1997). *Kids Count Data Book.* Baltimore, MD.

Technologically Enhanced Cornerstone Courses: A High Impact – Low Cost Approach to Modeling Technology for Pre-service Teachers

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Abstract: This paper reports on the project rationale and design of one initiative to better prepare preservice teachers to integrate technology into their future teaching. This project, technologically enhanced cornerstone courses, brings together teams of teacher educators to redesign large courses taken by most of our preservice teachers. These teams also worked to develop research questions related to the project. By focusing on the large courses taken by most of the preservice teachers the impact of the project is high.

Introduction

Our college of education has a goal to make technology infusion a systemic component of preservice teacher education. Several initiatives have begun in support of this goal. This paper will report on one such initiative, the development of technologically enhanced "cornerstone courses." These courses generally have large sections and are taken by most preservice teachers in our institution. We feel that it is in these courses that we can impact a large number of preservice teachers by modeling effective uses of technology. In addition to the modeling of technology, we are interested in how technology can help develop a more student-centered approach to instruction in large classes.

Project Rationale

The rationale behind this project is two-fold. First, we believe that the modeling of technology integration is key for preservice teachers. There are several opportunities for the teachers to experience the modeling of technology in the classroom. They may see it used in their own K-12 schooling, in the teacher preparation program or in field experiences. We obviously have little control over their own K-12 experience as a student, but we can impact their teacher preparation and field experiences. However, without a concerted effort on the part of the institution as a whole, the experiences will be haphazard. The same course may have one instructor who is well versed in the integration of technology while another may completely avoid its use. This project will focus on modeling technology use in the courses taken by preservice teachers.

The second component of the rationale behind this project is that lasting change must be generated from the bottom up. In other words, mandates about technology use in teacher preparation courses will be much less effective than supporting teams of educators in the development of effective and appropriate technology integration strategies. These teams of educators have a variety of competing demands on their time and energy. Technology integration must work in concert with these demands to make any lasting impact. Beyond the demands of teaching, these educators also have a substantial research commitment. By learning about the interests of these professors, the project facilitators will work to incorporate these interests in meaningful ways through the use of technology.

Project Design

Six courses that are taken by a large number of preservice teachers will be redesigned in three years to incorporate a more learner-centered approach through the use of technology. We refer to these courses as "cornerstone courses" as they are either requirements in the teacher preparation program or are taken by a large percentage of our preservice teachers. Three courses will be chosen from within the college of education and three will be from other colleges in the same university. The courses within the college were selected based upon the recommendations of the various department chairs in the college. The courses outside the college will be selected through an application and selection process.

One course within the college will be targeted each year. Participants in each cornerstone course project include the project facilitator, a coordinator and course instructors. The role of the facilitator will be to provide technical and pedagogical guidance. The coordinator will be a course instructor who also agrees to be the point person for the project. The hope is that the coordinator will take a lead in encouraging implementation now and in the future. An important goal of the project is to insure the activities are not simply viewed as a one-time occurrence, but rather become a part of the culture of that particular course. The coordinator will also play a key role in identifying the needs of the course and the best way to infuse technology in a way that will increase student centeredness. The course instructors who choose to participate will be involved by implementing the enhancements developed.

Each course identified in the cornerstone project will likely result in a wide variety of approaches. The participants are charged with enhancing the identified course by utilizing technology to increase the student-centeredness of the course. How they go about this is ultimately up to them and again can be guided by their own interests. The facilitator's role is not to dictate the approach but rather to listen to needs and provide suggestions for addressing those needs. Below is a description of how these development activities progressed with the first course targeted, Introduction to Educational Psychology.

The First Cornerstone Course: Introduction to Educational Psychology

This course certainly met the criteria of a cornerstone course by being a required course as well as the fact that the sections are quite large (about 60 students) and getting larger each year. This course was also appealing because of the large number of full-time faculty that regularly teach the course. The large number of faculty would insure that the impact of the project would be broad. One of the first steps in the process was to identify the participants that would be involved in the project. The natural choice for the project coordinator was a professor who had participated in some previous technology integration initiatives and also served as the coordinator of this course for the department. The other participants were recruited from the pool of professors that regularly teach the introductory course. All four of the professors who regularly teach the course expressed an interest in participating.

The coordinator and facilitator met regularly during the first semester of the project. These meetings turned out to be very fruitful in terms of project design and scholarly inquiry. During these meetings, two main course enhancements were identified. The first activity was to develop Web "Case Pages" for use in the course. A case page will be a multimedia Web page that describes a case that exemplifies a course concept or presents an opportunity to apply a course concept. For example, a case page could describe the concept "learned helplessness" by describing relevant research, showing a video clip of a student explaining why she cannot perform a task, links to other information sources and reflection questions. Case pages will be used to set the stage for class and bulletin board discussions. They may also be used in a distance-learning version of the course.

The second activity focused on scaffolded discussions. Advanced discussion board "modules" will be developed and then utilized throughout the course. These modules will utilize the most current ideas in the areas of computer supported collaborative learning (Koschmann, 1996) and knowledge building (Scardamalia & Bereiter, 1991). The approach used to facilitate the scaffolded discussions will be determined through a literature review of the above areas. It is expected that the review will produce several alternatives programs and/or approaches to the facilitation of these discussions. To make plausible the use of the case pages and scaffolded discussions, the project facilitator will work with the participants to move their courses online with WebCT.

Once the main activities were identified, we then delineated the expectations of each of the participants:

Coordinator

-Supervision of Case Page development
-Discussion board questions (scaffolds)

-Sharing with course instructors
-Participate in orientation meetings
-Meet w/ facilitator every two weeks

Facilitator

-Work with case page development
-Research scaffolding software (e.g., Knowledge Forum)
-Work with course instructors
-Coordinate participant meetings
-Meet w/ coordinator every two weeks.

Course Instructors

-Participate in two orientation meetings (prior to implementation)
-Participate in three meetings (two during implementation and one end-of-semester)
-Use WebCT
-Integrate Case pages and scaffolding tools into their courses

Needs related to the project were then discussed. It was clear that a Web development person was necessary to develop web case-pages, provide assistance with capturing the multimedia materials necessary for the cases and developing a home page for the course that could be used by all the sections of the course. Other needs included materials such as software (e.g., scaffolding program such as Knowledge Forum and video editing software) and hardware (e.g., video capture equipment). These needs and a small stipend for each of the participants would be funded by the Preparing Tomorrow's Teachers for Technology grant program.

Research Potential

A key component requirement of this project is that the activities meet several needs and not be limited to the need to model effective uses of technology. The instructors involved should also have the opportunity to use the project as a way to address some scholarly questions. By using electronic tools such as Listservs and WebCT, data collection becomes much easier than traditional methods. When the participants learned about some of these tools, they immediately envisioned several scenarios that were ripe for investigation.

As a result of the team discussions, several research projects were discussed. The first project will report on the efforts of the faculty to renovate the courses through the use of technology. This project will utilize a listserv as a forum for discussion of the group activities, trials and successes. Several different levels of expertise are represented in the group of instructors and it will be interesting to follow the discussion between them as the course proceeds. Another project will compare the perceptions of students in sections before and after the course improvement. One of the problems with a large introductory course such as this is that students fail to see connections between the course content and their goals and experiences. Our hope is that the use of technology will help make some of these connections by fostering greater communication with their peers.

In addition, to research projects that will review the cornerstone project, several other studies will be conducted the deal more directly with the interests and expertise of the participants. The coordinator for the Educational Psychology course is interested in argumentative reasoning and will investigate several research questions while observing the course discourse in the online bulletin board. How these discussions are facilitated is an area that is in dire need of investigation. Other members of the group are interested in various learner characteristics that they have studied in more traditional forums. For example, one member is interested in the relationship between epistemological beliefs and achievement. How these beliefs impact students participation in the online discourse is another area the will be further investigated as a result of this project. Investigating so many questions in one semester would be extremely difficult if it weren't for the collaboration that has occurred and will continue to occur during the implementation of these course enhancements.

Discussion

While the activities related to the project have only just begun, it is clear that the approach has the potential to have a lasting impact for virtually all of the preservice teachers in our program. It has also resulted in some powerful collaboration between different departments in the college both in terms of pedagogical and research issues. Insuring the next generation of teachers can use technology in an effective way will require a systemic and multifaceted reform of our teacher preparation programs. The cornerstone course can play a key role in that reform.

References

Koschmann, T. (1996). Paradigm shifts and instructional technology: An introduction. In T. Koschmann (Ed.), CSCL, Theory and Practice of an Emerging Paradigm. Mahwah, NJ: Lawrence Erlbaum.

Scardamalia, M., & Bereiter, C. (1991). Higher levels of agency for children in knowledge-building: A challenge for the design of new knowledge media. The Journal of the Learning Sciences, 1(1), 37-68.

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Technology In The College Classroom - Preparing Teachers To Use Technology

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Abstract: The panel presentation herein shares strategies and outcomes of the implementation of the SOWEGA PT3 (Preparing Tomorrow's Teacher to use Technology) Project at Albany State University (ASU). The strategies are: (1) Infusing technology into core courses that will serve as models for future teacher, (2) providing technology training to faculty in collaboration with the Education Technology Training Center to strengthen technology competence system-wide; (3) encouraging the development of technology intense course materials, (4) awarding mini-grants to faculty members who will promote the interests of the SOWEGA PT3 project; (5) targeting pre-service teacher for Intensive Technology (InTech) training, and (6) collaborating with area schools to encourage student teachers utilizing technology at schools where they are doing student teaching. The PT3 project has fostered multi-disciplinary activities that promote active use of technology.

Introduction

The SOWEGA Project is the Preparing Teacher To Use Technology (PT3) – funded initiative on the campus of Albany State University, a 100-year-old historically black university in southwest Georgia with a College of Education that graduates over 140 teachers each year. To prepare graduating teachers proficient in using technology in the classroom, the SOWEGA Project proposed a multi-disciplinary effort across the Colleges of Education and Arts and Sciences that would engage college faculty to model technology-rich teaching. Using this approach, a mini-grant process enabled faculty to address changes through revising syllabi, taking training courses in technology applications, working with technology-trained K-12 faculty and student teachers.

The panel presentation intends to share outcomes of the first 18 months of this effort, using evaluation outcomes and faculty participant interaction to enrich the panel. College faculty in mathematics, in the natural sciences, in English and modern languages, in social science and education courses revised their teaching strategies. In the course of designing new syllabi, faculty all engaged in a training process designed for Georgia teachers, called InTech. This intensive 7-day process uses skill application from Microsoft Office, coupled with other software and Internet skills to guides participants through a process that results in four new one-hour lesson plan designs. The InTech model is being adopted in other states for its excellence and relevance to INTASC standards for technology in the classroom.

Student teachers are also engaged in going through the InTech process, which has recently become a requirement for re-certification in Georgia. A culminating activity held at the ending of year one was the "Summer Seminar", a day filled with presentations shared by SOWEGA Project mini grantees, student teachers and K-12 teachers who completed the year of learning to enrich teaching through applications of technology. Some outcomes of the first year include: revisions of critical core courses, including Trigonometry or Pre-Cal, a process that engaged all mathematics faculty who periodically teach the course. One immediate outcome has been that 90% of the mathematics faculty have been trained in InTech, exceeding the proposal objective expectations; the faculty in English and Modern Languages also experienced a high rate of participation in the InTech training; in Teacher Education three faculty revised the Foundations of Education course and other faculty revised a reading course to produce student-produced multimedia books. In physical science, one of the core lab sciences taken by teacher education and all other majors, faculty used java programming to design a web-based simulation of basic principles of physics; and in history, faculty revised syllabi to enrich core courses using Internet resources. It is sharing of the cross-disciplinary efforts demonstrated in the SOWEGA Project, resulting in new technology skills for college faculty and for teacher education students that will be the focus of the panel presentation.

The first presenter of the six panelists, Betty Hatch will introduce the vision and planning of the project. Then Gerald Burgess will present the important role of InTech in PT3 project. Next Samuel Masih will provide insights on faculty development and implementation of a technology-intense Pre-calculus course. Our third presenter Rosemarie Mundy-Sheppard will share the excitement of infusing technology in English and social science courses. Next K.C. Chan will showcase the infusion of Java simulation technology for natural sciences and web database for the e-commerce. And finally Rani George will present a summary of the progress of the SOWEGA project using the results and findings of both the internal and external evaluations.

Panelist 2: Gerald W. Burgess, New Roles in Teacher Education: Creating Technology Connected Lessons

The media's attention on our nation's dependence on computer technology has no greater evidence than the impact of Y2K. Website addresses have become part of the language where the phrase "dot com" permeates our speech and is seen on billboard advertising. As future teachers move through our schools of education, technology is being taught as both an educational delivery method and instructional communication tool (Imel, 1999). Quality teaching in the 21st century will require teachers to be knowledgeable about a technology influenced student body and how to create learning environments, which integrate technology in the support and delivery of instruction. Teachers in the new millennium should view technology as a cognitive tool that has the potential of encouraging inquiry-based learning and reinforcing instructional concepts. Planning technology connected lessons will require teachers to think more creatively about how students learn and plan lesson which respond to the vast variety of learning needs. The positive effects of technology far outweigh their disadvantages when applied correctly. The greatest effect is that of contextualized learner-centered activities with the emphasis placed on student learning not teacher teaching. This multimedia paper will discuss technology connected lesson plans, their impact on teaching, student motivation and instructional delivery. The authors will outline strategies for developing technology connected lessons and discuss a model used by the Georgia Framework for Integrating Technology in the classroom.

Colleges of Education, especially those in teacher education, are entering a new era if they are not already in it. It is the era of the Technology Connected Lesson. The new technologies of the late-1990s, television broadcasting, satellite transmission, Microcomputers, the Internet, and the World Wide Web (WWW) are shaping the way we deliver information in the classroom. Its not so much that lesson planning is different today than 20 years ago, but planning a technology connected lesson today has more to do with the way we think about technology, use it, and focus student's attention on it. Technology is a tool. It's not the process, it's not skill development, it's a tool to research, communicate, and to publish. The problem is that we continue to think about lesson planning the way we did 20 years ago in terms of delivery of information rather than student involvement with the information and knowledge we expect them to gain. This paper will explore some of the issues surrounding developing Technology Connected Lesson Plans and their impact on teaching, classroom, student motivation and instructional delivery. The authors will strategies for developing lesson plans and discuss a model used by the Georgia Framework for Integrating Technology into the classroom.

InTech Program Description:

InTech is an intensively structured, 50-hour, Georgia Department of Education Professional Development Program. It provides many examples of effective technology-based strategies that support and enhance curriculum and can serve as a catalyst for fundamental change in the overall teaching and learning processes. One of the strengths of the program is peer-instructor modeling of technology-connected lessons. Developing skills in the following five critical areas characterize this integrated training approach: (1) Use of Modern Technologies, (2) Curriculum Integration, (3) Designs for Learning (4) Enhanced Pedagogy and (5) Classroom Management. Participating teachers learn basic technology skills while focusing on project-based activities that use Georgia's Quality Core Curriculum.

Initial training includes five-days and two follow-up days. DOE and DOE Regional ETTC's coordinate the on-going training of trainers and the publishing of technology-connected lesson plans. Support for this training will make extensive use of the Georgia distance education networks, Peachnet, PeachStar and GSAMS.

Program Criteria:

School Principals will agree to:

- Select a team of five teachers from selected critical content areas and grade levels, media or technology specialists and/or administrators. The team will agree to the requirements for participants listed below.
- Plan for seven release days from classroom duties for each team member.
- Plan to provide a multimedia workstation and software for each participating teacher.
- Attend an information session prior to the first training day.
- Attend a minimum of 10 hours of InTech training.
- Attend two one-half day workshops: #5775 Understanding the Classroom Module and #5800 Evaluating Teachers in a Technology Connected Classroom.

InTech Participants will agree to:

- Attend seven eight-hour training sessions (8am-4pm).
- Critically examine their own instructional practices to determine how technology can play a role in enhancing the teaching and learning process.
- Implement four technology-connected lesson plans and complete all InTech assignments (journal reflections, professional readings, email responses, etc.).
- Develop a group project that displays teacher-created materials and student-created projects developed during InTech. The project may be a tri-board, portfolio, electronic portfolio, etc.

Creating Technology Connected Lessons require a change of perspective, a process, standards, and the teacher. The place to start is with the curriculum – your expertise. Technology-connected activities should be based on ideas and concepts that you are teaching, with the activities being of critical importance to what students need to learn. As plans are developed, technology is used as the tool or the vehicle for acquisition, organization, evaluation and application of knowledge. Teachers in the new millennium should view technology as a cognitive tool that has the potential of encouraging inquiry-based learning and reinforcing instructional concepts. Planning technology-connected lessons will require teachers to think more creatively about how students learn and plan lesson, which respond to the vast variety of learning needs. The positive effects of technology far outweigh their disadvantages when applied correctly.

Panelist 3. Samuel Masih (Mathematics and Computer Science), Pre-Calculus Instruction Incorporating Technological Tools

The purpose of this activity is to provide a model of teaching and learning using the technology. In order to implement this objective, the PT3 provides mini-grants for mathematics faculty to acquire any technological tools and necessary release time as needed to revise their syllabi and to develop technologically rich lessons for presentation and delivery of course content. The intent of the mini-grants was not to teach the students technology know-how, but to construct an effective model of applying the technology in their teaching. This project incorporates technology in the pre-calculus course, which is required of all mathematics and science pre-service teachers and is taught by arts and science faculty. Since there are several sections of pre-calculus course, it became evident that in order to truly implement this objective all sections of pre-calculus would have to participate in this venture. For this reason there are five faculty in the Department of Mathematics and Computer Science that are Co-PI's in this mini-grant. The strategy for incorporating technology in the pre-calculus course was to develop a common syllabus for the course that addresses the use of technology. Fortunately, the Department of Mathematics and Computer Science at Albany State University already had many of the needed technology components that could be used to accomplish the objectives in the mini-grant. The course was redesigned to incorporate several major technological tools in the delivery of the course content. These were as follows.

1. Interactive Pre-calculus Software (IPS)
2. Maple V mathematics software
3. Access to the Internet
4. Technology Training Center (INTECH)
5. Microsoft Office Tools such as Power Point
6. Graphing calculators such as TI-83

All faculty in the mini-grant took INTECH training in the summer. Each faculty developed some technology rich lectures that could be shared by other faculty. A web-based tutorial system was developed for the course that provides common syllabi, study guides, homework assignments and help on the homework assignment (http://www.asuemath.asurams.edu/precal). From this page a student could branch out to specific assignments given by individual faculty. Access to the page is authenticated to keep track of the use of the web-based activities in a database. The database keeps records of student activities and provides feedbacks to individual faculty about their student activities for the purpose of evaluation. This page also provided means of collecting data on the web about students in the pre-calculus course.

Another important component in the course is the use of the existing Interactive Pre-calculus Software (IPS)(http://newton.asurams.edu/~smasih/precal). This software provides interactive multimedia instruction in the precalculus. The software is installed in the computer laboratories and is made available to students and faculty. It is used by the faculty for providing interactive simulations in the classroom as a part of their lecture and to subsidize instruction. The software is useful in stimulating discussion in the classroom. Students who are not doing well in the class are required to go to the laboratory and use the software to remedy their weaknesses. The computer laboratory also provides access to Maple V software. Maple V is a powerful software tool for doing mathematics and a great tool for simulations and graphing in the classroom. General workshops are conducted outside the classroom for the use of IPS and Maple V. Students are required to attend the workshops. As an incentive, the students earn 10% of their grade through doing activities using technology.

Several pre-service teachers are hired as student assistants by the mini-grant faculty. The faculty act as mentors to these students and use them in creating technology rich lessons and web –based material for their classes. These students are required to take INTECH training. An in-service teacher in the school system is associated with the mini-grant. The pre-service interns visit this teacher's classroom and provide help in the incorporation of technology rich lessons.

Outcomes. The following table shows the impact on arts and science faculty and pre-service teacher. A survey instrument is used to determine the number of pre-service teachers in the pre-calculus courses. A survey instrument is used to determine the number of pre-service teachers in the pre-calculus courses. An evaluation survey is conducted to see the impact of the use of technology. The following table provides a rough data concerning technologies used in instruction.

Percentage of potential Education majors in pre-calculus courses in the Fall 2000	29
On a scale from 0 to 5 the result of the Technology Survey is as follows	
1. The use of Interactive Precalculus Software in the class in teaching	4
2. The use of Interactive Precalculus Software installed in the computer laboratories	3
3. Web-based exercises and home work assignments	3
4. Help provided for the Web-based exercises and homework assignments.	4
5. Workshop in the use of Maple V software teaching	3
6. Using graphing calculator	4
7. Over all technology use in the class room	4

Table. 1 Percentage of potential education majors in pre-calculus courses in the Fall 2000

Some of this data is incomplete at the time of the writing of this paper. At the end of the Fall Semester 2000, all the data will be looked at for seeing the impact of all the technology components incorporated in the mini-grant.

Panelist 4: Technology Infusion in English Classroom, Rosemarie Mundy-Shephard (English)

The implementation of Technology Infusion in the English Classroom carries the following components: selection of the English Composition II--1102 course for technology infusion, in- depth training for pre-service (student) teachers, forming partnerships with service elementary and middle school teachers in prompting the use of technology, and, most importantly, establishing a technology team in the English Department at Albany State University. English Composition II was targeted for the implementation of technology. The students were first given a pre-course survey to gauge their technology backgrounds and attitudes. To demonstrate the use of the technology in teaching English, wireless laptops were used in the classroom by students to perform literature searches via the Internet, some learning games were designed (such as Dante's Inferno Game) to arouse students' interests, and the digital camera was used to illustrate the power of imagery in conjunction with literature. Parts of these activities supported the technology-enriched assignments for the students. For instance, to prepare for the full participation of the game, students completed a rigorous review of their work. Also, students tested their literal learning and review online as they competed and answered trivia questions on the assigned readings. Overall, students in the English Composition 1102 class completed a basic search for research materials, learned about useful composition websites and sent email communications to the instructor and at least one other student in the class. Moreover, instruction was enhanced because students enjoy using computers for research. All the work described required intensive preparatory effort. Pre-service students were recruited to participate in the implementation of the above strategy. The pre-service students attended an intensive In-Tech training class, where they learned how to use hardware (digital cameras, scanners, printers, laptop computers, and zip drives) and software (such as Microsoft Office Excel, Database, and Inspiration). These pre-service teachers also prepared Newsletters and created a Totem and templates for assignments, involving every aspect of preparing technology for teaching. To further prepare the student teachers for technology, we have established partnerships with in-service teachers in the local schools. In the process, these teachers were In-Tech trained as well. Because of the pilot project, we have generated enough interest in the department to assemble a team of teachers interested in adopting the technology and continuing the expansion of infusion of technology into the classroom; four of the faculty members on the team were In-Tech trained because of the process. In conclusion, PT3 has made a significant impact on the Department of English to incorporate the use of technology for core-level English instruction.

Panelist 5: K. C. Chan, Infusion of Java Interactive Technology into the Physical Sciences (Natural Sciences) and Infusion of the Web Technology Into Fundamental Computer Applications (Bus. Admin., Chiou-Pirng Wang)

A. Infusion of Java Interactive Technology into the Physical Sciences

Science is a difficult subject to learn because it involves concepts based on dynamic events and spatial entities that are awkward to be presented on 2 dimensional media such as textbooks and blackboard. Computer technology has broken this barrier and the Web has rendered computer simulation and visualization tools widely available. Thanks to Java technology, Web browsers today are capable of performing highly interactive computer simulation for all kind of science disciplines. Many high quality interactive Java applets for sciences are available on the Internet. The Interactive Java Project supported by the SOWEGA PT3 has decisively helped introducing Interactive Java into physical science course PHYS 1001K offered at Albany State University, a core course require by non-majors and education students. The intention of the project is to provide a learning and teaching model for student teachers who take this course.

The implementation of infusion of interactive Java includes the following stages:

1. Develop and compile existing java applets that are suitable for physical science curriculum.
2. Train the student to write his or her own web pages and use intranet for files access.
3. Train students to use the applets selected for the class project.
4. Ask students, as a class project, to develop an instructional web page based on their understanding of the applets and integrate it with the applet to develop a lesson page—not a lesson plan—to teach their fellow students the content conveyed by the applet.

This project is technologically intensive for the students in the course. First the student spent 10 hours learning how to create web pages via the InTech program. Then each student had to select an applet related the course content or be assigned one in random. The student must then master the content knowledge of the applet and the idiosyncrasy of operating the applet before creating an effective lesson. Then the student would present the result before the class. Students who had successfully finished the project would have a good grasp in how to apply interactive technology in teaching science and how to tap into vast Java resources available on the Web. Consequently, the project has developed three interactive java applets in house plus more still in development. Table below list eight such applets representing phenomena that are easy to understand when simulated but hard to understand when present in static media.

Applet Title	Contents
1. Transverse Wave	Wave and wave propagation concepts
2. Longitudinal Waves	Wave and wave propagation concepts
3. Interference	Interference property of wave
4. Pendulum	Parameters that controls pendulum motion
5. Light Rays	Light ray travels in straight line
6. Colors	Mixing of primary colors
7. Fluids (In house)	Fluid flow—conservation of mass
8. Frequency (In house)	The different between frequency and speed

Table 2. Selected applets

Evaluation. Student performance was evaluated not by objective testing. Instead students were graded according the following rubrics:

1. Do students understand the concepts well? (Based on student presentation and from the contents of their web pages)
2. Could a third person follow the instructional steps constructed by student author to use the applet effectively and correctly? (i.e. is the instruction clear and easily to follow?)
3. Are the steps or construction of the lesson clearly leading to learning objectives conveyed by the Java applet?
4. Are the concepts and instruction steps coherently represented?
5. Are student technology competent?
   - Can the student create the web page and upload it to the server location successfully
   - Can the student transfer file via the Intranet?
   - Can the student manipulate the Applet?
   - Can the student use the multimedia equipment to present the result properly?

Outcomes. Basically we have accomplished the mission of infusing technology into the classroom in a way that students can apply their new skills in how to use the technology for learning and teaching. The outcomes of the project could be viewed in two aspects: the technology know-how and the content knowledge. Since our emphasis is on content knowledge based on the foundation of technology, the outcomes of the project could be tabulated as shown in Table 2. In the end, eight web lessons were created.

	Pre-project Experience/Knowledge	Post -project Experience/Knowledge
Technology Operation Skills 100% = tasks accomplished 0 % = No prior experience	Web page development 0% Network File Transfer 0% Java 0% Computer Projector Presentation 0%	Web page development 100 % Network File Transfer 100% Java 100% Computer Projector Presentation 100%
Content Knowledge	0 – very limited knowledge	Grades: 25.0 % A 25.0 % **B** 37.5 % C 12.5% **D** Based on understanding reflected by the student's web lesson.
Web Authoring	none	Author a Web lesson

Table 3. Evaluation of PHYS 1111K student performance

B. Infusion of the Web technology into Fundamental Computer Applications, Chiou-Pirng Wang P. (Department of Business Administration and Education)

Microsoft InterDev 6.0, HyperCam, and Access Database were added to the traditional Fundamental Computer Applications for Business BISE2010 that teaches only word processing, spreadsheet, and PowerPoint presentation and database. The modified course demands students to create a database driven Web Pages using the InterDev. To get students up-to-date to the e-commerce technology, they must master the Web pages creation, Web forms and database concepts, connection of database to the server from the client, retrieval and update of database records. All these, even with the help of InterDev is procedurally too complex for students to learn in a short period of time, so HyperCam is used to prerecord some intricate procedures for playback by students later, just in time of need. Also, simple built-in Java and Visual Basic scripts were the first time introduced into this popular course. The class devotes 1/5 class time to the Web-based database. A post and pre-survey given to gauge the level of student understanding on the web-based database after a summer session is given below. It demonstrates the approach is working well.

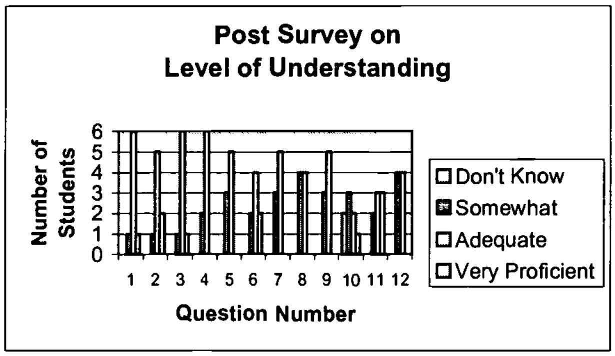

Fig. 1 Post course survey results.

Panelist 6: Results of the Evaluation, Rani George (Education) and Technology and Student Constructed

A. Results of the Evaluation

The major aim of any evaluation is to collect, analyze, and interpret information on the need for, implementation of, and efficiency of programs and intervention efforts. The evaluation helps answer the following fundamental questions: (1) Has the PT3 project achieved its goals? (2) How does technology impact learning? (3)How can we prepare tomorrow's teachers to use technology in their classrooms? (4) What changes are required in the curriculum for teacher preparation programs?

To answer these questions the project performs bipolar measurements, one set from the student and the other from the instructor. On the student side, the measures are student testing, projects, essays, extended performances, portfolios, student attitudes, morale, and satisfaction. On the teacher side, we evaluate Teacher's use of technology in the classroom, attitudes, satisfaction, competence, and curriculum changes.

I. Baseline studies

Subjects for baseline evaluation consists of 493 students, 18 ASU faculty, 7 mini-grant recipients, and 22 Summer Seminar Participants. Students answered a 37-item computer attitude survey. More than 85% reported positive attitudes toward the use of computers and a high degree of comfort in using the computer. Faculty responded to a survey, which measures faculty use of basic technology in their teaching and regular daily activities. Based on the results it can be stated that competency with basic computer operations ranges from beginning to more advanced. A system wide survey is underway to get a better understanding of faculty's level of technology competence. Of the 22 participants who attended the summer seminar 95% rated the seminar as an "outstanding activity" and stated that they received "ample information." Further evidence of technology comes from data that show that 32% of the faculty in the Colleges of Education and Arts and Sciences and 5% of Education majors have had InTech training. All the students enrolled in Prep for Teaching are currently undergoing InTech training.

II. Evaluation of the syllabi redesigned for technology infusion.

Six of the seven original syllabi had little or no technology components. The seventh added more advanced features to the technology already in use. Another set of 8 faculty members (2 English + 5 Math + 1 Business) have signed up to add technology components to their teaching. The findings related to the revised syllabi are complex. Two questions stood out in the evaluation of a syllabus (1) How often does the revised syllabus include technology? (2) What evidence is in this syllabus to indicate that, as a result of this course, students will know and/or be able to do the competences indicated in the standards? When judged against the National Education Technology Standards, the syllabi were found to echo strongly with the standard Technology Operations and Concepts but weak in Social, Ethical, Legal, and Human Issues. The table below shows two of the standards and the extent to which the seven course syllabi echo the standards.

Standard I. Technology Operations and Concepts
Standard II. Social, Ethical, Legal, and Human Issues

Syllabi	A	B	C	D	E	F	G	Examples of Evidence
Frequency of the syllabus satisfying standard I.	6	17	5	6	8	9	6	.Establish and use email account; join listserv .Use interactive software simulation .Use Internet for resources and research .Use computers, calculators, and other technology in completing assignment .Create Web Pages with data source link and site diagram .Demonstrate proficiency in computer-based search technology
Frequency of evidence that the syllabus satisfying the standard II	0	0	3	0	0	0	0	. Identify and describe teachers' responsibilities related to computer ethics. . Design student-learning activities that foster equitable, ethical, and legal use of technology by students.

Table 4. Evaluation of the syllabi redesigned against NETS standard

B. Technology and Student Constructed Books--Telling Stories of the Past-- a Bibliotheraphy,
Onetta Williams

The PT3 project has enable the introduction of technology to an Early Childhood Developmental Reading Course -- ECEC 3355. In the course, students learn to *follow directions explicitly*. Typically a child will secure a piece of wallpaper that measured 10 ½" X 14 ½", two pieces of mat board measuring 5 ¼" X 8 ½", a bottle of rubber cement, fold in half 5 sheets of copy paper, andstaple the sheets down the folded side to make a blank book. Then, the student starts to write the story. The student is required to recall an experience that occurred during their childhood when they were in the early years of school. The student will write the story, based on this remembrance, distributing it throughout the book on the front and back pages of the each page until the end of the story is reached. This hands-on textual learning is an important part of learning in early childhood and should also be done as an enhancement to the technology component of the project. However, to render the storybook attractive and impressive, students are encouraged to add the graphics and use the scanner and computer graphics programs tot support the content of the story. The student is encouraged to use old childhood photos and scan them into computer for software rendering and/or filtering them for inclusion into the book. After finalizing the written part of the story, the student will bind the book using a techniques modeled by the teacher. Finally, students will present the finished books enhanced by technology in a Book Showing where the entire class, families, and other faculty members are present. Refreshment are served and classical music is played softly to set the mood for the books to be read..

Bibliotheraphy is a technique used in book writing to help the student "get the story told". Often a young child experiences an event that leaves a lasting impression and the feelings from that event is never voiced, but remembered. In Developmental Reading, when students are required to reflect on an experience that took place when they were young, they often recall these previously mentioned events. The student chooses to write about this event and takes great care to use the "perfect" computer graphics and make use of the scanner to include photos of family members and the student himself. Often, the entire family gets involved with the writing of the project to ensure the authenticity of the book. When the story is read at the Book Showing, it often evokes tears and happiness within the student at the same time because the "story is finally told". Technology has added a happy dimension to the equation.

Conclusion.

In conclusion, we have presented here our overall strategies on implementing a system wide approach to prepare tomorrow's teachers to use the technology. Our framework is based on faculty peers training and InTech training, technology based model classes, intensive technology training for pre-service teachers, and collaboration with in-service teachers from local schools which desire to implement technology in the classroom. InTech plays a crucial role in training faculty and pre-service teachers and students alike who lack the fundamental technological skills. Based on the InTech foundation, we then build technology-based core courses and use them as models to showcase them to pre-service teachers as well as to faculty. It is important to notice that, as demonstrated by the presentation of the panelists mentioned above, the level of technology sophistication could vary significantly from discipline to discipline. Instead of standardizing education technology across the board, peers in each discipline, such the mathematics and English departments mentioned earlier, should be given an opportunity to decide on their own comfort level of technology needs. An appropriate technology, which matches the need of the discipline and its courses, is more important than the sophisticated and state-of-the-arts technology skills ever invented. For instance, the use of a scanner and computer to help capture images for the construction of a manual storybook by a child is highly effective for promoting early childhood reading; yet too much technology may damper the effectiveness of the hands-on approach. Based on this philosophy, the SOWEGA PT3 project is going to continue its effort to create more model courses that encompasses all kind of technological usages so that, in the end, no mater which core course an education student and hence the future teacher may take, he or she will be exposed to an usage of the technology.

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Use of Development Teams in Problem Finding

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Abstract:
Educators emphasize unit construction as an important part of teacher preparation. Technology-enhanced problem-based learning units are particularly exciting because they have the potential to involve students in complex, realistic problems that are both engaging and cognitively challenging. These units are difficult to develop, however, particularly for elementary education teacher candidates who often have limited content knowledge. The authors have enlisted arts and science faculty experts to participate as members of "development teams" to assist in the design of problem-based units in science and social studies. This collaboration produced units in which content is richer, problems are more complex, and resources are more substantive.

In teacher education, science and social studies methods courses typically include unit development as an essential skill for teacher candidates. Units of study provide an important vehicle for presenting content in a cohesive way, for integrating information from different disciplines, for putting content into a relevant, meaningful context, and for blending skills with content. Noted educators and educational researchers have long emphasized the value of curriculum integration (Whitehead 1929) and cautioned against the teaching of skills in isolation (Perkins 1986), so unit construction is an important competency for teachers.

Technology-Enhanced Project-Based Learning

Units come in many formats, each with its own strengths and underlying principles. In our methods courses at Elon College, we recently adopted technology-enhanced project-based learning as the unit model to use with our teacher candidates. In a project-based unit, students are presented with a situation or scenario that calls on them to accomplish a task or develop a product. They may be placed in roles that demand the adoption of a particular approach or the use of a particular set of skills. For example, one team of our teacher candidates developed a project-based unit that placed their fourth grade students in the role of journalists covering flood relief efforts in eastern North Carolina after a series of devastating hurricanes hit the coastal region of the state. The fourth graders were asked to investigate the storms, the resulting damage and subsequent relief efforts, then to write articles for "*North Carolina Today*," a magazine they fashioned after prototypical news magazines.

We selected the project-based learning unit model for several reasons. First, a project-based learning unit provides an authentic learning environment. Activity theory suggests that we learn by doing (Jonassen & Rohrer-Murphy 1999). Vygotsky, Leont'ev and other Russian psychologists (Wertsch 1981) have brought this idea to the educational forefront and given it theoretical validation, but it has immediate face validity as well. We learn when we want to learn, when we need to learn, and when we are interested. Learning happens almost without our being aware of it when we are deeply engaged in a project that is meaningful to us. Too often "school learning" is neither engaging nor meaningful. Skills are learned, but never applied in real-life situations; facts are learned, but never associated with important principles; concepts are memorized, but without being understood. Research confirms that transfer to out-of-school situations is unlikely when learning is so contexualized, so embedded in the classroom environment (Lave 1988; Perkins & Saloman 1988).

Second, project-based learning allows us to explore a content area in depth. With the amount of information in mandated curricula today, coverage is a major issue with teachers. The result is sometimes referred to as the "iceberg" approach to teaching, where only the tips of many knowledge areas are touched upon, none in depth. Project-based units provide opportunities to delve into subjects and emerge with deep understandings. For example, students in fourth grade might be expected to define a hurricane and to distinguish it from a tornado, and/or they might be expected to identify relief agencies and to list their functions. Approached this way, the topic of storms can easily be covered in a day or two, but activities such as these do not encourage the in-depth learning that is demanded by the project scenario developed by our teacher candidates

Third, project-based learning encourages both content integration and skills infusion. Projects are by their very nature integrated. Science, social studies, language arts, and mathematics all figure into the flood relief scenario outlined above. In addition, the writing assignment is a natural one. Students learn how to write in a particular fashion, to a particular audience, because they are placed in a role where that is what they must do – it is their job. It gives a whole new meaning to the writing assignment and actually does not seem like an assignment at all.

Though we could enumerate other reasons, the last one we will mention here is that project-based units provide a natural way to integrate technology into the curriculum. It is crucial for teacher candidates to begin to integrate technology into their instruction so that when they enter the teaching profession they can teach necessary technology competencies to their students. Project-based learning provides a natural vehicle for technology use because it is so clearly enhanced by technology (Moursund 1999). There are opportunities to organize information using databases and spreadsheets, to study new concepts using computer models and simulations, to present ideas using multimedia, and to conduct research in an authentic, collaborative environment.

Problem-Based Learning as a Type of Project-Based Learning

Some projects involve solving a problem, and when this is the case, project-based learning becomes *problem*-based learning (PBL). Though the difference is not always clear, the two can be distinguished in the following way: With project-based learning the emphasis is on the *product*, with problem-based learning the emphasis is on the *process*. The project-based learning unit we outlined above had students concentrate on locating information and writing a news article. If students had been asked instead to devise a plan for minimizing flood damage following hurricanes in eastern North Carolina, then they would have had to engage in substantial higher level thinking. The concentration on the complex thinking required in the project, rather than on the final product, suggests a more problem-based approach.

Because critical thinking and problem solving are crucially important skills, we encourage teacher candidates to develop projects that center on problems. As Rutherford and Ahlgren (1990) point out when they report on Project 2061, it is important to have students interact with significant problems:

> Students should be given problems – at levels appropriate to their maturity – that require them to decide what evidence is relevant and to offer their own interpretations of what the evidence means. This puts a premium, just as science does, on careful observations and thoughtful analysis. Students need guidance, encouragement, and practice in collecting, sorting and analyzing evidence, and in building arguments based on it. However, if such activities are not to be destructively boring, they must lead to some intellectually satisfying payoff that students care about. (pp. 188-189)

However, we have found that problem-based learning units are considerably more difficult for our teacher candidates to develop than are project-based units. While candidates have little trouble identifying meaningful products, they have a great deal of trouble finding worthy problems. Before considering why this might be so, let's briefly address what makes a problem "worthy."

Stepien and Pyke (1997) stress the importance of PBL problems being "messy," or "ill structured." That is, the problems require more information than is initially available to solve them, and there is no single "right" answer (Barrows 1985). These qualities encourage students to think creatively, form hypotheses, identify issues and questions, search for relevant information, and think critically about the data they collect. Gallagher (1997) points out, however, that being ill-structured is not enough. PBL problems should be constructed around learning goals and should have a conceptual focus and disciplinary relevance. Content is not incidental, but central to this form of problem solving. Because PBL is premised on the assumption that problems will motivate students to explore curriculum topics in greater depth, the problems themselves must be carefully designed to lead students into that curriculum.

Boyce, VanTassel-Baska, Burruss, Sher, & Johnson (1997) point out the importance of problems being realistic. They have found their science curriculum units are more powerful when the problem is tailored to create a localized ill-structured problem, rather than an entirely fictitious one. This encourages students to use a rich variety of local resources to address the problem. Indeed, the location and use of appropriate resources is another important aspect of PBL. Boyce et al. note, "Students need to do more than check the encyclopedia. Science books and databases, local resources and experts, journals, and Internet consultations with people across the country enrich the creation of students' solutions for the problem" (p. 375).

In summary, worthy PBL problems are open-ended, complex, realistic, and steeped in significant content. Now we must ask what it takes to find such problems. At the very least, it takes a sound foundation in the content area. In order to identify worthy problems that are realistic *and* that implicate core disciplinary content, one needs a deep understanding of the subject matter and its current status. This may explain the difficulty our elementary education majors have with problem-based learning.

Content Knowledge and Elementary Education Majors

The lack of adequate content knowledge among elementary education teacher candidates has been studied and well documented. In *The Rise and Stall of Teacher Education Reform*, Fullan, Galluzo, Morris, and Watson (1998) identified the need for a stronger knowledge base for teacher candidates. Stoddart, Connell, Stofflett, and Peck (1993) investigated the mathematics and science content knowledge of elementary teacher candidates and reported, "many teacher candidates enter elementary teacher education seriously deficient in understanding the mathematical and scientific content they will be expected to teach" (p. 238). This was the case even though these teacher candidates entered the teacher education program after successfully completing college math and science requirements. The majority had grade point averages in the upper quartile of their college class. In a similar finding, Schifter (1993) suggested, "a major obstacle in the transformation of the mathematics classroom into an environment that produces mathematical understanding is that most teachers have not learned to think mathematically" (p. 271).

Our own observations of teacher candidates reflect these concerns. We find that teacher candidates are not only lacking in content knowledge, but they do not always recognize the *need* for a thorough knowledge of the content. They incorrectly believe that as long as they know more than the students, they are adequately prepared. An equally troubling concern is that even when teacher candidates recognize their lack of content knowledge and want to rectify it, they do not always know how to access the information they need. Combine these deficiencies with the recognition that teacher education faculty are not content area experts either and we have the scope of the problem. It is clear that, as Quinn (1997) says, "changes should be made in (teacher candidate) content courses, their methods courses, or both" (p. 112).

Development Teams

In order to effect such a change, we heeded the words of Jerome Bruner (1977), "The experience of the past several years has taught at least one important lesson about the design of a curriculum that is true to the underlying structure of its subject matter. It is that the best minds in any particular discipline must be put to work on the task" (p. 19). For us, getting "the best minds to work on the task" meant involving arts and sciences (A&S) faculty in assisting us to develop problem-based learning units of study. In fall 2000 we began a project (supported by a Preparing Tomorrow's Teachers to Use Technology grant) that provided for the formation of collaborative Development Teams. In doing so, we were not only heeding the words of Bruner but also the admonition of the American Council on Education (1999) to coordinate the education faculty and the arts and sciences faculty in teacher education:

> A common problem in colleges and universities is that faculties and programs become isolated behind departmental lines. The responsibility for preparing prospective teachers in the subject areas they will teach rests not only with school of education faculty but also with faculty of the institutions as a whole – especially the arts and sciences faculty. (p. 21)

Recruitment and Collaboration

At the beginning of the project, we sent out a general meeting notice to A&S faculty who were recommended by teacher candidates or who previously had expressed an interest in working with future teachers. Encouraged both by the number of A&S faculty who responded to our call and by their level of enthusiasm, we met to explain the project. Afterward, we selected five faculty members with areas of expertise most closely aligned with the topics teacher candidates had been asked to address by their K-5 cooperating teachers, and Development Teams were formed. Each consisted of an A&S "mentor," four or more teacher candidates from the same grade level and/or with similar topics, their associated cooperating teachers, and a teacher education faculty member (one of the methods instructors). Content areas included geography, history, biology, and physics. Topics varied widely, ranging from "Matter" to "The First Thanksgiving."

Each of the five A&S faculty came to a methods class to listen to questions and to talk about their subject area. Teacher candidates were required to write a research paper on their selected topic and, in many cases, the A&S faculty reviewed the papers and provided helpful feedback. After that, it was the responsibility of teacher candidates to contact and communicate with their A&S faculty mentors. Not all Development Teams continued to meet, but at least four groups kept in close contact throughout unit development.

One of the most successful collaborations occurred in two teams of teacher candidates assigned to fifth grade social studies classes. Both teams were asked by their cooperating teachers to "teach about the western region of the U.S." They were asked to cover landforms, natural resources, major cities and landmarks, the economy, government, and people of the region. Knowing little about the western United States, the teacher candidates were at a loss about how to develop a problem-based unit on such a topic. Their A&S faculty mentor suggested that they address the topic through the problem of water shortage and water allocation, which would incorporate and focus much of the content they were asked to address. She worked with teacher candidates to help them develop this problem and locate pertinent print and Internet resources. At the end of the semester one of these students wrote, "Without Dr. G. I do not think that I would have been able to come up with a problem about the western United States. It definitely helped to get an expert perspective on things." Another wrote, "The water shortage issue was a good problem, a little hard to understand, but a good one because it tied geography into the issue. Before talking with her (Dr. G.) I was unaware that there was even this issue, so it is nice to have expert advice..." The water shortage problem and the issue of resource allocation provided an extremely rich problem situation for fifth graders to address.

Outcomes

We are encouraged by this initial attempt to establish and use Development Teams for problem finding, and we can report two positive outcomes at this point:

(1) Many A&S faculty are willing (even eager) to collaborate with teacher education faculty and teacher candidates on problem-based learning unit development, as this comment from an A&S faculty member indicates: "I think the interaction and discussion between faculty in the larger classroom was wonderful – a wonderful model of collegiality and of 'process' for the students. I thoroughly enjoyed interactions with students in the Development Team – this is where a lot of work and sharing and learning can be accomplished." We can also report that all five of the A&S faculty who served as Development Team members have stated their willingness to continue with the project.

(2) The quality of the problem-based learning units produced by Development Teams is discernibly higher. Unit evaluations indicate that in units developed in collaboration with A&S faculty:

- content is richer
- problems are more complex
- resources are more substantive

There are, however, some issues that need to be worked out. Only about 25% of teacher candidates developing PBL units worked in collaboration with their Development Teams beyond the initial meeting. One question, therefore, is how to get more active involvement between teacher candidates and A&S faculty on Development Teams.

Another issue is illustrated by a comment from one teacher candidate: "I did feel at times that Dr. G. got a little carried away about the topic, forgetting that wc only had 10 days to teach the unit and that we were teaching fifth graders." This comment suggests that A&S faculty can overwhelm elementary education majors with the amount and the complexity of the information they give. So, another question is how to facilitate a meaningful dialog between the "experts" and the "novices" so that the information provided is ultimately useful.

A Technology-Enabled Knowledge-Building Community (Use of Knowledge Forum)

In recognition of the need to provide a platform for collaboration among Development Team members, we elected to use Knowledge Forum, a second generation CSILE (computer supported intentional learning environment) product. CSILE, an asynchronous discourse medium, was originally designed for information sharing and knowledge building among a group of learners. The conceptual bases of CSILE come from research on intentional learning and on the process aspects of expertise, and from analysis of how discourse in knowledge-building communities contrasts with that of the discourse found in typical classrooms (Scardamalia & Berieter 1994). This discourse also differs from current "ask the expert" arrangements that are being tried through e-mail. The CSILE-based approach more closely resembles "a community engaged in solving shared problems" (Scardamalia & Bereiter 1999), which provides an excellent fit for our project.

During this first semester we have not been able to do more than install Knowledge Forum and familiarize ourselves with its operation. Development Teams used email to communicate, and both teacher candidates and A&S faculty expressed the need for a better method of communication. Neither email nor the threaded discussion feature of our college courseware (CourseInfo) has proven satisfactory in providing a platform for the kind of dialog in which the Development Teams should ideally be engaged. Initial trials with Knowledge Forum look very promising in this regard.

Conclusion

The use of Development Teams in problem finding is an exciting component of our work with teacher candidates in the development of technology-assisted problem-based learning units. It clearly addresses the need for a strong knowledge base in the identification of worthy problems, but there are other benefits as well: A closer collaboration with the arts and sciences in teacher preparation, and the use of technology in a problem solving environment.

References

American Council on Education. (1999). To touch the future: Transforming the way teachers are taught. Washington, DC: Author.

Barrows, H. S. (1985). *How to design a problem-based curriculum for the preclinical years.* New York: Springer.

Boyce, L. N., VanTassel-Baska, J., Burruss, J. D., Sher, B. T., & Johnson, D. T. (1997). A problem-based curriculum: Parallel learning opportunities for students and teachers. *Journal for the Education of the Gifted, 20*(4), 363-379.

Bruner, J. S. (1977). *The process of education*. Cambridge, MS: Harvard University Press.

Fullan, M., Galluzzo, G., Morris, P., & Watson, N. (1998). *The Rise and Stall of Teacher Education Reform.* Washington, DC: AACTE Publications.

Gallagher, S. A. (1997). Problem-based learning: Where did it come from, what does it do, and where is it going? *Journal for the Education of the Gifted, 20*(4), 332-362.

Jonassen, D., & Rohrer-Murphy, L. (1999). Activity Theory as a framework for designing constructivist learning environments. *Educational Technology Research & Development, 47*(1), 61-79.

Lave, J. (1988). *Cognition in practice: Mind, mathematics, and culture in everyday life*. New York: Cambridge University Press.

Moursund, D.G. (1999). *Project-based learning using information technology*. Eugene, OR: ISTE.

Noddings, N. (1998). Teachers and subject matter knowledge. *Teacher Education Quarterly, 25*(4), 86-89.

Perkins, D. N. (1986). *Knowledge as design*. Hillsdale, NJ: Lawrence Erlbaum.

Perkins, D. N., & Saloman, G. (1988). Teaching for transfer. *Educational Leadership, 46*(1), 22-32.

Quinn, R. (1997). Effects of mathematics methods courses on the mathematical attitudes and content knowledge of preservice teachers. *The Journal of Educational Research, 91*(1), 108-113.

Rutherford, F. & Ahlgren, A. (1990). *Science for All Americans*. New York: Basic Books, Inc.

Scardamalia, M., & Bereiter, C. (1994). Computer support for knowledge-building communities. *The Journal of the Learning Sciences, 3*(3), 265-283.

Scardamalia, M., & Bereiter, C. (1999). Schools as knowledge-building organizations. In D. Keating & C. Hertzman (Eds.), *Today's children, tomorrow's society: The developmental health and wealth of nations* (pp. 274-289). New York: Guilford.

Schifter, D. (1993). Mathematics process as mathematics content: A course for teachers. *The Journal of Mathematical Behavior, 12*(3), 271-283.

Stepien, W. J., & Pyke, S. L. (1997). Designing problem-based learning units. *Journal for the Education of the Gifted, 20*(4), 380-400.

Stoddart, T., Connell, M, Stofflett, R., & Peck, D. (1993). Reconstructing elementary teacher candidates' understanding of mathematics and science content. *Teacher and Teacher Education, 9*(3), 229-241.

Wertsch, J. V. (Ed.) (1981). *The concept of activity in Soviet psychology*. White Plains, NY: M. Sharpe.

Whitehead, A. N. (1929). *The aims of education*. New York: The Free Press.

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Mentoring Collaboration to Integrate Technology into Science Curriculum: A PT3 Project

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Abstract: This paper describes an exemplary case in mentoring collaboration between the student teacher and cooperating teachers to integrate technology into the curriculum and discusses various activities that have occurred during the project. The educational technologist provided one-on-one and just-in-time coaching customized to needs in the context/placement classroom for a semester through the whole technology integration process. The project addresses three important problems/issues including: 1) collaboration between student teachers and cooperating teachers, 2) a model for integrating technology into the curriculum, and 3) communication among faculty in higher education, cooperating teachers, and student teachers.

Introduction

Every year hundreds of northeast Ohio K-12 teachers serve as cooperating teachers, opening their classrooms and providing guidance to pre-service teachers fulfilling their field experience requirements. We believe that the role of cooperating teachers is one of the critical factors to prepare pre-service teachers to model technology integration in their classrooms.

In the 1999-2000 MIMIC (Modeling Instruction with Modern Information and Communication Technologies) Project, a U.S. Department of Education grant program, K-12 cooperating teachers were recruited for mentoring from school districts that accept student observations, practicum students, and student teachers. Educational technology faculty from the participating institutions mentored small numbers of cooperating teachers to assist them in the development and implementation of technology in their teaching. Each team paired with an educational technologist and cooperating teachers implemented a context-based and content-specific approach for modeling the integration of technology for pre-service teachers.

This paper describes an exemplary case in mentoring collaboration between the student teacher and cooperating teachers to integrate technology into the curriculum and discusses various activities that have occurred during the project.

Background

Many researchers have reported that student teachers have few opportunities to apply what they have learned in the teacher preparation program. A study about effective supervision of student teaching points out that student teachers abandon what they have learned in teacher education courses in as little as two weeks rather than applying it into the placement classroom. In conventional student teaching, student teachers adapt and replicate the practices and attitudes of their cooperating teachers to facilitate the smooth function in the classroom (Richardson-Koehler, 1988). Rodriguez, Sjostrom and Alvarez (1998) report that nontraditional student teachers viewed and interacted with cooperating teachers as peers and friends, whereas traditional student teachers felt they could not overstep boundaries. The result of a survey on student teachers' success/failure in student teaching indicates that student teachers exhibited less confidence when using nontraditional approaches to teaching, particularly cooperative learning, individualized instruction, and integrated approaches (Gormley, et al., 1991).

Over the past decades, the administration in K-12 schools has focused on educational technology and teacher preparation programs in universities have emphasized integrating technology into the curriculum. America's progress report indicates that 78% of teachers received professional development that focused on the integration of technology in the grade and subject they taught in 1998. However, in too many schools, most teachers and students still use computers only as the equivalent of expensive flash cards or as the tools for drill and practice. The productivity side of computer use in the general content area curriculum is neglected or underdeveloped (Moursund,1995). With this environment, student teachers have no or little opportunity to integrate technology into the curriculum during the student teaching. In addition, another major problem in student teaching is the isolation. Although student teachers need more help to solve the difficult realities and complexities of classrooms, student teachers are often disconnected from university training, peers, and other classrooms (Schlagal, Trathen and Blanton, 1996).

While many researchers have pointed out some limitations in student teaching, there are several successful student teaching models that have applied learning from universities or tried an innovative approach. As an example, Wetzel (1996) describes the implementation of a project to prepare mentor and student teachers to teach mathematics and science through the integration of multimedia technology. He found that student teachers were better prepared to integrate technology and that mentor teachers changed how they taught mathematics and science. To release student teachers from the isolation of the placement classroom, Schlagal, Trathen and Blanton (1996) suggest the telecommunications that can link members of the student teaching triad. Student teachers can use e-mail to discuss their classrooms with university supervisors and peers in other classrooms.

The project described in this paper addresses three important problems/issues, including: 1) collaboration between student teachers and cooperating teachers, 2) a model for integrating technology into the curriculum, and 3) communication among faculty in higher education, cooperating teachers, and student teachers. The educational technologist provided one-on-one and just-in-time coaching customized to needs in the context/placement classroom for a semester through the whole technology integration process.

Case Study

A case study was used to determine the effectiveness of the proposed mentoring approach for preparing preservice teachers with technology. The participants of this study were two cooperating teachers and a student teacher in an urban school district. These teachers chose to participate in the MIMIC project preparing preservice teachers to integrate technology into their teaching. One cooperating teacher (K) was identified with moderate skills in the use of technology and the other (C) was at the novice level. Both of them have been teaching for more than10 years, mostly at the primary level. Teacher C has worked with student teachers for the last 10 years, Teacher K for 5 years. They currently both teach 2nd grade--all subject areas. The cooperating teachers have been working in collaboration to exchange instructional ideas and resources. They both have laptop computers supplied by the district and have taken a technology class offered by their district. In their school, technology consists of three IBM computers with one printer in each classroom. The software selection is limited to about 15 titles. The student teacher from a major urban university has learned various technology tools through the teacher education program and has developed several lesson activities or material with technology as a course work.

The Planning Phase

In the beginning stage of collaboration, the educational technologist helped two cooperating teachers and the student teacher recognize the various ways in which technology-based activities may be integrated into or transform traditional subject area curricula. To develop an initial plan, the collaboration team including two cooperating teachers, the student teacher, and the educational technologist reviewed technology and science standards in national and local levels such as state, district, and school building. After analyzing the standard, the educational technologist introduced several sample projects that enhance students' learning with technology to help them. During the project, the educational technologist visited the school building on a regular basis (every other week) to support the cooperating teachers' technological skills and to discuss the integration ideas. With assistance of the educational technologist, two cooperating teachers and the student teacher developed an initial plan and timeline for the project. They also discussed an appropriate technology tool and integration methodology that provides more possibilities for students' learning in the placement classroom. HyperStudio was selected as a multimedia instructional design tool for this project. Although HyperStudio was available on three machines in each classroom, many teachers in the school weren't aware of the availability of the software and didn't know how to use it for their teaching.

To choose an appropriate topic for a lesson, the collaboration team outlined all topics which will be taught in the 2nd grade science for the Spring semester. They selected the solar system to be covered at the end of semester as a major topic for the project for two reasons. First, they needed reasonable amount of time to develop instructional material with their regular routine. Although they received some technology training by their school district, it focused on computer literacy skills rather than context-based activities that can be used to teach curriculum in a subject area. Teacher C expressed that group training through one time workshop was not helpful for novice users like her who need step-by-step guidelines and on-going supports. In addition, since this project was their first experience in instructional design with technology tools, they needed enough time and support to learn many major components in instructional design and as well as technology skills. Second, they thought that the multimedia lesson including images, audio, and animations would be a useful method for students to understand the key concepts of solar system.

The Design Phase

Once a topic and design tools were selected, the collaboration team developed an outline of the lesson unit to teach Space. Through the collaboration work, Teacher K who has moderate skills with technology took the major role in the design process, Teacher C collaborated with K as a subject matter expert, and the student teacher provided just-in-time help to solve technical problems and to improve the instructional material with technology. All participants also relied on e-mail to share work in progress, ideas, and to plan the next steps. The educational technologist provided feedback and suggestions on their work progress through face-to-face meeting or e-mail.

The solar system lesson unit includes one main card and nine sub cards about each planet. The main card including a graphic of nine planets used non-linear design that allowed students to select any topic to learn about our solar system. Each sub card consisted of a planet graphic, the text explanation of an individual planet and voice recording of Teacher K.

The Implementation Phase

Upon completion of the lesson unit, the integration of technology was implemented in the real classroom setting. In the implementation phase, we used Teacher K's classroom which has three IBM computers with headphones and more space for student activities. For the first period, Teacher K taught the solar system lesson unit for her own class for 45 minutes. She provided a workbook including several questions on each planet and divided students into four activities. She set up the computers into three different ways: 1) Solar system created by team, 2) Commercial science program including the solar system, and 3) Internet. The students in pairs explored the solar system on the computer. After exploring the computer for 10 minutes, the students returned to the big group. The students in the big group searched information in reference books prepared by the teacher. Students during this lesson were required to think critically and solve problems through inquiry and collaborative activities. In the second period, Teacher K switched her students with Teacher C's class and used same strategies for the lesson implementation. Teacher K repeated these activities for a week to teach the solar system and gave equal opportunities to all students.

The Evaluation Phase

Two cooperating teachers and a student teacher were observed developing a technology-based instructional material to teach the 2nd grade science and two classes were observed implementing a science lesson using a technology tool during the Spring of 2000. According to Apple Classrooms of Tomorrow (ACOT) study, there are five stages: 1) Entry - learn the basic of using new technology, 2) Adoption - use new technology to support traditional instruction, 3) Adaptation - integrate new technology into traditional classroom practice (usually productivity tools), 4) Appropriation - focus on cooperative, project-based and interdisciplinary work--technology is one of many tools, and 5) Invention-discover new uses for technology tools. Through this project, two cooperating teachers changed their stage before entry or from adoption stages to appropriation stage and the student teacher could apply what she learned in teacher education program in the meaningful and complex context.

During the classroom observations, the researcher wrote comments in her notes that indicated the extent to which the plan, goals, and expectations, as defined in the planning stage, were reached. The researcher also took note of how technology seemed to be influencing the teaching of science. The majority of the students picked up on the main objectives of the lesson and were interacting with other students in the group. Some students needed more redirection and guidance. In a paired group, students helped and redirected each other so they did not spend any unnecessary time focusing on irrelevant material without the teacher's assistance. Most students were strongly motivated in using computer-based material rather than searching traditional resources.

Discussion

In the beginning of this project, two cooperating teachers pointed out common problems in many professional development programs as following:

- Training occurs in isolated, short, "stand-alone" sessions.
- Training is delivered by non-teachers so that technology and pedagogy are not linked or connected.
- No long-term professional development plan is in place.

Our efforts to overcome these problems were successful. Although a one-to-one mentoring approach may not impact on teacher modeling to larger groups, this approach provided context-based comprehensive training in-depth from needs assessment to evaluation rather than isolated technology literacy skills or a one-day workshop.

Through the technology mentoring collaboration, we found varying degrees of possibilities and limitations to integrate technology into a curriculum. The limitations were related to the instructional time, teachers' preparation time, limited access to equipment or software, and administrative support. The possibilities could be increased by teachers' willingness and collaboration with peers or educational technologists. Most importantly, the project produced very positive results on students' learning with technology in the classroom. Also a one-to-one mentoring collaboration model to integrate technology into curriculum can easily be conducted among cooperating teachers and student teachers at any school site. According to Knapp and Glenn (1996), the process of educating teachers must include both academic practice, and practical knowledge and skill gained only by working in actual schools and classrooms with experienced educators. Therefore, teacher preparation must involve collaboration between the two sites of the university and the school.

References

Apple Classrooms of Tomorrow (ACOT) study. Retrieved March 25, 1999, from the World Wide Web: http://www.research.apple.com/go/acot/default.html

Gormley, K. A. et al. (1991). And others prospective teachers' perceptions about their teacher preparation and success in teaching: A preliminary analysis. (ERIC Document Reproduction Service No. ED 342 738)

Knapp & Glenn (1996). *Restructuring schools with technology*. Allyn & Bacon.

Moursund, D. (1995, December). Effective practices (part 2): Productivity tools. *Learning and Leading with Technology*, 23(4), 5-6.

Richardson-Koehler, V. (1988). Barriers to effective supervision of student teaching. *Journal of Teacher Education*, 39, 28-34.

Rodriguez, Yvonne E.; Sjostrom, Barbara R.; Alvarez, Idalis (1998). Critical reflective teaching: a constructivist approach to professional development in student teaching, (ERIC Document Reproduction Service No. ED 418 054)

Schlagal, B., Trathen, W., & Blanton, W. (1996). Structuring telecommunications to create instructional conversations about student teaching. *Journal of Teacher Education*, 47(3), 175-183.

Wetzel, K. et al. (1996). Innovations in integrating technology into student teaching experiences. *Journal of Research on Computing in Education*, 29(2), 196-214.

The Integration of Technology into Classroom Lessons in the Teacher Preparation Program at the University of Houston-Clear Lake

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Abstract: This paper describes the successful development of a one-year capacity building grant funded by the U. S. Department of Education's Preparing Tomorrow's Teachers to use Technology (PT3) program. The focus of the grant was to prepare teacher candidates to become proficient in developing and delivering classroom lessons that effectively incorporate technology in the learning process so that all students (Pre-kindergarten to 12th grade) use technology in demonstrating mastery of lesson plan objectives. Qualitative and quantitative results indicate that the preparation model has been successful with teacher candidates becoming proficient in developing and delivering technology-integrated lesson plans. Moreover, participants' (i.e., teacher candidates, mentor-teachers, and university faculty) comfort level with technology and frequency of technology usage has increased.

The Lack of Technology Integration within the Curriculum is a Nationwide Issue

In elementary and secondary schools throughout the United States, the ability to incorporate technology within the curriculum is one of the most difficult tasks for teachers (Benton Foundation, 1997; Driskell, 1999). Teachers' lack of familiarity with varieties of technological hardware and software appropriate for curriculum integration has contributed to this development (U. S. Congress, Office of Technology Assessment, 1995). Trotter (1997) indicates that while teachers may have received sufficient preparation with content and pedagogy, they have not been sufficiently prepared to exercise technology within teaching; thus, creating a huge bottleneck in the use of computers in the nation's classrooms (Benton Foundation, 1997).

Technology Literacy is a National Mandate

Research studies indicate that technology can serve to positively impact student learning in terms of academic achievement, skill development, and attitude toward school attendance (Kane, 1994; Kulik & Kulik, 1991; Kulik, Kulik, & Bangert-Drowns, 1985; Pisapia & Perlman, 1992). Technology in the classroom serves as a tool to develop students' critical thinking, resourcefulness, and collaborative skills as well as to improve students' self-concept and attitude toward learning, and to increase student/teacher interaction (U.S. Congress, Office of Technology Assessment, 1995). Technology literacy for all students is a national mandate of the United States (U.S. Department of Education, 1997). An increasing number of educators and technologists believe that computer and communication technologies can provide a vehicle to help facilitate the evolution of a new education system to provide more accessible, higher-quality learning opportunities for everyone (Hunter, 1993).

Teacher Education Programs Need to Provide Technology Integration Preparation

University and college teacher education programs continue to produce teachers who do not possess the skills to integrate technology within the curriculum. Only eighteen states require technology preparation as part of their teacher certification program (NEA, 1997). The 1998 report, *Technology and the New Professional Teacher: Preparing for the 21st Century Classroom*, commissioned by the National Council for Accreditation of Teacher Education (NCATE) strongly urges schools of education to prepare future teachers in the use of technology in the classroom (Driskell, 1999). The NCATE includes in its accreditation review process of teacher education programs a set of twelve national standards for educational technology as developed by the International Society for Technology in Education (1992). The sixth standard directly relates to the integration of technology in the curriculum stating, "Evaluate, select, and integrate computer technology-based instruction in the curriculum of one's subject area(s) and/or grade level(s)" (Driskell, 1999, p. 121).

Technology Integration Strengthened in UHCL Teacher Education Program

The University of Houston-Clear Lake (UHCL) in partnership with eight rural and urban school districts in the Houston, Texas area has established a successful, field-based teacher preparation program. The University of Houston-Clear Lake (UHCL) is an upper-level university, i.e., junior and senior and graduate level students. UHCL has an enrollment of approximately 7,500 students, and serves the academic and professional needs of regional students, as well as national and international students. UHCL is accredited by The Commission on Colleges of the Southern Association of Colleges and Schools (SACS), the National Council for Accreditation of Teacher Education (NCATE), and the Texas State Board for Educator Certification (SBEC). The UHCL School of Education has earned one of the highest cumulative pass rates on the statewide test for teacher certification with a pass rate of 97.2% (1997-1998).

While a collaborative, field-based teacher education program has been effectively developed at the University of Houston-Clear Lake with teacher candidates receiving technology education linked to standards, teacher candidates still needed specific preparation to integrate technology within the curriculum. The United States Department of Education's Preparing Tomorrow's Teachers to use Technology (PT3) grant application process provided the impetus to review the technology preparation of teacher candidates at UHCL. The first step in the review (grant development) process was to assess the current teacher education program components in light of the research on technology integration within the curriculum, specifically the ten factors for technology integration.

Ten Factors for Technology Integration within the Curriculum

For integration of technology to occur within the curriculum, ten factors need to be incorporated in a professional teacher preparation program (Driskell, 1999). The ten factors include (1) access to technology tools; (2) technology training; (3) pedagogy behind effective integration of technology; (4) assessment of teacher candidates' skills using technology effectively in the classroom; (5) models that demonstrate the integration of technology within the curriculum; (6) incentives for teacher candidates to integrate technology within the curriculum; (7) time for teacher candidates to learn about and plan for technology use; (8) school climate that encourages use of technology resources in innovative ways; (9) collaboration among teachers (teacher candidates and mentors) about technology integration; and (10) technology integration support.

Analysis of Factors in the UHCL Teacher Preparation Program: Identifying Specific Gaps

In analyzing the current teacher candidates' preparation in technology at UHCL, four of the ten factors were being directly met: (1) access to technology tools; (2) technology training; (3) pedagogy behind effective integration of technology; and (4) assessment of teacher candidates' skills using technology effectively in the classroom. These four factors were being addressed through a technology course entitled "Computer Use in the Classrooms" (INST 3133). Although receiving technology preparation, teacher candidates were not developing and delivering lesson plans that effectively incorporate technology in the learning process (following an assessment rubric) so that classroom students (Pre-kindergarten to 12th grade) used technology to demonstrate mastery of lesson plan objectives. Three major gaps were identified in the technology preparation of teacher candidates.

Gap #1: Integration and Modeling by Faculty

Authentic lesson plans with technology integration are not specifically taught in any class at this time. Education faculty members, some of whom are part-time, teach lesson plan development and delivery, but not the integration of technology within lesson plans, including technology standards, e.g., International Society for Technology in Education (ISTE) Standards. While able to use technology, most faculty members are not proficient in the integration of technology within the curriculum. Consequently, many of their course syllabi do not include this requirement. In addition, the technology course entitled "Computer Use in the Classrooms" (INST 3133), a required course for teacher candidates, focuses more on technology skills development than on technology integration within lesson plans. Most sections of the course are taught by part-time faculty some of whom have not been classroom teachers, thus, have little or no experience in developing lesson plans. Because of this gap, some factors are not being addressed: (5) models that demonstrate the integration of technology within the curriculum; (6) incentives for teacher candidates to integrate technology within the curriculum; (7) time for teacher candidates to learn about and plan for technology use.

Gap #2: Field Placement of Teacher Candidates

Teacher candidates are not necessarily placed with mentor-teachers proficient with technology. While mentor-teachers have extensive teaching experience, many of them have not received the necessary technology education to model technology usage and integration. While experienced teachers participate in mentoring training to become mentor-teachers, they are not required to participate in a technology education program. Moreover, most school districts do not have sufficient resources to provide technology education to classroom teachers, much less in a specific area of technology integration within the curriculum. Because of this gap, a couple of factors are not being addressed: (8) school climate that encourages use of technology resources in innovative ways and (9) collaboration among teachers (teacher candidates and mentors) about technology integration.

Gap #3: Support System

Teacher candidates do not have ready access to an established support system at the university and campus levels that provide assistance in technology integration. While individual faculty members and campus teachers may have knowledge of technology integration, teacher candidates do not have ready access to these resources. Moreover, university faculty and campus teachers are unaware of teacher candidates' technology needs. No central clearinghouse component exists, e.g., Web site, that provides names and addresses of resource people at both the campus and university levels, as well as allows teacher candidates to ask questions and find models of lesson plans. Because of this gap, (10) technology integration support is not being addressed.

Development of Lessons Plans to Demonstrate Technology Integration within the Curriculum

Once the assessment phase was completed and needs (gaps) identified, then, objectives and strategies were developed to address current needs. The objective of the grant proposal was to develop a program model that addressed the factors in preparing successful teacher candidates to integrate technology within the curriculum, specifically, in classroom lesson plans.

The central proof of a teacher's ability to effectively incorporate technology within the curriculum is the development and delivery of classroom lesson plans that integrate technology. The implementation of these lesson plans will result in classroom students (Pre-kindergarten to 12^{th} grade) using technology to develop products that demonstrate mastery of lesson plan objectives. To become proficient in lesson plan development, teacher candidates need preparation in two areas. The first need is in the application of various types of technologies, e.g., computers and computer software appropriate for classroom use. Second, they need the ability to compose lesson plans that incorporate the appropriate technology within the curriculum for student application. The central strategy in addressing these two needs is the development of an interactive professional development technology practicum.

An Interactive Professional Development Technology Practicum

After receiving a one-year PT3 capacity building grant, the UHCL Collaborative developed a three-day, interactive professional development technology practicum to prepare teacher candidates to develop and deliver lesson plans that integrated technology within the curriculum. The practicum included the following components: (a) vision of student-centered technology-rich classroom environments, (b) technology integration with one (few) computers in a classroom, (c) guidance of students in creating successful multimedia presentations using multimedia software, (d) guidance of students to use higher order thinking skills in technology use, (e) use of electronic educational templates, (f) technology and performance standards in a lesson plan, (g) development of student electronic, journals, book reports, and technology portfolios, (h) guidance of students in researching on the Internet and (i) effective uses of telecommunication tools in education. The practicum also addressed the needs of economically disadvantaged campuses. For novice computer operators only, an additional one-day basic technology skills session was provided prior to the three-day technology practicum.

Teacher candidates, along with their mentor-teachers and university faculty, became proficient in the application of technologies and gained understanding of the pedagogy behind the specific technology's usage, and collaboratively developed authentic lesson plans that integrated technology following a designed lesson plan template. Lesson plans were assessed for appropriateness and completeness using a designed lesson plan rubric. Teacher candidates delivered their lesson plans to classroom students (Pre-kindergarten to 12th grade) and student developed products (using technology applications) that demonstrated mastery of lesson plan objectives. The technology consultant and project evaluator assessed student products for relevance and completeness. This developmental process allowed teacher candidates to assess their own progress in developing and delivering technology-integrated lesson plans, as well as to improve their delivered lesson plans. Teacher candidates published their lesson plans on the Project's Web site.

After completing the three-day professional development technology practicum, participants were provided ongoing professional support via the Project's Web site as they developed and delivered lesson plans in the classroom. Ongoing professional support for participants is a critical element of success (Brooks, & Kopp, 1989; International Society for Technology in Education, 1992; Benton Foundation, 1997), especially in a constructivist learning environment (Wilson, 1996). The interactive professional development technology practicum was successful in addressing the ten factors (See Fig. 1 below) that effect the integration of technology within the curriculum.

Figure 1: How Practicum Addresses the Ten Factors for Successful Technology Integration

(1) Access to technology tools	Technology training matched the technology tools available at teacher participants' campuses.
(2) Technology training	The grant provided 18 hours of hands-on technology training linked to the state technology standards.
(3) Pedagogy behind effective integration of technology	Understanding the most effective method for integration of technology was a focus for the training for teachers.
(4) Assessment of teacher candidates' skills using technology effectively in the classroom	Each participant received assessment reviews for their lesson plans.
(5) Models that demonstrate the integration of technology within the curriculum	Model lesson plans were accessed through the Project' Web site, as well on other Web sites.
(6) Incentives for teacher candidates to integrate technology within the curriculum	Incentives were given to each campus that participated in the grant project.
(7) Time for teacher candidates to learn about and plan for technology use	Grant participants were provided time to ask questions and experiment with various new technology skills and knowledge components during training sessions.
(8) School climate that encourages use of technology resources in innovative ways	Administrators endorsing this grant effort promoted the teacher's technology use with students.
(9) Collaboration among teachers (teacher candidates and mentors) about technology integration	Working together to share and ask questions was a major component of the grant. Collaboration occurred by telementoring as well as face-to-face during the training.
(10) Technology integration support	Each teacher had follow-up technology support from the university and campus levels.

Evaluation of the One-Year Capacity Building Study

The methods of evaluation provided performance feedback and permitted periodic assessment of progress toward achieving intended outcomes (Erlandson, Harris, Skipper, & Allen, 1993). The participants in this capacity building study represented three groups: teacher candidates, mentor-teachers, and university faculty. Participants attended training sessions to assist them in developing lesson plans with appropriate technology that met established standards.

At the beginning of the first session, participants completed three locally developed instruments designed to document areas where change was expected over thc course of the training. The instruments included a Technology Comfort Scale, a Frequency of Involvement in Technology Scale, and an Attitude Toward Technology Scale. The scales were determined to have a Cronbach's alpha reliability coefficient of .91, .95, and .98, respectively. The magnitude of these coefficients indicates good scale reliability for each of the three scales.

In this capacity building study, thirteen teacher candidates, twenty mentor-teachers, and six university faculty participated in the practicum to become proficient with the application of various types of technologies for classroom use and to develop lesson plans. The training consultant guided the participants through exercises designed to gain proficiency with various technologies. Teacher candidates demonstrated their ability to develop lesson plans that integrated technology to meet established standards. The technology consultant used a scoring rubric to assess the successful construction of lesson plans that integrated technology. With feedback and assistance from the consultant, teacher candidates developed lesson plans that included components required for proficiency.

At the end of the third day of training, participants were tested a second time using the same instruments as exercised at the beginning of the practicum. This method allowed for a pretest/posttest comparison to demonstrate change during the project. The training days were not sequential, which allowed participants to return to their classrooms to use skills learned prior to the beginning of the next session.

The teacher candidates gained an average of slightly more than 8 points on their level of comfort with technology. However, by the end of the three days of training, the rating of frequency at which they were using various aspects of technology had increased approximately 5 points. The positive attitude of the teacher candidates toward technology increased by about 1 point by the end of the practicum.

The mentor-teachers gained an average of slightly more than 1 point on their level of comfort with technology. However, by the end of the three days of training, the rating of frequency at which they were using various aspects of technology had increased by nearly 7 points. The positive attitude of the mentor-teachers toward technology increased approximately 2 points by the end of the practicum.

The university faculty gained an average of slightly more than 12 points on their level of comfort with technology. However, by the end of the three days of training, the rating of frequency at which they were using various aspects of technology had increased by nearly 13 points. The positive attitude of the university faculty toward technology increased by approximately 2 points by the end of the practicum.

In each case, the gain in positive attitude was minimal; however, the positive attitudes toward technology in each group were very high from the beginning of the study, and this most likely accounts for the lack of change. Additionally, since each of the groups was relatively small (thirteen teacher candidates and six university faculty) the documentation of any change should be considered a success. It would be useful to gauge these developments with a larger sample over a longer period of time (longitudinal study) to analyze whether similar results occur.

In addition to the quantitative approach described above, samples of classroom student work (the results of teacher candidates' delivery of lesson plans) were reviewed using the scoring rubric developed by the training consultant. The lesson plans were found to contain the required elements indicating that teacher candidates had effectively integrated technology into their teaching and that classroom students were using technology in demonstrating mastery of lesson plan objectives. Examples of student work were placed on the Project's Web site.

Conclusion

During this one-year, PT3 capacity building study, teacher candidates, mentor-teachers, and university faculty participated in developing a program model to prepare teacher candidates in integrating technology within the curriculum. This process took the form of developing and delivering lesson plans that integrate technology so that all students (Pre-kindergarten to 12^{th} grade) use technology to demonstrate mastery of lesson plan objectives. Qualitative and quantitative results indicate that the preparation model has been successful in preparing teacher candidates to become proficient in technology integration and that participants' comfort level with technology and frequency of technology usage had increased.

Along with addressing the ten factors for technology integration within the curriculum, this educational process developed the three agendas for school reform in the information age. These agendas include (a) developing agreement about learning and teaching, (b) integrating technology, and (c) restructuring (Mehlinger, 1996). Participants discussed the pedagogical process of integrating technology in classroom lesson plans with developmentally appropriate hardware and software, during which process they became more confident and competent in using technology applications. In this developmental process, participants were describing ways to restructure learning in the classroom, making it more active, and student-oriented. As one principal in the UHCL Collaborative declared, "The operations of this grant has moved our school into a new century."

References

Benton Foundation (1997). *The learning connection: Schools in the information age* [Online] Available: http://www.benton.org/Library/Schools/connection.html [1 May 1998].

Brooks, D. & Kopp, T. (1989). Technology in teacher education. *Journal of Teacher Education,40* (4), 2-8.

Driskell, T. L. (1999). *The design and development of Helper, a constructivist lesson plan web resource to model technology integration for teachers.* Unpublished doctoral dissertation, University of Houston-Central Campus, Texas.

Erlandson, D. A., Harris, E. L., Skipper, B. L., & Allen, S. D. (1993). *Doing naturalistic inquiry.* Newbury, CA: Sage.

Hunter, B. (1993). Internetworking: Coordinating technology for systemic reform, *Communications of the ACM, 36* (5), 42-43.

International Society for Technology in Education (ISTE). (1992*). Curriculum guidelines for accreditation of educational computing and technology programs.* Eugene, OR: ISTE.

Kane, C. (1994). *Prisoners of time, research*, National Education Commission on Time and Learning. Washington, DC: US Government Printing Office, 29.

Kulik, C. & Kulik, J. (1991). Effectiveness of computer-based instruction: An updated analysis, *Computers in Human Behavior 7*, 75-94.

Kulik, J. & Kulik, C. & Bangert-Drowns, R. (1985). *Effectiveness of Computer-Based Instruction: An Updated Analysis*, Center for Research on Learning and Teaching, Ann Arbor, Michigan: University of Michigan.

Mehlinger, H. D. (1996). School reform in the Information age. *Phi Delta Kappan*, *77* (6), 400-407.

National Education Association (NEA). (1997). *NEA: Technology brief no. 11-1997.* [online] Available: http://www.nea.org/cet/BRIEF/brief11.html [5 August 1998].

Pisapia, J., & Perlman, S. M. (1992). *Learning technologies in the classroom: A study of results*, Richmond, VA: Educational Research Consortium, December.

Trotter, A. (1997). Taking technology's measure. *Education Week* [Online] Available: http://www.edweek.org/sreports/tc/intros/in-n.htm [25 April 1998].

U.S. Congress, Office of Technology Assessment. (1995). *Teachers and technology: Making the connection.* Washington, DC: U.S. Government Printing Office (Report No. OTA-HER-616).

U.S. Department of Education. (1997). *The seven priorities of the U.S. Department of Education* (July). [Online] Available: http://www.ed.gov/updates/7priorities/index.html3toc [16 June 1998].

Wilson, B. (1996). *Constructivist learning environments: Case studies in instructional design*. Englewood Cliffs, NJ: Educational Technology Publications.

Preparing Today's Faculty to Prepare Tomorrow's Teachers to Use Technology: Lessons from a PT3 Project

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Abstract: Three types of data were obtained in order to objectively determine faculty development needs in the area of technology in teacher education. On the basis of the data it was determined that most members of the faculty needed to acquire specific skills and knowledge about generic technology tools, about subject specific technology applications and about creating technology based activities or products for incorporation into teacher education courses. A Technology Learning Team model of faculty development was created.

This paper provides a description of an ongoing PT3 project at a comprehensive teacher education institution. The primary focus of the project is to provide faculty development in knowledge and skills to infuse technology into courses across the teacher education curriculum. The paper will describe 1) the steps taken to objectively identify faculty development needs, 2) the strategies developed to effectively respond to these needs, 3) the resources, in addition to those provided by PT3, necessary for successful implementation of this PT3 grant, 4) the obstacles encountered in the initial implementation of the grant, 5) the solutions developed to overcome these obstacles, and 6) recommendations for comparable institutions engaging in similar activities.

I. The steps taken to objectively identify faculty development needs.

Three types of data were gathered: 1) a survey of faculty based on a modified version of the School Hardware Technology Survey (Edmin Open, 1998), 2) data from faculty focus groups, and 3) a rating of the faculty on the Ohio SchoolNet Professional Development Matrices (Ohio SchoolNet, version 1). These data revealed that all full-time faculty members who completed the survey (n=31) have a computer in their office. Data from the Office of the Dean further indicated that all full-time members of the faculty have been assigned an office computer. Two thirds of the surveyed group have a computer that is Internet capable and most have machines that are CM-ROM capable. While all have either an ink-jet or laser printer, their access to other devices, such as scanners or digital cameras is low (less than 10%). Faculty access to technology in classrooms is less frequent. Aside from a computer workstation in the math methods classroom, few classrooms are equipped with audio/visual equipment such as overhead projectors and VCRs with monitors. Such equipment can be reserved from a central audio/visual department for use in class. However, this is a relatively cumbersome process involving the transportation of the equipment from a different building on a 3-building vertical campus.

Only one member of the faculty was specifically hired to teach in the area of technology. Two additional members of the faculty include technology as a major area of their expertise, but were not hired on technology faculty lines. The following can be said of the technology skills of the faculty in relation to the Ohio SchoolNet Professional Development Matrices, which rate technology skills in the areas of productivity, information, network, and hypermedia tools.

Approximately 6% of faculty members are at the expert level across the four areas. (These are 3 faculty members described above). Most faculty members are at the "novice" or building capacity level in 3 of the 4 areas. About 25% of faculty members are at the "practitioner" level in at least one technology tool. (In general practitioners adopt models of technology and apply them to specific curricular lessons or units).
The most common uses of technology by faculty are word processing and accessing e-mail. About 65% report using e-mail; 39% have developed web-based activities, mainly, posting course syllabi on the Web; 4 have online chat rooms that serve as an integral part of their courses.

II. Strategies developed in response to the needs identified by the faculty.

These include faculty, staff, and mentor teacher development workshops as well as significant improvement in a range of technology hardware. The hardware, which was not provided by the PT3 grant, is discussed in Section III, below. The development activities consist of placing all of the faculty, staff, and mentor teachers, in cohorts of approximately 20 each semester, into Technology Learning Teams (TLT). Each TLT comprises four to six participants, consisting of a cross section of individuals from the above groups. The focus of each team is on using technology as a teaching-learning tool, and on integrating this tool function into instruction in a content area of interest or relevance to team members. (For non-teaching staff the focus is on the support services they provide). The TLTs work with external consultants with expertise in technology knowledge and skill development and their application to teaching and with unique collections and resources in the arts. The latter is an area of interest to a significant number of faculty members who have recently worked to incorporate art across the teacher education curriculum. The role of the consultants is to provide workshops and serve as facilitators to help TLT members achieve the following objectives:

- Acquire specific skills and knowledge about generic technology tools.
- Acquire knowledge about subject specific technology applications.
- Create learning activities or products that incorporate technology or that are technology-based.
- Assess the impact of the product or activity on learning in a course or in a classroom.
- Provide unique collections of resource materials and pedagogical practices.
- Assist in the development of meaningful, effective and creative ways of combining these with technology.

The TLT staff development model consists of 4 phases each consisting of principal objective and method for achieving it.
Phase 1: The acquisition of skills in a technology tool domain through modules/workshops conducted by expert consultants.
Phase 2: The design and development of technology products or activities for use in a course for pre-service teacher candidates.
Phase 3: The incorporation of developed technology products or activities

produced into courses for pre-service teacher candidates and into student support services.
Phase 4: The evaluation of the effectiveness of the implementation of the technology products.

III. The resources, in addition to those provided by PT3, necessary for successful implementation of PT3.

Since PT3 did not provide significant resources for the purchase of hardware, and required evidence institutional capacity in this area, funds provided by the college's administration, and foundation grant support were necessary. Evidence of the institutions capacity building include:

- Ongoing replacement of outdated computers in faculty offices (25 new or refurbished PCs received in last 2 years, with additional ones due next year)

- Renovation of the computer laboratory with 24 networked computers and a teacher workstation controlling all multimedia functions

- Creation of a "Smart Classroom", with a high-end presentation, hypermedia workstation (Internet-access, satellite feed, VCR, computer input and audio system)

- Creation of a multifunctional, multimedia conference room with video streaming capability opening a cyber window between the college and several public schools that serve as field sites for teacher education candidates

- Acquisition, through a state grant, of a set of laptops for the Teaching English to Speakers of Other Languages (TESOL) Program

IV. Obstacles in the initial implementation.
The obstacles that were encountered were of several different varieties: 1) facilities; 2) prior faculty commitments; and 3) competing grant-funded activities. Within the area of facilities, delays in the construction of the adjacent space for the "smart classroom" and the education technology lab, prevented theses two facilities from being on-line during the fall 2000. The demand for other technology facilities on campus by other faculty members, students and administration resulted in a delay of the technology skill development workshops. Alternative arrangements had to be made to provide facilities for the required technology-based courses in our various programs.

Faculty selected for Cohort 1 were not available to participate in the proposed technology training during the Fall 2000 semester because of required participation in the state-mandated redesign and reregistration of every teacher education program in the School of Education. Approximately, 40 programs had to undergo redesign in light of new certification requirements. Moreover, faculty who had administrative responsibilities as program coordinators, about a dozen faculty members, were restricted in the amount of additional released time from teaching that they could receive during any given academic years. As program coordinators, these faculty members had additional responsibilities during the program reregistration process.

Finally, additional grant opportunities threatened the faculty eligible to participate and receive the prescribed incentives from the PT3 initiative. Theses grants include federal and state training grants and school district grants to support school reform and curricular change initiatives. In particular, a university-wide technology grant to support distance learning was received at the start of the fall semester. Faculty were offered a substantial cash incentive for participation in that initiative and many faculty from HCSE applied for this opportunity.

V. The solutions developed to overcome these obstacles.

The solutions that were developed were varied and also were designed to support the goal of faculty development of course-related technology skills that would directly impact the instructional environment of the teacher candidates.

1. There were no alternatives to the lack of needed facilities so the technology workshops were postponed until 2001.
2. The highest priority in HCSE was the completion of the reregistration process. Thus, there was another reason, in addition, to the lack of available facilities to delay the start of the project.
3. With the help of the Dean of the HCSE and the project staff, a group of faculty were selected who would serve as pivotal individuals within programs or disciplinary areas and were invited to participate in the project. The nominations were made in light of existing commitments to grants and administrative responsibilities. Faculty members, who had applied for the university-wide technology grant, were not included in the current project initial cohort.

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Critical Approaches to Technological Literacy and Language Education

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Abstract: When we integrate technology into teaching and learning, our challenge is to imagine and enact technology-rich learning environments in which both teachers and students can succeed in ways that technicians and administrators can sustain. We suggest three approaches to designing such environments; each approach is useful at a different level of specificity. In the classroom, technology autobiographies help teachers learn about their students' technological backgrounds and capabilities. At the institutional level, a "multiculturalism" metaphor helps teachers and administrators imagine locally appropriate models of technology support. In the context of pre-service and in-service teacher education, a heuristic we've developed encourages critical reflection by teachers as they learn and implement new technologies.

Background

Teachers are using technology more frequently than ever before as schools try to respond to student needs and get in step with new federal and state computer literacy initiatives. Yet, technology in the classroom does not exist for its own sake: It exists to support teaching and learning. When we teach with technology, we consider ourselves remiss if we don't first establish expectations for student learning, and then build in technologies that can help us to enact those expectations. Yet, for students to learn and for teachers to teach, complex technological systems must work smoothly. Moreover, teachers must learn how to teach with technology and how to use technology to facilitate scholarly and administrative work.

However, in many cases, computers, training, and curricular implementation occur concurrently, as schools hasten to meet student needs and administrative mandates. Teachers are left scrambling, striving to retool with complex new skills while simultaneously revamping their teaching strategies. Individual teaching styles, content parameters, institutional constraints, and student characteristics all compete for teachers' attention. Meanwhile, administrators, eager to implement technological enhancements to curricula, struggle to fund the support systems that teachers so desperately need. Critical reflection on the entire system, not unexpectedly, often takes a back seat in such a chaotic environment. But it doesn't have to. In our on-going struggles to imagine and enact technology-rich learning environments, we have employed several strategies that appear to allow teachers and students to succeed in a way that technicians and administrators can sustain.

One of the problems is that students—who often possess the technological skills that teachers need to learn—are trapped with teachers in an inflexible model of education. In a familiar pattern of learning and power dynamics that Margaret Mead (1970) called postfigurative learning, students learn while teachers teach. Although outside of school, the larger technoculture relies heavily on cofigurative or peer-to-peer learning and on prefigurative learning, in which the young teach the old (Mead 1970), when it comes to schooling, we are stuck in a post-figurative mode of operation in which older citizens teach younger citizens. The challenge we face as technology-using teachers and administrators is to find ways to tap into technological knowledge wherever it resides and subsequently make it possible to distribute that knowledge throughout our institutions wherever it is needed. This sharing can be accomplished at the level of the classroom or institution, and it can be addressed in pre-service or in-service teacher education.

Starting in the Classroom: Technology Autobiographies

Teachers of writing often find that asking students to consider the history of their literacy practices, early memories of reading and writing, and the writing and literacy expectations of their parents and teachers can help reveal the personal—and oftentimes unspoken—contexts that students bring to the classroom. Accordingly, literacy autobiographies are sometimes employed as a way for students to write about and reflect on those memories. Similarly, technology autobiographies can be assigned in many types of classes to help teachers understand the experiences with and attitudes toward technology that students bring with them to the classroom.

We have become convinced of the value and usefulness of assigning technology autobiographies in a variety of classes for several reasons. First, and perhaps most obviously, we already know—though it's seldom mentioned in the context of literacy education, and academics understand it only at surface levels—that students are entering our classrooms with sophisticated technological literacy skills and charged attitudes toward technologies (Mead 1970; Tapscott 1998). We think of students as the users of educational environments and consider ourselves to be the primary designers of such environments. With technical communication scholar Robert Johnson, we believe that designers of systems are "obliged to learn how to value, how to see, the knowledge that users produce and then to learn how to make this knowledge an integral part of the technologies we use" (Johnson 1998). As teachers, then, we need to know more, and know more intimately, what is behind the literacy skills and attitudes that students bring to our classroom.

Secondly, we have observed that teachers work within an increasingly complex system of *technologies within technologies*. By that we mean that on one level, teachers are important stakeholders in the construction of systems of teaching and learning, systems that we have come to regard as technologies (Johnson). Teachers' objectives for teaching and learning may vary considerably, but we all start out with the intention of creating learning systems or environments for students that will also function effectively within the social systems or institutions within which we work. In our efforts to accommodate these institutions, we attend to influences on the technology of teaching and learning. Included among these influences are the efforts of curriculum committees, institutional missions and values, budgets, building layouts, time schedules, purchasing conventions, the abilities of support personnel, administrators' needs, the work of state and national professional organizations, and our own intellectual interests and physical capabilities.

Increasingly, teachers attend as well to a range of electronic systems that influence and complicate course and curriculum planning. Such electronic systems make up another set of technologies within the technology of teaching and learning. As we construct classes (or, more accurately, construct learning and teaching environments), we often have the opportunity to decide whether—and how—to incorporate technologies. Teachers no longer simply design classes and lesson plans: they are the architects of technologies of teaching and learning. Teachers don't just use tools. They construct learning environments in which they and their students live for a time.

A third reason for our interest in assigning students to write technology autobiographies has to do with the fact that teachers think of themselves as creators of courses and curriculum, just as engineers think of themselves as creators of cars and the other mundane artifacts of our culture. However, teachers usually work alone on the design of teaching and learning technologies, influenced, of course, by the particular institutional environments in which we work. In contrast, engineers usually work as productive partners in development teams. We don't dispute that teachers should adopt the label of creator and curriculum designer: this designation certainly makes clearer our responsibilities to the students with whom we share the learning environments that we create. It is, however, not enough for teachers to imagine themselves as creators. They must also acknowledge the needs and values of the people for whom they create teaching and learning spaces and incorporate such needs and values into the curriculum design process.

Armed with the rich data to be found in technology autobiographies, teachers can begin to draw on the strengths their students bring to the classroom. Technology autobiographies also enable teachers to map changes in students' attention and aptitudes over time, thereby helping them to understand technocultural changes at a very localized and specific level. In some regions, technology autobiographies may reveal deep-seated inequities among student populations and suggest learning outcomes that are not measurable with standard assessment tools. For example, some students' technology autobiographies demonstrate that problem-solving and collaboration skills can be learned by playing video and computer games. Others illuminate the types of risk-taking behaviors that often accompany technological success. These learned behaviors—stemming from early and prolonged exposure to complex, fast-paced, and highly interactive technologies—can suggest curricular innovations that build on what has already worked for these students.

Locally Appropriate Technology Support Systems: the Multiculturalism Metaphor

As technology has become simultaneously more complicated and more ubiquitous, departments have begun to hire specialists to support the integration of technology into curricula, classrooms, and research contexts. Sometimes, a faculty member or librarian takes on the role of technology specialist. But a number of schools at all levels are hiring professional staff members to support technology, rather than assigning the task to tenured or tenure-track faculty.

Schools don't really know how to integrate these new types of employees. They have professional credentials, yet they are not teachers. Paradoxically, though, they *teach* the teachers, who, in turn, are charged with teaching the students. In an apt metaphor, technology specialists are rather like "foreigners"; they are "different, outsiders visiting the territory of other disciplines, and their interaction with the local residents helps to bring about change" (McLeod 1995). McLeod was writing about directors of Writing Across the Curriculum (WAC) programs, but her characterization of the foreigner roles played by technology specialists is right on target. Similarly, Julia Kristeva discusses the fleeting and sporadic nature of interactions with foreigners. She notes that it is considered exceptional when a foreigner has something to teach the natives. Moreover, once the foreigner's purpose has been accomplished, he or she is expected to "depart, as a friend taking leave of friends, and be honored by them with gifts and suitable tributes of respect" (Kristeva 1991). In other words, a foreigner's stay is expected to be short-lived, to last only as long as he or she is contributing something to the community or at least is not poaching excessively on the community's resources.

McLeod (1995) outlined five short-lived foreigner roles that WAC directors sometimes adopt. These five roles are similar to roles that technology support specialists may assume—briefly—within academic departments. **Conquerors** impose programs from above. When a technology specialist acts as a conqueror, technology becomes "something done *to* rather than *with* faculty." Because imposing a program from above can position the technology support person as "the tool of an insensitive, even hostile administration," the practice often engenders faculty "defensiveness" and "active resistance." **Diplomats** are emissaries from one department to another. Often, these emissaries come from the central computing organization, and, although they may have the best intentions, nonetheless represent their departments' interests. Ultimately, diplomats perpetuate the idea that technology is the purview of the technology department, not the English department. **Peace Corps volunteers** tend to regard technology development as a kind of selfless service. They "work for the sheer love of it," requiring "no released time, no funding for workshops, no administrative support." **Missionaries** "go forth to convert," armed with the conviction that their "particular beliefs and practices are superior to all others." Their goal is one-dimensional: "to teach their own views as the correct ones." **Change agents**, which McLeod regards as the least objectionable of the five foreigner roles, couple an "unfamiliarity with and respect for the local culture" with a "willingness to listen and learn from that culture" that makes them "appealing visitors." They regard their own knowledge as something to be discussed and perhaps broadened through dialogue (McLeod 1995).

Each of these foreigner roles can be used to accomplish specific goals, but no single role can or should stand alone as a unified approach to departmental technology support, because each has its dangers and limitations. What I submit may be more effective is a "multicultural" approach to technology support, in which the technology specialist—still the foreigner in many educational contexts—assumes different roles as needed: diplomat, Peace Corps volunteer, missionary, and change agent. In addition, faculty, staff, and students who work with technology within the school or department also take on roles and responsibilities, regardless of their discipline or field of expertise, adding to the multicultural atmosphere.

A paradox faced by foreigners is that to change the system, they need to be integrated into it. That is, they need either to attain some respectable level of power or to establish a significant degree of engagement with the system. In short, they need to feel some connection to the system and to care about what happens to it. Engagement and power cannot easily be attained within alien turf, but if we construct educational environments as "borderlands," following Gloria Anzaldúa, we may be able to understand why some technology specialists, despite being "foreigners," are able to become engaged and to exert power. Borderlands are "physical places where two or more cultures edge each other, where people of different races occupy the same territory, where … the space between two individuals shrinks with intimacy." They are "place[s] of contradiction," where it is difficult to keep intact "one's shifting and multiple identity and integrity." But they are also places of "exhilaration." Because the border dweller or *mestiza* lives constantly in the midst of contention, discomfort, and alien-ness, he or she is a "participant in the further evolution of humankind" (Anzaldúa 1987).

When technology specialists join departments, a kind of borderland is created. Both faculty and technology specialists at first experience some of that discomfort with which Anzaldúa is so familiar. The owners of the turf—the faculty—may feel threatened, both by the presence of a newcomer and by the prospect of using computer technology to support and even to deliver their courses. As a result, the technology specialist may feel at odds and unwelcome. Anzaldúa writes, "The coming together of two self-consistent but habitually incompatible frames of reference causes… a cultural collision." In its most unproductive form, such a collision may result in a metaphorical standoff or duel that ends when the newcomer, the technology specialist, "decides to disengage from the dominant culture, write it off altogether as a lost cause, and cross the border into a wholly new and separate territory." Anzaldúa advocates a different course of action: instead of disengaging, she suggests that border-dwellers can survive best if they "shift out of habitual formations" and move "toward a more whole perspective, one that includes rather than excludes." Border dwellers cope, in short, by "developing a tolerance for contradictions." They operate not in a dualistic but in a pluralistic mode—"nothing is thrust out, nothing abandoned" (Anzaldúa 1987).

In a technology-rich educational environment, everyone—not only technology specialists, but also teachers, students, and administrators—dwells on the border. Like the *mestiza*, the most successful border-dwellers "straddle two or more cultures," willing to be "vulnerable to foreign ways," to give up safety and familiarity. The *mestiza* consciousness turns border-dwellers from foreigners to multicultural shape-shifters, available to move in and out of relevant roles as needed (Anzaldúa 1987).

Thinking Critically About Technology: Pre-Service and In-Service Teacher Education

A heuristic for critical reflection on technology would encourage teachers to become local technological activists (as opposed simply to technological advocates). Specifically, our heuristic suggests that those who teach with technology should attend to "infrastructure": the material, institutional, and human conditions that surround their classes, students, and instructional effort. Part of any technology activist's job is to help set up institutional infrastructures that facilitate the design of productive technology-rich systems. In addition, because technological systems are already in place in many institutions, the technology activist must understand how to influence existing systems.

We should expect a critical technologically literate activist, then, to take a three-pronged approach:

1. Learn as much as possible about how technologies influence literacy practices;
2. Determine which practices are worth encouraging; and
3. Finally, learn how to help sustain those practices over time and across the social spectrum, or "digital divide."

Technological activism is a state of mind, an attitude toward the important work we do as educators. With that state of mind, even overworked teachers, technicians, and administrators can accomplish a great deal if they distribute their efforts over many years.

References

Anzaldúa, G. (1987). *Borderlands/La Frontera: The New Mestiza*. San Francisco: Spinsters/Aunt Lute, 1987.

Johnson, R. R. (1998). *User-Centered Technology: A Rhetorical Theory for Computers and Other Mundane Artifacts*. Albany, NY: State University of New York Press.

Kristeva, J. (1991). *Strangers to Ourselves*. L. S. Roudiez (Trans.). New York: Columbia University Press.

McLeod, S. H. (1995). The Foreigner: WAC Directors as Agents of Change. In J. Janangelo and K. Hansen (Eds.) *Resituating Writing: Constructing and Administering Writing Programs*. (pp. 108-116). Portsmouth, NH: Boynton/Cook Publishers.

Mead, M. (1970). *Culture and Commitment: A Study of the Generation Gap*. Garden City, NY: Natural History Press/Doubleday.

Tapscott, Don. (1998) *Growing Up Digital: The Rise of the Net Generation*. New York: McGraw-Hill.

Evolution of an Online Data Acquisition System

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Abstract: The evolution of online data collection systems implemented by the Preparing Tomorrow's Teachers to Use Technology (PT3) Millennium Project team (US Dept. of Ed. Capacity Building Grant # P342A990474) during the 1999-2000 school year is described. Examples of the software and survey instruments, database structures, and feedback systems that were initially developed as well as those which are now in place are presented. Participants can access and complete surveys on an experimental system that provides immediate educator feedback by graphing profiles of their responses against the database norm.

Introduction

Paper-based surveys are often expensive, time-consuming, and cumbersome ways to gather data required for evaluation or assessment of project activities. Many projects have moved away from paper surveys to web-based acquisition of data from teachers and students. This paper covers alternatives explored by members of the U.S. Department of Education project team for The Millennium Project: Pathways for Preparing Tomorrow's Teachers to Use Technology. The paper addresses survey procedures and instruments, database structures, and feedback systems which are now in place on servers at the University of North Texas. Plans for merging the PT3 system with a similar one needed for a U.S. Dept. of Education Technology Innovation Challenge Grant evaluation are described as well.

Online data acquisition alternatives

Paper surveys. Paper-based surveys have been the traditional method of gathering responses for many decades. For many populations, such as young children, paper continues to be the most viable alternative because paper surveys require little or no special technology to administer or complete and can be tallied by hand. The method is familiar and fault tolerant. However, it is also labor-intensive and time-consuming for large volume applications. A decision about whether or not to use paper is often strongly influenced by the accessibility of online submission technology for respondents and whether or not there is a time critical need for mass administration and collection of data in a single sitting. Examples involving actual situations in these respective categories may serve to illustrate these points. During 1999-2000, the UNT PT3 Capacity Building grant team began the year using online data collection techniques but ended the year with a front/back one-page paper form. This was because there was great difficulty in getting all 321 teacher preparation students into a lab with computer access for the first half of the year, and there was a need to quickly gather data from all who completed the survey in one mass administration at the end of the school year (Knezek, Christensen, Zoeller, & Griffin, 2001). By contrast, for the Key Instructional Design Strategies (KIDS) project evaluation (Knezek & Christensen, 2000), approximately 75% of the 9,029 baseline data surveys gathered during the fall were paper-based and required 6 months to compile, while more than 90% of the 9,712 spring 2000 surveys gathered were completed via the WWW and required less than 1 month to organize for analysis. The magnitude of the problem necessitated finding an alternative to paper surveys in the latter case.

Mark Sense/OCR. Pre-printed forms that utilize machine-readable bubble-coded responses have been common in the educational area for many years. Typically these can be completed and scored very quickly, but they are also expensive when commercially produced, quite rigid in response format, and require lead time and printing volume that make their use impractical in many research environments. In the case of our PT3 activities for 1999-2000, the volume of surveys was not large enough to make this approach cost-effective, and the process of designing and printing mark-sense forms would have taken too long. In the case of the Technology Innovation Challenge grant, it was anticipated that some of the survey instruments would need to be modified between pretest and posttest administrations, so a large volume printing would have been wasteful. There was the additional issue of some survey instruments being sufficiently long to necessitate more than one mark-sense form per questionnaire. Initial recommendations to use generic (pre-printed) mark-sense forms along with photocopied survey instruments were soon discarded when the issue of dealing with multiple mark-sense forms per survey surfaced. Newer optical character reader (OCR) technology that can actually sense which response was circled by a teacher or student holds promise for improvements in this area. In these kinds of systems, multiple page surveys simply have the staple removed and each page is fed through a photocopier-type feeder mechanism. If the scanner mechanism has a problem deciphering the mark, it stops and requests that the operator make a judgment based on the scanned image.

HTML forms/E-mailed responses. This elegant approach was developed for experimentation during the fall of 1999 and discarded before being placed into full operation. The concept was simply to have each workstation's local browser post the survey, gather the responses, and E-mail the completed form to a centralized E-mail address when the respondent pressed the 'submit' button at the end of the form. These E-mailed messages then went through a response processing procedure that placed the item ratings in a text file or database. Unfortunately this approach had to be discarded as a universal solution when it was learned that many school-based browsers were not typically configured to send E-mail. Nevertheless, in a modified form the approach continued to be used throughout the fall of 1999. For the KIDS project in particular, a web server was used to post the survey and gather the information, and the server itself launched the E-mail to the central collection site. Post-processing difficulties related to hidden characters, incomplete data caused by randomly-distributed failures by respondents to complete selected items, and space limitations (500-1000 messages) for E-mail inboxes, all contributed to the perception that this system was too cumbersome to be workable with 1999 technology. Still, even with all the difficulties encountered, because the collection system is totally decentralized (survey could even be loaded from and responses written to a local floppy), this system is the most scalable of all the approaches explored. It appears likely that a system capable of surveying all teachers in the USA in one day, or all teachers in the world in one week, would need to based on an approach similar to this.

HTML forms writing to text file(s). This system was developed during the fall of 1999 and continues to be our backup approach as of the fall of 2000. In order to speed development for PT3 pretest administrations, survey instruments were placed online for web access using FrontPage as the development tool and FrontPage server software running in a Windows NT environment as the delivery mechanism. The server presents the form to the respondent and gathers the data when the respondent clicks the "send" button after completing the survey. The server writes the data into a tab delimited text file for further processing via SPSS or a database program. Practical limitations we have encountered have to do with the server becoming swamped and unable to process in real time all responses whenever more than 20-25 users are pressing 'submit' nearly simultaneously. This limitation has forced us to move to the database system described below. Future plans call for not abandoning the text-file-writing approach but instead using CGI scripts on a Unix-based platform in order to ameliorate some of the practical shortcomings of the current system.

HTML or Database-published forms writing to database via the Internet. This approach is centralized and elegant. Theoretically it should work well. However, we have found that when administering long (> 100 item) surveys using FrontPage, we still sometimes encounter 'multiple hit' bottlenecks. This is true even when running on a Pentium 500 Windows NT server with a large amount of RAM and a multiple gigabyte reserve of unused hard drive space -- even when using Access as the database. As a result, we sometimes have difficulty simultaneously administering surveys in two student labs of 32 machines each, and we have found ourselves needing to develop a schedule to spread 12 schools from a large suburban school district in Texas over a six week data collection time period.

Competing database approaches

Several competing database approaches appear to be vying for universal adoption in the not-too-distant future. Microsoft Access interfaces well with FrontPage, and is widely used. FileMaker Pro works well with web server software, is easy to use, and has been successfully used in producing graphical feedback (color bars) for a teacher who has completed his/her form. Commercial packages akin to voter polling systems or product advertising/feedback systems have made inroads into the realm of educational survey administration as well. However, many of these are based on hardware/software platforms costing an order of magnitude more than the solutions envisioned by the authors as affordable for an individual researcher or school district.

Compatibility with data analysis systems

One problem that arises with most database solutions to the problem of online survey administration is how to get the data out of the database and into a tab-delimited or comma-delimited text file for use in a statistical data analysis package such as SPSS or SAS. Typically a researcher will not be sufficiently familiar with Access (a relational database package) or FileMaker (a flat file manager) to be able to merge files and write the proper output in a single record as text. Reliance on a database appears to create the need for manager at the server site who can transform these files on short notice.

Prospects for the future

Our long-range plan is to consolidate the data acquisition approaches currently in trial operation into just one or two types, regardless of whether the service will be used by PT3 respondents, by others, or in combination. We are not optimistic that in the short run all of our needs can be met through a single platform, so we plan to maintain development toward a fully interactive system that gives immediate graphical feedback to the respondent, and also toward a large-scale, highly efficient system for simply gathering and perhaps screening the data. In both of these approaches we plan to begin more clearly separating the (forms serving) data presentation and acquisition process from database management and analysis.

References

Knezek, G., & Christensen, R. (2000). Refining best teaching practices for technology integration: KIDS Project findings for 1999-2000. Denton, TX: Univ. of North Texas.

Knezek, G., Christensen, R., Zoeller, M., & Griffin, D. (2001). Experiences with online data acquisition. Presentation to the Texas Computer Education Association Annual Conference, Austin, Texas, February 2001.

P3T3: Purdue Program for Preparing Tomorrow's Teachers to Use Technology

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Abstract: This paper describes P3T3: Purdue Program for Preparing Tomorrow's Teachers to use Technology, a PT3 project designed to: (1) prepare pre-service teachers to demonstrate fundamental technology competencies, and (2) prepare teacher education faculty to teach pre-service teachers in technology-rich environments, modeling approaches that future teachers should use themselves. The paper describes the project's three complementary components: (a) a comprehensive faculty development and mentoring program; (b) use of two-way communication technologies, notably IP-based video conferencing, for distant field experiences designed to expose students to diversity and technology use; and (c) development of a dynamic web-based digital portfolio system for pre-service teachers.

Introduction

Deficiencies in the preparation of teachers to use technology in the classroom have been highlighted in a number of national reports (e.g., Moursand & Bielfeldt, 1999; Office of Technology Assessment, 1995; Panel on Educational Technology, 1997). These reports indicate that technology is not central to teacher preparation in most colleges of education. Problems include limited use of distance education and computer-assisted instruction in teacher education courses, an emphasis on teaching about technology rather than teaching with technology, lack of faculty modeling of teaching with technology, insufficient funding and faculty professional development opportunities, and lack of emphasis on technology in students' field experiences.

Given that an estimated 2.2 million teachers are expected to join the work force in the next decade, the time for teacher education to change is now. The recent study by the International Society for Technology in Education (ISTE) commissioned by the Milken Exchange (Moursand & Bielfeldt, 1999) recommended: (1) institutional planning for integration of educational technology into teaching and learning, (2) technology integration across the teacher preparation curriculum rather than limited to stand-alone courses, (3) increased opportunities for student teachers to use technology during field experiences, and (4) faculty development to bring about appropriate modeling of technology uses in their courses.

After five years of reform planning by its faculty and administration, the School of Education at Purdue University has begun the implementation of completely restructured elementary and secondary teacher education programs that make significant strides toward addressing the recommendations of the ISTE/Milken report. The new programs, which were launched with students entering teacher preparation programs in the fall of 1999 and will not be fully implemented until the spring of 2002, feature a cohesive set of block courses and practical experiences that are anchored by four strands – technology, diversity, field experience, and portfolio assessment.

In Purdue's new teacher preparation programs, the technology strand is manifest in: (1) concentrated course work focused specifically on educational technology (e.g., EDCI 270, Introduction to Educational Technology – an introductory course that focuses on helping students build basic technology knowledge and skills within the context of planning, implementing, and evaluating instruction); (2) integrated instruction in the application of technology in specific disciplines and with a variety of learners throughout block courses and in methods courses; and (3) reliance on supporting technologies for communication and to provide examples of exemplary practice. The diversity strand is supported through appropriate course work and by exposing pre-service teachers to various forms of diversity (e.g., socioeconomic, rural/urban, religious, cultural, intellectual, special needs/gifted populations) during field experiences in neighboring schools. However, Purdue is not located near a major urban center and hence cannot easily expose students to certain types of cultural and ethnic diversity. The field experiences strand is supported by a Theory Into Practice (TIP) component that accompanies each block of courses in the new program. The TIPs provide more and more cohesive field experiences for our students than were available in the past. Finally, in the new program, each student will develop a professional portfolio that will: (1) be used for self-reflection on learning, (2) document professional growth, and (3) provide the foundation for performance-based licensure. Helping to guide implementation of the new programs and ensure that technology is integrated as originally intended, Purdue is engaged in a PT3 implementation grant, entitled P3T3: Purdue Program for Preparing Tomorrow's Teachers to use Technology.

The overall goals of the P3T3 project are to (1) prepare pre-service teachers to demonstrate fundamental technology competencies, using technology as a tool for teaching/learning, personal productivity, communication, and reflection on their teaching, and (2) prepare teacher education faculty in Education as well as colleagues in Science and Liberal Arts, to teach pre-service teachers in technology-rich environments, modeling approaches that future teachers should use themselves. The project will meet its goals via three complementary components: (a) pre-service teachers will be taught by technology-proficient faculty who participate in a comprehensive faculty development program in which they learn new teaching/learning technologies and practice using them with mentoring and technical support leading to lasting technology integration into teacher education courses; (b) pre-service teachers will participate in rich and diverse field experiences enabled and enhanced through the use of technology; and (c) a dynamic assessment system will provide pre-service teachers the tools and opportunities to select multiple ways of viewing their evolving teaching practice, reflect on that practice, and use digital representations to meet performance-based assessments as they build digital multimedia portfolios. Ultimately, the pre-service teachers will learn about technology, integrate it as they see it modeled by their instructors, and reflect on their own learning about teaching via digital technologies that they will eventually model and use with their K-12 students.

This paper provides an overview of three implementation components of the P3T3 project: faculty development, technology-enabled field experiences, and a dynamic digital portfolio system. Together, these three components provide a cohesive solution to many of the problems related to technology integration that confront colleges of education, and one that fits well the particular needs of teacher education at Purdue University.

Faculty Development

The faculty development component of the project focuses on helping faculty to develop technology knowledge and skills by modeling learner-centered approaches that they can use with their pre-service teacher (who, in turn, can use them with their K-12 students). In technology-rich classroom environments, teachers tend to shift toward more learner-centered practices (Sandholtz & Ringstaff, 1996). Adopting a problem-based perspective to teaching technology (Hill, 1999) offers an approach that aligns with the learner-centered characteristics of the technology-rich classroom. P3T3 faculty development approaches include problem-based workshop experiences, use of mentoring teams with technical support, and online support.

As originally conceived, the professional development component of the project for a group of faculty was intended to begin with a week-long introductory workshop followed by year-long participation in mentoring teams. Faculty development workshops were planned for the summers when most faculty members have times of availability. Each workshop was to enroll about 20 participants consisting of about 10 Education faculty members, 4 graduate teaching assistants who work with teacher preparation courses, 2 faculty members from Liberal Arts and/or Science, 2 Education undergraduates, and 2 master technology-using teachers from our K-12 partner schools. In this, the first year of the project, we were forced to make a change because a late start left us unable to organize workshops for the summer of 2000. Instead, we scheduled the first faculty workshop as an abbreviated two-day start-up workshop during the fall semester break and then followed this with a variety of mini-workshops for faculty at times scattered through the fall semester. Our first workshop also was not as representative of all of the constituencies as we wanted, because no non-Education faculty or undergraduate students participated. However, a mixed group of participants remains a goal for each of the workshops to come.

Our initial two-day mini-workshop was designed to model problem-based learning processes as described by Torp and Sage (1998). In this process, individuals are confronted with a complex problem, define the parameters of the problem, conduct an investigation, and communicate the results. For our workshop, we had groups of faculty members address the question, "What technologies are available at Purdue University to support teaching and learning, how can they be used, and what do faculty and students need to know about them?" Teams of participants developed their own investigations, gathered information, and prepared a multimedia report about their investigation for the other groups. Technology was used during this process to acquire background information (e.g., Internet), produce artifacts (e.g., digital camera pictures), and prepare a presentation (e.g., Powerpoint). Through this process, faculty members were exposed to constructivist approaches to technology integration in the service of content learning. They were able to observe the processes, reflect on the roles of teachers and learners, and see certain applications of technology in the classroom.Following the problem-based learning activity, a variety of available technologies were demonstrated simply to raise awareness of them. Faculty cannot be expected to integrate technologies unless they have some conception of what they can do and how they might be used. Then, we asked faculty to develop their own concrete plans for integrating technology into one of the courses that they teach. The project provides support, in the form of expert assistance and funding, to help implement these projects during the coming year.

As a final step, we offered a number of "how-to" workshops throughout the semester for participating faculty and others. Topics included: web page design, use of the WebCT environment, graphics, managing one's university computer account, and so forth. To achieve extended support, an academic year-long mentoring program (abbreviated to one semester in the project's first year) is underway. Experienced faculty members who integrate technology in their teaching, along with the project's graduate assistants, work with a team of less-experienced faculty members who completed the workshop. Each team member pursues his/her personal and course technology integration goals established at the end of the workshop. Teams meet regularly to discuss implementation activities and to provide mutual support. In addition, work is underway to establish a web-based electronic community where faculty can exchange ideas and gather resources. Faculty who successfully complete a year of professional development activities, and who effectively integrate technology use into a course, will be eligible to lead professional development activities in subsequent years.

Technology-Enabled Field Experiences

Many colleges of education face difficulties placing students in field situations that provide for needed experiences such as interaction with diverse student populations and implementation of exemplary technology use. This problem is particularly acute for Purdue, which is not located near a major metropolitan center. As one way to address this problem, Purdue's P3T3 initiative is making use of two-way video conferencing to link college students and classrooms with K-12 students and classrooms.

Several video-based conferencing technologies are available for use depending on the nature of the activity and the types of interactions desired. For person-to-person interaction, desktop videoconferencing over the Internet provides a convenient and low-cost option. Each party must have a computer equipped with a microphone, speakers, an inexpensive camera, and appropriate software such as White Pine's CUSeeMe or Microsoft's NetMeeting. The grant provides equipment for equipping partner school classrooms with this technology. We will be exploring this option for one-to-one interaction, such as tutoring, between a Purdue pre-service teacher and a child in a K-12 classroom but as of this writing we have not implemented any activities using it.

For group interaction, a higher quality video conferencing solution is needed. High quality videoconferencing can be obtained by systems that operate over high-speed telephone lines (e.g., fiber, ISDN) or over the Internet. In Indiana, over 200 schools are part of a fiber optic video network called Vision Athena that is operated by the Corporation for Educational Communications, a partner in the P3T3 project. Although Purdue is not part of the Vision Athena network, we can link our ISDN-based PictureTel videoconferencing unit to the Vision Athena network via a network bridge. While the quality is not as high as the purely fiber network, this system has already been used on multiple occasions to link Purdue classes with classes at K-12 school sites, and it will continue to be used in the P3T3 project. A new option is the use of IP-based videoconferencing systems, such as those made by Polycom (http://www.polycom.com) and other vendors, which support the H.323 standard for video conferencing over the Internet. These units can operate at data rates from 128K to 768K and yield results comparable to ISDN-based compressed video systems such as the PictureTel unit that Purdue already uses. Initial experiments in the use of this technology, which is markedly superior to computer-to-computer desktop video conferencing, suggest that it provides a viable alternative for some types of student observations and interactions in school-based settings that typically occur through traditional field placements. As long as adequate bandwidth is available between the school and university site, this technology can support class-to-class videoconferencing.

In the first P3T3 project experiment in implementing two-way connections with a K-12 site, Professor JoAnn Phillion used a Polycom Viewstation to connect her class to an elementary school classroom in East Chicago, an urban area in the northern part of Indiana. The students in Professor Phillion's class, who were enrolled in the first block course in the teacher education program, were able to make observations of the class, interact with students and the teacher, and even teach some small instructional units via the two-way video connection themselves. The connection at 256K was solid with only occasional dropped packets resulting in a high-quality two-way video linkage. This experience suggests that these two-way video connections can expand opportunities for our students to engage in "field" experiences reaching the kinds of diverse sites, such as urban settings, that would ordinarily be very difficult because of Purdue's geographic location.

Dynamic Digital Portfolio System

Portfolio assessment is becoming an important way to address competency-based standards for teacher preparation programs. There is growing interest in the use of electronic multimedia portfolios for documenting growth and development of pre-service teachers (Barrett, 2000; Read & Cafolla, 1999). As part of its P3T3 project, Purdue is developing a dynamic web-based assessment system that will provide pre-service teachers with the tools and opportunities to select multiple ways of viewing their evolving teaching practice, reflect on that practice, and use various representations to meet performance-based assessments as they build digital multimedia portfolios.

Digital, or e-portfolios, take many forms from simple repositories of disconnected student artifacts stored digitally on CD-ROMs or web servers to highly organized and systematically retrievable work representing the synthesis of professional growth (Campbell, 1997). In our project we have focused on the latter. We are attempting to build an e portfolio component as one part of what we call a dynamic assessment system. The system is dynamic because unlike traditional text-based portfolio systems, it emphasizes interaction and ongoing reflection rather than archiving of artifacts; and, unlike many existing digital portfolio systems, it emphasizes the complexity of teaching practice through a variety of web-based components that provide resources about how ongoing teaching practice and assessment are tied to existing theoretical frames, and provides a "community of learners" component where pre-service teachers can interact with peers about their mutual experiences in their evolving practice.

The dynamic assessment system uses the e-portfolios as one component of a Unit Assessment System (UAS), the plan in the School of Education that indicates how pre-service teachers are meeting new performance-based state licensure guidelines. The e-portfolio is comprised of two primary components: (a) a web-based input template in which all pre-service teachers can enter digital artifacts (pictures, video clips, audio clips, text files) they can categorize according to three broad Principles in Practice that organize how they are thinking about learners, curriculum in context, and ongoing professional growth and participation in the teaching profession, and (b) a query component in which they can systematically acquire a "presentation" version of the portfolio in which all artifacts classified according to performance assessments, theoretical frames, instructional principles, and ongoing reflective themes, can be retrieved for formative assessment purposes (pre-service teachers' ongoing assessment and reflection on evolving practice) and summative purposes (presentations to portfolio evaluators at key checkpoints on the teacher education program). On the input side, we anticipate that several links will be available: (a) Communities of Learners in Practice, (b) Theory in Practice, (c) Performance in Practice, and (d) A Continuum of Growth. The Communities of Learners in Practice page will include our P3T3 partner schools and their web sites, along with our own P3T3 site and the national PT3 site and a page explaining the various projects at Purdue that are related to these initiatives. Theory into Practice will include resources about theoretical foundations of teaching, learning, and reflection on teaching. Performance in Practice will link to a variety of resources providing examples and models of various teaching practices that students can compare with their own evolving practice. Finally, A Continuum of Growth will provide links to a Purdue University's Professional Development Schools and the school web sites, other courses or collaborative initiatives of the School of Education that a student or visitor might be interested in, and links to various professional organizations

Both faculty and students will have the ability to log in and have tools and features accessible to them when they enter the e-portfolio area from the main page. For example, a student who logs in might go to the site of a P3T3 partner school and locate a video of a teacher using a project-based activity with science students. The teacher education student may watch the video, see the teacher's lesson design and comments about the lesson, and then activate a "reflective writing" tool to comment on what he or she sees. The observations made in the reflection box/pad (dialogue window) will then be automatically recorded in the student's portfolio in a designated place. When artifacts are retrieved via a query, the retrieval will occur in such a way that all artifacts, their interrelations to one another, and the student's ongoing reflections of evolving practice are all displayed along with a map that shows how a given student is meeting performance goals of the UAS as he or she moves through the teacher education program. Ultimately the e-portfolio system will meet the primary goal of the P3T3 project by providing a forum in which pre-service teachers, though their use of technologies needed to build and use the portfolio, learn about and feel competent with the very technologies we want them to use with their future students.

Conclusions

Purdue University's PT3 initiative, P3T3: Purdue Program for Preparing Tomorrow's Teachers to use Technology, seeks to prepare our teacher education students to effectively utilize computers and allied technologies for personal productivity, for documenting and reflecting on teaching practice, and for effective teaching and learning. Three interrelated components form the basis of our approach for achieving these aims: (1) a faculty development program, (2) use of two-way communication technologies for virtual field experiences, and (3) development of a dynamic web-based digital portfolio system for pre-service teachers. The faculty development program focuses on the use of problem-centered approaches to technology use with a year-long mentoring and support program to help faculty integrate educational technologies their own courses so that they effectively model its use. Two-way video communication technologies, notably IP-based videoconferencing, allow students to observe and interact with school sites from a distance. This permits students to experience diverse school sites unavailable in the vicinity of the university and so broaden their horizons and preparation. Finally, the development by all pre-service teachers of digital portfolios is a component of a dynamic assessment system for the School of Education. Through the development of web-based portfolios, students will reflect on their emerging practice, demonstrate competencies needed for licensure, and, at the same time, learn about and use the very technologies that we want them to use with their students. Through these approaches, we seek to ensure that teacher education reforms at Purdue, initiated less than two years ago, are implemented according to a vision that emphasizes diversity, field experience, portfolio assessment, and technology as key to the preparation of all teachers. For more information about the project, visit the project website at: http://research.soe.purdue.edu/p3t3.

References

Barrett, H. (2000). Electronic teaching portfolios: Multimedia skills + portfolio development = powerful professional development. Paper for Society for Technology and Teacher Education (SITE) conference, San Diego, CA. Available online: http://transition.alaska.edu/www/portfolios/site2000.html

Campbell, D., Cignetti, P. B., Melenyzer, B. J., Nettles, D. H., & Wyman, R. M. (1997). *How to develop a professional portfolio: A manual for teachers*. Boston: Allyn and Bacon.

Hill, J. R. (1999). Teaching technology: Implementing a problem-centered, activity-based approach. *Journal of Research on Computing in Education*, *31*(3), 261-279.

Moursand, D. & Bielefeldt, T. (1999). *Will new teachers be prepared to teach in a digital age?* Research study by the International Society for Technology in Education, commissioned by the Milken Exchange on Educational Technology. Milken Exchange on Educational Technology. Available online: http://www.mff.org/pubs/ME154.pdf.

Panel on Educational Technology. (1997, March). *Report to the President on the use of technology to strengthen K-12 education in the United States.* Washington, D.C.:President's Committee of Advisors on Science and Technology.

Office of Technology Assessment. (1995, April). *Teachers and technology: Making the connection,* OTA-EHR-616. Washington, D.C.: U.S. Congress, Office of Technology Assessment.

Read, D., & Cafolla, R. (1999). Multimedia portfolios for preservice teachers: From theory to practice. *Journal of Technology and Teacher Education*, *7*(2), 97-113.

Sandholtz, J. H., & Ringstaff, C. (1996). Teacher change in technology-rich classrooms. In C. Fisher, D. C. Dwyer, & K. Yocam (Eds.), *Education and technology: Reflections on computing in classrooms* (pp. 281-299). San Francisco: Jossey-Bass.

Torp, L., & Sage, S. (1998). *Problems as possibilities: Problem-based learning in K-12 education.* Alexandria, VA: Association for Supervision and Curriculum Development.

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Preparing Tomorrows Teachers to Use Technology Implementation Grant For The Years 2000 – 2003: Raising The Technology Learning Curve by Energizing Teaching to Empower Students through Emerging Technologies

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Abstract: This paper presents program goals implemented through a Preparing Tomorrow's Teacher's to Use Technology PT3 implementation grant at Clarke College. One goal is to design a "school" environment in real and virtual spaces to transform learning throughout the liberal arts and education departments. These new "school environments" provide space where new knowledge is created together as a community of learners. A second goal is to build a web-based virtual space to facilitate communication between and among our learning communities: K-12 students and teachers, teacher preparation students, and liberal arts and education faculty. This virtual learning space provides tools for "digital" exchanges using email, the Internet, and the Iowa Communication Network (ICN). A third goal is to create an Alternative Licensure Teacher Preparation Program. This graduate licensure program offers technology learning opportunities to prepare re-entry teachers, mid-career changers, and out of field teachers for the 21st century workplace.

Part I. PT3 Program Goals

This paper presents program goals of our Preparing Tomorrow's Teacher's PT3 implementation grant. Clarke College, together with its partners, the Catholic Schools of the Archdiocese of Dubuque and the Iowa College Foundation, has created a program to improve instruction of our pre-service teachers through effective use of information technologies. Components of this program incorporate new teaching paradigms implemented through program goals and a technology-learning plan.

One component of our program is the creation of "school" environments in real and virtual spaces to transform learning and teaching. These new "school environments" are where students and teachers explore, discover, and create new knowledge together as a community of learners. This component includes a program for designing strategies for infusing information technologies throughout liberal arts and education coursework. Faculty development programs provide instructional training on techniques for creating "smart technology" environments.

A second component is the building of a web-based virtual space to facilitate communication between and among our learning communities: K-12 students and teachers participating in Clarke's education program, pre-service teachers, liberal arts and education faculty. This virtual learning space provides tools for "digital" exchange of information and resources through email, the Internet, and the Iowa Communication Network (ICN).

A third component is the establishment of an Alternative Licensure Teacher Preparation Program. This graduate licensure program provides learning opportunities to prepare re-entry teachers, mid-career changers, and out- of- field teachers for the 21st century workplace.

Grant goals form the framework for implementation of program objectives, activities, training, and support transforming learning environments throughout liberal arts core courses and teacher preparation program. They are as follows:

Goal 1: To create innovative improvements in our existing liberal arts and teacher preparation program by enhancing coursework and student activities through transparent use of technology resources.

Goal 2: To create a learning exchange to facilitate digital connections between and among Clarke College faculty and K-12 teachers and students in our Archdiocesan Catholic Partner Schools.

Goal 3. To create a new graduate Alternative Licensure Teacher preparation program for preparation of re-entry teachers, mid-career adults and out-of field teachers.

Continuous achievement of performance objectives sustain a climate for college faculty, students, K-12 teachers and students to facilitate building collaborative models for exploring "learning how to learn" together through transparent use of information technologies.

Ongoing project activities exemplifying innovative improvements are:

1) offering one-to-many and one-to-one learning opportunities to faculty,
2) developing techniques for strategizing support to liberal arts and education faculties for integrating new models of instruction into coursework,
3) providing student training in technology skills through the Student Technology Assistants Plus+ (STA+) Program to extend technical support to faculty,
4) creating an online structure for collaboration and community building where students and teachers connect, communicate, and share resources through a web-based digital exchange,
5) developing a telementoring program as a vehicle to sustain support for first-year teachers during their critical first year of teaching, and
6) creating an Alternative Licensure Teacher Preparation Program to meet the critical shortage of K-12 teachers in Iowa as well as to prepare new teachers with technology rich models for teaching and learning.

A Technology Education Center (TEC) provides space for one-to-one and many-to-one training sessions for faculty. This center is equipped with hardware and software to provide opportunities for learning new technologies, such as, high-end computers for creating multimedia projects, scanners, digital video cameras, and content specific software appropriate to education and liberal arts courses.

Additional learning opportunities for faculty are provided through an "Anytime, Anyplace Technology Learning Space" (AATLS) consisting of a wireless mobile unit containing 15 laptop computers for teacher training sessions. This AATLS provides a flexible, hands-on learning/training space using portable laptops and a multimedia projector. A technology resource specialist utilizes these spaces offering designing and planning opportunities for faculty. STA+ students are trained to assist the technology resource specialist in extending support across the liberal arts and education departments.

Our project creates innovative models to improve the current teacher preparation program. The National Educational Technology Standards (NETS) aligned with the Interstate New Teacher Assessment and Support Consortium (INTASC) standards provide a framework for assessment of pre-service technology skills. These standards are incorporated into education department course syllabi to promote a seamless integration of technology into all education courses.

The following vignette is one example of a learning model for our teacher preparation students exemplifying a best learning practice using technology. Three secondary education/biology majors completed research on types of authentic prairie plants and animals native to Iowa prairies. Students used electronic data base programs as well as PowerPoint and digital imaging processes to produce their electronic product. They presented their research results to Clarke College Administrators and requested a piece of land on the Clarke campus to plant a prairie. This prairie will become a permanent authentic learning environment for Clarke students and K-12 students in Dubuque.

Learning with technology extends from the Clarke Campus to our two Archdiocesan Professional Development Schools where pre-service teachers are placed for field, student teaching, and clinical experiences. The Professional Development School was created in collaboration with St. Mary's/St. Patrick's and St. Anthony's Catholic Schools in the Archdiocese of Dubuque At the professional development site Clarke students attend college classes and collaborate with faculty and K-12 teachers "on-K-12-site" to practice a seamless integration of technology within the learning environment.

Pre-service elementary teachers bring laptop computers into the K-8 environment to implement strategies for incorporating technology into the curriculum. Students use programs, such as, Inspiration, HyperStudio, Microsoft Office Suite, and the Internet to produce new learnings through effective uses of technology.

New "digital" web based communication exchanges facilitate and maintain communication between and among members of our learning communities: Clarke faculty, K-12 teachers and students, pre-service and first year teachers, and teacher mentors. Examples of digital tools utilized are: email, the Internet, and the Iowa's Communication Network (ICN). New web applications support communication between and among our learning communities through the creation of discussion forums and chat rooms. This virtual space showcases technology rich learning processes and products created by Clarke education students, education and liberal arts faculty and K-12 teachers. Projects can be accessed at the following url: http://www.clarke.edu/pt3.

Another project is the creation of a new graduate Alternative Licensure Teacher Preparation Program. The goal is to recruit and prepare new teachers through a program enriched by technology instructional models. This program offers re-entry teachers, mid-career adults, and out of field teachers a technology rich program to prepare them for the 21st century workplace. The Iowa Communication Network (ICN) is one technology utilized for course delivery. This system provides a two-way audio/video course delivery utilizing ICN classrooms across the state of Iowa. This program description is explained in part II of this paper.

Part II. Alternative Licensure Program

Justification for Program

It is projected that 40% of Iowa's teaching force will retire within the coming decade. Our current teacher education programs are not graduating sufficient teacher candidates to make up this loss (Heldt, 2000). During the summer of 2000 the Iowa State Department of Education proposed rules for an alternative preparation license and urged colleges within the state to design programs that would meet these requirements and also attract a broader audience.

The development of alternative routes to teacher certification is a trend that has grown steadily since the 1980's in this country, particularly in states that faced fast-growing populations and teacher shortages earlier than Iowa. In 1999, forty states reported having alternatives to approved college teacher education programs for certifying teachers (Feistritzer & Chester, 2000).

Determination of Target Population

National statistics indicate that prospective teacher candidates are to be found among people who already have degrees in fields other than education, people older than the traditional 18-22 year old college student cohort, people who are changing careers, former military personnel, and among ethnic and racial groups that are currently underrepresented in our teaching force (Feistritzer & Chester, 2000). Of 63 non-traditional aged (over 24 years) daytime students at Clarke College (5% of the student body), 27 (22.5% of the non-traditional group) are currently enrolled in our teacher preparation programs, but a number of them have expressed the difficulties they face trying to maintain their other job and family responsibilities and also attend classes given in our usual daytime format. (Clarke does have 227 non-traditional students participating in evening classes in fields other than education.) We anticipate more adult students being interested in teacher preparation if the scheduling and course delivery methods meet their needs.

Investigation of Viable Models

Roth as quoted by Turley and Nakai (2000), noted that alternative routes to certification typically seek to fast track or circumvent traditional university-based teacher education. Some see alternative routes as a serious threat to university sponsored professional preparation. Still others maintain that the issue is not over professional preparation per se but over the timing and institutional context for teacher preparation. Programs are operated by the local school district, by state departments of education, and by colleges and universities. It is our contention that it is possible to develop programs that provide high quality professional preparation and provide that training through means and with schedules that are accessible to adults with family and job responsibilities.

As a college, we determined that the model that appeared most likely to gain approval by our institution and by the State Department of Education of Iowa would be grounded in the competencies that a beginning teacher needs in order to teach and manage a classroom environment effectively and that would meet the requirements of the state's proposed rules for alternative preparation. The core of knowledge provided to our current pre-service teachers had to be made available through delivery systems and on a schedule that would serve the new populations we were targeting.

Inclusion of Stakeholders

At this point, contact was made with stakeholders in this endeavor. Conversations were held with directors of personnel in the local public school district; the superintendent of the Archdiocese, a parochial school district of ten K-8 schools and one high school; the teacher representative of the local teacher's union, and a list of key personnel in schools within a nearby three-state region. An informational meeting was held with administrative and student services departments on our campus whose buy-in and support is crucial to the success of such a program. These stakeholders included the academic vice president, the vice president for adult and continuing education, the vice president for college advancement, the vice president for business and finance, the public relations department, the grant-writing department, and the library. The needs of this program for distance, online, and evening services such as admissions, registration, fee-paying, financial aid, academic and career advising, library and bookstore services were addressed. The stakeholders expressed support and appreciation for being brought into the program early in its development.

Design of Proposed Program

A first decision was to target adults who already have a bachelor's degree. Therefore, rather than develop another undergraduate program, ours would build on their prior education and provide both a master's degree and the competencies necessary for teacher licensure in Iowa. The education core courses were re-envisioned at a master's level.

Both elementary and secondary education candidates would take the six three-credit-hour courses that form the education core. The titles of these courses and the key topics for each reflect the mission of the college to develop personally and socially responsible individuals. They include: Introduction to Reflective Teaching, Active Learning: Constructing Knowledge, Teaching in a World of Diverse Learners, Balanced Assessment and Issues in Evaluation, Managing the Classroom Environment for Effective Instruction, and Teaching for Social Justice in a Multicultural World.

After completing the education core, the elementary and secondary tracks would diverge. Elementary majors would take two intensive three-credit hour curriculum and instructional methods courses. Secondary majors would take a general middle school/secondary school methods course followed by a discipline-specific methods course dealing with music, art, physical education, laboratory science, foreign language, English or history methods related to the student's content area.

The optimum timeline for students in this program would be eighteen months, completing the core and methods courses in fall, spring and summer semesters. One semester would remain in which the candidate would do a sixteen-week, all day internship or student teaching requirements for which twelve credit hours would be granted.

The delivery method(s) envisioned for the first twenty-four credit hours include heavy use of WebCT courses with strongly interactive elements including scheduled chat rooms and listserv, email, or forum exchanges of ideas, reflections and beliefs regarding course readings and online lectures. To simulate some of the classroom observation and participation that the best practices teacher preparation programs provide a collection of video clips of exemplary teaching practice in action will be utilized. Students will develop lesson plans to provide instruction similar to the best practices videos. In addition to web and video, a third technology, two-way audio-video classes will be used to allow students to participate in and view peer teaching in which students teach their classmates. Two-way audio-video class meetings using the Iowa Communication Network (ICN) may be used to introduce courses and to build community among the cohorts of students who will continue through this entire program as a group.

Partnerships with schools in communities where our students reside will aid us in providing opportunities for a minimum of forty hours of live classroom experience prior to the internship. Forty hours is the current Iowa state requirement. This program will of necessity have to be flexible in finding alternative ways to meet the requirements and develop the needed teaching skills.

Funding and permission to provide internships with a stipend to cover cost of living for the sixteen-week final semester are being sought. A strong mentorship with a teacher in the school where the internship takes place is a requirement. Clarke faculty or Clarke-hired adjunct faculty will serve the same role they currently fill in student teaching, including weekly observations of the student teacher or intern.

This proposal is being evaluated by the Clarke Education Department, the Clarke Educational Policy Committee, and will then be taken to the Iowa State Department of Education for program accreditation.

Literature References

Feistritzer, C. E. & Chester, D. T. (2000). *Alternative teacher certification: A state-by-state analysis 2000.* Washington, DC: National Center for Education Information.

Heldt, D. (2000, September 14). Educator: Iowa faces serious teacher shortage. *Telegraph Herald*, p. 3A.

Lindman, B.A. (1994). Consensus of educational administrators on admission requirements, professional instruction, internships features, and evaluation of candidate competency for alternative routes into teaching licensure: A Delphi survey. . (Doctoral Dissertation, University of Minnesota, 1994). Dissertation Abstracts International, 56/02A, p. 0517.

Turley, S. and Nakai, K. (2000). Two routes to certification: What do student teachers think? *Journal of Teacher Education*, Mar/Apr 2000.

Developing a Foundation for Enhancing Modeling of Technology Integration

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Abstract: Recent national survey shows that most college and university faculty do not model the use of information technology skills while most student teachers do not routinely use technology during field experiences. This paper discusses a consultant-client model related to the current issues in teacher preparation, and reports the development and progress of the federally-funded "Teaching to Learn" project at Oakland University involving urban and suburban school district partners. We believe that a strong, positive and collaborative relationship between the pre-service student and the in-service educator (university or K-12) is a potent force for change and success in technology integration. A project course is presented, with discussions on the model's goals, needs, challenges, and opportunities.

Project Purpose, Context and Model

Technology has the power to improve teaching and learning. However, making informed decisions about effective use of technology requires more than just an understanding of hardware and software. It requires the knowledge and wisdom of an experienced teacher who understands issues related to curriculum, and learning processes and outcomes. A teacher preparation program needs to take the perspectives into consideration. According to a survey commissioned by the Milken Exchange on Education Technology on how schools, colleges, and departments of education in the United States were preparing new teachers to use information technology in their work (Moursund, 1999), the following concerns were identified:

1. Most faculty do not model the use of information technology skills.
2. Most student teachers do not routinely use technology during field experience and do not work under master teachers and supervisors who can advise them on information technology use.
3. The "integration factor", composed of items that addressed graduates' class-room skills and the actual use of information technology during college training was the best predictor of other scores on the survey.

The School of Education and Human Services (SEHS) at Oakland University identified these concerns a number of years ago and set out to remedy the problem. Oakland University has a long history of preparing our teacher education students to use technology in the classroom. For almost 20 years, Oakland has offered a Microcomputer Applications in Education Certificate at the graduate level and for over 10 years has required our pre-service elementary teacher education students to take a technology applications course. Graduate students in both the Master's and Doctoral programs in Reading and Language Arts can minor in Instructional Systems Technology (IST) Programs that include courses in exploring the use of advanced technology in the classroom in light of current brain research, multiple intelligences, and information processing and Constructivist perspectives (Caine & Caine, 1991; Gardner, 1983, 1985; Stepich & Newby, 1988; Duffy, Lowyck, & Jonassen, 1993). Those courses have laid emphases on multimedia authoring, exploring educational software, using basic computer tools for classroom management and learning activities, exploring electronic stories, using software to enhance higher level thinking skills, teachers telecommunicating, advanced Hyperstudio, authoring for the WWW, digital video editing, teachers and students using the WWW, etc.

Our most recent efforts involve a U.S. Department of Education, Preparing Tomorrow's Teachers to Use Technology grant entitled: "Teaching to Learn: A Consultant/Client Model to Enhance Classroom Integration of Technology." This project places digitally literate pre-service teacher education students and established educators in a mutually supportive and collaborative environment which results in a major shift in the information technology experiences available to these and other students as they learn to construct effective learning environments.

Project Course: IST 464 Consultation: Integrating Technology in the Classroom

The "Teaching to Learn" project is a Student Initiated Model. This model is designed to use the technology skills of our students to assist educators (university or K-12) in bringing computer mediated communication and information management to be modeled in university or K-12 classrooms, and to enhance the technology integration modeling our students experience in their field placements.

Our pre-service students are also beginning to develop a digital portfolio in their required technology course (IST 396: Education Uses of Microcomputers and related technologies) which will serve as documentation that they have achieved competency in the areas identified within the SEHS Technology Plan and the National Educational Technology Standards (NETS), International Society for Technology in Education (ISTE). For purposes of the model proposed here, the digital portfolio will serve as the "certification" of competency that is used as a prerequisite to registering for a course where the student functions as a technology consultant.

Once a pre-service teacher education student has completed the required technology course, that student is eligible to register for a 4 semester hour Technology Consultant class (currently designed as a project course - IST 464: Consultation: Integrating Technology in the Classroom). This class is offered as a regular university class, though the requirements are unique. The instructor of this class is responsible for overseeing and evaluating the experiences of students in their placements. For instance, suppose we have 25 pre-service teacher education students in the Technology Consultant class: some are elementary and some are secondary education students. Each of these students has a number of possible placement options. They can work as a technology consultant with a faculty member at the university, or work with an elementary education teacher in a classroom setting, or work with a secondary education teacher who is teaching in that student's major area. The student can also work as a resource person in our Educational Resource Laboratory (ERL) to help other students who are developing their technology integration skills and their digital portfolios. During Technology Consultant course sessions, students receive instruction on consulting skills and are provided with opportunities to enhance their technology application skills through whole group presentations and small group hands-on collaborative learning experiences.

When assisting an in-service educator (university or K-12), the technology consultant agrees to spend 10 hours per week for 10 weeks helping the client (in-service educator) more effectively model technology integration in the classroom. The consultant may attend and assist in sessions of the faculty member's classes. However, the technology associate is not responsible for the content of the class, but rather for helping the faculty member identify and implement the modeling of technology in support of the faculty member's goals for the class. Students have the opportunity to collaborate with a professional in their field in the design of technology supported learning environments, gain experience in doing technology integration needs assessments, and in making technology integration decisions and experiencing the outcomes of those decisions. Further, all of our student consultants gain increased exposure to a variety of continuously evolving models of technology integration. When assisting a collaborating educator (university or K-12), the students spend approximately the 10 hours per week on consultant related activities in and outside of the client's classroom. All student Technology Consultants communicate electronically to share their experiences and resources with their classmates during the process of their work.

Challenges of Fitting Project Course into Teacher Education Program Requirements

To date we have offered the Technology Consultant course as a pilot course with 8 student consultants and as a fully approved course with 18 students. Without a doubt, the most difficult challenge we have encountered is finding a way to make the course attractive to students who already feel they cannot possibly fit one more thing into their busy schedules. In the beginning, this course was viewed by students as both an extra expense and an extra time commitment which had no legitimate place in students programs. Only the most committed students chose to participate. By the time the grant ends we must demonstrate that this is a "don't miss" opportunity that students will seek out even though it does require extra effort.

While we operate under the grant we can offer extras which will not be available when the funding runs out. We have employed various incentives during this development period. Our Vice President of Academic Affairs demonstrated his support of the project by partially subsidizing the tuition of the students in the pilot course. For the first regular course offering we purchased a classroom set of textbooks which students can use for the duration of the course and return at the end. Through the grant we will also be able to return a portion of the cost of tuition to the students after successful completion of the course. Much more important than these short run incentives, we have been successful in getting the course approved to count as an elective in students' majors and minors. By careful placement of student consultants with either university faculty or K-12 classroom teachers matching their majors or minors, we have been successful in having the Consultant course approved as an elective in the various majors and minors for the participating students.

Support Required to Develop and Maintain this Model

We have pledged that we will continue to support the technology integration efforts of students who have completed the Consultant course by continuing to provide technology workshops and equipment which can be checked out through the duration of the grant. This means that students will have technology support throughout their student teaching and possibly into their first year of teaching. We have intentionally developed the course to the extent that the students who have completed the course are major advocates for the course among their peers.

In addition to the efforts described above, funding from the grant has provided for the development of an on-line "problem-solving" data base which contains step-by-step instructions for using various software applications in classroom activities. This data base is open to all on a university server and can be downloaded by the user at "http://pt3.oakland.edu/consultants/jobform6.asp".

At the same time, our university is providing increased course support to all classes through a web-based course support application which provides on-line chat, discussion forums, calendars, email, etc. Incorporating these other support components has enabled us to modify our required technology course to help all of our teacher education students learn first-hand how the integration of technology can help students become much more independent in terms of developing self-help skills and much more collaborative in making it easier to develop "communities of learners". In the Consultant course, our students have been particularly effective in developing this concept of community of learners through their use of the discussion forum. They have made it very clear that they expect to maintain their community as they move into the next phases of their educational preparation, which for many of them is student teaching. Their discussion forum will continue on a university server.

While we had hoped that our grant activities would provide valuable information we could incorporate into our other courses, we are pleasantly surprised at how quickly our experiences with the grant project development have facilitated change beyond the immediate scope of the project. We have already mentioned the changes occurring in our required technology course. Technology support in our Educational Resource Laboratory (ERL) has been dramatically enhanced through the Teaching to Learn project. Our ERL is a unique facility which combines the roles of an educational resource library and a technology laboratory. By assigning grant funded technology support personnel (students with strong technology skills who are not necessarily education students) to work in the ERL, the ERL has become a magnet for education students who are interested in informal technology support. The director of the ERL, excited by the increased student interest, has become an active technology integration advocate. She had her staff are developing a variety of technology workshops which will continue, independent of grant funding. These workshops can be offered at the request of students, professors, or departments, again, increasing the general level of technology support available and lowering the threshold for integration.

While it is still too early to predict long term results, we are beginning to consider the possibility that perhaps we are close to a critical number of students and faculty who have decided to make an active effort to incorporate technology into their teaching strategies which will function perhaps as a tipping point, making adoption of technology integration much quicker and easier among those remaining. We are certainly seeing an obvious increase in technology related activity. It will be interesting to see if the momentum continues to increase.

Various Project Participants, Challenges and Opportunities

In addition to Oakland University, the "Teaching to Learn" project involves Michigan Virtual University, an urban school district, and a suburban school district as partners. The Michigan Virtual University is to act as a systems integrator or broker between colleges, universities and training providers. Its role in the "Teaching to Learn" project is to provide support in the development of an online set of modules which introduce and provide models for best practices in online learning environment. The participating urban school district has about 25 instructional sites and 13,500 students, with diverse refugee, immigrant and migrant populations. While the District scores are well below the state average on standardized tests that measure students achievement, the school district has demonstrated its commitment to ensuring that its students have the critical experiences and enhanced learning opportunities offered through the classroom integration of technology. The participating suburban school district, on the other hand, has 18 instructional sites with over 13,000 students. Integration of technology into the teaching and learning environment is a top priority and the district has made great strides in the development of technology for its students and staff over the past few years.

Various partners in the "Teaching to Learn" project allow both in-service educators and pre-service teachers to experience technology integration from different perspectives. Overall, the participants expressed positive opinions about the changes in their views and skills of technology integration throughout their participation. They are pleased with the resources provided by the project and agree that their role as a consultant or a client allows them to experience a fundamental mental shift in the understanding of how technology can be used to help improve their classroom teaching practices and enhance the students' learning environment.

The 'Teaching to Learn" project also witnessed challenges and opportunities for the participating consultants (pre-service teacher education students) and clients (in-service educators). One of the major challenges for the consultants is lack of time, since they are usually taking four or even five courses at the same time. The clients also feel difficult to find time to meet with the student consultants, owing to the fact that they are so occupied with their teaching tasks. The lack of hardware and software in some school and classroom settings seem to be another major challenge, especially for the urban participants. Both consultants and clients have to work out ways to deal with the consequent issues. Therefore there are slow progresses in some cases. Some consultants (pre-service teacher education students) may face with potential role conflict because they are functioning as a consultant for the project course and may be placed with the same teacher (client) as a field placement for other classes where this classroom teacher is serving in a supervisory role. Some clients, on the other hand, may encounter negative peer pressure related to their extra efforts to incorporate technology.

With the challenges come the opportunities. The participants become aware that technology is very much their own response to overcome obstacles that stand in the way of a better, more productive way of education, and that technology is their tools, their methods, and their creative attempts to solve problems in the teaching and learning environment.

Michigan COATT Certificate

The "Teaching to Learn" project also aims at a goal of technology achievement for the participants. Early in 1998 Michigan's senior U.S. Senator, Carl Levin, hosted a gathering of over 400 Michigan leaders to focus on the issue of how we were using technology to advance education in Michigan. This meeting resulted in the formation of the "Working Group on Teacher Training in Technology". The "Working Group" completed a plan to create the nation's only standards-based credential to be awarded to teachers (both pre-service and in-service) who demonstrate outstanding achievement in the use of technology to enhance student learning as judged by a multi-institutional review panel. June 3, 1999 was the date of the kick-off news event for the Consortium for Outstanding Achievement in Teaching with Technology (COATT) (visit its website at http://www.coatt.org).

The COATT Certificate is a key factor in the long term institutionalization of the "Teaching to Learn" project. This certificate provides a strong incentive for achievement to students who wish to document that they have achieved technology competence at a level which prepares them to be technology leaders in their schools. Oakland University has participated from the beginning in the development of this certificate. Through workshops, first developed through the "Teaching to Learn" project, then continued through the ERL workshop program, students who began developing their electronic portfolios in their required technology course will receive the sustained support they need to earn the COATT Certificate, external documentation of their high level of achievement in the area of technology integration in education.

Summary

This paper has presented a consultant-client model in developing a foundation for enhancing modeling of technology integration in university as well as K-12 environments. Oakland university's recent involvement with the "Preparing Tomorrow's Teachers to Use Technology" grant project is reported, starting with a description of project purpose, context and model, followed by a presentation of the project course development and applications progress. Challenges and opportunities related to the current issues of teacher preparation and technology integration have also been discussed. Both consultants (pre-service teacher education students) and clients (in-service educators) participating in the project have experienced positive changes in views and skills in using technology for classroom teaching and learning.

References

Caine & Caine. (1991). *Making connections: Teaching and the human brain*. Menlo Park, CA: Addison-Wesley Innovative Learning Publications.

Duffy, T. M., Lowyck, J., & Jonassen, D. H. (1993). *Designing environments for constructive learning*. Berlin : Springer-Verlag.

Gardner, H. (1983). *Frames of mind: The theory of multiple intelligences*. New York: Basic Books.

Gardner, H. (1985). *The mind's new science: A history of the cognitive revolution*. New York: Basic Books.

Moursund , D. (1999). *Will new teachers be prepared to teach in a digital age?: A national survey on information technology in teacher education*. Santa Monica, CA: Milken Family Foundation.

Stepich, D. A., & Newby, T. J. (1988). Analogical instruction within the information processing paradigm: Effective means to facilitate learning. *Instructional Science,* 17, 129-144.

The Unit of Practice: A Roadmap for Technology Integrated Learning

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Abstract. Teacher integration of technology in K-8 teaching has remained limited despite increasing connectivity and increasing numbers of computers in classrooms. Few teachers use analytic and project-oriented software on a frequent basis. Rrecent teacher education graduates report that they do not feel prepared to integrate technology in their curriculum. To address this low technology integration in teaching, ASU West. through its PT3 grant, is introducing preservice teachers and their mentor teachers to the Unit of Practice (UOP). The UOP, a product of Apple's ACOT project, builds on several learning theories, addresses educational standards, and provides a framework for organizing thought and integrating technology into classroom instruction. It helps classroom teachers guide students' learning through multiple sources of information. The authors discuss the nature of the UOP, how teacher-student teacher pairs develop UOPs that reflect standards, and how the UOPs are assessed in this PT3 project.

Introduction

Using computers as facilitators of students' learning represents a challenge for inservice as well as preservice teachers. Although by 1999, 95 percent of US schools had Internet connectivity (NCES, 1999) and the student-computer ratio was 6:1 (Anderson & Ronnkvist, A., 1999), teacher integration of technology in K-8 classroom teaching has remained limited. Only about one third of teachers assign computer work on a regular basis and elementary teachers still make frequent use of game and drill software (Becker, Ravitz, & Wong, 1999). Few teachers use analytic and project-oriented software on a frequent basis (Becker, Ravitz, & Wong, 1999). The fact that recent teacher education graduates report that they do not feel prepared to integrate technology in their curriculum (U.S. OTA, 1995) exacerbates this situation as they enter the classroom.

As part of a PT3 implementation grant to help teachers integrate technology into their teaching, Arizona State University West provides preservice teachers and their mentor teachers with technology training and an introduction to the use of ACOT's Unit of Practice (UOP). This Practicum Plus Program pairs of preservice and mentor teachers attend a week-long all-day summer workshop followed by monthly sessions during the Fall semester in exchange for 3 graduate credit hours. This paper provides a historical and theoretical framework for the UOP, as well as a description of the UOP and its assessment.

Historical Background

To study how the regular use of computers in the classroom by teachers and students might change teaching and learning, in 1985 Apple Computers began a research and development collaboration with public schools, universities, and research agencies in conjunction with university researchers. ACOT research looked at how computers should be used by teachers to improve students' learning. The project provided computers and training for teachers in selected classrooms known as the Apple Classrooms of Tomorrow (ACOT).

This project was timely and much needed for studying classrooms where students and teachers had immediate access to a wide range of technologies. The rich data from the thirteen years of ACOT demonstrated that the introduction of technology into classrooms significantly increased the potential for learning, especially when it is used to support collaboration, information access, and the expression of students' thoughts and ideas (Fisher, Dwyer & Yocam, 1996).

As part of the ACOT project, Apple Computers, the National Science Foundation and the New American Schools Development Corporation collaborated to create a structured curriculum framework and named it Units of Practice. The UOP is a thematic approach to planning for integrated learning with technology that meets educational standards. This integrated approach allows children to explore knowledge in several subjects (Humphreys, Post and Ellis, 1981) through meaningful association of curriculum areas in a holistic way that reflects the real, interactive world (Shoemaker, 1989).

Underlying Learning Theories

The UOP builds on several learning theories. Brain compatible learning perceives the brain as a social brain that has an innate need for meaning. It also proposes that complex learning be enhanced by challenge (Caine & Caine, 1997). The UOP encourages student collaboration, inquiry and problem solving. Constructivism emphasizes learning rather than teaching, encourages learner autonomy and initiative, encourages learner inquiry, nurtures curiosity, emphasizes performance and understanding, encourages learners to engage in dialogue with other learners, and provides opportunities for constructing new knowledge and understanding through authentic experiences (University of Pretoria, 1996). The UOP exhibits each of these constructivist characteristics. In addition, the UOP reflects Dewey's emphasis on projects and concrete activities, Vygotsky's social interaction, and Bruner's social construction of ideas or concepts based on current knowledge and integrating experiences.

Essential Elements of UOP

The UOP, is a framework for organizing thought and embedding technology into teachers' classroom instruction that draws on principles validated through research. These principles inform teachers in how to design classroom activities relevant to students to foster their learning through doing. The UOP brings into focus seven elements of instruction used to align curriculum with developmentally appropriate standards across grade levels and content. The seven elements (Invitation, Situations, Tasks, Interactions, Standards, Assessment and Tools) are part of the three phases of teaching: planning, instruction and evaluation. The UOP provides teachers with a common language as they integrate technology. It centers on the student as learner with the teacher as a facilitator of learning through modeling, reflecting, and supporting self-inquiry.

The first element of the UOP, the Invitation, focuses on what the students are going to learn and do. It is the curriculum question that teachers and learners will be addressing throughout the entire unit. It is designed to be a thought-provoking question that invites inquiry during teaching and learning process. It is intended to spark students' interest in the unit and provide then with a project overview. It is the teacher's invitation to the students to join in the process of learning, exploring, finding information, raising further questions and finding an answer to this initial unit question.

The second element, Situation, is a clear description of where, when and for how long students will engage in the unit. It not only frames the chronology, but also identifies where learning activities will occur. It specifies the time required for the unit, i.e., a day, week, month or semester. It also addresses the arrangement of the physical environment where instruction will take place.

The third element is Tasks. This is a clear-cut description of what students will do to achieve the goals and standards incorporated in the unit. It explains the activities that are linked to the selected standards. The tasks must clearly correlate to each standard included in the unit of practice. Each task includes situational or interactional activities.

The fourth element, Interactions, describes group dynamics and the roles of the teacher and students. It spells out how students interact among themselves and with the teacher. This fourth element specifies who does what. It specifies if the teacher or the student initiate the dialogue process that generates the appropriate learning experiences.

The fifth element, Tools, lists everything needed for the unit including clearly defined software titles with appropriate references so others can easily locate them. Tools are the resources provided by the teacher to engage students in the act of learning and the creation of their own knowledge. They can include specific software programs, Web pages, reference books, and informational videos.

The sixth element, Standards, clearly states what the learning objectives are and links them to curriculum and technology standards across grade levels. The objectives also incorporate mandated district, state and national standards. All specific standards addressed are listed in the UOP. These standards delineate the expected student outcomes, as well as the criteria for evaluation of learning.

The seventh element is Assessment. This element of the UOP gives a clearly stated description of how students will be evaluated on the academic standards, goals and learning objectives set forth in the unit. The key question asked during the assessment process is: Did students meet the standards through their completed tasks?

An additional element was added in the PT3 Practicum Plus Program, an Abstract/Overview. This element provides a concise, clear summary of the content knowledge and skills expected of students. The Abstract/Overview gives other teachers a frame of reference as they look at the UOP online at the ACOT website and relate it to their own classrooms.

Assessment Procedure

The purpose of assessing each UOP is to objectively and precisely validate the design of instruction and technology integration. The assessment looks at participants' application in the UOP of standards and their integration of technology as a means for student learning.

UOP	Accomplished – 3	Developing – 2	Emerging – 1	Comments
Abstract/ Overview	Abstract is clearly stated and includes the content knowledge and skills students should know and be able to do. It is concise and clear.	Abstract is clearly stated, but lacks complete information students should know.	Abstract is too vague or general. The standards, goals and objectives are not addressed.	
Invitation/ Engagement	Motivates the student into the unit by relating to the learner's interests and goals; is engaging and matches the unit.	The invitation somewhat relates to the learner's interests.	The invitation is purely factual with no appeal to relevance or importance.	
Standards With Objectives	Content and technology standards are listed and referenced in the task and assessment components of the unit.	Content and technology standards are defined in general terms.	Content and technology standards are vague or not included.	
Tasks	Tasks are clearly stated, sequenced and easily understood for a teacher trying to duplicate this Unit of Practice.	Tasks are not clearly stated or sequenced.	A general list of the tasks is included.	
Interactions	Group dynamics and participants' roles are clealry stated. Teacher's role is defined. All are correlated with the tasks.	Group dynamics and participants' roles are stated but not clearly defined. Teacher's role is not clearly defined.	Participants and teacher's roles are not stated.	
Tools/	Required tools and	Most of the required	Required tools and	

Materials	specific software titltles are clearly listed and defined so that anyone could find the materials.	tools and specific software titles are listed, but not clearly defined.	specific software titles are not clearly defined.	
Situations	Situations are described in terms of location; time required per day, week, month or year; duration and physical environment	Situations are described in general terms of location, time or duration.	Location, time or duration is too vague or omitted.	
Assessments/ Evaluations	Description of how students have met all standards, goals and objectives is clearly stated.	Description of how students have met some of the standards, goals and objectives is stated.	Description of how students have met standards is vagues or omitted.	

Figure 1: Unit of Practice Evaluation Rubric

External evaluators, teacher education faculty and PT3 personnel having teaching and UOP experience, validate the UOPs through refereed review. They assess each UOP following a rubric (see Figure 1). The rubric, adopted and expanded from one used by the Arizona Learning Interchange (2000), provides a scale from 1 to 3, with 1 being the lowest, for assessing each element and the degree to which it was accomplished. The UOPs developed by preservice-inservice teacher teams can also be accessed through the ACOT website, fostering networking, collaboration and sharing of ideas and strategies across the United States and around the world.

Conclusions

Implications for the importance of the UOP lie in classroom teachers who are trained to break out of the textbook dependency mode, guiding students' learning through multiple sources of information. Training teachers to develop and use UOPs for instructional planning and delivery will invigorate learning for students by allowing their interests to help guide the lessons. Teachers will become empowered through increased confidence in technology integration, breaking away from games, drills and word-processing limitations.

The benefits for students are multiple. First, they are learning in a carefully thought through, sequenced course of study on a particular topic that addresses academic standards. They are learning to explore topics deeply, looking for and accessing information through a variety of sources. They are learning that the textbook is not the know-all, end-all for knowledge acquisition. Most importantly, they are developing technology skills that foster and promote research habits that will be useful throughout their educational careers and continuing in life after school.

To address the issue of low technology integration in classroom teaching, ASU West through its PT3 grant, is introducing student teachers and their cooperating teachers to the UOP as a way of planning for technology integrated learning. The presenters will share the nature of the UOP, how the pairs develop their UOPs to reflect standards, and how the UOPs are evaluated. The presenters will provide examples of UOPs and the evaluation rubric. Handouts will be available for the participants.

References

Anderson, R. E. and Ronnkvist, A. (1999). The Presence of Computers in American Schools. Center for Research on Information Technology and Organizations, University of California, Irvine and University of Minnesota. [On-line.] Available:
http://www.crito.uci.edu/tlc/findings/computers_in_american_schools/html/startpage.htm

Arizona Learning Interchange. (2000). Units of Practice Overview. [On-line]. Available: http://azli.asu.edu/ali_help/units_help.shtml

Becker, H J.; Ravitz, J. L.; and Wong, Y. T. (1999). *Teacher and Teacher-Directed Student Use of Computers And Software.* Center for Research on Information Technology and Organizations, University of California, Irvine and University of Minnesota. . [On-line.] Available: http://www.crito.uci.edu/tlc/findings/computeruse/

Caine, R. & Caine, G. (1997). Mind/Brain Learning Principles. 21st Century Learning Initiative. [On-line]. Available: http://www.newhorizons.org/ofc_21clicaine.html

Fisher, C., Dwyer, D. & Yocam, K. (1996). *Education and Technology – Reflections on Computing in Classrooms.* San Francisco, CA: Apple Press.

Humphreys, A.; Post, T.; & Ellis, A. (1981). *Interdisciplinary Methods: A thematic Ajpproach.* Santa Monica, CA: Goodyear Publishing Company, 1981.

National Center For Education Statistics. (1999). *Internet Access in Public Schools and Classrooms: 1994-98.* [On-line]. Available: http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=1999017

Shoemaker, B. (1989). Integrative Education: A Curriculum for the Twenty-First Century. *Oregon School Study Council* 33(2).

University of Pretoria. *What is constructivism?* (1996). [On-line]. Available: http://hagar.up.ac.za/catts/learner/lindavr/lindapg1.htm

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Abstract: The purpose of this research was to examine the benefits of one-on-one mentoring for technology coaches and teacher preparation faculty as they learned to use technology. Participants included 33 teacher preparation faculty and 14 technology coaches, teacher education majors. The technology coaches worked with the faculty members in their offices and classrooms as they learned to use technology for their personal benefit and to integrate technology into their teaching. Interviews and observations indicated that coaches as well as faculty members gained in their knowledge of technology.

Faculties often need one-on-one, just-in-time assistance with technology as they learn to use it for their personal benefit and as they explore opportunities to use technology in their teaching. With the rapid increase in the available technologies, faculties are overwhelmed as they attempt to learn to use technology. Faculty development workshops provide a foundation upon which to build technology expertise (O'Bannon, Matthew, & Thomas, 1998). However, faculties also need just-in-time instruction as they attempt to use the knowledge gained from technology workshops and as they attempt to incorporate what they have learned into their teaching. MacArthur et al., (1995) found that technology mentors are one way to provide individualized and on-going support to faculty members as they move through the complex task of changing the way they teach to maximize the potential of technology to enhance student learning.

Dusick's (1998) review of literature revealed that several factors impact whether or not faculties use computers for instruction. These factors include: 1) administrative support, 2) computer availability, 3) resources, 4) support staff, and 5) training in the use of computers. Reporting on a three-year program focused on infusing technology into a teacher education program, Thompson, Schmidt, and Hadjiyianni (1995) identified these essential factors for success: 1) easy access to technology; 2) allowing faculty to become personally comfortable with technology before using it for instructional purposes; 3) having technology integration as a department goal; 4) receiving strong support from the administration; 5) inviting participation in the program; and 6) one-on-one mentoring for faculty.

A national survey conducted by the International Society for Technology in Education (ISTE) commissioned by the Milken Exchange on Education Technology found that teacher preparation programs are not preparing teachers to effectively teach with technology (Moursund & Bielefeldt, 1999). Results of this survey indicate that teacher preparation faculty do not model technology use in part because they lack the skills to do so, and they lack the necessary hardware and software. Teacher preparation faculty includes faculty in the colleges of arts, sciences, and humanities many who do not recognize themselves as preparing future teachers (White, 1994).

In order for preservice teachers to integrate technology into their classrooms, they need to see it modeled in the university classes they are taking. Teacher preparation faculty in all content areas must model how technology can be integrated into the curriculum, not added on as an afterthought (Beichner, 1993). If preservice teachers are not required to use technology in their teacher preparation classes and they do not see it modeled by their professors, they will not use technology in their classrooms. Additionally, they must participate in classroom activities designed to provide experiences in enhancing instruction with technology to meet the individual needs of students. Through these experiences they will see the benefits and limitations inherent in teaching with technology. Preservice teachers will teach tomorrow the same way they are taught today (NCATE, 1997).

Faculty members who are not comfortable using technology for their own personal benefit are unlikely to integrate technology into their teaching. Stewart (1999) and Thompson, Schmidt, and Hadjiyianni (1995) found that one-on-one faculty mentoring assures faculty members receive the support they need to become comfortable using technology. Mentoring assures the faculty members receive individualized attention focusing on what they want to learn, a self-paced approach to learning, a comfortable setting, flexible times, and on-going support during the learning experience. Faculty members who participate in mentoring programs not only learn to use technology they are more likely to model technology use in their classes (Gonzales et al., 1999).

Faculty Technology Use

Faculty do not incorporate technology into their classes for a variety of reasons including, lack of access to appropriate hardware and software, limited technology skills, lack of knowledge of how to integrate it into their teaching, and lack of technical support. Lack of access to technology in university classrooms and faculty members' offices is often a major problem. However, when it is available faculty members need instruction on how to use the technology. Workshops provide them with the skills to use the technology, but do not provide them with the ongoing support needed to adapt the skills learned to their classroom teaching. Additionally, workshops often focus on teaching the technical skills, but do not show faculty how to integrate the technology into their specific subject area. Furthermore, in order for technology to reach its full potential, faculty members need to change the way they teach which is often not addressed in workshops.

Since faculty members have different work schedules they need to have assistance available when they are in their office, at flexible times. It is difficult for them to match their schedules to the times of scheduled workshops. Workshop participants are on a variety of technology levels and interests, so it is often difficult to provide the specific help faculty members need. One-on-one support in their offices and classrooms can be tailored to their personal interests and matched to their ability levels.

Each year students are arriving on college campuses with more technology and more technology skills (Olsen, 2000; Sheffield, 1996). When they see technology use modeled in some classes and find some course materials on the web they begin to question why other professors are not using technology and not placing course materials on the web. Hence, students are applying pressure to faculty members to learn to use technology and to incorporate it into their curriculum (Olsen, 2000; Thompson, Schmidt, & Hadjiyianni, 1995).

Technology Coaches

Thompson, Schmidt, and Hadjiyianni (1995) found that successful technology staff development included not requiring participation, but inviting participation and the use of one-on-one mentoring for interested faculty. One key to the integration of technology into teaching is ongoing coaching or mentoring for faculty after initial technology workshops as the transfer of skills to the classroom requires ongoing support (Ritchie & Wiburg, 1994). McKenzie(1991) found that faculty members need comfortable, familiar environments in which to learn to use technology as well as personal support. Faculty members want immediate help when they have problems, they want help from someone with whom they feel comfortable, and they want just-in-time instruction specific to their own personal needs. Technology coaches meet with faculty in their offices where they have access to their own computer and coaches provide the faculty with personal support in a non-threatening manner as they experiment with technology.

A United States Department of Education Preparing Tomorrow's Teachers to Use Technology (PT3) grant provided funding for technology coaches to assist teacher preparation faculty as they learned to integrate technology in their teaching. Support staff for the coaches included two technology proficient College of Education faculty members. Through collaboration with another PT3 grant within the College of Education, technical support and instructional support personnel provided coaches and faculty with additional onsite assistance. The purpose of this research was to examine the benefits of one-on-one mentoring for technology coaches and teacher preparation faculty as they learned to use technology.

Methodology

Participants

Participants in this study included 33 teacher preparation faculty and 14 preservice teachers. Faculty members (33) from the College of Education, College of Applied and Natural Sciences, College of Liberal Arts, and the University Lab School received one-on-one assistance from the technology coaches. Three of the coaches were married with children, one was married and pregnant, one was married, one was a single mother, and the remaining eight coaches were living at home or in a dormitory on campus. The coaches were 14 full-time female preservice teacher education majors who had completed the required teacher preparation technology course and had a high interest in learning more about using technology. During the 1999-2000 academic year there were eight technology coaches. During the summer 2000 there were nine technology coaches, three of who had been coaches during the academic year.

Procedure

At the beginning of the fall quarter professors who taught the initial technology class recommended students they felt were proficient in technology. Since many of the technology coaches would not be attending summer school, additional coaches were recruited during the spring Kappa Delta Pi initiation. Some students applied to be technology coaches after hearing about the positions from other students and learning that the salary was above minimum wage. Students were asked to complete a form indicating which hardware and software they had previously used and to indicate their proficiency levels. Students were also asked to provide information as to when they were available to work with faculty within the 20 hour per week limit set by the university. Students were reminded to not miss classes in order to work with faculty and to allow themselves enough time for studying.

The availability of the technology coaches was introduced at department and lab school faculty meetings and through memorandums placed in faculty mailboxes. Faculty members were asked to complete forms indicating the areas in which they needed assistance. They were reminded that the coaches were there to assist them in using the technology, rather than to complete projects for them. Forms completed by the coaches and the faculty were used to match student expertise with faculty needs.

In order to assure that the coaches had the necessary skills to assist faculty, opportunities were provided for them to work through tutorials and attend workshops on *HyperStudio, Microsoft Office, Inspiration*, and *Netscape Composer*. When faculty requested assistance with graphics, email, and using a digital camera, coaches were given individual instruction prior to their meeting with the faculty member. Coaches were at first concerned about their limited technology expertise. They were assured that they were not expected to know all of the answers and that support staff was available to assist them in finding the answers. They quickly learned that the support staff did not have all of the answers. However, they also learned that the support staff worked together to find the answers they needed and helped them to learn the skills they needed to assist the faculty. As new software arrived for the faculty computer lab and the campus model technology classrooms, students assisted in the installation, learned to use the software, wrote up step-by-step directions for using the software, and worked with faculty members as they used the software with their students.

Faculty development workshops were provided to preservice teacher education faculty during the day and after school for the university lab schoolteachers. The coaches attended the workshops and provided support to the faculty members during the workshops. The workshops provided opportunities for the coaches and faculty members to meet one another. Relationships formed during the workshop were often continued as faculty members requested that the students work with them in their offices and classrooms. Faculty workshops in the College of Education were not well attended, however, faculty members were interested in having coaches work with them one-on-one in their offices and classrooms. Lab schoolteachers attended workshops in their school library as part of their monthly faculty meetings and appreciated the opportunity to learn to use technology while working with one another.

Coaches worked with faculty in their offices on their own computers, which provided a safe, comfortable environment for the faculty as they were familiar with the software on their own computer. Coaches assisted faculty members as they attempted to use skills learned in workshops. Simple things such as differences in the configuration of the toolbar between the computer used in a workshop or the computer in another faculty member's office and the computer in their office frustrated faculty members as they learned new skills such as centering or underlining text. Coaches were also available to assist faculty in their classrooms as they learned to use the multimedia carts for classroom presentations. These carts contain a VCR, speakers, document camera, laptop, and a presentation system and had to be checked out prior to class and returned after class. In addition to being overwhelmed by the buttons, cables, and keys, faculty members soon discovered that since the equipment on each cart was from different manufacturers the configuration and the setup varied. If they could not check out the same cart each time, they were faced with figuring out how to operate the equipment on the available cart.

Some faculty were interested in learning to create their own web pages and placing course materials on line. Coaches varied in their ability to create web pages and they were given additional instruction in web page design and development. A simple web page template was designed and placed on the College server so that the coaches could download it directly onto the faculty member's own server space. Instructions on placing web pages on the faculty member's server space were developed for coaches. Faculty members were given directions on how to locate, maintain, and edit their web pages.

With the opening of three distance education classrooms the need for proctors became evident. Since funding for distance education proctors was not available, technology coaches were asked to proctor the classes. Convinced that knowledge of teaching via compressed video would be beneficial to them professionally, students volunteered to learn to proctor the classes. Since many of the distance education classes were taught at night, this provided students additional work opportunities that did not conflict with their university classes. The director of the campus Center for Instructional Technology and Distance Learning (CITDL) and his staff conducted a proctoring workshop for the technology coaches. Additionally, on the first class meeting one of the grant support staff worked with the coaches to assure that the equipment operated correctly and that the coach was comfortable with the assignment.

Technology coaches were asked to write down a brief description of their visits with faculty members and to have them sign the forms to verify that the student had worked with them. Faculty members were also provided separate forms for comments to send directly to the grant director about the mentoring sessions. Interviews with the faculty and the coaches conducted by an external evaluator and grant personnel provided additional data about the mentoring process.

Results

Interviews with and observations of teacher preparation faculty and technology coaches indicated that both showed growth in their technology skills, which led to them feeling more comfortable using technology and more willing to incorporate technology into their teaching. The coaches were at first intimidated by the prospect of teaching their professors and because they felt they did not have the expertise needed to teach someone to use technology. However, faculty members and coaches soon developed a working relationship. Since the coaches did not know everything about technology, the faculty felt comfortable asking for their help. One student commented that she thought the faculty felt comfortable working with the coaches, because they were not "techno-experts." The coaches accepted the faculty at their level of technology expertise and tailored the instruction to meet the needs of the faculty member. However, two coaches were rather disconcerted to discover that a faculty member did not know how to type and did not know the location of the keys on a keyboard.

Faculty members expressed appreciation for students helping them learn to fully utilize their office computers, such as organizing files on their computer hard drives, sending email attachments, using spreadsheets, and writing down instructions for the faculty member to be able to do things on their own. The coaches worked to accommodate faculty members' schedules; however, they were frustrated when faculty members set up appointments and then failed to keep them. The coaches came to understand that faculty members' schedules were often beyond their control.

One coach worked with a professor loading math software on a laptop computer on the multimedia cart and assisted the professor as the software was demonstrated for the students. This student then made herself available for her classmates as they worked problems in the computer lab using the software and printing out their answers. Another coach learned to use several pieces of early childhood software and then worked with the professor in her classroom as she used the software with her students. Several professors asked for assistance learning to use PowerPoint and to create slide shows for their conference presentations. Coaches were successful in teaching faculty members to use PowerPoint, but were less successful teaching faculty members about design issues. Coaches reported that faculty members insisted on putting excessive amounts of text on the slides in small font and including distracting sounds and animations. Jarring colors, small fonts, and irrelevant animations were also a problem with faculty web pages.

At first the cameras, microphones, monitors, computers, document cameras, fax machines, telephones, and VCRs in the distance education classrooms were overwhelming to both the proctors and the professors. However, they soon developed a routine for working together and operating the equipment. One student became particularly adept at moving the camera and operating the equipment and took great pride in her work. Although no longer employed as a technology coach, she volunteers her time whenever she is registered in a distance education course. During the summer session one professor overwhelmed by the prospect of using any technology was assigned two proctors for his compressed video class. The students at the distant site continually asked to see his notes on PowerPoint slides saying that it would be easier to follow along. The professor resisted until one of the coaches assured him she could create a slide in less than a minute and then proceeded to do so. Knowing that they were to teach the professors rather than do everything for them, the proctors insisted that he create one or two slides for each class and they would complete the others. The two coaches enlisted the assistance of other coaches and they all worked together to create PowerPoint presentations for some of the professors other courses. At the end of the class the professor took the students to lunch and he continues to maintain close contact with the students as they complete their teacher education program.

The individualized attention and on-going support of the coaches facilitated faculty members' growing expertise and use of technology. Having assistance available in their classrooms when working with their students encouraged faculty to weave technology into their teaching. Some faculty members did make changes in their teaching by allowing students to work together and solve problems using technology. Some faculty members saw the potential of technology to enhance their teaching and continue to ask to learn new ways to use technology. For example one faculty member with the assistance of a technology coach created her own web page and was ready for another challenge, so she decided to establish a listserv to use with her students. Other faculty members simply created web pages and put course syllabi on-line with no appreciable change in their classroom teaching. Some faculty members had a difficult time understanding that with all the different configurations of computers in the College what coaches learned to do on the computers in the lab may not work on the faculty members' office computers. For example, one faculty member's office computer did not have sufficient memory to work with graphics.

Overall the technology coaches indicated that after working with faculty they felt more comfortable using technology and had gathered ideas for using it in their own classrooms. During interviews three of the coaches expressed interest in obtaining a master's degree in instructional technology. One coach graduated in May, immediately applied for the master's program, and continued her work as a technology coach during the summer. Over the summer she spent time using the computers and printers to create things for her classroom and to plan activities for her new students.

The technology coaches developed a sense of pride in their technology expertise and developed problem solving skills as they encountered hardware and software problems. Coaches learned to move between Macintosh and Windows computers with ease and became familiar with a wide variety of software for use in their classrooms. The teacher preparation faculty and their classmates see the coaches as valuable resources. A real commitment to their work was evidenced by the discovery that many of the coaches were working at home and on weekends to learn to use technology to help the professors and were working on projects for the professors on their own time.

Conclusions

The adoption of technology is a complex process that takes time and resources in addition to requiring ongoing individualized support. The results of this research supports the research of the others (MacArthur et al., 1995; Gonzales et al., 1999; Stewart, 1999; Thompson, Schmidt, & Hadjiyianni, 1995) regarding the benefits to faculty of having one-on-one mentoring as they model the integration of technology in the classroom curriculum. One-on-one assistance in their offices provided faculty members the support they needed to become comfortable using technology, an essential first step to using technology in their teaching (Thompson, Schmidt, & Hadjiyianni, 1995).

As evidenced by the students in the distance education class who requested that the professor use PowerPoint presentations, students are applying pressure to faculty to incorporated technology in their teaching (Olsen, 2000). Having preservice teachers mentor teacher preparation faculty benefited both groups as they worked together to learn to use technology for their own personal benefit and in their teaching. Furthermore, they established positive relationships that continued after the mentoring ended.

References

Beichner, R. J. (1993). Technology competencies for new teachers: Issues and suggestions. *Journal on Computing in Teacher Education, 9*(3), 17-20.

Dusick, D. M. (1998). What social cognitive factors influence faculty members' use of computers for teaching? A literature review. *Journal of Research on Computing in Education, 31*(2), 123-137.

Gonzales, C. L., Hill, M., Leon, S., Orrantia, J. F., Saxon, M., & de Montes, L. S. (1999). Faculty from Mars, technology from Venus: Mentoring is the Link. [24 paragraphs]. *Computers in the Social Studies Journal.* [On-line Serial]. Available: http://www.cssjournal.com/gonzales.html.

MacArthur, C. A., Pilato, V., Kercher, M., Peterson, D., Malouf, D., & Jamison, P. (1995.) Mentoring: An approach to technology education for teachers. *Journal of Research on Computing in Education, 28*(1), 46-62.

McKenzie, J. (1991, April). Designing staff development for the information age. [44 paragraphs]. *From Now On The Educational Technology Journal.* [On-line Serial]. Available: http://www.fno.org/fnoapr91.html.

Moursund, D., & Bielefeldt, T. (1999). *Will new teachers be prepared to teach in a digital age?* [Online]. Available: http://www.milkenexchange.org/article.taf?_function=detail&Content_uid1=116

National Council for Accreditation of Teacher Education. (1997*). Technology and the new professional teacher: Preparing for the 21st century classroom.* [Online]. Available: http://www.ncate.org/specfoc/techrpt.html.

O'Bannon, B., Matthew, K., & Thomas, L. (1998). Faculty development: Key to integration of technology in teacher preparation. *Journal of Computing in Teacher Education, 14*(4), 7-11.

Olsen, F. (November 3, 2000). Campus newcomers arrive with more skill, better gear. *The Chronicle of Higher Education, 47*(10), 39, 43.

Ritchie, D., & Wiburg, K. (1994). Educational variables influencing technology integration. *Journal of Technology and Teacher Education, 2*(2), 143-153.

Sheffield, C. J. (1996). An examination of self-reported computer literacy skills of preservice teachers. *Action in Teacher Education, 17*(4), 45-52.

Stewart, E. B. (1999). Learning together: The use of mentoring for faculty development in the integration of technology. *Journal of Computing and Teacher Education, 16*(1), 15-19.

Thompson, A., Schmidt, D., & Hadjiyianni, E. (1995). A three-year program to infuse technology throughout a teacher education program. *Journal of Technology and Teacher Education, 3*(1), 13-24.

White, C. S. (1994). Technology in restructured preservice education: School/university linkages. *Journal of Technology and Teacher Education, 2*(2), 119-128.

Lessons Learned

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Abstract:
Last year our School of Education received a PT3 Capacity Building grant. This year we received a PT3 Implementation Grant to continue our work with integration of technology into our teacher preparation program. In addition, last year we received a 5 year Title II Partnership for Teacher Enhancement grant to assist us redesign our teacher education program. The PT3 grants support this effort.

A panel of university faculty will interact with the audience as they share their experiences on lessons learned and the continuous assessment that occurred during this period of change.

Overview:

The University of Alaska Anchorage School of Education (http://www.uaa.alaska.edu/ed/) has been redesigning its teacher education programs. The goal of the redesign was to provide preservice students with an education that meets the needs of educators in Alaska and to provide practicing educators with ongoing professional development support. An additional goal was to be able to become NCATE accredited.
A five year Title II Partnership for Teacher Enhancement grant, Alaska Partnership for Teacher Enhancement (APTE), provided assistance with the redesign our teacher education program. UAA, through the APTE Title II partnership grant is creating a post-baccalaureate Professional Development School model. Four schools in Anchorage and 5 schools in the rural school districts have been identified for the 2000-2001 school year. In addition, the APTE program will be developing a distance-delivered program for village teacher aides that will lead to a Liberal Arts Bachelor's degree and elementary teacher certification. The APTE grant allowed School of Education faculty to interact with Pre-K to 12 faculty, administrators and private sector partners. The first task was to create a new post-baccalaureate program and begin implementation within one year.

In addition to this major task, faculty were being asked to integrate technology in their classes. The Alaska PT3 grants assist with this process. Our PT3 grant addresses four specific goal areas: Program Development, Faculty Development, Student Development, and K-12 Partnerships. They are part of a systemic change in teacher education and linked to each other and to other projects and programs within the SOE. These are the goals of the PT3 grant.

STUDENT DEVELOPMENT: SOE GRADUATES will be well prepared, technology proficient educators.

FACULTY DEVELOPMENT: SCHOOL OF EDUCATION AND CONTENT AREA FACULTY will be knowledgeable about current practice related to the use of computers and technology and integrate them in their teaching and scholarship.

PROGRAM DEVELOPMENT: SCHOOL OF EDUCATION PRESERVICE TEACHER EDUCATION PROGRAMS will reflect best practice including the integration and modeling of technology in all courses, using distance technologies to erase the differences between urban campus-based and rural programs.

K-12 PARTNERSHIPS: SCHOOL DISTRICTS WILL BECOME FULL PARTNERS in new teacher preparation through mentor teachers modeling best practice supporting pre-service year-long internships and shared training activities.

To help faculty members develop the vision needed as they experiment with using technology in their current courses and model use of technology in the field, as part of the 1999-2000 Capacity Building project, UAA faculty members participating in this project have already received laptop computers with software comparable to what the students have in the SOE lab. A small projector and "smart cart" with student laptops is now available for check out.

One immediate benefit of the PT3 Capacity Building year has been increased awareness of technology integration into instruction. The team building resulting from UAA sending 10 people (SOE, CAS, ASD) to the SITE conference in February 2000 was a pleasantly unexpected outcome of this activity.

Faculty were asked to think about the lessons they have learned from these experiences. Those attending the SITE conference in March 2001 will participate in this session by sharing lessons they have learned.

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Bootstrapping Online Organizational Knowledge: Technologies and Practices from a PT3 Initiative.

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Abstract: Large-scale projects often depend in critical ways on points of leverage where modest effort has significant influence on outcomes. The purpose of this paper is to describe how a coordinated system of Web resources served as such a point of leverage in a federally-funded effort to promote technology in support of teaching and learning. We believe two other decisions were important in the success of our Web tools as a point of leverage. One decision was to avoid high-tech proprietary systems (i.e., "groupware") in favor of a loose collection of relatively "low tech" tools. The second was that we sought to build on, rather than replace, existing workplace practices and protocols. We believe these decisions also significantly enhance the generalizability of the model we have developed for preparing teachers to teach in an information age.

Introduction

Initiatives in teacher education are complex enterprises that typically involve large numbers of participants and a wide range of constituencies. In addition to technical issues related to curriculum, credit hours, and certification, there are many practical matters related to working practices and protocols in university and K-12 academic settings. Given such circumstances, it is critically important that initiatives intended to promote institutional change establish a broad collaborative base of knowledge from which change can emerge. This paper describes how "low-tech" Web technologies have been applied to create and support the development of a collaborative organizational knowledge base with the objective of promoting in-service and pre-service teacher development in the area of technology integration.

Although it has become something of a straw figure, it may still be useful to emphasize that technology integration that relies simply on investing as much as we can in the latest hardware and software is not likely to lead to desired outcomes. There is ample evidence that simply introducing new tools in the absence of continuing support will be unproductive (Maddux, Cummings, & Torres-Rivera, 1999; McGregor & Pachuski, 1996; Bork, 1995). Moreover, teacher educators and the institutions they work within have well-established workplace protocols and practices that reflect local needs and knowledge (Walters & Pritchard, 1999; Slick, 1998; Maddux, Johnson, & Harlow, 1993). Depositing the "latest and greatest" technologies in a teacher's classroom may be the equivalent of sending a tractor to a third world farmer who has no ready access to gasoline. In principle, it has utility, but it presupposes a context that is missing. Teacher education initiatives are further complicated by the fact that they almost invariably are required to bridge institutional boundaries (Slick, 1998). Efforts to revise a curriculum will often require participation by state licensing offices and field placements and internships can only be arranged working with colleagues in PK-12 school systems (White, 1994). Even purely physical constraints can result in serious obstacles to reform when participants are scattered across school systems, cities, and states.

As participants in a federally supported Preparing Tomorrow's Teachers to Use Technology (PT3) project, we were eager to begin but wanted to be sure to coordinate our efforts so that our work could effect institutional changes that would not disappear with our federal funding. From the beginning, we felt that the power of the Internet (and specifically, the Web) would be central to our efforts. At the conclusion of the first year of work it is now clear that, if anything, we underestimated the potential of the Web as a platform for our efforts.

Project Overview

Our project has three major objectives, all related to technology integration in PK-12 or post-secondary classroom settings.

1. Assist pre-service teachers in developing teaching styles that make effective use of technology.
2. Promote pre-service teacher experience with technology-enhanced learning in their own education.
3. Establish a model for technology integration that can grow and change as technology evolves.

Our project achieves these objectives within a training and internship program that places digitally literate pre-service teacher education students as technology consultants with established public school and university educators interested in learning more about technology integration. This consultant/client model is designed to introduce new teaching and learning technologies in a mutually supportive collaborative environment that benefits the pre-service interns, the teachers with whom they work, and the students in the classrooms where technologies are introduced. The project is also intended to develop a broader, more flexible model for technology integration to ease technology transitions for individuals and institutions in a variety of settings.

We believe the ultimate success of our efforts will be demonstrated by the extent to which tools and practices we develop are institutionalized in our programs and in our collaborative interactions with field-based colleagues and school systems. As a consequence, we made an early choice to adopt a collection of inexpensive and widely used "low-tech" tools (email, listservs, discussion boards, Web pages, and WebCT, a course development and delivery system) to build a foundation for our project knowledge base. Our decision to opt for a "low tech" approach had a number of important consequences for us.

One consequence was that most project participants were already familiar with many tools we had chosen, an important benefit in getting project activities started. A second more complex consequence was that, since most participants used the tools we had adopted, they had already established practices and protocols for this use. While this sometimes was an advantage, it occasionally resulted in problems since established patterns of use could run counter to our objectives. One instance where this led to some difficulties was where students had come to rely on workplace Internet access rather than on the access provided by the university. Practices and protocols that might be appropriate in a workplace setting (e.g. no Internet downloads) could make essential project activities impossible, even when employers were sympathetic to our objectives. Finally, a third consequence of our choice to use "low-tech" tools was that institutionalization would not require resources to support specialized hardware or software when external funding ended. The success or failure of the institutionalization effort would thus depend on *practices and protocols for technology use* we could develop, not on resources we had managed to accumulate when outside sources supported our work.

In the fall of 1999, project activities began with participants from Oakland University (OU), Michigan Virtual University, Pontiac City Schools, and Rochester Community Schools. The working groups we established included OU faculty and students, colleagues from the Michigan Virtual University, and local school administrators, including technology coordinators, and an assistant superintendent for curriculum. We began our work by identifying expectations, points of contact, and participant roles and responsibilities. Although the implementation of the project would not begin until the following term, it soon became apparent to us that that the Web-based systems we planned to use in supporting our technology consultants would probably be equally important to us in planning, coordinating, and documenting project activities. Our online information and document management systems thus became an important early priority.

In January 2000, we began creating technology and content components that would be a part of the course for the student technology consultants. A small group of 8 students helped us pilot this new 4-credit course, co-taught by faculty from Instructional Systems Technology and Human Resources Development. From January to June of 2000 we broadened our technology base and significantly expanded the "content" we could deliver. By mid-winter our Web server was fully operational, the Web development team had created a wide range of project support materials, and the outlines of our broader framework for information management and distribution were established. In the fall of 2000, our first full class of technology consultants began working with teachers at the university and in our two participating school systems.

Building a Foundation for Knowledge

Well before our first group of technology consultants began their work in the field, we had come to the realization that our success would depend on capturing what we were learning in a well-organized and accessible knowledge base. It was clear that, given our existing workplace practices, documents would be a central element in our knowledge base. Proposals and planning documents had been the foundation for our future work and had helped us establish timelines and assess progress. We also expected to produce a variety of user guides, project reports, and research papers. We were also well aware that managing the flood of paper generated by a large-scale project like ours could be difficult. Distribution of printed documents would create unnecessary and unproductive duplication, requiring participants to manage their own hard-copy document archive, as well as inviting versioning problems that arise when multiple drafts of a document are circulated.

One approach to solving these problems is to create a single centrally managed print document archive, but this approach is usually expensive and relatively inflexible, as a result of the administrative infrastructure that must be created to support intake, registration, and distribution. We opted for an alternative "distributed" approach to document management that allows individual project participants to submit, review, and retrieve documents through our project Web site. The foundation of this distributed approach is a database system that helps us organize materials, while it simultaneously solves problems related to versioning and duplication by providing a single readily accessible but authoritative source. One advantage we had in considering how we might manage the documents produced in our project was the fact that we had immediate control over our Web site, since the project Information Services Coordinator was also the server administrator. It has been our experience, however, that while this degree of control can confer some advantages (e.g., we can rely on our operating system to manage user access), the methods we have developed do not depend on this arrangement. Although working both sides of the traditional IT "divide" has given us an appreciation for the role of technology administration, our decision to emphasize low-tech tools meant we were looking for generic tools that would not require special server access.

Our server platform is a Windows NT machine running Microsoft's Internet Information Server 4.0. One feature of this platform that has been central to our project is its support for Microsoft's Active Server Pages (ASP), an environment for integrating a variety of server-side scripting languages into our Web site, and Microsoft's ActiveX Data Objects (ADO) that support our database connections. Fortunately, however, these technologies provide relatively straightforward methods for creating dynamic database-driven pages without sophisticated programming skills, an important element in making our methods generalizable. Moreover, these techniques can be implemented in a step-by-step incremental fashion that helps those involved in developing and delivering information services acquire skills as they bring new capabilities online.

Overview of the Web-based Systems

As illustrated in Figure 1, our Web-based information system includes two main components, a document management system (DMS) and a course delivery system (CDS). The DMS runs on our project Web site, while the CDS (WebCT) runs on a university server. One disadvantage of assembling project-specific and university resources as we have done is that it requires participants to manage multiple user accounts (for access to different components), but we have not had problems with users managing accounts. Moreover, although these systems are distinct, we have found that information is easily shared since both components are Web-based resources on our local university network. While this arrangement limits our control somewhat, it also means we do not need to manage the CDS, a complex software system. All things considered, we believe our distributed approach has important benefits for both the sustainability and generalizability of our model.

Figure 1 provides an overview of our Web-based systems. Rectangular regions represent users, oval regions represent information, tools, and documents, and arrows represent the flow of information. Some groups are exclusively "consumers" of information, while others also contribute information to the system.

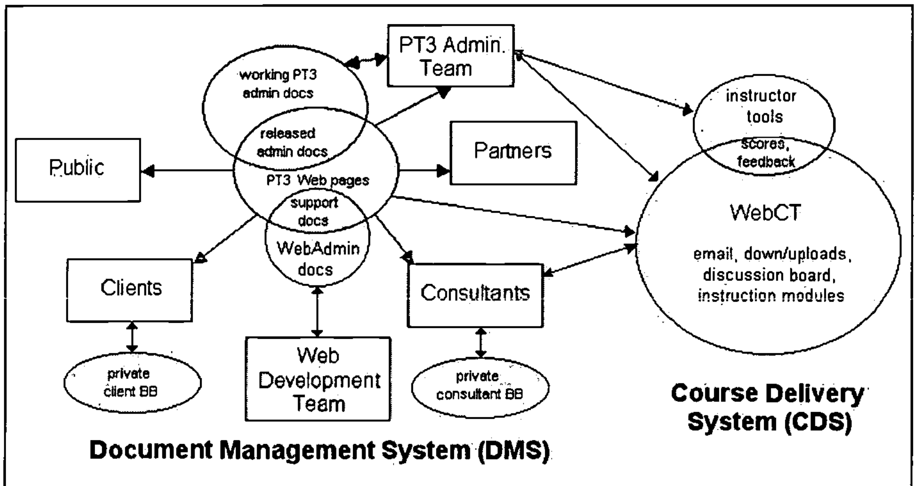

Figure 1. Web-based systems for support, admninistration, and instruction.

Both the Web Development Team and the PT3 Administrative Team, for example, are linked to the DMS with double-headed arrows indicating they receive *and* contribute to this resource. Likewise, both Consultants and the PT3 Administrative Team are linked to the CDS, indicating that these groups participate as both consumers and contributors. In effect, these double-headed arrows represent the interactive elements in our system, places where participants contribute as well as consume information.

The DMS includes five main types of documents. The oval at the top represents documents created and contributed by the PT3 Administrative Team, the group of that leads the project. This part of the system supports operations that are "internal" to the administrative team. Most documents created by this group start out as restricted-access "working" materials, available only to other members of the administrative group. Some of these documents are, however, eventually moved out into the public area. The lowest central oval in the DMS represents a part of the system set aside to support development of support materials. Since members of the Web Development Team have primary responsibility for authoring these materials, this group has authoring privileges and is linked to the system with a bi-directional arrow. As with the administrative materials, support documents are initially held in a restricted-access region but usually move quickly into the public-access region. The final elements in the DMS are private, password protected discussion/bulletin board areas intended to promote and support *private* interaction within the client and consultant groups. As indicated by the arrows, only members of these groups have access to their respective discussion boards.

As indicated on the right side of Figure 1, the course delivery system (CDS) involves two participant groups, consultants and the administrative team. As a part of their project participation, consultants register for a 4-credit consulting course that helps them establish effective working relationships with clients (i.e., participating teachers.) Since our online courseware includes a variety of interactive features, both consultants and members of the administrative team who co-teach the course are linked with a bi-directional arrows.

Some Participant Perspectives

From the Project Director

As project director, my role is leading, coordinating, and making sure that all of the individuals involved have what they need. In order to do this effectively, I need relevant information about all aspects of the project and continuous two-way communication. Because my responsibilities also include teaching our student consultants, I am also in continuous communication with the students. I consider on-demand access to information resources and computer mediated communication essential ingredients in the success of our project. Our Web-based systems make my job much easier.

While our Web resources certainly facilitate the work of the PT3 administrative team, I am most fascinated by observing the use of resources by our student consultants. There is no question that they are personally experiencing the possibilities technology offers in support of learning. Our students have come to consider themselves a community of learners. They build on each other's knowledge through discussion boards and classroom interaction. They often answer each other's questions and provide one another support when challenges arise. They use the technologies at their disposal as just-in-time tools instead of just-in-case last resorts. Perhaps most important of all, they are not learning about technology integration in the abstract, they are actively applying technologies to meet personal learning needs in a way that will transform both their view of the tools and their ideas about teaching and learning. Although it is still too soon to know for sure how their experiences in the project will influencc thcir future professional practices, what we see suggests they will be less likely to limit their future students to a "book learning" model.

Although we are pleased with the tools we have developed, what we have learned about how to more effectively support student learning leads us to conclude that we must continue to expand and develop the communication and information resources we deliver online. Administratively, we have created models that help us manage programs and create, store, and retrieve knowledge more efficiently and effectively. Further, I think we will find that many of our administrative Web resources will evolve into classroom learning support tools – teachers morphing into learning team managers – that's an interesting thought to ponder!

From the Web Development Team

The primary focus of the Web team is to create support materials for use by consultants and clients. We began by identifying common technology tasks (e.g. how to create a Web page using Netscape Composer) and then created (or linked to) support documentation. For the most part we worked independently. An online "job board" (part of our WebAdmin site - see Figure 1) allowed us to choose a task, keep work records and, ultimately, upload the final version of our completed support material into our "PT3 Problem Solver Database."

In addition to regular Web team meetings, one team member attends meetings with consultants. This provides us an important user perspective on our support system, helping us learn how documents are being used, which documents are the most useful and what, if any, problems are encountered. We are also testing documentation in face-to-face consultant workshops in an on-campus computer lab. Hard copies of documentation are distributed to each consultant at the workshop. Consultants use the documentation as a primary learning resource to acquire new technology skills while Web team members observe their use of the documents. Consultants have an opportunity to raise questions both on a one-to-one basis as they work at a computer or in a group debriefing session immediately following hands-on learning. We have been very pleased with the quality of the feedback consultants have provided us, particularly in our workshop sessions.

From Student Consultants (based on interviews)

Overall, student consultants seem very pleased with the resources they are provided. Our discussion boards systems seem to have had the greatest influence in reshaping the way these students think about their learning. The students have begun using phrases such as "community of learners" in describing their experiences. Although one of our two discussion boards is private (the one in the DMS), we know from server stats that they are using this resource. Moreover, based on their comments in interviews, they appear to be differentiating their use according to their perceived role. Discussions that focus on consultants' roles as students appear more commonly on the CDS discussion board, while those that deal with field–based issues related to their roles as consultants appear more likely to crop up on the DMS discussion board.

When asked about whether they felt their PT3 experiences were likely to change their classroom teaching practices, consultants expressed strong opinions that their use of technology will be dramatically different that what it would have been, had they not participated. Consultants indicated they felt they had crossed both a "confidence threshold" and a "competence threshold", in addition to developing practical skills and ideas about integrating technology in classroom settings. It appears that fundamental mental shifts have taken place in the awareness of PT3 consultants concerning teaching, learning, and technology.

Summary and Conclusions

As a result of our Web-based management tools, project participants can interact and share their work with one another through the project Web site. Working groups usually have short weekly face to face meeting to talk over issues but our document management system has helped us automate processes that can be time consuming and error prone. Web Development Team members can select "jobs", track and annotate their work, record hours, and ultimately submit the work they complete (primarily support documentation) directly into the DMS, where it can be accessed by other project participants. A job completed and uploaded becomes immediately available to everyone else, something that seems to reinforce the important idea that the team is developing materials for users, not for their team leader. Our administrative systems have promoted the same sense of immediacy and audience in our project management materials and in the future we expect to initiate a similar consultant management system to help track and support our consultants who are working in the field.

We believe that our success thus far is due in large part to three factors. One factor is our decision to build our knowledge systems around Web technologies. A second factor is our decision to avoid high-tech proprietary systems (i.e. "groupware") in favor of a loose collection of relatively "low tech" tools (e.g., Microsoft Office, email, bulletin boards, and Web-enabled Access databases). And the third (related to the second) is to build on, rather than replace, our existing workplace practices and protocols. We also believe the model we have developed will generalize effectively. It requires only modest tools, modest levels of expertise, and modest changes in the working practices of participants. Once created, the technological and cognitive infrastructures that support the system are easily maintained and can continue to develop incrementally.

References

Bork, A. (1995). Guest editorial: Why has the computer failed in schools and universities? Journal of Science Education and Technology, 4(2), 97-102.

Brush, T., Knapczyk, D., & Hubbard, L. (1994). Incorporating technology in the field-based preparation of teachers. Journal of Technology and Teacher Education, 2(1), 91-102.

Maddux, C. D. (1997). The newest technology crisis: Teacher expertise and how to foster it. Computers in the schools, 13(3,4), 5-12.

Maddux, C. D., Cummings, R. & Torres-Rivera, E. (1999). Facilitating the integration of information technology into higher-education instruction. Educational Technology, 39(3), 43-47.

Maddux, C. D., Johnson, L., & Harlow, S. (1993). The state of the art in computer education: Issues for discussion with teachers-in-training. Journal of Technology and Teacher Education, 1(3), 219-228.

McGregor, G. & Pachuski, P. (1996). Assistive technology in schools: A re teachers ready, able, and supported? Journal of Special Education Technology, 13(1), 4-15.

Rose, S.A. & Winterfeldt, H. F. (1998). Waking the sleeping giant: A learning community in social studies methods and technology. Social Education, 62(3), 151-152.

Slick, S. K. (1998). A university supervisor negotiates territory and status. Journal of Teacher Education, 49(4), 306-315.

Telem, M. (1991). A knowledge base for information technology in educational administration. Journal of Research on Computing in Education, 23(4), 594-610.

Walters, S. & Pritchard, F. (1999). The complexity of partnering: A case study of two middle school professional development schools. Peabody Journal of Education, 74(3&4), 58-70.

White, C. S. (1994). Technology in restructured Preservice education: School/university linkages. Journal of Technology and Teacher Education, 2(2), 119-128.

USING A SURVEY TO DESIGN AND EVALUATE PROFESSIONAL DEVELOPMENT ACTIVITIES

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Abstract: To implement our PT3 grant, we needed to answer three questions. First, we needed to identify the current level of computer skills in our faculty, both at the University as well as in two public schools that are participating in our grant. Second, we needed to know how the faculty were currently using computers in their teaching. And third, we needed to gain information regarding the faculty's attitudes toward integrating technology in education. This paper discusses the development of a brief survey questionnaire that can be used to help design computer support services and training workshops, help individual teachers and professors design professional development plans, and help administrators and program evaluators assess the effectiveness of these types of professional development activities. The paper will also show how survey data of this type can be used to help identify how receptive a group of educators is to increasing the role of computers in the curriculum.

To implement our PT3 grant, we needed to answer three questions. First, we needed to identify the current level of computer skills in our faculty, both at the University as well as in two public schools that are participating in our grant. Second, we needed to know how the faculty were currently using computers in their teaching. And third, we needed to gain information regarding the faculty's attitudes toward integrating technology in education.

This information was needed to serve several purposes. We had to assess the faculty's current computer skills as well as their use of computers in their teaching in order to design support services and training workshops that would meet their needs and be well received and utilized. This information was needed to design workshops and support services for the faculty as a whole as well as for designing individual professional development plans. We wanted to gain an idea of the faculty's attitudes regarding the integration of computers in education for the same purposes, but also to gauge how receptive the faculty might be with regard to increasing the role of computers in the curriculum. It was also very important that we would be able to measure the effectiveness of the grant activities, so we needed an instrument that would provide useful baseline and follow-up data.

A literature search found no available questionnaires which could serve these purposes well, so we incorporated some of the best approaches from other instruments to create a comprehensive questionnaire that is brief and user-friendly but still provides useful information. Initial statistical analyses of the 23-item questionnaire have found scores on the instrument to be psychometrically reliable.

Our PT3 grant is focused on increasing faculty use of computers at both the K-12 level and the university level, so we have used this survey questionnaire with both K-12 teachers as well as the professors who teach the students in our teacher preparation program. To date, the entire faculty at two local public schools and the entire teacher education faculty at the University have completed the survey, and we are beginning to survey all of the faculty in the College of Arts and Sciences and the College of Communication. The data currently being collected will serve as baseline data, and the questionnaire will be readministered annually to help establish the effectiveness of the activities undertaken as part of our PT3 grant.

This paper will demonstrate how a brief survey questionnaire can be used to help design computer support services and training workshops, help individual teachers and professors design professional development plans, and help administrators and program evaluators assess the effectiveness of these types of professional development activities. In addition, the paper will show how survey data of this type can be used to help identify how receptive a group of educators is to increasing the role of computers in the curriculum.

Forming a Cadre of Learners: Effective Educational Technology Integration in a Teacher Preparation Program

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Abstract

West Chester University's USE-Tech Partners (PT3) program has been a catalyst for increasing interest in and cooperation for preparing technology proficient teachers. Project activities during the capacity-building year included monthly participant meetings, development of integration strategies by faculty, consortia partnership development, completion of the university technology plan, and project evaluation activities. Nineteen participating faculty had released time during the Spring semester or Summer of 2000 to develop and test integration strategies in one or more of their courses. Faculty enhanced the learning of preservice teachers through: e-mail, the Internet and web-based learning applications (e.g., BlackBoard), content specific software, presentation software and other productivity tools, and video-conferencing.

During the past year and a half West Chester University's (WCU) Preparing Tomorrow's Teachers to Use Technology (PT3) grant, (the **USE-Tech Partners,** University-School Educational Technology Partnerships grant), provided funding and focus to technology integration. The program is working to ensure that all teacher candidates are able to integrate technology effectively into classroom instruction. Our vision is to use this capacity-building grant as a springboard for making WCU a model in preparing technology-proficient teachers, and to become a school that attracts the best teacher candidates and is closely connected to the K-12 schools we serve. The first year activities of this PT3 grant laid the groundwork for ultimately achieving a two-part goal, namely, *the modeling of technology integration by WCU faculty in both methods and content area courses, and the achievement of specified technology competencies by preservice teachers.* The grant, a catalyst for greatly increasing interest in and cooperation for preparing technology-proficient teachers at West Chester University, has formed a cadre of learners including university and K-12 administrators, university faculty in the School of Education and the College of Arts and Sciences, preservice teachers, K-12 students and teachers, and business members which joined together in these technology integration efforts.

The USE-Tech University Partners Program Activities

Project activities during the capacity-building year included monthly participant meetings, development of integration strategies by faculty, consortia partnership development, completion of the university technology plan, and project evaluation activities. A program extension has been granted by the Department of Education and a new application is being made for a PT3 implementation grant so that this work can continue to expand -- "scaling up" the positive impact on preservice teachers and inservice teachers documented through collected data.

Nineteen participating faculty had released time during Spring semester or Summer of 2000 to develop and test integration strategies in one or more of their courses. They enhanced the learning of preservice teachers through: e-mail, the Internet and web-based learning applications (e.g., BlackBoard), content specific software, presentation software and other productivity tools, and video-conferencing. Four categories of faculty support, i.e., released time, frequent meetings to share successes and challenges, workshops and training sessions, and ongoing support of individual learning, were essential to learning how to integrate technology into the curriculum.

In a state-funded higher education institution such as WCU, faculty are expected to produce scholarly work, serve the university, students and community; and teach a full 12-credit course load. Release time from this hectic schedule is not easily found. The alternative work assignment (AWA) 3-credit course relief provided by this grant was seen as a valuable and rare support by all of our 19 participants. Having adequate time to work on appropriate technology resources that would support their teaching was appreciated by every faculty member.

Through regular gatherings of USE-Tech faculty participants found a supportive environment during which participants shared successes and challenges related to their work with technology integration for more effective teaching and learning. These meetings established a forum for faculty members to talk about technology issues in new and productive ways and learn from one another in a collegial setting.

A week-long workshop, the "USE-Tech" Winter Institute, was held at West Chester University in January 2000 and included visits by guests (consultants) from other universities. In addition to the opportunity to speak with other higher education faculty who have successfully included technology in their own teaching, West Chester University USE-Tech participants enjoyed, hands-on workshops related to their own personal goals. Ongoing support for faculty learning is provided through the Faculty Technology Center (FTC), and includes workshops and just-in-time support from staff and students.

Collaborative planning sessions included: consortium members, additional members of the WCU academic community, and representatives of the K-12 School Districts we serve. Groups within the university, K-12 school districts, businesses, and community are working toward a common goal of integrating technology into teacher preparation as a result of project activities. An objective of this project was to have collaborative partners agree to support the project, and identify roles and responsibilities. Written agreements of participation, roles and responsibilities already include 7 school districts, and 5 business/community groups. As a result of our USE-Tech efforts we have successfully expanded our goals in the area of collaboration to include the introduction of a new graduate educational technology certificate program, the "*Teaching and Learning with Technology*" program designed for inservice teachers from local school districts, and the creation of a proposal for a PT3 implementation grant. University collaboration led to renovation of technology facilities in the School of Education during the summer of 2000.

Lessons Learned from the USE-Tech Program

Baseline survey data on faculty skills and use of integration activities was collected at the beginning of this project in the Fall of 1999. Attendance numbers and a rating of on-going professional development activities have been collected. End of the year survey data on faculty skills and use of integration activities will be collected by the end of the Spring term, and interviews with faculty regarding their experiences are now being completed. Some the findings of this grant include the following:

- As faculty become more adept at the use of technologies, they become more comfortable with taking informed risks in their teaching; expansion of original technology goals was common.
- Although much of this professional development and support work has been accomplished by USE-Tech staff, some has also been done through the collaborative effort of participant-teams and through the use of existing university resources, such as: training offered in the SOE by a university web instructional specialist. Existing university resources have been better utilized when project faculty have learned about them from their project colleagues.
- Faculty become more interested in technology when they see students using technology -- preservice teachers and K-12 students and teachers.

- Making technology easily accessible to students and faculty enables its effective use for enhanced teaching and learning environments. Easy access to technology when and where it is needed is very important for higher education faculty.
- Faculty members experience different parts of the shared vision for technology integration -- time is needed to communicate these ideas with one another.
- Released time is a good incentive for faculty for the specific purpose of improving technology skills and integration of technology. Faculty need and appreciate the time allocated for their professional development.
- There are clues that something different is happening at WCU as a result of PT3 grant activities as faculty from three schools of the university join together. There are some definite hints that systems changc is possiblc.
- Faculty began to feel part of a special cadre of tech-users, attending meetings that included displays of new technology integration and were often attended by not only faculty but by deans, the Provost and even the university president. Faculty members mention in their interviews that they received support not only from the FTC, or from their assigned "buddy" but also from colleagues who were available at the right time and place.

The USE-Tech program instilled new confidence in faculty participants to use technology which is captured in the following words of one member: "Before my work with USE-Tech, my understanding of technology was very limited - I didn't even know where to begin or what questions to ask. Now that I have gained some level of comfort with technology, I have a sense of what I need to know, and how I can use these new resources with my students."

Building the Capacity to Infuse Technology in K-6 Classrooms: A Training Model

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Abstract: A recent effort that enhanced university/K-12 school partnerships is Project PICT (Preservice Infusion of Computer Technology). This project, piloted in 1999-2000, and funded by the U.S. Department of Education, used a team approach to promote the infusion of technology in the teacher education and K-6 curricula. This paper will describe the Technology Training Model design, implementation and results collected from participants regarding their perceptions of the model. In addition, a lesson library of technology rich lesson plans, developed by K-6 teachers and preservice teacher teams, and artifacts will be shared. Findings from this pilot study determined the design of the Technology Training Model adopted for the three year Implementation Project, now underway.

Introduction

Teachers that are capable of preparing technology proficient students for the 21^{st} century is notably one of the most critical needs in public schools today. This need has challenged teacher preparation programs to produce teachers that are able to infuse technology and curriculum. A recent response to this challenge is *Project PICT (Preservice Infusion of Computer Technology)*, a pilot project funded by the U.S. Department of Education, as part of the *Preparing Tomorrow's Teachers to Use Technology* Program. This project employed a team approach to assist the infusion of technology in the teacher education program at Bowling Green State University and K-6 curricula. The primary goal of *Project PICT* was to provide future teachers with the knowledge to utilize technology to enhance teaching and learning. To promote the realization of this goal, a *Technology Training Model* was developed which established a collaboration between teacher education faculty, arts and sciences faculty, K-6 teachers, and preservice teachers and was designed to facilitate the infusion of national and state (Ohio) technology standards for teachers.

The Model

The *Technology Training Model* was designed in keeping with research findings on effective technology training. Studies involving technology training (Dyrli & Kinnaman, 1994b; Munday, Windham, & Stamper, 1991; Sheingold, 1991; Siegel, 1995) report that the success or failure of technology integration is dependent on teacher training. This training should occur throughout the teacher prep program (Byrum and Cashman , 1993; Thompson, Schmidt, and Hadjiyianni, 1995), should establish a vision of how to use technology in the classroom (Wetzel, 1993; Sprague, Kopfman & de Levante Dorsey, 1998) and should be an active process with participants being exposed to hands-on instruction that establish how to use technology as a resource for instruction (Roblyer and Edwards, 2000). Further, training should be in-depth, and should include on-going support (Bruner, 1992; Thompson, Hansen, & Reinhart, 1996).

Accordingly, participants were involved, for four months, in a variety of whole group sessions (Kickoff session, training sessions, support sessions) and project and team meetings. The Kickoff session established a vision of how to apply technology in classroom situations as area K-12 teachers presented a variety of strategies for using technology as a tool to enrich curriculum. Successful lesson ideas were presented and student products were available for examination. The Kickoff was followed by a series of in-depth hands-on training sessions featuring the application of the Internet and multimedia as tools to enhance learning in elementary curricula. Support sessions were scheduled throughout the four-month training period to provide on-going support to participants, enhance skill levels and build confidence in participants. Bi-monthly meetings of teams resulted in team and individual plans for technology infusion. These meetings served as an additional source of support for team members. Team plans included team goals, a description of how (lessons plans) each individual would integrate technology throughout the semester to meet these goals and how the subsequent lessons would be used to complement teacher education courses. Team plans are presently were implemented in teacher education classes and K-6 classrooms as a part of the *Technology Infusion Model.*

The Study

There were 28 educators that participated in this pilot study. Of these 28 participants, there were eight university faculty, ten elementary teachers, and ten pre-service elementary teachers. Focus group interviews were held at the end of the pilot study to reveal participant perceptions of the *Technology Training Model.* These interviews were audiotaped. The questions were related to project outcomes. The data was analyzed with the participants being offered the opportunity to review the transcripts. In addition, pre and post surveys were also administered to all participants (Vannatta & O'Bannon, 2000).

Findings

Results from the focus group interviews revealed that participants had very specific notions about the *Technology Training Model.* Participants reported that all sessions were beneficial but having technology using teachers share successful lessons and student products provided the inspiration and vision for infusion. Further, the use of K-12 teachers, as opposed to university faculty, as training facilitators was instrumental in making them believe that they could be successful. The support opportunities provided by project personnel and the teaming process was a critical component in the success of this project.

Conclusions

The primary goal of *Project PICT* was to provide future teachers with the knowledge to utilize technology to enhance teaching and learning. Outcomes revealed that the *Technology Training Model* developed and implemented in this pilot project facilitated this goal. In addition, there continues to be an increase in the level of technology infusion in teacher education classes at Bowling Green State University and in two of the schools that serve as professional development schools for this teacher education program. Project success has resulted in an empowered teacher education faculty with a dedication to expose preservice teachers to teaching methods that use technology as a resource for instruction. The findings in this pilot study provided a foundation for the design of the 3 year *Project PICT Implementation* that is now underway. Access more about this project at http://www.bgsu.edu/colleges/edhd/LPS/EDFI/PICT/

References

Becker, H. J. (1994). How exemplary computer-using teachers differ from other teachers: Implications for realizing the potential of computers in schools. *Journal of Research on Computing in Education, 26*, 291-321.

Brunner, C. (1992). Integrating technology into the curriculum: Teaching the teacher. (Technical Report No. 25). Bank Street College of Education. Center for Technology in Education.

Byrum, D.C., & Cashman, C. (1993). Preservice teacher training in educational problems, perceptions, and preparation. *Journal of Technology and Teacher Education, 1* (3), 259-274.

Dyrli, O., & Kinnaman, D. (1994). Gaining access to technology: The first step in making a difference for your students. *Technology and Learning, 14* (4), 16-20, 48-50.

Munday, R., Windham, R., & Stamper, J. (1991). Technology for learning: Are teachers being prepared? *Educational Technology, 31* (3), 29-32.

Roblyer, M. D., & Edwards, J. (2000). *Integrating educational technology into teaching.* Upper Saddle River, New Jersey: Merrill.

Sheingold, K. (1991). Restructuring for learning with technology: The potential for synergy. *Phi Delta Kappan, 73* (1), 17-27.

Siegel, J. (1995). The state of teacher training. *Electronic Learning, 14* (8), 43-53.

Thompson, A, Hansen, D., & Reinhart, P. (1996). One-on one technology mentoring for teacher education faculty: Case study reports. *Technology and Teacher Education Annual, 1996.* Proceedings of SITE '96 – Seventh International Conference of the Society for Information Technology and Teacher Education. Charlottesville, VA: Association for the Advancement of Computing in Education.

Thompson, A., Schmidt, D., & Hadjiyianni, E. (1995). A three-year program to infuse technology throughout a teacher education program. *Journal of Technology and Teacher Education, 3* (1), 13-24.

Vannatta, R.A. & O'Bannon, B. W. (2000). *Putting the pieces together: A technology infusion model for teacher education*. Unpublished manuscript, Bowling Green State University.

Wetzel, K. (1993). Teacher educators use of computers in teaching. *Journal of Technology and Teacher Education*, *1*(4), 335-352.

Coexistence of Technology and Healthy Active Lifestyles

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Computer use has significantly impacted the lifestyles of children, youth and adults in today's society. According to a major government report from the Centers for Disease Control and Prevention, the percentage of overweight children has doubled since 1980. The report warns of "...a new generation of young people who are in large part inactive, unfit and increasingly overweight." Much of the sedentary lifestyles are due to increase in computer usage and numerous technological advances that allow us to do more while moving less.

As physical education teacher educators we are faced with the dilemma of preparing teachers who will positively influence children to lead healthier more active lives and at the same time be able to infuse technology into their pedagogical practices. We must accommodate both of these issues by integrating technology in ways that substantively change the way pre-service teachers learn, so that we are not merely adding technology to an already full curriculum. The challenge is to create an environment in our teacher education program that allows for the coexistence of technology and healthy active lifestyles.

Our first step was to revise a traditionally taught fitness course, Lifetime Fitness, with a course focusing on healthy active lifestyle education (HALE). The intent of HALE is to: 1) Provide content that mirrors the situations in schools and communities. 2) Provide technological applications representative of resources available to preK-12 teachers. 3) And, infuse pedagogical strategies that reflect student centered learning practice. This curricular revision has taken considerably longer than we had first envisioned. First there were meetings and communications with PT3 group members, then selection and purchase of hardware and software, followed by hours of training and experimentation with set-up, application, and integration of hardware and software. We not only had to learn how to use the equipment and software, we had to design protocols for instruction. These protocols then had to be piloted with students to ensure viability in the instructional context.

Hardware included digital cameras, digital video camcorders, MAC iBooks@ connected to an AirPort@ base station, Qbe's@ (personal computing tablets), scanners, and recording devices that included portable CD-RW and Zip@ drives. Software included Dreamweaver@, Fireworks@, Flash@, Freehand@, and Adobe Photoshop@. Access to the wireless web, the availability of affordable digital video camcorders, and the portability and durability of this new hardware increased the feasibility of integrating this technology into a course occurring in a movement context. We have been able to capture teaching and learning episodes as they naturally occur in the complex environment of the gymnasium. The ability to construct instructional materials with such high ecological validity led us to focus on strategies emphasizing situated learning experiences.

We selected case method as our primary vehicle for educating students about HALE content and concepts. Physical education teacher education has traditionally used text-based-case-scenarios, however the digital video medium and other technological advances allowed us to enhance the case method. Certainly the value of the case method as a problem-based learning experience is well documented as it enables the learners to grapple with problems representing rich chunks of reality (Merseth, 1990). Never before has technology enabled teacher educators to so readily capture, manipulate and construct cases represented through digital media and publish them in user friendly, web-based environments. These learning experiences will allow pre-service teachers to examine the material outside of class at their own pace and reflect on the meaning of a healthy active lifestyle for themselves and their future students. Not only will students use case method to examine the material, they will be required to design and build their own cases and thereby learn to use this technology as a pedagogical application. Overall, HALE will allow physical education teacher educators to model technology integration and examine ways in which it can contribute instead of detract from the goal of a healthier, more physically active society.

[A digital video case demonstration will be used to illustrate the case method and related technology.]

References

Centers for Disease Control and Prevention. (1997). Guidelines for school and community programs to promote lifelong physical activity among young people. *Morbidity and Mortality Weekly Report,* 46(RR-6), 1-36.

Merseth, Katherine K.. (1990). *The case for cases in teaching education*. Washington, DC: American Association for Higher Education: American Association of Colleges for Teacher Education.

Working with Urban Schools Across the Digital Divide

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Abstract: This presentation addresses some of the issues which one university encountered when it collaborated with 3 disadvantaged urban schools as part of a PT3 project. Using a case study format, we detail many of the obstacles which were faced by this partnership including hardware availability & maintenance, wiring in older buildings, threatened teacher strikes and work slowdowns, changes in delivery schedules, prioritization of schools within the district for various types of support, and levels of approval needed for changes to take place. What the university ultimately needed to supply and how this partnership became part of a larger outreach to the schools and community helps to describe the special challenges faced when working on technology partnership issues in social environments of this type.

Large urban school systems present many technology infrastructure opportunities. Size alone makes them promising markets for telecommunications companies, and cable networks are often eager to supply low cost or free internet access to schools in exchange for rights to offer commercial services in that locale.

However, these same urban school systems can present many special challenges. This is particularly true when the "digital divide" is also a factor. This paper describes some of the issues which one university encountered when it collaborated with three disadvantaged urban schools as part of a Preparing Tomorrow's Teachers to Use Technology (PT3) project. The level of support which was required for thc schools exceeded anticipations, and while the end product was satisfying, it was quite different from what had been envisioned.

Inner-city schools are among the most vulnerable to both the "access" and the "information underclass" problems which are key dimensions of the digital divide (National Center on Adult Literacy & International Literacy Institute, 1999). Each of these phenomena can also be observed in other settings (e.g. rural schools in isolated areas) but urban schools have their own manifestation.

Access can be considered in terms of *availability of internet services* (e.g. whether internet connectivity is available in classrooms or labs) or in terms of *quality of service* (e.g. are computers capable of sustaining access to the internet at sufficient speed). Although we were initially told that the schools with which we were working had internet access, we encountered access problems of both types. At one school, for example, wiring had been completed throughout the building almost a year before we entered, but due to contract disputes with the installer the drops had never been lit. In other cases, basic access was available, but the computers in the classrooms were either outdated or not maintained at a level where they could be reliably used for instructional purposes.

"Information underclass" (IU) is a term which refers to the widening gap between technology haves and have-nots. It is a complex phenomenon where problems in one area exacerbate related problems. For example, when an older school with an outdated electrical supply is put on hold for computer upgrades until the entire school can be re-wired, the technology gap between that school and others which have adequate wiring grows larger. When the teachers in that school which is not upgraded are not given inservice training and/or do not attempt to use computers as part of their instruction because of the older technology which was not upgraded, the gap is further amplified.

Several case studies illustrate many of the access and IU obstacles which were faced by this partnership between a university and three disadvantaged urban schools. Two examples of these cases are:

1) Hardware availability & maintenance - In at least two of the schools, teachers had an opportunity to participate in a local inservice model through which they would be given a new computer and printer for classroom use if they completed a technology project. However, in order to complete the project they had to access available computers in the building, many of which were old and prone to breakdown. Once they did complete the project and received the computer & printer, many were unable to connect to the internet, which made the computer primarily a local-use device which had minimal use by students. Local technology support personnel (in one case, teachers who contributed time after school) were unable to maintain all of the hardware, and replacement was not a priority.

2) Prioritization of schools within the district for various types of support - A district-wide program to upgrade the electrical supply in most of the schools did not include these schools because thcy were so old that the administration agreed that a separate contract would be needed. That contract was delayed for various reasons, and that delay had an impact on other technology which could be installed in the building.

Ultimately, a partnership was able to be formed between these schools and the PT3 grant which supported teachers and student teachers in these buildings. However, the extra time and equipment which had to be provided greatly exceeded the time and equipment provisions for other schools which participated in the project.

References

National Center on Adult Literacy & International Literacy Institute (1999)*International Roundtable on the Lifelong Learning and New Technologies Gap: Reaching the disadvantaged.* ERIC document ED 440 255

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InTime: A PT3 Catalyst Grant

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Abstract: The purpose of InTime (Integrating New Technologies Into the Methods of Education) is to provide the necessary resources for methods faculty to revise their courses, model technology integration, and require preservice teachers to integrate technology, along with components of quality education, in their lessons and units. This project is developing online video case studies to be utilized in methods courses that include videos of best practices showing scenarios from PreK-12 classrooms where teachers are integrating technology in a robust educational environment. The participants will have a chance o view and critique one of the online case studies of best practice in technology integration and quality education via video streaming. The issues addressed in this session will be interesting for deans, administrators, faculty, and decision –makers of all expertise levels.

Statement of the problem:
Reports from the National Council for Accreditation of Teacher Education (NCATE) and the Office of Technology Assessment (OTA) have called attention to existing deficiencies in teacher preparation programs in preparing preservice teachers to use technology effectively in the PreK-12 classrooms. Technology and the New Professional Teacher (NCATE, 1997) reports that preservice teachers should be required to apply technology in their courses and should see faculty model technology use in the classroom. In addition, Teachers and Technology: Making the connection (OTA, 1995) suggests that in teacher preparation programs where faculty model technology use, students will adopt the use of educational technology in their instruction. In order for undergraduate students to learn to use technology when they teach, it is vital that university teacher education faculty change the way they prepare teachers to use technology.

Literature Review:
According to conclusions drawn by the OTA, it is not enough to tell students about what is possible. "They must see technology used by their instructors, observe uses of technological tools in classrooms, and practice teaching with technologies themselves if they are to use these tools effectively in their own teaching" (OTA, 1995, p. 185). It is far more common, however, for education faculty to discuss technology, have students read about it, or demonstrate technology, rather than model it or require students to incorporate technology use into their lessons or units (OTA, 185). Also, NCATE (1997) identifies five reasons for the lack of technology integration in teacher education courses: 1) teacher education programs lack sufficient hardware and software; 2) education departments lack sufficient technical support; 3) teacher education faculty lack the knowledge, skills, and training that support technology integration in their teaching; 4) teacher education faculty are out of touch with what is happening in P-12 classrooms, including the rapid introduction of technology; and 5) the academic culture rewards and recognizes individuality among faculty, rather than valuing a common version about technology and incentives to seek professional development. Therefore, the goals of InTime project provide direct solutions to each of the above five barriers that prevent teacher education faculty from modeling appropriate integration of technology in their courses and requiring students to apply technology in their lessons and units.

Project Goals:
InTime (Integrating New Technologies Into the Methods of Education) is a $2,397,594 Catalyst Grant from the United States Department of Education. The Three-year InTime project addresses deficiencies in teacher education programs in preparing preservice teachers to use technology effectively in the PreK-12 classroom. The purpose of InTime is to provide the necessary resources for methods faculty to revise their courses, model technology integration, and require preservice teachers to integrate technology, along with components of quality education, in their lessons and units.

This project is intended to produce change in teacher education programs in three ways. First, the project will generate new learning resources on the web to support new teaching and learning processes in education methods courses. New learning resources will include development of video scenarios of PreK-12 teachers effectively integrating technology, along with components of quality education, in a variety of grade levels and content areas. These videos will be stored on a video server already in place at the university of Northern Iowa and made accessible online nation-wide. Second, methods faculty will revise their courses to model technology integration using the video scenarios and online discussion forum, require students to apply technology, and implement the Preservice Teacher Technology Competencies as exit criteria for their courses. Finally, methods faculty will share strategies for integrating technology and course revision with other faculty involved in the grant through Faculty Online Discussion Forum and nation-wide through print and web publications of their findings as well as presentations at national conferences.

Participant involvement and outcome:

1)The participants will understand the crucial part of the project, the "Technology as Facilitator of Quality Education Model" used in this project which shows that technology is not at odds with the core values of the American educational system. The model includes several major dimensions:

1. Students at the center of their own learning
2. Principles of good learning
3. Aspect of information processing
4. Standards from content disciplines, and
5. Tenets of effective citizenship in a democratic society
6. Teacher knowledge and behavior
7. Technology

The seven dimensions of the model provides a way for educators to view the integration of technology related tools into a robust educational environment and thus answer the hard questions regarding support for the shift in our educational activities toward technology. It sets up a framework for this robust educational environment and identifies key points at which technology should be implemented and evaluated to determine its impact. It simultaneously allows for the integration of new research findings into the appropriate segments of the model while maintaining the structure to evaluate the impact of technology tools on these new findings as part of an ongoing evaluation process. In so doing it allows a variety of stakeholders to see the complex process that is education and how technology is affecting the process.

2) The participants will view and critique online case studies of best practices in technology integration and quality education in a P-12 setting via video streaming technology. They will consider what content standards were addressed, how technology was integrated and which other components of quality education were present in the lesson.

3) The participants will discuss the project as well as share their ideas about its goals, applications, strengths and weaknesses.

REFERENCES:

American Association of School Librarians and Association for Educational Communication and Technology. (1998). The nine information literacy standards for student learning (excerpted from chapter 2, "Information Literacy Standards for Student Learning," of *Information Power: Building Partnerships for Learning*) [Online]. Available: http://www.ala.org/aasl/ip_nine.html {1999, May 25].

Callahan, W. (1997). Meeting the challenge: Improving education for native American youth. *Renaissance Group Magazine I* (1), 26-28.

Hall, G. E., George, A. A., & Rutherford, W. L. (1997). Measuring stages of concern about the innovation: A manual for the use of the SoC Questionnaire. Austin, TX: Research & Development Center for teacher Education, The University of Texas. (ERIC Document Reproduction Services No. ED 147342)

International Society for Technology in Education. (1998). *National Educational Technology standards: Guiding the development of new learning environments for today's classrooms* [Online]. Available: http://cnets.iste.org/ [1999, May 25].

International Society for Technology in Education. (1998). *Recommended foundations in technology for all teachers* [Online]. Available: http://www.iste.org/Standards/index.html [1999, May 25].

Kenny, R., Andrews, B., Vignola, M., Schilz, M., & Covert, J. (1999). Towards guidelines for the design of interactive multimedia instruction: Fostering the reflective decision-making of preservice teachers. *Journal of Technology and Teacher Education 7* (1), 13-31.

National Council for Accreditation of Teacher Education. (1997). *Technology and the new professional teacher: Preparing for the 21st century classroom*. Washington, DC: National Council for Accreditation of Teacher Education.

National Council for Accreditation of teacher Education. (1997). *NCATE's current standards for technology and teacher education* [Online]. Available: http://www.ncate.org/projects/tech/currtech.html [1999, May 25].

Stuhlman, J. (1998). A model for using technology into teacher training programs. *Journal of Technology and Teacher Education 6* (2/3), 125-139.

Switzer. T., Callahan, W., & Quinn, L. (1999). Technology as facilitator of quality education: A model. Paper presented at the Society for Information Technology and Teacher Education. San Antonio, TX, March 2, 1999.

U.S. Congress, Office of technology Assessment. (1995). *Teacher and technology: Making the connection* (OTA-HER-616). Washington, DC: U.S. Government Printing Office.

INTIME (Integrating New Technologies into the Methods of Education):
A PT3 Catalyst Grant

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Purpose:

Reports from the National Council for Accreditation of Teacher Education (NCATE) and the Office of Technology Assessment (OTA) have called attention to existing deficiencies in teacher preparation programs in preparing preservice teachers to use technology effectively in the PreK-12 classrooms. Technology and the New Professional Teacher (NCATE, 1997) reports that preservice teachers should be required to apply technology in their courses and should see faculty model technology use in the classroom. In order for undergraduate students to learn to use technology when they teach, it is vital that university teacher education faculty change the way they prepare teachers to use technology.

Within this framework, the InTime (Integrating New Technologies Into the Methods of Education) project is developing online video case studies to be utilized in methods courses that include videos of best practices showing scenarios from PreK-12 classrooms where teachers are integrating technology in a robust educational environment. These video scenarios will help methods faculty and preservice teachers stray in touch with P-12 classrooms, thus breaking down time-worn distinctions between preservice and inservice teaching. This project will provide video scenarios from PreK-12 classrooms across the nation that will be made assessable to anyone at the project website. In addition, the methods faculty and students and PreK-12 teachers will utilize web-based instructional materials and an online discussion forum to foster reflective discussion about the methods of technology integration combined with best learning practices. Methods faculty will also revise their courses to include first-hand observations of technology integration in their partner PreK-12 classrooms.

Relationship to SITE 2001 Conference:

This project relates to SITE 2001 Conference because the online video case studies that will be available via video streaming from the project website feature best practices of PreK-12 teachers as they integrate technology in a robust educational environment. This environment, which is defined by the model, Technology as Facilitator of Quality Education (TFQE), currently being developed by the InTime project at the University of Northern Iowa. The model includes seven major dimensions:

1. Students at the center of their own learning;
2. Principles of good learning;
3. Aspect of information processing;
4. Standards from content disciplines, and
5. Tenets of effective citizenship in a democratic society.
6. Teacher knowledge and behavior
7. Technology

The seven dimensions of the model provides a way for educators to view the integration of technology related tools into a robust educational environment and thus answer the hard questions regarding support for the shift in our educational activities toward technology. It sets up a framework for this robust educational environment and identifies key points at which technology should be implemented and evaluated to determine its impact. It simultaneously allows for the integration of new research findings into the appropriate segments of the model while maintaining the structure to evaluate the impact of technology tools on these new findings as part of an ongoing evaluation process. In so doing it allows a variety of stakeholders to see the complex process that is education and how technology is affecting the process.

Abstract of Presentation:

InTime (Integrating New Technologies Into the Methods of Education) is a $2,397,594 Catalyst Grant from the United States Department of Education. The Three-year InTime project addresses deficiencies in teacher education programs in preparing preservice teachers to use technology effectively in the PreK-12 classroom. The purpose of InTime is to provide the necessary resources for methods faculty to revise their courses, model technology integration, and require preservice teachers to integrate technology, along with components of quality education, in their lessons and units.

This project is intended to produce change in teacher education programs in three ways. First, the project will generate new learning resources on the web to support new teaching and learning processes in education methods courses. New learning resources will include development of video scenarios of PreK-12 teachers effectively integrating technology, along with components of quality education, in a variety of grade levels and content areas. These videos will be stored on a video server already in place at the university of Northern Iowa and made accessible online nation-wide. Second, methods faculty will revise their courses to model technology integration using the video scenarios and online discussion forum, require students to apply technology, and implement the Preservice Teacher Technology Competencies as exit criteria for their courses. Finally, methods faculty will share strategies for integrating technology and course revision with other faculty involved in the grant through Faculty Online Discussion Forum and nation-wide through print and web publications of their findings as well as presentations at national conferences.

Participant Outcome:

Participants will understand the purpose of the Technology as Facilitator of Quality Education Model used in this project to illustrate that technology is not at odds with the core values of American educational system. This project will not just increase the use of technology but help teachers use technology to appropriately help children learn content, learn how to process information using technology, and practice the skills necessary to be a thinking citizen in a democracy. The participant s will be provided with an opportunity to experience online video applied on the educational environment.

REFERENCES:

American Association of School Librarians and Association for Educational Communication and Technology. (1998). The nine information literacy standards for student learning (excerpted from chapter 2, "Information Literacy Standards for Student Learning," of *Information Power: Building Partnerships for Learning*) [Online]. Available: http://www.ala.org/aasl/ip_nine.html {1999, May 25].

Callahan, W. (1997). Meeting the challenge: Improving education for native American youth. *Renaissance Group Magazine 1* (1), 26-28.

Hall, G. E., George, A. A., & Rutherford, W. L. (1997). Measuring stages of concern about the innovation: A manual for the use of the SoC Questionnaire. Austin, TX: Research & Development Center for teacher Education, The University of Texas. (ERIC Document Reproduction Services No. ED 147342)

International Society for Technology in Education. (1998). *National Educational Technology standards: Guiding the development of new learning environments for today's classrooms* [Online]. Available: http://cnets.iste.org/ [1999, May 25].

International Society for Technology in Education. (1998). *Recommended foundations in technology for all teachers* [Online]. Available: http://www.iste.org/Standards/index.html [1999, May 25].

Kenny, R., Andrews, B., Vignola, M., Schilz, M., & Covert, J. (1999). Towards guidelines for the design of interactive multimedia instruction: Fostering the reflective decision-making of preservice teachers. *Journal of Technology and Teacher Education 7* (1), 13-31.

National Council for Accreditation of Teacher Education. (1997). *Technology and the new professional teacher: Preparing for the 21st century classroom*. Washington, DC: National Council for Accreditation of Teacher Education.

National Council for Accreditation of teacher Education. (1997). *NCATE's current standards for technology and teacher education* [Online]. Available: http://www.ncate.org/projects/tech/currtech.html [1999, May 25].

Stuhlman, J. (1998). A model for using technology into teacher training programs. *Journal of Technology and Teacher Education 6* (2/3), 125-139.

Switzer. T., Callahan, W., & Quinn, L. (1999). Technology as facilitator of quality education: A model. Paper presented at the Society for Information Technology and Teacher Education. San Antonio, TX, March 2, 1999.

U.S. Congress, Office of technology Assessment. (1995). *Teacher and technology: Making the connection* (OTA-HER-616). Washington, DC: U.S. Government Printing Office.

InTime (Integrating New Technologies Into the Methods of Education): A PT3 Catalyst Grant.

Masha Plakhotnik
Univ. of Northern Iowa

Objective:

The objective of this session is to consider how to utilize online video case studies of PreK-12 teachers using technology in a robust educational environment in preparing tomorrow's teachers to use technology.

Short description of the presentation:

During the session the participants will experience an online video developed at the University of Northern Iowa applied on the educational environment. This video as well as 49 more videos is a product of InTime (Integrating New Technologies Into the Methods of Education) which is a $2,397, 594 Catalyst Grant from the United States Department of Education and which involves five Renaissance Group universities. The three-year InTime project addresses deficiencies in teacher education programs in preparing preservice teachers to use technology effectively in the PreK-12 classroom. The purpose of InTime is to provide the necessary resources for methods faculty to revise their courses, model technology integration, and require preservice teachers to integrate technology, along with components of quality education, in their lessons and units.

This project is intended to produce change in teacher education programs in three ways. First, the project will generate new learning resources on the web to support new teaching and learning processes in education methods courses. New learning resources will include development of video scenarios of PreK-12 teachers effectively integrating technology, along with components of quality education, in a variety of grade levels and content areas. These videos have being stored on a video server already in place at the University of Northern Iowa and made accessible online nation-wide. Second, methods faculty will revise their courses to model technology integration using the video scenarios and online discussion forum, require students to apply technology, and implement the Preservice Teacher Technology Competencies as exit criteria for their courses. Finally, methods faculty will share strategies for integrating technology and course revision with other faculty involved in the grant through Faculty Online Discussion Forum and nation-wide through print and web publications of their findings as well as presentations at national conferences.

The InTime project is developing the 50 best practice videos which will be available via video streaming on the project website http://www.intime.uni.edu Every video has seven audio tracks, first of which is the live classroom audio. Also, each video is analyzed in six additional versions which will contain narratives about how the teacher is demonstrating one of the six elements from the technology as Facilitator of Quality Education Model (TFQM). Elements of quality education from UNI's Technology as Facilitator of Quality Education Model include

1. exemplary technology;
2. democracy in the classroom;
3. rich content;
4. information processing;
5. effective principles of learning;
6. exemplary teacher knowledge and behaviors.

The above listed elements of quality education provide a way for educators to view the integration of technology related tools into robust educational environment and thus answer the hard questions regarding support for the shift in educational activities toward technology.

The edited videos of approximately 5 minutes in length are searchable at the project website not only by the elements of quality education but also by grade level, content area, teacher's name, state, video tittle, and video code. In addition, these videos will be also available on CD-ROM and DVD.

During the session, the participants will have a chance to view one of the videos and its seven versions. Each of the seven audio tracks will appear on the left side of the screen with a written teacher's narration running at the bottom of the screen. On the right side of the screen, the participants will see the full description of the classroom practice. This description includes the teacher's name and the school location, grade and curriculum area. Further, they will see the detailed unit description which covers necessary preparations and procedures. Next, all necessary information about this classroom practice, such as tools and resources, assessment, timeline and course outline as well as the teacher's personal comments on the implementation of this particular activity will appear on the right side of the screen.

Participant Involvement and Outcomes:

So, the participants will understand the purpose of the "Technology as Facilitator of Quality Education Model" as well as view and critique online case study of best practice in technology integration and quality education in a PreK-12 setting via video streaming technology. They will consider what content standards were addressed, how technology was integrated and which other components of quality education were present in the lesson.

ABSTRACT:
The objective of this session is to consider how to utilize online video case studies of PreK-12 teachers using technology in a robust educational environment in preparing tomorrow's teachers to use technology. The participants will have a chance to view and critique one of the online case studies of best practice in technology integration and quality education in a PreK-12 setting, developed at the University of Northern Iowa, via video streaming technology. They will consider what content standards were addressed, how technology was integrated and which other components of quality education were present in the lesson. The issues addressed in this session will be interesting to deans, administrators, faculty, and decision-makers of all expertise levels.

Putting the Pieces Together: Systemic Change for Technology Integration in Teacher Education

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Abstract: Today's schools must prepare students to use computer-related technologies well in a range of tasks. For K12 schools to prepare their students, colleges and universities must prepare teachers to integrate technologies well for learning. Thus, reform in teacher preparation must become a high priority. Research has shown that lasting reform must be systemic—in other words, the parts of an educational system must synergistically support one another. In efforts to reform teacher education at an urban public university, we have tried to ensure that policy, curriculum, field experiences, and faculty teaching practices all support the meaningful integration of technology. Our efforts to sustain systemic change along these lines have been greatly enhanced by a "technology and learning center" and a Preparing Tomorrow's Teachers to Use Technology grant. We show through a case study and vignette how these pieces fit together for reform towards the integration of technology in teacher preparation.

Introduction

The Need for Technology-Using Teachers

Today's workplaces are increasingly computerized and networked; hence, schools must better prepare students to use these technologies flexibly and creatively in their lives, for tasks ranging from problem solving to information gathering to communication (SCANS, 1991). In order for K12 schools to prepare their students, colleges and universities must prepare teachers to integrate technologies well for learning. But colleges, schools and departments of education have lagged to date in their integration of technologies for learning into teacher preparation. Thus, reform in teacher preparation must become a high priority if real change is to take place in schools (Darling-Hammond, 1993).

Historical and Theoretical Background: Change Studies

Research on educational change has shown that lasting reform must be *systemic* (e.g., Brown, 1992; Fullan & Miles, 1992). In other words, the various parts of an educational system must synergistically support one another. A sociocultural (Wertsch, 1998) perspective on human action provides some guidance as to how to explain and plan for systemic change. Wertsch shows how the multifaceted, interrelated aspects of human activity in complex social settings can be captured using Kenneth Burke's "pentad": the act, scene, agents, agency (or cultural tools), and purpose. The meaning of an *act* is simultaneously constituted by the *scene* or location in which the act occurs, the knowledge, role, and personal history of the *agents* involved, the properties of the *cultural tools* or mediational means used to accomplish the act, and the *purposes* which the act served. In our reform, we are making an effort to change the "scene" at the College of Education to include use of technology as a cultural tool for teaching as a normal matter of course. The relevant agents in our case have been the dean and faculty members, supported by staff working on a Preparing Tomorrow's Teachers to Use Technology (PT3) grant. The scene began changing with policy and curriculum changes and the opening of a state of the art "technology and learning center." Through a curriculum reform, the teacher preparation activities supported by faculty in their courses have been reexamined to more adequately integrate technology while simultaneously serving the many other purposes of individual courses. In this paper, we explicate how we have put these pieces together for systemic reform towards the integration of technology in teacher preparation.

Background at the College of Education

The College of Education at the University of Missouri-St. Louis prepares a large number of teachers for K12 schools in our region. Prior to 1995, technology was not an integral aspect of the college's life. Although all faculty had computers in their offices and a few Educational Technology courses had been offered for years, few faculty members used technology for their instructional work. For instance, approximately 2% of our faculty was using email and online discussion groups with their students, and about that same percent referred their students to web resources and taught using technology. There was neither a technology course requirement nor an expectation of teacher education students demonstrating technology integration competency prior to certification.

A New Dean and a New Teacher Preparation Curriculum

With the entry of a new Dean and statewide certification changes in the second half of the 1990s, the situation changed. Paper copies of "The Dean's Weekly Update" were banished upon the dean's arrival in 1996—faculty members who did not use email before his appointment were forced to begin using it soon after. Innovations and grants involving technology were encouraged. A "futures" planning process resulted in a college-wide commitment to the importance of technology to the preparation of new teachers for the 21st century, and in a redesigned curriculum that required both a larger field component and technology integration in courses at all three "levels" (Level 1: Exploration, followed by Level 2: Analysis and Level 3: Professional). And finally, the state of Missouri instituted new performance-based (rather than course credit-hour based) standards for teacher certification, which included the need for all new teachers to demonstrate competence at integrating technology.

The Final Pieces: PT3 and the TLC

Our dean and development officer also envisioned and secured funding for a Technology and Learning Center (TLC) for our College and an Endowed Professorship of Technology and Learning. In the Winter of 1999, the Endowed professor and another full-time faculty member (the first author) were hired, and plans for the building of the TLC began in earnest.

At the same time, a group (headed by the second author) who had worked on technology integration with teachers in local K12 schools (the MINTs—Multimedia Interactive Networked Technologies—Project) submitted a grant proposal to the U.S. Department of Education's PT3 program. We proposed adapting the professional development practices utilized in MINTs to support change towards technology integration in active teaching and learning projects among cadres of university faculty, and using the MINTs classrooms as fertile sites for future teachers' field experiences.

During the Fall of 1999, the PT3 grant was awarded and the TLC plans were also finalized. The TLC was planned as a "hothouse" for educational technology, to mirror and model the possibilities for technology integration in K12 schools. It includes work clusters, a model classroom space, a seminar room with interactive whiteboard, and a "cyberlounge" with wireless networking (see Figure 1). The reconfigurable work clusters are set up to allow for solo work or collaboration on projects involving the Internet, standard office suites, and multimedia technologies including graphics and digital video. The classroom space is meant to allow discussion without computers between people as well as computer workstations and tables for discussion or work offline.

The pieces had all come together for the Winter semester of 2000:

- policy at the state and college level that encouraged technology integration,
- a new curriculum that allowed for introduction of new activities and tools in courses,
- requirements for field experiences as well as sites that integrate technology well,
- a PT3 grant to support university faculty in changing their teaching to incorporate technology, and
- a technology and learning center with staff and infrastructure to support technology integration

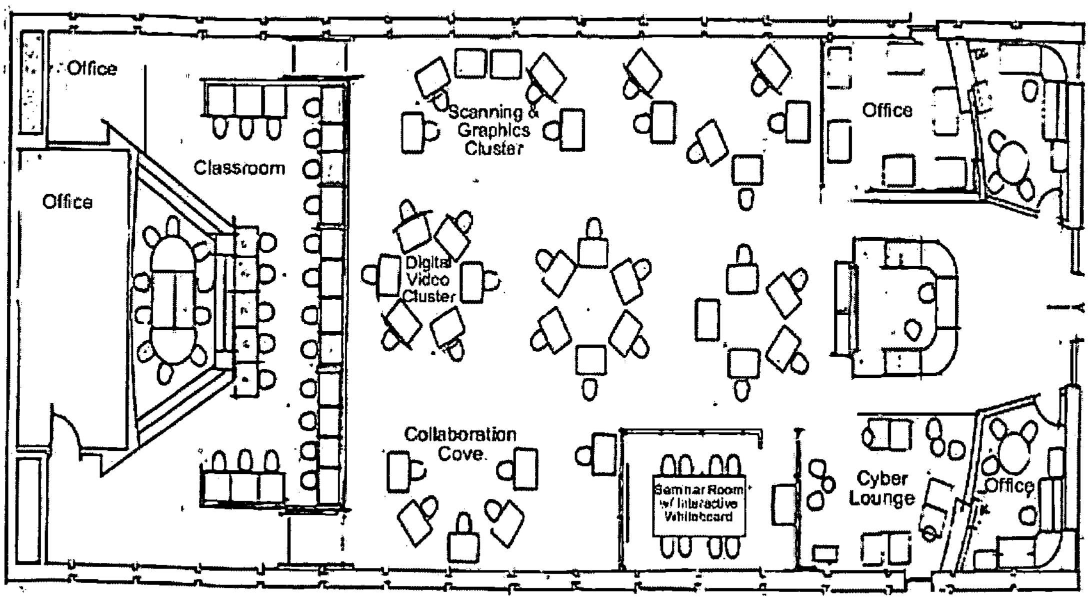

Figure 1: Floor Plan of the E. Desmond Lee Technology & Learning Center at the University of Missouri-St. Louis College of Education.

Case Study: Introduction to Learners and Learning Course

The new undergraduate teacher preparation curriculum at UM-St. Louis consists of three levels, the first of which is Exploration. At this level, there are three courses: Introduction to American Schools, Introduction to Teaching, and Introduction to Learners and Learning. In order to illustrate how the pieces of our reform efforts fit together, we describe the technology component of the latter course as implemented in the Winter 2000 semester.

The fourth author instructed this course, and groups of her students developed web sites about child development topics of their choice. The primary goal for the project was learning about psychological development, but secondary goals included gaining an appreciation of the range of resources available on the World Wide Web, learning how to find those resources, and beginning to learn how to make web resource pages (which we expect technology-using teachers at the K12 level to utilize to support learning activities in the classroom). The construction of a set of resource web pages about development, with synthesis and annotated links to related sites on the Internet, was an ambitious project for an introductory education class, and many students began the process with considerable trepidation. As one student stated, "learning how to create a web page was very stressful to even think about" at the beginning. Student reactions to the technology were somewhat related to their level of experience with technology, with beginners feeling more overwhelmed at the beginning despite recognizing the relevance of technology skills for classroom applications.

In order to support the preservice teachers in the achievement of this complex, ambitious project, a variety of supports were utilized. During class meetings held in a computer classroom, two PT3 staff acted as guest facilitators along with the instructor. The PT3 staff introduced the class to web page editing basics using Netscape Composer (a free web page editor included with Netscape Communicator), and distributed a handout describing the basics. Using a web page template on disk, the facilitators assisted the groups in adding and modifying text, a digital photo of themselves, and links to resources on the Internet. Several classes were devoted to completing the assignment. The computer expertise and comfort in the class varied widely, from a couple with extensive experience including web page editing, to quite a few with word processing, email, and web browsing, to several with little experience and a good deal of fear. The instructor created groups of three or four students and made an effort to place at least one student with stronger technology expertise as measured by a skills survey administered online with a system called Profiler (http://profiler.scrtec.org). The in-class orientation and the handouts proved to be scaffolds of some use to the students, but more in-depth background and detailed written reference materials were desired by many. Not surprisingly, the people provided the most effective scaffolding: the multiple facilitators during class meetings provided by PT3 helped, as did the more expert peers spread among the groups. Nonetheless, many students wished for more in-class time with facilitators, and some lamented the difficulties of groups meeting outside class at a largely commuter university.

Several students wished for more staff support in the computer labs between classes. Frustration at the lack of support at the drop-in labs is notable, because at the time the assignment began, the College's Technology and Learning Center had not opened (it opened mid-way during the semester).The staffing model of the traditional "computer labs" on our campus probably reflects the norm on most campuses—staff are hired mainly to control access into and out of the area and maintain the equipment. The staffing level is typically one "monitor" per lab. In contrast, the TLC's mission is explicitly to support the educators—and all are future or current educators—who use the facility in their use and learning of technology for education. In addition to the scheduled workshops we offer to students and faculty, our staff "on the floor" offer as much assistance and guidance as they can give to our customers, although on-the-spot, extended individual tutorial sessions are not practically feasible with our large numbers of users (hundreds per month in the spring of 2000, thousands in the fall). We have worked hard to cultivate an atmosphere in which our customers feel free to ask questions and seek assistance. This is facilitated by having two staff on duty at most times we are open.

In reflection papers submitted after the assignment was complete, most students expressed agreement with the notion that teachers should be prepared to integrate technology. As one student said, "I believe it is very important for our class as college students and also as future teachers to be aware of and comfortable with the technology available." But some expressed frustration at a technology assignment they did not expect in a psychology of learning class. This frustration may have been exacerbated by the fact that some sections of the introductory class during this period were not being offered in the new curriculum model, and thus did not include the technology work—therefore, students were aware that some of their peers were not required to complete the difficult work involved in a web site. As the new curriculum is more fully implemented, students who do not use technology in their courses will be more the exception than the rule.

Despite the frustrations, most students were pleased with their accomplishments. As one put it, "while I did have a hard time working on this website, ... I did learn a lot about the Internet, computing skills, and all the support websites that are available."

In the Fall 2000 semester, the developmental web site project was repeated and extended to three sections of the new curriculum course, two of which are taught by part-time instructors. Most of the class meetings on technology were scheduled in the TLC classroom space, and facilitators were once again available for those meetings. Students during this second round had very similar reactions to the project as those in the second round—a mixture of excitement at using technology which is recognized as important for education and some trepidation at the newness and complexity of the task. Students have made more considerable use of staff support in the TLC after spending time in the space with their class, and in reflection papers, no requests for additional supportive staff were made.

Vignette: Technology Overcomes Achilles

A vignette from early in the Fall 2000 semester serves as an example of the promise of readily available information technology settings such as the TLC as learning resources. One of the instructors involved in PT3, who we will call Ann, injured her Achilles tendon before the second class meeting of the semester, and was consequently unable to attend her Introduction to Instructional Methods class. On the day of class, Ann called up the PT3 project director, Ms. Mastin, and asked her to take over the class for the day by leading the group in an assignment Ann had prepared. Ms. Mastin asked the faculty member if they were using the new university online course material system, a version of CourseInfo's Blackboard. The system had just been installed on campus in the summer, and many of the instructors and students, including Ann and her class, had not yet had training or experience using it. Ms. Mastin suggested they give it a try anyway. With Ms. Mastin's help over the phone, Ann posted an announcement for her students, and posted the assignment document in the area reserved for that. Ms. Mastin met Ann's class and took them to the TLC to read and work on the assignment. The class completed the assignment in the TLC, with Ms. Mastin acting as the facilitator, and also with the support of discussions with their neighbors about both technology and content.

The TLC and the technology infrastructure facilitated this successful adjustment of a class meeting in several important ways. Ms. Mastin's availability to advise Ann on the capabilities of technology to enable work on the assignment was essential. The relative ease of posting announcements and assignment documents on the Blackboard system was also key—if Ann had wanted to post her ideas to a standard web site and had not yet attended a training session, she would have been unlikely to succeed in a timely enough fashion for class that very evening. And finally, the availability of a space in the TLC for individual class meetings to work with staff facilitation, a projector for display and walk-through of technologies for first-timers, and a classroom space that allowed for students comfortably working with one another all created new possibilities for successful technology integration into university coursework.

Next Steps

At this point in the implementation of our reform, we are expanding our scope in multiple ways. The new curriculum is being phased in at the same time new groups of faculty are being supported in technology integration. In the Winter of 2000, one section of the three Level 1 courses was offered. In the Fall of 2000, three sections of each Level 1 course is being offered, and one section of each new Level 2 course. In the Winter of 2001, Levels 1 and 2 will be offered in more sections, and new Level 3 courses will be offered. At the same time more introductory level courses are being offered in more sections, we are recruiting faculty members to participate in PT3 professional development activities in order to get extra support in integrating technology, and make use of the Technology and Learning Center. In addition, we are attempting to build in sensible articulation of technology competencies across courses and levels of the curriculum, but we have a great deal of progress yet to make. The change over the past year has been tremendous, however.

Conclusion

Researchers have demonstrated that the adoption of symbolic aspects of reforms such as trendy descriptors ("multiple intelligences", "brain-based instruction") or new textbooks can prove more symbolic than substantive (Ball, 1990; Fullan & Miles, 1992). At the University of Missouri-St. Louis College of Education, we have attempted to provide a whole new "scene" (Wertsch, 1998) where university instructors and students preparing to be teachers try out new ways of acting. Maybe this exciting new play they are constructing will have a longer run on the educational scene than other reforms.

References

Ball, D. L. (1990). Reflections and deflections of policy: The case of Carol Turner. *Educational Evaluation and Policy Analysis, 12*(3), 247-259.

Brown, A. L. (1992). Design experiments: Theoretical and methodological challenges in creating complex interventions in classroom settings. *Journal of the Learning Sciences 2*(2), 141-178.

Cuban, L. (1986). *Teachers and machines: The classroom use of technology since 1920.* New York: Teachers College.

Darling-Hammond, L. (1993). Reframing the school reform agenda: Developing capacity for school transformation. *Phi Delta Kappa*, 74, 10.

Fullan, M. G., and Miles, M. B. (1992). Getting reform right: What works and what doesn't. *Phi Delta Kappan*(June), 745-752.

Office of Technology Assessment [OTA] (1995). *Teachers and technology: Making the connection.* Office of Technology Assessment.

Secretary's Commission on Achieving Necessary Skills (1991). *What work requires of schools: A SCANS report for America 2000.* Washington, D. C.: U. S. Department of Labor.

Wertsch, J. V. (1998). *Mind as action.* New York, Oxford University Press.

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Rethinking Teaching and Learning in the Age of the Virtual-Classroom

"**Abstract**:" The objective of this paper is to address the question of the changing conception of knowledge at present and the need for institutions of higher learning and educators to reconceptualize the notion of knowledge and learning in order to keep in line with the changes in the society. Furthermore, I will argue that it is necessary to develop teaching methodology that can function effectively in the new technologically-grounded paradigm that is evolving in the realm of the social and the economical on a global scale today. This paper is based on my experience in developing, designing and delivering a web-based Spanish Civilization course at the University of Arizona, Tucson.

Learning Environment

The Spanish Culture and Civilization course, Spanish 430 was taught during Summer Session I, 2000 at the University of Arizona, Tucson. It was unique in that it gave students the freedom to access class resources at any time, from any internet-connected computer in the world. Indeed, while many students in the Tucson area used the Web to read class materials, many others took part in class discussions and completed their assignments from Phoenix, Flagstaff, and Nogales, Arizona, San Diego and Los Angeles, California, and even from as far away as Spain and Italy.

The course lessons were divided into three broad categories: *La Tierra* y *El Pueblo*, *Poetas*, and *Pintores* (The Land and People, Poets, and Painters, respectively). Each of these categories was divided into subsections where class readings, practice quizzes, and discussion topics could be found. All class readings included images, photos, maps, audio and video materials along with text, and a dictionary feature that instantaneously provided word definitions at the click of a mouse.

One of the most innovative features of the course was a collaborative project. Students were required to form groups of three and read Spanish newspapers during the five-week period of the class, paying close attention to a particular news story and the manner it was presented in the Spanish news media. At the end of the course the groups presented their observations in the form of essays.

Student participation was facilitated principally through a section of the course called *Mesa_Redonda*, but also through available chat rooms and e-mail. *Mesa Redonda* was a virtual round table where students were required to both post their thoughts on class lessons and read the postings of their classmates. During the five weeks of this course, there were over 500 postings. Students also had the option to use chat rooms to ask specific questions about class materials during the professor's virtual office hours, or were able to have their technical questions addressed by the Technology Preceptor of the course. Chat rooms also provided for students who were in different areas of the world a means by which class readings and projects could be discussed in real-time. Students also made use of both the class e-mail system and their own e-mail accounts to discuss class topics and have their questions answered.

The designing, developing and delivering this experimental course presented me with several challenges and made me think about teaching and learning in the age of technology.

Technology and teaching

Technological innovation, the demands of global economy and the drive towards a cost-effective education are forcing educators, administrators and students alike to incorporate new and innovative technologies into education. Consequently, the virtual-classroom has emerged as an alternative to the traditional classroom as well as conventional distance learning courses. However, the virtual-classroom is yet to realize its full potential. Teaching and learning in a virtual-classroom cannot be conceived as a simple enhancement of the delivery of customary text-based materials, nor should it be thought only as freedom on the part of learners to access materials outside the confines of physical classroom and text. Technologically-oriented education in its present state continues to rely on traditional pedagogy. This approach will be unable to cope with the new paradigm that is redefining the society in hitherto unknown ways. The challenge for educators is to evolve new methodologies wherein the concept of teaching and learning has to be thought anew.

Knowledge in Information Age

The technological innovations and societal changes over the last fifty years have profoundly transformed the concept and utility of knowledge. Jean-François Lyotard in his book *The Postmodern Condition: A Report on Knowledge* characterizes knowledge in the postindustrial age as "payment knowledge" and "investment knowledge" (Lyotard, 1984, p. 6). While the "payment knowledge" is "units of knowledge exchanged in daily maintenance" the "investment knowledge" is "dedicated to optimizing the performance of a project" (Lyotard, 1984, p. 6). However the educational institutions-unaffected by changes in half a century—conceive knowledge as an end in itself. The academics envision the universities as places for pursuing whole body of human knowledge, therefore "research and the spread of learning are not justified by invoking a principle of usefulness" (Lyotard, 1984, p. 34). These two forms of conceptualizing knowledge today are the undercurrent of conflict witnessed between the communities and legislaturcs who demand greater accountability from academics on the one hand, and the universities that defend their freedom on the other. Wedding Internet technology and education as solution for this conflict is a losing preposition because these two groups views of knowledge are radically different. The possible resolution lies in institutions of higher learning reconceptualizing their idea of knowledge and its pursuit.

Teaching in classroom

Teaching in a traditional classroom takes place in a narrative framework: sender, receiver and referent. The teacher is the sender who stands before a class and transmits information during sixty minutes. The receivers are students who patiently wait for sixty minutes to pass, and the textbook, a bound volume of knowledge, is the referent. This narrative model does not have an inbuilt mechanism to foster teacher creativity and learner involvement. They are left largely to the personal initiative of senders and receivers. The anecdotal experience of most of those who went through colleges and universities demonstrates that they have had one or two teachers who inspired them to learn and one or two courses where they really learned.

The dissonance teachers experience between teaching and learning in the classroom is the reflection of the conflict between the two notions of knowledge I referred to earlier. The student body that enters academia is drawn from a society affected by the technological changes. They are exposed to a different form of information mapping and they process that information in a different way. Television and videogames, major sources of information and interaction, are episodic in nature, task-oriented and use-determined. However the narrative models of teaching and learning ensue an accumulation of large body of knowledge whose goals and utility may or may not be realized at a later date.

Challenges of a virtual-classroom

The Internet, so far, is the maximum achievement of the technological revolution. If web technologies are to be used in education, the concept of knowledge, how it is presented and for what purposes it is used has to be rethought. Without this reconceptualization of knowledge, publishing lessons and class notes on web with few added features such as note taking, search and visuals will be a mere translation of narrative model to Internet. Using the web as a delivery mechanism of traditional classes will be counterproductive because research has shown that students have not taken to reading on screens. Moreover, web learning eliminates the many benefits of live interaction in a classroom.

In a fixed classroom an innovative teacher responds immediately to evolving dynamics of the course through interaction with students and by evaluating students' responses to the material and teaching style. However in the web-delivery such spontaneity is missing. The course cannot be redesigned or reoriented at such short notice. One potential solution is to incorporate as many scenarios as possible into course design and use the multimedia interactions. The teacher in a virtual-classroom has to forgo his or her role as transmitter of knowledgc and become facilitator of learning. For this to occur the students have to be trained to play a new role, that is of active learner instead of passive listeners. My experience has taught me that both, the role of teacher and student have to be rethought and reengineered in adopting technology in education and creating virtual-classrooms.

References: Lyotard, J-F. (1984). *The Postmodern Condition: A Report on Knowledge.* Minneapolis, MN: University of Minnesota Press.

Developing Techno-Savvy English Language Arts Teachers: from Blank Screens to Full Directories

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Abstract: This paper discusses the ongoing process of infusing technology into an English language arts teacher preparation program and includes an update of a longitudinal case study of a cohort of undergraduate students' development as teachers, learners, and users of technology and English language arts pedagogy. Principles and practices used to determine the degree and process of infusion are discussed in connection with teaching, learning, and technology strategies used by the methods professor and the preservice teachers. Also included are the perspectives of an instructional technologist specialist who works with the program, a middle school teacher, and the student teacher supervisor.

Introduction

The Middle Grades English language arts teacher education program at NC State University has in recent years committed to infusing technology in a seamless, constructivist way that simultaneously supports the building of students' confidence and competence as teachers, learners, and technology users. By merging the NC Technology Competencies for preservice teachers into the curriculum, the faculty and students have learned together the value of balancing and interweaving content, context, and technology. This process was catalyzed in 1999 by the reception of a PT3 grant from the US Department of Education. Through the grant the English language arts faculty received both technical and instructional assistance in boosting the degree of technology infusion in content methods courses.

Background

As a way to assure the infusion of technology into the program, faculty from English education and instructional technology created MIDtech, a web site specifically designed for preservice students in the middle grades program (http://www2.ncsu.edu/midtech/). The web site, developed with continuous feedback and evaluation by students in the program, contains interviews with middle school educators who infuse technology into their teaching in a thoughtful, successful way as well as numerous other useful resources. From the site NC State students, soon to become teachers, can locate exemplary lesson plans written by teachers, materials they can use in teaching, tutorials for technology use, and links to other courses and student work. They can also find the North Carolina required competencies for teachers (http://www.dpi.state.nc.us/tap/assess.htm#BASIC) as well as the matrix which shows how these competencies have been infused into the curriculum and courses for their program at NC State (http://www2.ncsu.edu/midtech/resources/preservice/msltables/matrix1.html).

Planning and Principles

The English language arts middle grades students take several pedagogical content courses that provide opportunities for technology infusion. Three classes which assume much of the technology infusion responsibility are ECI 307 Teaching Writing Across the Curriculum, ECI 430 Methods and Materials for Teaching Language Arts in Middle School, and ECI 454 Student Teaching in Language Arts. It is from these courses that the following examples were drawn.

Beginning in January 2000, we [the English language arts methods professor (Carol), with the assistance of an instructional technology specialist/graduate assistant (Judy) as well as the university supervisor (Amelia), and a middle school teacher/graduate student (Julie)], set as a goal the seamless infusion of technology into the Teaching Writing course. Carol was concerned about keeping content pedagogy, not technology, as the touchstone for the class; Judy was anxious to be of assistance and to bring her technology knowledge and skills to the planning; Julie was interested in connecting the preservice students with her middle school students to improve their writing; and Amelia referenced the state of technology in the area middle schools where these students would be student teaching.

Initial brainstorming and creation of the syllabus provided the jump-start for an active, challenging semester. Within the first week of class, Carol collected from the students a self-evaluation narrative of their computer competency, confidence, and present use. The students reported that they used computers primarily for writing papers (word processing), emailing, and searching the Internet. One student reported her ability to use PowerPoint for presentations while another reported using her computer for playing games. All of the students said they were comfortable when they knew the computer and the software but had little confidence in themselves as "experts" who could use technology in teaching. In short, they were blank screens about the infusion of technology into their teaching of English language arts.

In the months preceding the beginning of class, Carol had been working independently to add computer technology to her teacher preparation classes. Her refusal to make the technology just an "add-on" to the program and courses set into motion her struggles about the best ways to both use and infuse technology. Frequently Carol refers to content-specific methods instruction as a double helix--i.e., teacher educators are not just teaching the content but also the content pedagogy; adding technology to that duality created another element to an already complex challenge. Driven by that challenge, Carol worked with Jeffrey Golub at the University of South Florida to develop an article entitled "Preparing Tomorrow's English Language Arts Today: Principles and Practices for Infusing Technology" (Pope & Golub, 2000) published in the new on-line journal, *Contemporary Issues in Technology and Teacher Education* (http://ww.citejournal.org). The purpose of this article, like the other content-specific articles in the first issue of the CITE Journal, is to stimulate a national conversation about the principles and the viability of their use in preparing English language arts teachers.

The following principles from that article guided the infusion of computer technology into English language arts pedagogy courses: 1) introduce and infuse technology in context; 2) focus on the importance of technology as a literacy tool; 3) model English language arts learning and teaching while infusing technology; 4) evaluate critically when and how to use technology in English language arts classroom; 5) provide a wide range of opportunities to use technology; 6) examine and determine ways of analyzing, evaluating, and grading English language arts technology projects; 7) emphasize issues of equity and diversity.

Place and Practice

Using the principles as guidelines for pedagogical decisions, Carol and Judy worked together and independently to explore ways of naturally infusing technology into the Teaching Writing class and then again in the Fall 2000 methods class--the two university-based English language arts pedagogy courses that precede student teaching. The Teaching Writing class was held in the computer lab so that Carol and the students had easy access to technology. By being in the room with the technology, Carol thought she would be much more likely to use the available technology for teachable moments that grew from the class interests and to have the technology waiting to be used. This decision proved to be a wise one. At the end of the semester when we calculated the number of hours of technology use in the class, we discovered that over 50% of the class time had been spent using technology in the class context.

One of the most valuable technology infusion lesson cycles Carol used in the Teaching Writing class was the one in which she and Julie connected their students via technology. This E-PALS Project was one which Julie and Carol had tried before with limited success. This time they knew both the technological and communication hurdles they faced and were able to eliminate most of those problems. Carol's students were matched one-to-one with Julie's middle school students. The goal of the E-PALS project were that 1) the middle school students would get special attention from a university student to help them with their writing; 2) the university students would learn, through practice and guidance from Carol, how to respond to students' writing and guide their revision to a final product. This process is discussed and outlined on an NC State web site (http://www2.ncsu.edu/ncsu/cep/ci/eci307.html).

The E-PALS Project addressed all of the principles for infusing technology into teacher preparation. The preservice teachers were using technology to learn how to respond and guide middle school students' revision, and they experienced the impact of language choice, audience, and voice when the "teacher" was communicating completely on-line. Because class time was spent on guiding the preservice teachers' responses and guidance to the middle school students, the university students critically evaluated what was being lost and gained by e-communication as opposed to the face-to-face interaction they had with each other in the classroom. Questions regarding how to evaluate and how to grade technology products constantly emerged without Carol's designating a "block" of time to consider grading and evaluating. As they worked with their E-PALS over several weeks, the preservice teachers had numerous questions about issues of equity and diversity--e.g., how to provide more-than-equal time to students who do not have access to computers at home and how to write grants to get more computers in classrooms for all students. They also experienced how to keep information in e-folders in the classroom and how to open each student's file from the local server.

Most importantly, the students built relationships with middle school students via email. They learned both how to communicate openly with their own students and how to guide students' writing; they learned how to revise and guide revision; they learned not to make assumptions about students unnecessarily; and they built their confidence as teachers. When Carol's students went to Julie's classroom across town at the end of the semester, the students immediately began talking and establishing the same bond in person that they had established through cyberspace. Both groups of students benefited greatly from this interaction.

More Applications - Teaching Writing

Following are a number of other ways in which Carol, with Judy's assistance, infused technology into her Teaching Writing and Methods classes.

Class Web Site:	The web site is an in-process location that changes as the class evolves. It is dynamic and reflects the class movement itself. Teachable moments become web links, and student work contributes to the site.
Class Notes:	Each week one student keeps the class notes, which are posted by the students on the web site for both downloading and keeping a record of the class.
Daily Writings:	Student have opportunities to write daily in the Teaching Writing class. They have a choice of writing on computers or by hand. Students often choose differently, depending on the day, as does Carol.
Response/Chats:	Students respond to each other's writing, ideas, questions, and views via email, Netforums, real-time chat formats, face-to-face, on e-cakewalks (by moving from computer to computer and responding), and by opening documents within their own and their peers' e-files.
Server:	One of the ways in which students get practice in how they can store and retrieve both their own and their future students' work is to set up

and experience the use of a class folder and their own folders. From these folders (which are analogs to tangible class writing folders), students pull up assignments placed in e-folders by Carol and get a chance to post information in their peers' folders.

In addition to these larger activities, students also experience and reflect on the usefulness and application of such strategies as using split-screen response and/or note-taking/note-making, searching the Internet and taking notes on a word processing screen, doing "invisible writing" to break habits that block writing fluency (Strickland, 1997), evaluating and critiquing web sites in writing (then sharing their written results with their peers), and participating in videoconferences with other universities.

The critical element in the infusion of these technology activities in the Teaching Writing class is that before, during, and after the experiences, Carol and the students reflected on the value of the activity. Then they considered various ways of applying those activities in a real middle school classroom. Why, according to what we know from English language arts pedagogy research and informed theory, would these experiences benefit the learning of the middle school students? What would they gain from using computer rather than paper and pencil technology? How could the experiences be modified if the classroom had only one computer? three computers? no computers, but a computer lab down the hall? The incorporation of reflexive thinking assured that the preservice teachers were not only answering the "What" question but also considering the "So What" and "Now What" questions.

Building on Experiences

When the students from the Teaching Writing Across the Curriculum class entered the Methods class this fall, Carol and Judy sought to build on the students' skills and also stretch them a bit. However, the class was not scheduled in the computer lab. Instead, Carol, Judy, and the students used a mobile classroom cart which included wireless computers complete with Internet access via airports, a teacher computer with display capability, and a portable printer. The students quickly learned to set up the cart, hook up the Internet access, use both the MACs and PCs, and use the demonstration computer. They also determined how best to set up the classroom so that every student could participate and see both the front and back of the classroom, dual foci for projection and discussion. Even though students had valuable experience with this equipment and quickly made connections about how such wireless technology could be a tremendous advantages in schools, neither they nor Carol used the computers as readily as they did in the computer lab where there was no danger of batteries being dead or other quirks being encountered. Although that class has not yet ended, we project that Carol and the methods students will use the technology in class much less often than they did in the Teaching Writing class.

Besides using computer technology to critique web sites, do research on the Internet, and view various software programs, Carol and the students embarked this semester on a project to develop lesson plans appropriate for teaching Mark Twain's *The Adventures of Tom Sawyer* to middle school students. After reading the novel and perusing web sites, the class visited Stephen Railton, an English professor at the University of Virginia who has created a series of digital archives that he uses in teaching his university classes on Twain. The preservice teachers visited his class on the day they were discussing *Tom Sawyer*; they observed and participated in the class. Students are now creating lesson plans for teaching *Tom Sawyer* with middle school students by using the digital archives (http://etext.virginia.edu/railton/tomsawye/tomhompg.html).

These lessons, along with the preservice teachers' work from this semester, will be posted on web sites they are currently developing as part of their teaching and technology portfolios. The web sites will include an introduction, various types of lesson plans, student teaching unit plans, a teaching philosophy, and lessons which include technology infusion. [Although these web sites are not currently posted, web sites from former Methods students can be found at http://www2.ncsu.edu/classes/eci430001.]

Student Teaching and Beyond

Besides continuing to support and guide preservice teachers' infusion of technology in their exemplary English language arts teaching, we want the students to use materials from their own web sites in their student teaching and with their cooperating teachers. However, from our work in schools in our areas, we know the challenges our preservice teachers will be facing as they attempt to infuse technology seamlessly into their teaching. Many schools have computer labs halls away from the content classrooms, and often these labs are reserved for "computer classes" (keyed to the eighth grade computer competency test). This phenomenon was validated when the students went into area middle schools to determine what computer technology exists and what is actively used. By and large, students found few computers in classrooms and even fewer teachers using the computers in their own teaching. Rather, they found computer labs that had to be reserved far in advance and teachers who used technology at home but not as an active part of their teaching.

Amelia's observations and studies of area middle schools confirm that schools face challenges of equipment shortages, outdated or malfunctioning equipment, and often only one computer lab for a thousand students. She also reports that, although there are often highly committed technology resource teachers in the schools, they cannot take care of all the demands for both their time and the equipment. Teachers face the greatest challenge in that they have little time to learn and then figure out ways to use technology in their own teaching.

Student teachers who, as a result of the increased infusion of technology into content methods courses, view technology as a positive teaching tool and are ready to use technology in their teaching. If their cooperating teachers use technology and are not intimidated by the computer and/or computer lab, students teachers are much more likely to implement what they know in their teaching. However, one surprising variable we have discovered is that often student teachers' use of technology is stymied by middle school students' not having their "technology policy" permission slips signed by parents. If students do not have these permission forms filed at the school, they cannot fully participate in the class activities; teachers and student teachers are hesitant to use technology in such circumstances.

Research Update

To date, the cohort of students who are about to enter student teaching acknowledge that they will never know everything about technology because, according to Alice, "even the saviest technology people do not know everything." They believe they have "broken down [the] barriers of insecurity in using technology," (Rose) and will, as Paula suggests, continue to "work on those 'stumpers' "--i.e., tools she is not yet completely comfortable using independently.

Encouraged to discuss ways in which they intend to use technology in their teaching, even the students who have philosophic concerns about technology interfering with the human touch acknowledge ways to "bridge" people across the world through technology. Barb says she will "embrace [technology], look at it and manipulate [it] as a tool for empowerment." She wants to have students learn about global issues and reach out to people who might not be reachable in any other way than through email. Her students, then, will "form relationships and establish bonds, which may open new dialogue" among groups. By examining the motivations and intentions of email, web sites, and technology, they will become critical users.

When these students are asked to list the kinds of technology tools they will use in their own teaching, they include student-created web sites, real-time chats, videoconferencing, digital archives, writing process through computers, E-PALS connections, global connections with other cultures, scavenger hunts, and numerous activities we have used in both classes. This list is a far cry from the blank screens of the students' first narratives. They see the potential for enhancing their teaching through technology, and they know they will be continuous learners as well as teachers.

Challenges to Technology Infusion

Judy, as a result of her work with Carol and other pedagogy content specialists at the university, notes that the initiative to infuse technology into teacher preparation poses special problems for pedagogical content specialists. Professors like Carol have been preparing preservice teachers for many years. Now they are called upon to prepare future educators to be technologically literate while they are also making the transition to new forms of instructional delivery. They face such obstacles as 1) insufficient personal knowledge and skills in technology, thereby creating anxiety and frustration that accompany any learning curve; 2) expecting themselves to model and infuse technology skills before they have mastered the skills themselves; 3) inadequate time to research underlying principles upon which successful practice can be based.

The challenges facing the pedagogical content specialists prompt equal challenges for instructional technology specialists who may, as graduate students, be paired with professors to assist them. Thus their collaboration time is limited because of the demands of both their roles. And, although individualized, just-in-time training may seem realistic and beneficial for personal growth, these teachable moments may not be sufficiently comprehensive. At the same time, the technology assistant's expertise may not be in the same area as the professor, thereby establishing the necessity for collaborative planning and learning. In such situations brainstorming ideas and strategies that are relevant, engaging, and successful for both the instructor and the students is critical.

Conclusions

The primary goal of teacher preparation should be that the infused technology appear seamless and be used only as it improves teaching and learning. However, basic computer skills are necessary before the learners (whether they be professors or students) can comfortably grasp and employ advanced processes. Both assistants and professors need to allow time for basic skill development through short lessons during class as well as applying the skills to the content pedagogy itself.

In our experience, the professor-assistant-student trio has been both rewarding and challenging. Every person in the triptych is both a learner and a teacher; therefore, each person serves several different roles. The teaching/learning field is level and shared; the preservice teachers then see an active model for technology infusion--one which requires an equal sharing of roles and responsibilities and one which honors the myriad opportunities to fill blank screens with full directories.

References

Pope, C. & Golub, J. (2000). Preparing tomorrow's English language arts teacher today: Principles and practices for infusing technology. *Contemporary Issues in Technology and Teacher Education, 1* (1), 89-97.

Strickland, J. (1997). *From disk to hard copy: Teaching writing with computers*. Portsmouth, NH: Boynton/Cook, Heinemann.

A Technology Consultant Model Implemented In A Project-Based Pre-Service Teacher Education Program

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Introduction

A recent national survey on the preparation of new teachers to use information technology (Moursund, 1999) reports that most college and university faculty do not model the use of information technology skills and most student teachers do not routinely use technology during field experiences. Topp's (1996) also revealed that recent graduates of teacher education programs felt that their preparation for using technology was inadequate because their programs did not include modeling of technology uses in methods and general education classes. Almost certainly related to the problem of limited faculty modeling of information technology in the university setting is the fact that faculty who adhere to a traditional professorial role may intentionally avoid using technology, fearing that it will reveal their lack of expertise and undermine their instructional authority. Moreover, the fear of appearing technologically inept is magnified by the familiarity and experience students frequently have using technology in other settings. Ironically, the very technology skills we hope to develop in students may undermine efforts to introduce new teaching technologies to classrooms by intimidating teachers. The traditional professorial model simply will not work under these circumstances and that, in part, seems to be the reason there is such widespread interest in alternative approaches to teaching with technology (Duffy, & Jonassen, 1992). The professor as a facilitator of learning is one particularly powerful example that has been used with technology-supported case analysis (Cognition and Technology Group, 1990; Risko, 1995) and problem-based learning (Savery, & Duffy, 1995; Barab, Hay, & Duffy, 1998).

The Project

This federally funded project (Preparing Tomorrow's Teachers to Use Technology, PT3) places digitally literate pre-service teacher education students and experienced, highly effective educators in a mutually supportive, collaborative environment. The ultimate goal of the project is to increase the number of in-service educators modeling effective integration of technology for our pre-service students both in classes across the university and in education field experiences,

Students participating in the grant (consultants) enroll in a 4 credit course, IST 464 Consultation: Technology Applications in Education which meets once a week for two hours and includes activities and guidance in the development of consulting skills and educational technology applications. This course is designed to help students integrate knowledge from any education major/minor with educational applications of technology.

Student consultants work for 10 hours per week throughout the semester in an applied field setting in either an urban or a suburban school system, or at Oakland University, with experienced educators (clients) who are interested in increasing the integration of technology in their classes. The consultants' goals are to help the clients learn technology integration skills that support the clients' teaching styles and curriculum needs. In addition, as they learn about what an already effective teacher actually faces in his/her efforts to integrate technology our students develop strategies to overcome these inherent challenges.

Major Activities and Findings

September through December 1999 was spent getting project personnel, systems, and preparation for the pilot offering of the technology consultant course in place. From January through April, 2000, primary personnel hiring was completed, the project website was launched and the technology Consultant course was piloted with eight pre-service teacher education students (consultants). These student consultants were matched with five university professors and three K-12 teachers (clients). Many lessons were learned as a result of the pilot offering of the course and were implemented in the first full offering of the Consultant course which occurred in Fall of 2000. Eighteen pre-service teacher education students enrolled in the Consultant course and were matched with three university faculty members and fifteen K-12 educators.

As a part of the project evaluation, all consultants and clients were interviewed at the end of the Fall semester. Despite a number of challenges which will be identified below, all participants described the experience as extremely worthwhile, and all would recommend the experience to their peers. When asked of the likelihood of the project experience changing classroom teaching there was a unanimous positive response. Consultants were very strong in their certainty that the consultant experience will impact their use of technology in the classroom. In particular, consultants indicated that they had crossed a "confidence threshold", a "competence threshold", and had come across many ideas of how to integrate technology into the classroom. Without a doubt, fundamental mental shifts have taken place in the awareness of the project consultants. Clients expressed similar sentiments. Many commented that it was so different having on-going technology support as opposed to sporatic technology workshops. They felt that the support enabled them to work through some of the barriers that prevented them from actually implementing applications they had learned about.

Challenges encountered included: lack of technical resources in client environment, lack of time on the part of the client, adjustment to the role reversal between experienced educators and pre-service teacher education students in the client and consultant roles, potential role conflict when students were also doing traditional field placements with the same K-12 educator, and competing demands of work, family and other courses on time of student consultants. This last issue, busy student schedules, is the project's greatest hurdle in recruiting students to enroll in the Consultant course. Our challenge is to create a "don't miss" reputation for the course in the minds of our potential students.

In summary, we believe that the model presented in this paper, provides a long-term solution to the "lack of modeling and use of technology in pre-service teacher education" problem in university classrooms and in field placements. Essentially, in this model pre-service education students help university professors and in-service teachers create effective learning environments for them, and ultimately, for their own students.

References

Barab, S. A., Hay, K. E., & Duffy, T. M. (1998). Grounded constructions and how technology can help. *TechTrends, 43(2)*, 15-23.

Cognition and Technology Group (1990). Anchored instruction and its relationship to situated cognition. *Educational Researcher, 19*(6), 2-10.

Duffy, T. M. & Jonassen, D. H. (1992). *Constructivism and the technology of instruction: A conversation*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Moursund,D. (1999). *Will new teachers be prepared to teach in a digital age?. A national survey on information technology in teacher education*. Santa Monica, CA: Milken Family Foundation.

Risko, V. J. (1995). Using videodisc-based cases to promote preservice teachers' problem solving and mental model building. In Wayne M. Linek & Elizabeth G. Sturtevant (Eds.), *Generations of Literacy. The Seventeenth Yearbook of the College Reading Association*. Carrollton, GA: College Reading Association.

Savery, J. R. & Duffy, T. M. (1995). Problem based learning: An instructional model and its constructivist framework. *Educational Technology, 35*(5), 31-38.

Topp, N. (1996). Preparation to use technology in classrooms: Opinions by recent graduates.

Visualize This:
PT3 Project InSight Develops Three Resources to Promote Visual Communications

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Abstract: As part of its activities funded by the U. S. DOE as a PT3 Implementation Grant, Project InSight, led by a consortium at the University of West Georgia, has three objectives to promote more visual communication of ideas and skill training among preservice students and faculty. These objectives include: (1) expanding a video-based school-to-university network link among six partner school districts and the university; (2) developing a series of video demos illustrating effective instructional uses of adaptive/assistive technologies; and (3) developing virtual reality and 3D environment examples to illustrate diagnostic applications and instructional uses of these emerging technologies in meeting special needs of students with disabilities. This presentation will describe the Year 2000-2001 activities and progress on accomplishing these objectives, and demonstrate the products developed to date for each.

Introduction

As the University of West Georgia developed a three-year Implementation Proposal as a follow-up to its Capacity-Building grant, it became evident that more visual communications were destined to play an increasingly greater part in our efforts to infuse technology into our preservice program. After considering our needs and the potential role of "face-to-face communications at a distance," we designed three different activities that would further visual communications and set the stage for similar activities in the future.

Expanding a Video-based School-to-University Network

One of the most successful efforts in the Capacity Building phase of our PT3 work was putting in place and testing a streaming video link between a local school district and the university. Evaluations of this activity reflected a high level of excitement shared by university and K-12 faculty about the link's potential. It became clear that many of us felt that more visual communications can improve the quality of teacher education in two key ways:

- By immersing preservice teachers into classroom activities at a distance; and
- By allowing teacher education faculty to include distant K-12 classroom activities into on-campus learning.

During the initial year of the Implementation grant (2000-2001) year, we are involving schools in additional partner districts in the network by accomplishing the following steps:

- Assisting our partner school districts (with funds and technical expertise) to obtain and implement high-speed connections between their sites and ours;

- Testing the links for each school/district site with a basic set of instruction-related activities we have designed to make use of the current link in classes and during internships;

- Initiating additional communications capabilities in schools to supplement our streamed video capability with additional video capabilities over the Internet (e. g., with EnVision); and

- Integrating the video activities as components in our teacher education program.

Developing a Series of Videos on Adaptive-Assistive Technologies

A need that has been identified and acknowledged by many preservice programs is additional training to prepare non-special education content area teachers to meet the needs of children with mental and physical disabilities. All too often, teachers receive substantially less training than they need in this area, not because they or their programs consider it unimportant, but because of limitations on the number of hours they can take in their programs. Courses in their content areas and in basic methods of teaching children in certain age groups must take precedence over other courses and skills.

To make it more feasible for faculty to provide training within current courses that will prepare preservice teachers to meet students' special needs, we are developing and providing training to faculty on a set of transportable, easy-to-manage materials they either can use in courses or have students use outside class. This set of materials would combine existing print and video materials with the video-based demonstrations we will develop. The proposed video demonstrations would make the content and delivery of this information more visual and, thus, easier to use outside class. They also would provide more graphic illustrations of how teachers can use technology-based tools to meet the special needs of students in inclusion classrooms. Special Education faculty will work with local teachers to develop these videos. Steps to accomplish this task include:

- Obtaining copies of existing materials on this topic;

- Developing video demos to illustrate technology uses and package it with print materials;

- Placing videos in our Support for Infusing Technology Center and disseminate them via our web site; and

- Providing presentations with infusion suggestions to teacher education faculty in all areas.

Developing Virtual Reality (VR)/3-D Examples That Meet Special Instructional Needs

Virtual reality (VR) technologies and other 3D environments have been talked about for years in terms of their potential for meeting needs of students with disabilities. As Roblyer & Cass (199) noted, "VR could allow students with disabilities to learn certain skills:

(a) with greater physical and/or emotional safety,
(b) in a more timely and cost effective way,
(c) in ways that do not highlight their disabilities,
(d) in a manner that does not interfere with the general public, and
(e) in a way that better meshes learning and learner characteristics."

Yet this obvious potential remains largely untapped. Two primary reasons have accounted for this discrepancy. First, not many educators have skills required to design VR programs. Second, the cost of designing and implementing good quality VR capabilities has been relatively high.

However, recent developments in VR software have made it increasingly feasible to develop VR environments with relatively low levels of technical expertise and at a comparatively reasonable cost. In order to illustrate the uses of VR environments in meeting special learning needs, we are using SuperScape's *VRT Development Software* to develop two kinds of model VR environments with this lower-cost software:

- **Virtual Shopping** - Using video footage of popular shopping areas, we are developing an environment to train students with mild mental handicaps to learn and practice a series of shopping and purchasing activities. This training product is being designed and developed in conjunction with K12 special education faculty and teachers. Once in draft form, it will be field tested with students and evaluated for its transfer to real situations.

- **Spatial Mobility Training** - To help students with physical and mental challenges learn to negotiate spaces in buildings during emergency and non-cmcrgcncy situations, we will design a model simulations in a school building, test it out with students with physical and mental challenges, and evaluate them for transfer to problem solving skills in buildings under real conditions.

Summary

All these activities are in keeping with our project's theme of "InSight" we have gained into the resources that are needed by preservice faculty and students if they are to infuse technologies into their instruction meaningful ways. During the presentation, we will discuss these needs, our insights about how to meet them, and the tasks we have undertaken thus far. Finally, we will demonstrate products we have developed to date under each objective.

Faculty Development as an Agent of Technology Change: Implementing a Shared Vision

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Abstract: This paper will describe first year efforts in reference to a PT3 Implementation grant. The grant promotes an alliance between two very diverse institutions of higher education. One university is a historically white public institution while the other is a small historically black private institution. Both institutions are implementing a series of initiatives to transform their respective teacher preparation programs. Using shared resources, these initiatives include an extensive program of faculty development in instructional technology for both arts and sciences and teacher education faculty. Significant changes to both institutions technology infrastructure provide faculty, preservice teachers, and classroom teachers with significant technology support, including individual assistance and a lending library of software and portable technologies. Using these support services, university faculty are modeling the use of instructional technology in their courses and increasing the use of technology into course assignments.

Introduction

A historically white public institution and a small historically black private institution partner in their faculty development efforts as part of a PT3 Implementation grant beginning the 2000-01 academic year. Through this grant, two diverse universities are jointly implementing a series of initiatives to transform their respective teacher preparation programs. Significant changes to instructional technology facilities at both universities are providing faculty, preservice teachers, and classroom teachers with significant technology support. Using these support services, faculty will help preservice teachers develop the needed knowledge and skills to infuse technology into content-based instruction.

As part of first year initiatives under the PT3 grant, one focus has been on ensuring that faculty receive training on the use, operation, and integration of technology into their respective curriculum areas. A recent survey of faculty (conducted during a 1999-2000 PT3 Capacity Building grant) at both institutions revealed a pressing need for improving faculty development and for providing assistance with infusing technology into teaching. Faculty also reported reasons for resistance to integrating technology throughout the teacher education curriculum. Approximately half the faculty identify classroom resources, costs of hardware and software, inadequate time for training, lack of motivation and knowledge, and costs of ongoing support systems as barriers to more use of technology. Other comments state that while training sessions are available, they may not be convenient or targeted to specific needs related to content and the skill level of each faculty member. This suggests that general training sessions need to be followed by opportunities for individual consultation to target training to meet specific needs. A primary need for both faculty and preservice teachers is enhanced availability of intensive training.

Solutions: A Starting Point

In an effort to respond to faculty needs for technology training and assistance with the use and integration of technology into curriculum, the following initiatives are currently being offered: *Goal One*: Offer technology resources, training programs, support and other opportunities to faculty at both universities.

To accomplish goal one, 16 faculty per year in teacher education programs and 14 faculty per year in Colleges of Humanities and Sciences at both universities are being provided with course release time.

This release time will provide faculty with opportunities to develop and infuse instructional technology into their courses and to serve as leaders in their respective disciplines. Because both universities require that prospective teachers earn a BA or BS in a Humanities and Science major, it is imperative that H&S faculty infuse their use of technology into their curriculum. While the release time initiative is just underway, a previous Capacity grant awarded during the 1999-2000 academic year has demonstrated the strong effect that release time can have on the use and integration of technology into instruction.

Faculty who have obtained release time over the 1999-00 year have actively learned about technology and incorporated it into their respective disciplines. Faculty represent a variety of program areas: elementary education, middle education, high school education, and special education. For example, a professor of science education has learned to use the new QX3 computer Microscope and then infused its use into his courses. His students, in turn, have used loaner microscopes to teach lesson in area schools.

A professor of special education has devoted time to learning about assistive technology and software. In his classes, the professor is demonstrating touch screens and other hardware devices that provide a variety of methods for inputting information. Second, he is demonstrating to preservice teachers how computer operating systems can be programmed to accommodate students with special needs.
Humanities and Sciences professors have also actively learned about infusing technology into their classes. A professor of English is using Web Course in a Box to deliver instruction to her students and to model how technology can be used for instructional purposes. This same professor is also serving as a technology resource in the College of Humanities and Science, regularly visiting fellow professors to demonstrate the use and integration of technology.

These representative samples show how our Implementation Grant is allowing university faculty across disciplines opportunities to learn about new technologies; infuse technology into courses; share technology skills and strategies with their students; and serve as mentors to other faculty who wish to expand their knowledge about effective uses of technology for instruction. VCU and VUU faculty are also collaborating on technology infusion projects, technology conferences, seminars, and other activities that encourage faculty from both universities to learn from one another.

Faculty who have obtained release time, or are in the process of requesting a course release during the grant period require a great deal of guidance, training, and one-on-one assistance with technology. Hence, Goal Two: Improve the operation of the Department of Education Computer Lab at VUU and the Instructional Technology Center (ITC) at VCU.

VUU is expanding its collection of multimedia capable laptops and enhancing its collection of peripheral equipment such as scanners and digital cameras. At VCU the ITC has extended its capabilities by adding an "Infusio" Laboratory that provides "hands-on" assistance for faculty at both universities to incorporate technology into their classroom instruction. The Infusio Lab will also serve as a distribution system for the checkout of hardware and software technology resources.

The School of Education at VCU, for example, currently operates an Instructional Technology Center (ITC) that provides an initial base of technology support and equipment for students, staff, and faculty. The Center houses thirty computer workstations along with scanners and printers. Digital and video cameras, some educational software, and other technology-related resources are available for checkout. Some faculty assemble students in this facility to demonstrate the integration of technology into K-12 educational settings. In addition, workshops geared for faculty and staff provide opportunities to share ideas and technological innovations with peers.

The facility is often used as a classroom space by professors who utilize technology throughout their coursework. ITC personnel are also responsible for managing portable equipment and cataloging and checking out educational software programs. As a result of Virginia Commonwealth University's commitment to infuse technology throughout its curriculum, the ITC has experienced a large increase in use and an increased demand for instructional support provided by ITC personnel. The growth in usage of the ITC has led to a need for more physical space and staffing. For instance, a multi-year grant awarded to us in Fall of 1999 has provided us with funds to purchase new educational software titles. Our growing software collection requires a significant time investment by current personnel. Titles must be cataloged, stored in a secure location, and checked out to faculty, students, and teachers throughout the greater Richmond area. The expansion of software selection has increased the checkout of the materials by faculty and students.

To accommodate the needs of our university faculty, preservice teachers, and classroom teachers, the current ITC is being enlarged by adding a Laboratory center known as "Infusio". Three graduate students are employed to manage and operate the facility. One of these graduate assistants will receive an increased stipend and be designated the lead director of the Infusio lab.

Personnel employed in this facility will have four major responsibilities: 1) Provide "hands-on" assistance for faculty to incorporate technology into their classroom instruction; 2) Offer training and support to student teachers and practicum students, with an emphasis on infusing technology into curriculum; 3) Provide technical assistance on the use of portable and handheld technology for faculty and students; 4) Provide greater access to and security for our expanding software collection.

Staff at Infusio will also be responsible for creating a Web site that will serve as a master information medium for all grant participants. The Infusio Web site will disseminate ideas, lesson plans and strategies for infusing technology into various curricula. Additionally, discussion forums will allow consortium partners to share ideas and concerns with others in the field. This model of asynchronous communication will foster the sharing of ideas across boundaries. Synchronous chat rooms will allow grant participants to share ideas, concerns, and general information in a "real-time" environment. Interested parties can discuss ideas without assembling a large group of participants from several geographic locations.

Conclusion

The central component of our project is that it allows us to provide systematic training and ongoing support for faculty to develop and apply technology skills to enhance their teaching and, specifically, to model effective technology-related instructional strategies. The development and implementation of cross-institutional experiences are fostering a sharing of ideas, resources, and technology expertise to accomplish a common mission – to use technology as one tool to meet the needs of diverse K-12 student populations.

Simultaneous Renewal in Teacher Education: Strategies for Success

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Abstract: To adequately prepare preservice teachers to use technology in their own classrooms, teacher education programs must develop comprehensive models for technology integration that include meaningful uses of technology to improve and renew the teacher education curriculum. In addition, model K-12 sites must be fostered where preservice teachers can practice using technology to create active learning environments for students. Integrating technology effectively into teacher education courses and working collaboratively to create rich technology field experiences are both tremendous challenges for teacher education programs. Given the needs and challenges that both K-12 schools and teacher education programs face with respect to effective use of technology, it appears that both entities would benefit from collaborative work to address these needs. John Goodlad's theory of simultaneous renewal for colleges of education and K-12 schools provides a useful framework for this type of collaboration. This paper describes several strategies that faculty at Iowa State University have used to successfully integrate technology throughout the teacher education program and in K-12 classrooms.

A primary focus of the majority of teacher education programs is to graduate teachers who have had meaningful experiences learning with technology in their courses and who have worked in technology-rich K-12 classrooms where children actively use technology to facilitate the learning process. Throughout their preparation program, preservice teachers must experience, observe, analyze, critique, and learn with technology. As a result, teacher education programs must develop comprehensive models for technology integration that include meaningful uses of technology to improve and renew the teacher education curriculum. In addition, model K-12 sites must be fostered where preservice teachers can study the integration of technology into teaching and learning. Integrating technology effectively into teacher education courses and working collaboratively to create technology-rich field experiences are both tremendous challenges for teacher education programs.

Given the needs and challenges that both K-12 schools and teacher education programs face with respect to effective use of technology, it appears that both entities would benefit from collaborative work to address the problems. John Goodlad's theory of simultaneous renewal for colleges of education and K-12 schools provides a useful framework for this type of collaboration. Goodlad has observed:

> "What comes first, good schools or good teacher education programs? The answer is that both must come together. There are not now the thousands of good schools needed for the internships of tens of thousands of future teachers. The long-term solution - unfortunately, there is no quick one - is to renew the two together. There must be a continuous process of educational renewal in which colleges and universities, the traditional producers of teachers, join schools, the recipients of the products, as equal partners in the simultaneous renewal of school and the education of educators." (Goodlad, 1994, p. 2)

Iowa State University is using Goodlad's theory to the guide the effective use of technology for learning and teaching throughout its teacher education program. Technology as a tool to improve teacher education is the primary vision that drives the comprehensive technology in teacher education program in the College of Education at Iowa State University. This approach involves technology integration initiatives and strategies that impact the entire teacher education curriculum, including collaborative efforts with other colleges and K-12 schools. In recognition of these efforts, the American Association of Colleges for Teacher Education (AACTE) presented Iowa State University with the "Best Practice Award for the Innovative Use of Technology" for the year 2000.

This paper will begin with a brief overview that summarizes several technology integration strategies that have been used with Iowa State faculty and students for the past ten years. Then, the paper will describe additional integration strategies that have been designed as part of Iowa State's Preparing Tomorrow's Teachers Today (PT3) implementation grant.

Background: A Comprehensive Approach to Technology and Teacher Education

For over a decade, technology use and integration has been a major initiative for faculty and students in the College of Education at Iowa State University. Several technology integration initiatives have been designed that enhance faculty development, teacher education courses, field experiences, and extracurricular activities for students. These initiatives include a nationally-recognized technology mentoring program for faculty, a school-based technology integration model that creates technology-rich field experiences for students, a minor in educational computing, and teacher education courses in which faculty members model effective uses of technology.

The Department of Curriculum and Instruction in the College of Education has identified, designed, and implemented technology experiences that enhance teacher education courses, field experiences, and extracurricular activities for students. These experiences have been developed in the context of a large department (35 FTE faculty, 30 joint-appointment faculty, and 14 adjunct or temporary instructors) with approximately 1000 undergraduate elementary education majors and 450 secondary education students. In 1991, the college voted to include technology integration as a major initiative. Both the dean of the College of Education and the department chairs associated with teacher education provide leadership and commitment to the goal of effective technology use in teacher education. In this context, several programs have been collaboratively developed to support technology integration efforts in the College. The following sections provide brief summaries of programs that were developed to support this initiative.

Faculty Development: Technology Mentoring Program

A primary goal of the College of Education's technology integration plan is to provide all faculty with the tools they need to make technology infusion a reality. In 1991, a mentoring program was established to assist faculty interested in technology integration, as well as to provide students with opportunities to develop individual, professional relationships with faculty members in their program. Cited as an exemplary national program in the 1999 CEO Forum Report, the mentoring program has resulted in successful professional development for more than 70% of the teacher education faculty.

Course and Curriculum Redesign: Technology Integration in Methodology and Content-Specific Courses

Not only are ISU preservice teachers required to design and use technology to complete course assignments, but they have many opportunities to observe faculty members modeling effective uses of technology in their courses. Some examples include:

- reading faculty members illustrate literacy assessment and diagnostic tools by using digital video case studies
- special education instructors use laptop computers to teach how preservice teachers can access and fill out electronic forms to document the progress of special needs students
- preservice teachers in social studies methodology courses use e-mail and discussion groups to communicate with preservice teachers at other universities to discuss themes and issues related to the social sciences

College of Education faculty members also work collaboratively with College of Arts and Sciences faculty and College of Engineering faculty to design courses that connect content and pedagogy using technology. For an introductory science course, meteorology and education instructors have created computer-based simulations designed to engage students in constructivist, inquiry-based learning activities. Faculty in the Colleges of Engineering and Education have implemented a "Toying with Technology" course that actively engages teacher education students in the design and construction of simple models of real-world systems.

Field Experiences: Collaborative Learning Communities

Based upon the faculty technology mentoring program, a similar program was extended into PreK-12 classrooms. This technology integration model promotes the collaborative efforts between preservice and inservice teachers. Participants include teachers and students from school districts, instructional technology consultants from an Area Education Agency (AEA), and faculty and students from the College of Education. This model provides school-based opportunities for preservice and inservice teachers to work together as mentors to examine methods for integrating technology effectively into classroom learning environments and helps to establish technology-rich field experiences for students.

In-depth Preparation: Educational Computing Minor

A minor in educational computing is offered by the College to provide in-depth experiences for students who wish to pursue leadership careers in technology. Established in 1984, this minor provides preservice teachers with comprehensive learning experiences that prepare them to use technology throughout the PreK-12 curriculum. Over one hundred students are currently enrolled in the minor. They take fifteen credit hours of coursework that includes classroom applications of technology, distance learning and the Internet, PreK-12 technological innovations in engineering, and field-based practicums in technology-rich schools.

Extra-curricular Activity: The Educational Computing Club

Undergraduate students are encouraged to develop leadership skills and pursue outside activities that contribute to their professional growth. Established in 1995, The Educational Computing Club (TECC) is an undergraduate student organization whose membership consists primarily of preservice teachers. Each year, TECC members organize and participate in a variety of activities. Examples of these activities include working with teachers and students in PreK-12 classrooms; assisting faculty, staff, and students in the College of Education with the use and integration of technology; writing grants to secure funding for technology; and sharing expertise by presenting ideas and projects at state and national conferences.

The technology in teacher education initiatives summarized here were designed to develop and define specific technology tools and instructional models that prepare teachers who can use technology in innovative and effective ways in classrooms. Even though this multi-faceted set of approaches has already positively impacted the teacher education program, additional strategies have begun to evolve from and expand upon these initial activities because of the PT3 support. In the next section, some additional integration strategies that have been initiated in the department will be described.

Additional Strategies for Successful Technology Integration in Teacher Education

The purpose of Iowa State's PT3 implementation grant entitled, *Technology Collaboratives for Simultaneous Renewal in Teacher Education*, is to create a strong collaboration between a school of education and K-12 school districts as both work simultaneously to infuse technology into teaching and learning. One goal of the project is to establish a collaborative learning community where there is a sharing of expertise and resources to rethink how technology can be integrated and used effectively in college and K-12 classrooms. Specifically, this collaborative effort embraces a vision of technology as a tool to facilitate renewal in both a teacher education program and K-12 schools. Because of this vision, several grant initiatives have significantly contributed to expanding and enhancing the use of technology throughout the teacher education program and in the partner schools. These strategies include: 1) establishing a cohort model preservice teacher program, 2) assisting 'technology scholars' (teacher education faculty) as they redesign their courses to infuse technology experiences for students, 3) working with a master teacher from the collaborating school district, 4) increasing the quantity and quality of K-12 field-based experiences using technology, and 5) providing collaborative activities to support K-12 teachers.

Technology Cohort Group of Preservice Teachers

Based upon the successful Project Opportunity cohort model developed at Iowa State University, a technology cohort of students in teacher education (TechCo) has been formed. Twenty-eight students were selected based upon their academic credentials, previous work with children, and technology interest and experience. This cohort group of preservice teachers will take their teacher education classes together beginning their sophomore year. During fall semester 2000, these twenty-eight students were enrolled in a field experience course that included twenty-four hours of field work in schools and a one-hour weekly campus seminar.

TechCo students will take each of their professional education and methodology courses as a cohort. As TechCo students progress through the teacher preparation program, they will enroll in the several courses (teaching strategies, methodology, field experiences, inquiry, and capstone) as a group. In addition, the TechCo students will take four courses required for the educational computing minor and will have the option to take the additional two courses to complete the minor's requirements.

To promote the use and integration of technology in courses and out in the schools, the ISU preservice teachers in this cohort were given the opportunity to purchase Apple iBooks at a discounted price. Twenty-one of the twenty-eight students purchased iBooks. Additional iBooks were purchased to provide access to students for checkout. The iBooks have wireless networking capabilities available both on campus and in the partner school sites. Having access to this technology has promoted and supported a 'wired learning community' where preservice teachers are observed using the iBooks in a variety of settings: classrooms, hallways, outdoors, and at home.

Teacher Education Faculty Technology Scholars

Iowa State's faculty mentoring program is well documented. For over ten years, teacher education faculty in the Department of Curriculum and Instruction have participated in a mentoring program that provides them with graduate and undergraduate student support as they learn to use technology. Even though the ISU mentoring program has been extremely successful, teacher education faculty members still need more time to learn about specific technologies and to develop technology integration ideas for their classes.

Building upon the existing mentoring program, teacher education faculty were given the opportunity to participate in a professional development activity designed to provide them with an extended period of time to focus on sharpening their own technology skills and to design technology experiences for students that would enhance their courses. So far, six faculty members participated in this activity. Each faculty member was given the option of a one-course release or one-month summer salary. These faculty members were soon nicknamed the 'technology scholars' because of their intense focus on developing meaningful ways to use technology that informs scholarship and practice.

In addition to providing faculty with time to work on these initiatives, other resources were available to support their efforts. A graduate student in curriculum and instructional technology provided additional support and one-on-one mentoring upon request. The graduate student was also available for course material and resource development. In addition, the 'technology scholars' met as a group with PT3 project directors for an hour each week to share their weekly celebrations. These sharing sessions were extremely valuable because the technology scholars gained ideas from each other as ideas were exchanged and discussed.

Master Teacher from Collaborating School Site

In order to facilitate communication between the university and the collaborating school sites, a master teacher from the participating school district was hired. The teacher was selected based on her interest in the position and because of her effective use of technology in her own classroom. The master teacher spends half of her time working in the schools and half of her time on campus at Iowa State. While at the collaborating school sites, the master teacher provides technology support for the inservice teachers involved in the project. The master teacher conducts model lessons in teachers' classrooms, facilitates workshops for teachers, and provides one-on-one consultation with teachers when requested. At Iowa State, the master teacher teaches one lab section of the required introductory instructional technology course and helps organize and schedule the collaborative project activities between the school sites and the university. Having a master teacher working as a liaison between the university and the schools has been an essential and a necessary component to successful project implementation.

Increase the Quantity and Quality of K-12 Field-based Experiences Using Technology

Other project goals include providing additional and extended field cxperiences for preservice teachers and creating model technology-rich field sites for field-based experiences. The school sites will provide opportunities for preservice teachers to use technology in K-12 learning environments for course practicums and field experiences. In order to increase the quantity of field-based experiences for preservice teachers, both teacher educators and inservice teachers have begun to redesign the structure of practicum experiences so preservice teachers can spend more time in classrooms while taking teacher education classes.

As indicated earlier, the twenty-eight TechCo students were enrolled in a field experience course that included twenty-four hours of fieldwork in schools. The primary purpose of this 'early' field experience was to begin working collaboratively with teachers in the partner schools and to observe teachers in PreK-12 classrooms (at times modeling technology use in classrooms). Instead of placing each preservice teacher with one teacher for the entire experience, each student was placed with a different teacher for a nine-week rotation. Using this format, the ISU preservice teachers observed nine different teachers teaching at different grade levels (PreK-12). Students appreciated having this field experience early in their preparation program. Next semester, the TechCo students will have another field-based experience that will be connected to a teaching strategies course.

Collaborative Activities to Support K-12 Teachers

For change to occur and be sustained, personnel from both universities and schools must work together to implement and support school reform efforts that impact instructional strategies and technology use. A variety of staff development activities were designed to assist and support teachers' use of technology in classrooms at the partner school sites. These activities are delivered in multiple formats: traditional large group, classroom modeling, consultation and collaborative group settings. The most successful staff development strategy has been to schedule at least one inservice day per month at each school. Teachers are released from their classrooms for a 90 minute session, so they can work one-on-one with an ISU faculty member or an Area Education Agency (AEA) technology consultant. Prior to these sessions, teachers must submit a brief description of what they intend to work on during the session and how the activity is connected to curriculum standards and benchmarks.

Summary

Collectively, these integration strategies are positively impacting the use and integration of technology throughout the teacher education program at Iowa State University. Based in a teacher education program that is known for its work in integrating technology in teacher education, these combined efforts are providing the framework needed to sustain a technology-rich teacher education program. Using Goodlad's theory of simultaneous renewal as a foundation, this teacher education program is continually working in partnership with others to develop a comprehensive model that uses technology to facilitate teacher education renewal.

References

Goodlad, J., (1994), Educational Renewal, Jossey-Bass Publishers, San Francisco.

Meeting the Accountability Challenge—Electronically

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Abstract. The teachers who graduate from our nation's teacher education programs will face an increasing professional challenge of accountability in their classrooms. Public schools are hearing an escalating call to arms to raise the standards of the performance of our students. Raising the standards for our students translates directly into raising the bar for our teachers. High stakes tests for college admissions of high school students are not the only major benchmark of student success nowadays. Middle and even elementary school teachers are preparing their students for high stakes benchmark exams. Under the microscope of political and public scrutiny, teachers are being held directly accountable for their students' performance in ways that did not previously exist. Pre-service teachers need the immediate attention and support of the mentors who are preparing them to enter this high stakes arena. How do technology and accountability intersect teacher education?

The teachers who graduate from our nation's teacher education programs will face an increasing professional challenge of accountability in their classrooms. Public schools are hearing an ever-louder call to arms to raise the standards of the performance of our students. Raising the standards for our *students* translates directly into raising the bar for our *teachers*. Under the microscope of political and public scrutiny, teachers are being held directly accountable for their students' performance in ways that did not previously exist. High stakes tests for college admissions of high school students are not the only major assessment of student success. Middle and even elementary school teachers are preparing their students for benchmark exams. Pre-service teachers need the immediate attention and support of the mentors who are preparing them to enter this highly charged arena.

To ensure academic success for all students, educators need a clearly-defined curriculum. What objectives does our state, district, and/or standardized assessment tool measure? How can we know that what's being taught is what's being tested? How can we know that all our teachers are "on the same page"? With accountability mandates voiced more and more publicly over the years, states and districts have responded at different rates and different levels of urgency, with varying implementation strategies, timelines for curriculum development, and methods of holding teachers and learners accountable. Districts with well-established curriculum teams have found themselves in a continual cycle of curriculum revision: once a curriculum has been developed, it is only a matter of time before revisions and updates require time-intensive modification or even overall restructuring. State guidelines change. Teachers or administrators who were not part of the original development team enter the district. Key supporters of a curriculum revision leave. A different norm-referenced test is designated as the new high-stakes assessment tool. Even without the "given" of such external changes, internal data from local assessment, standardized tests, and classroom assessment by individual teachers call for updates and changes in a dynamic curriculum.

Most states have done an efficient job in providing documents outlining the expectations for students to the school districts and their teachers. This monumental task of curriculum development and realignment has traditionally been accomplished during summer months and late nights, with state, district, and local personnel teaming up to correlate massive amounts of information *by hand*. Curriculum teams work like Sisyphus to integrate all of the "non-negotiables," to ensure no objectives were eliminated, to set ups naturally progressive sequences with one grade taking responsibility for mastery, and to reduce redundancies to a minimum. The documents that result are often cumbersome and hard to implement. The sheer volume of a well-defined curriculum makes it hard to respond gracefully and swiftly to external and internal changes. And, if that weren't challenge enough, the relationship between the curriculum document and high-stakes tests is often unclear to the very people who will be directly implementing the curriculum—classroom teachers.

With increasing demands on time and professional resources, many districts began searching for more efficient ways to manage curriculum development, revision, and alignment to ever-changing mandates. I was part of the curriculum development team in one of those districts. We wanted to produce dynamic curriculum documents that clearly related what was being taught to what was being assessed on high-stakes tests, both at the state and national levels. We found that such documents *can* be produced and implemented—and that technology can help keep them current. technology equip pre-service teachers to engage in--and impact--this situation? Fort Osage School District, where I taught for <# of YEARS> before coming to EdVISION Corporation, used curriculum development software to create a fluid, working curriculum that helped increase student test scores up to 43%.

A Manual Curriculum

In 1996, I was working as a math teacher for a third year at Fort Osage School District in Independence, Missouri. Missouri had just sent out the "Show Me Standards" and, as part of the state review of school districts, required the integration of these standards into curriculum at the district level. I became involved in an intensive curriculum revision process as a member of the math curriculum team. Seven math teachers, ranging from grades K-12, met in the summer in a conference room. A lead teacher had been asked to guide the process in all areas to provide consistency. Because of my technical background, I was soon elected the "technical lead." We cut and glued, we argued and protested, and after a week had a document that we called our "curriculum." We soon realized that we needed a template in which to input all of the documents written. Somehow, I was chosen to design and implement a relational database for our curriculum guides. I spent the next 3 summers working on the writings and revisions of our curriculum.

Our curriculum team eventually involved almost 200 of the 350 teachers in the district in the writing process over those 3 summers. Teachers worked in content groups over the summers to develop documents that were consistent with the Missouri State Frameworks and had appropriate progression between grade levels. These three years were quite intensive, the culmination of a total of five years of developing and revising a curriculum by hand. The lead teacher and I were quite proud of what we had accomplished. Late in August 1997, we delivered seven 3-ring notebooks full of color-coded curriculum documents to each building principal and each board member got a complete set of the entire curriculum. The board members didn't want to take theirs home (seven notebooks must have been too much to contemplate). This should have been our first indication that these documents would never be used.

Undaunted, we placed our hope in the expected response from grateful teachers. We had worked so hard to accomplish this massive output, and had involved so many of our colleagues in the decision-making process, that we felt teachers would enthusiastically embrace the new guidelines. A few weeks into the school year, the lead teacher and I admitted we'd been wrong. Documents sat on shelves and were not being used. Teachers continued to teach the way they always had. There was no change-- except for the sag in the district shelves on which the notebooks sat.

The Electronic Curriculum

In August 1998, our Assistant Superintendent asked the lead teacher to sit in on a session of the Administrator's Back-to-School Meetings. Because I had been leading the technological side of the District's curriculum implementation, I was asked to sit in on the meeting as well. In this meeting, a representative from an educational software company presented a program that would design curriculum aligned to state standards *electronically*. We were reluctant to believe that a product could make alignments better than the teachers themselves in just a few clicks. We were even more taken aback when we were told that our district was going to purchase the program. Another shock came when the lead teacher and I learned *we* would be the ones to implement the new software into the curriculum process. My understanding of the technical processes driving the software had, in short, promoted me to implementation management of a district-wide initiative.

In the fall of 1998, Fort Osage purchased Curriculum Designer software from EdVISION Corporation (formerly Tudor Publishing Company) and set up a hands-on training workshop on campus. Our initial skepticism turned into jubilation. We realized we could take our existing document, transfer it into the program's database, and compare our document to the state standards, standardized tests, and state test that we gave in the district. What an exciting thing to actually *see* the objectives students would be tested on!

We put the curriculum so lovingly and laboriously created by teachers into the product and ran comparisons, matching Fort Osage objectives to the Missouri state framework document, the MAP (Missouri's state test), and the Terra Nova, ACT, and SAT (the national standardized tests adopted by the District). We started with our Math curriculum and matched all of our teacher-created objectives to the state objectives and national test standards in the *Curriculum Designer* database. Surprisingly—and despite the seven, color-coded 3-ring binders our long summers of curriculum building had produced--we found gaps and overlaps. Once the Math curriculum was aligned, we repeated this process for the other content areas, and then followed up by adding our non-core subjects to the program. Curriculum teams continued to discuss the movement of objectives when necessary or the addition of new objectives we did not have in our current document.

Next, alignment between grade levels became an issue: grade level teachers were no longer isolated. Grade level teachers discussed who would introduce, who would master, and who would reinforce specific content objectives. Grade levels with too much material were able to share objectives with other grade levels to balance the load. The teachers responded with great enthusiasm over the work we were doing. Suddenly, teachers and administrators did not have to "guess" what needed to be included in the curriculum. We had it in front of us. Teachers were free to focus on teaching.

We still had to face the hard fact that most teachers did not utilize print-based curriculum documents. Our assistant superintendent had had a vision years before of putting curriculum on "every teacher's desktop." What, we asked, if we disseminated the curriculum through a web-based application? Would teachers feel less overwhelmed? I spent that summer creating our district curriculum web pages. My concern was keeping the web-interface "point and click" so that it wouldn't cause any stress on teachers to learn something new. We had over 240 courses entered and each of these had to have an Adobe .pdf file created for it. Link pages were set up so that teachers could view courses by grade level or content area. There were also links to allow searching the entire K-12 curriculum or each subject area in its entirety.

Fort Osage's curriculum was ready for the Internet. Would teachers be willing to train to use the web pages to access their curriculum and other information? We decided to hold trainings the 2nd week of August on a voluntary basis. We sent a letter to every teacher with possible dates and times the trainings would be held. This was strictly voluntary and there was no compensation provided. I was given a voice mailbox and the teachers were told to call this number with their choice of time for training. I checked the box 3 days later and it was *full*. Over 40 teachers had called within a day's time. The calls continued to roll in; I ended up training over 2/3 of the staff members that week. What made it exciting was that teachers stayed after the trainings to look at the curriculum documents, print them out, and discuss *curriculum* with each other.

This excitement continued throughout the school year. Teachers gave up their time voluntarily to learn more about using the curriculum website. Conversations in the halls started to include how to teach specific objectives to the students. Collaboration multiplied, and staff members began to share resources. Teachers became involved because they knew the written (or in this case, electronic) document was not guesswork, but an accurate reflection of what the students needed. There was a definite change of focus from the teachers' standpoint. They were no longer having to wonder if they were teaching what the students would see on the test: now they *knew* what the students would see.

When testing came, there was not a panic two weeks prior to test time to "cram." Teachers felt very comfortable that the students were prepared as best they could be. We took the state tests and waited for our scores.

When test scores came, they exceeded even our fantasies. In eight of the twelve MAP tests administered, we made gains greater than the state in moving students into the two highest achievement levels, Advanced and Proficient. Fort Osage also had fewer students scoring in the two lowest achievement levels than the state average in seven of the twelve MAP tests administered. While the state increase was 20.27%, Fort Osage saw an overall 43% increase in all grade levels tested.

The software

Curriculum Designer software, designed by EdVISION Corporation, is a computer-aided design tool used by curriculum developers to quickly generate curricula that meets the needs of their district and state. A team of content and assessment experts reviewed state and national documents, identifying over 72,000 learning objectives for Mathematics, Language Arts, Science and Social Studies to develop a massive database of objectives. This database is correlated to national standards, state frameworks, state tests, and standardized tests.

This software does electronically what curriculum developers traditionally have spend hundreds of hours and thousands of dollars to do manually. The program sorts through testing and standards documentation in order to ensure alignment to state frameworks, tests and national standards. Curriculum Designer drastically reduces the time and money spent creating an effective curriculum, making this entire process much more efficient and manageable. Curriculum developers are no longer required to develop goals and objectives, arrange and rearrange instructional sequences, and write lengthy reports. This software efficiently automates these tasks, allowing for state mandated changes to be quickly enacted.

Electronic curriculum design is especially effective in crafting a clear plan of instruction that details what students are to know in a particular grade or course. Included in the final curricular documents from Curriculum Designer are "learner will" descriptions of clearly defined learning objectives. These statements are consistently written to allow for a unified language within the curriculum. Also included are Bloom's taxonomy codes for each skill which help to offer insight into the curriculum's goals.

Curriculum Designer's Instructional Hours feature projects a teaching time for every identified objective within its database. With this information, the user can organize the curriculum's objectives for each area and course by the hours needed to teach each objective, balancing the limited number of hours in the classroom with the required amount of time to teach the outlined skills. Such a check is valuable to ensuring there are enough hours to accomplish the teacher's task in the school year.

Other features of Curriculum Designer include sequencing, editing, entering resources, and printing the curriculum. Thc Sequence folder arranges units and objectives in the order to be taught, easily allowing for revision to reflect a change in the teaching sequence. The Editing feature is a multi-faceted tool used to create, include, remove or relocate any objectives, competencies or units within the curriculum. The ability to add instructional and assessment resources is featured in the software as well, which can provide teachers with a complete guide to district resources available to them. Finally, curriculum developers can provide printed reports in a variety of formats, including information for administrators, teachers, parents, and students as needed. A special feature allows the curriculum to be exported to the Internet to be published in HTML format on a web page.

Generating a curriculum electronically allows teachers to produce a dynamic curriculum that is responsive to change. New mandates, changes of personnel, or the adoption of different high-stakes assessments don't have to mean hours of painstaking rethinking and revision. Allowing the software to do intensive searches of massive amounts of data frees teachers up to do what they do best—teach our students. At Fort Osage, we found all these reflected in higher test scores.

Conclusion

A year after implementing the electronic version of their curriculum, Fort Osage students returned some of the best test scores ever seen in the district. In some areas, the gain was over 40%. Overall, scores improved in 45 of 72 areas. These gains were accomplished with just one year of focus on the curriculum. What changed? Aligning the curriculum and assessment electronically got the curriculum documents off the shelf and into the hands of the teachers. The electronic curriculum documents allowed Fort Osage to give teachers clear, current, readily updateable, accessible guidelines of what should be taught so that they could refocus their energies in addressing how to teach.

The adoption of an electronic curriculum at Fort Osage and many other schools around the country represents a paradigm shift in education. Systemic change is being sparked by the escalating urgency driving accountability mandates. As states and districts attempt to respond to the additional administrative demands placed on them, a great deal of administrative work is being shifted onto the classroom teacher. With this extra workload comes the (often urgent) opportunity to become change agents in their schools and their districts. Our pre-service teachers may soon find themselves involved in the implementation of system-wide change in the districts that hire them. This is especially true for those who have a technical background. Their ease and expertise in technological solutions such as the electronic curriculum described here can promote them into positions of leadership early in their careers.

What does that mean for teacher-educators, who are training teachers to move into this time of transformation in our public schools? The teachers and administrators in training now will be hired, at least in part, because of the technological background they're acquiring as pre-service teachers. New hires with technological backgrounds will tend to be relied on for specialized projects that their "non-electronic" colleagues won't. They can bring fast, cost-effective technological solutions to processes once done manually, at great time and expense. This ability will cause them to be put into positions of accelerated responsibility. In short, they will be *required to be* change agents.

Our technically-oriented pre-service teachers are much more likely to be listened to as problem-solvers than other workers just entering a profession. They are much more likely to be recruited into systemic reform projects or "administrative" roles (even if their job titles don't immediately reflect that). Because technology can accomplish the kinds of change I've discussed here, new hires with technical training come in with a "halo" effect. The district, at least initially, hopes their ease with technology can make them strong change agents within the district's own development strategies. The more pre-service experience these students have with innovative software solutions like the one I've outlined here, the more likely they are to transform this "halo" effect into solid career accomplishments.

More than ever, we are preparing the next wave of change agents for our schools—and the change they'll be involved in has a distinctly electronic face. As teacher trainers we can help pre-service teachers who will already be entering a district with great expectations placed on them to *confirm* those expectations. We can train them now to carve out solid positions for themselves within the district so that the initial "halo" of potential becomes a solid record of achievement.

Preparing Tomorrow's Teachers to use Technology: Developments and Strategies of Ten Grantees

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Abstract: There is a substantial demand to integrate technology into teacher education programs. Future teachers are not prepared to effectively integrate technology into the classroom. Emphasis is placed on the concept that effective programs are needed in order to produce technology-adept teachers. This paper describes project activities from 10 Preparing Tomorrow's Teachers to Use Technology (PT3) grantees. Information was gathered from the PT3 web site, grantee web sites, and project members via electronic mail. Developments focus on revamping teacher education programs. Strategies include facilitating teacher and methods faculty workshops, and building interactive web sites and video based web instruction.

Introduction

Dialogue among educational scholars upholds the concept that future teachers are not equipped to properly integrate technology into the curriculum. "There is much rhetoric today about the inability of teacher preparation programs to fully prepare new teachers to use technology effectively in their professional practice" (Morsund & Bielefeldt, 1999). Computers are not utilized effectively in the classroom. The past two decades have proven the computer is no longer an additional tool in the classroom it is now essential (Puma, Chaplin & Pape, 2000). Teachers are hesitant to use computers because they lack training and are incapable of adjusting to technological evolvements. Research suggests that the traditional teacher preparation programs are not up to par in the field of integrating technology (National Center for Education Statistics [NCES], 2000). It is crucial to have teachers in the classroom who possess the ability to integrate and utilize technology. Once technology is effective in the classroom the teacher will become a facilitator of learning as opposed to a source of information (Office of Educational Research and Improvement [OERI], 1999). It will not be easy to re-educate existing teachers with out professional development that provides the same technology literacy skills required of students (National Council for Accreditation of Teacher Education [NCATE], 1997; OERI, 1999). Teachers must perceive technology as interesting, not an added chore or a waste of time. Future teachers will not appreciate the value of the computer if their practicum experience is with a teachers who think efforts to integrate technology will hinder routine work (NCATE, 1997; Wang, 2000). In addition to teacher apathy, faculty members themselves are not fully aware of the evident demand. "Not using technology much in their own research and teaching, teacher education faculty have insufficient understanding of the demands on classroom teachers to incorporate technology into their teaching" (NCATE, 1997).

Currently, teacher preparation programs are undergoing several changes. Morsund & Bielefeldt (1999), emphasizes teacher education programs are not properly training teachers to implement technology into the classroom. Trainers in the field of educational technology should provide effective support to teachers; a simple additional course or a staff member who happens to know how to use a computer is not deemed adequate (NCATE, 1997; OERI, 1999). It is difficult to provide students with adequate training in technology, because special "technology funds" are not highly prioritized (NCATE, 1997). "In an effort to help schools, colleges, and departments of education meet the increasing demand for technology-proficient teachers, the U.S. Department of Education established the Preparing Tomorrow's Teachers to Use Technology (PT3) grant program" (Planning and Evaluation Service [PES], 2000).

The PT3 program awards three types of grants: Capacity Building, Implementation, and Catalyst. Capacity Building grantees receive one year of support while Implementation and Catalyst grantees obtain funds for a total of three years. Capacity Building grants are awarded to institutions at the beginning phases of technology-based endeavors. Implementation grants focus on local initiatives to revamp existing teacher education programs. Catalyst allowances uphold institutions that currently maintain commendable resources to make statewide, regional, or national improvements.

Selection of Grantees

Ten grantees were randomly selected from the PT3 web site (**Error! Reference source not found.**): one Capacity Building, four Catalyst, and five Implementation. The capacity building grantee is Southwest Texas State University. Catalyst grantees include The University of Northern Iowa, Louisiana Systemic Initiatives Program, Mississippi State University, and Maryland State Department of Education. Selected Implementation grantees include New Mexico State University, Bowling Green State University, West Virginia University, Boise State University, and Wichita State University. A database search was conducted on the PT3 web site by entering components of desired projects for review. Components selected were taken from the categories of grant type, content focus, and grade level. Project summaries were reviewed and web sites navigated. Grantees selected have distinctive information readily available and a site that is easy to navigate. Project members were contacted via electronic mail for project descriptions with no universal resource locator (URL) listed. The project members made reference to the project name and web site. Project activities, which encompass developments and strategies, were reviewed. Activities examined include goals and objectives, partnerships established (consortium), and project initiatives (local, regional, statewide or national).

Developments and Strategies of Grantees

Project overviews document consortia that consist of universities, schools, school districts, and partnering institutions. Grantee websites present goals, objectives, and project activities. Projects, URLs, and activities are described below.

Capacity Building Grantee
Southwest Texas State University

Southwest Texas State University facilitates workshops for faculty members demonstrating how to designing web pages, web quests, and web-based forms and tests. The project is called *The Viewing and Doing Technology Project* (VDT), which may be found at: Error! Reference source not found.. The overall goal is to nurture a university and school partnership to launch a new teacher education program. The project members work with 20 high school sites and approximately 300 students. The partnership is between Southwest Texas State University and Hays County Independent School District. The secondary methods courses serve as the focal point. The plan is to restructure the process by having education courses taught outside the college of education. Select faculty members receive training in areas of expertise. Professional Development workshops are an ongoing process. Practicing teachers take part in a summer course and secondary student teachers are assigned to them. Taking the summer course ascertain the placement of students with cooperating teachers proficient in technology.

Catalyst Grantees
The University of Northern Iowa

The University of Northern Iowa's project is InTime, an acronym for *Integrating New Technologies Into the Methods of Education* at **Error! Reference source not found.**. This is a national initiative encompassing a consortium across five states. The consortium members include: University of Northern Iowa, Eastern Michigan University, Association for Educational Communications and Technology, North Central Regional Education Laboratory, Emporia State University, Longwood College, and Southeast Missouri State University. Universities assure that faculty members will have access to resources and technical support. Selected faculty members participate to gain information on how to revise methods courses. Each university hires a full time graduate student to trouble shoot on the web site and offer assistance to faculty members who want to learn about new software and equipment. Participating methods faculty receive a stipend. The best practices in the classroom are taped and are posted on the website. Videos are displayed by descriptors such as content area, grade level, state, lesson title, and technology competency.

Louisiana Systemic Initiatives Program

Louisiana Systemic Initiatives Program is located at **Error! Reference source not found.**. THE QUEST, *Technology in Higher Education: Quality Education for Teachers and Students*, is a statewide initiative. The consortium members include Louisiana Board of Regents, Microsoft Corporation, Louisiana Governor's Office, Louisiana Systemic Initiatives Program and the Louisiana Department of Education. THE QUEST provides assistance and professional development for faculty across the state of Louisiana. Faculty members involved teach introductory educational technology courses, other faculty members, and methods courses. K-12 teachers serve as mentors and supervisors. Two centers for professional development are strategically placed in the northern and southern parts of the state. Teaching, Learning, and Technology Centers (TLTC) are located in Louisiana Tech University in Ruston (northern area) and the University of Louisiana at Lafayette (southern area).

Mississippi State University

Mississippi State University's initiative may be found at **Error! Reference source not found.**. The project is entitled *Preparing Teachers to Deliver Technology-Rich, Problem-Based Learning Experiences*. This is a statewide initiative. Consortium members involved are Jackson State University, University of Mississippi, Mississippi State University, and the University of Southern Mississippi. Technology rich problem based instruction is provide for faculty at the university and community college level. Hands-on projects take place throughout course work. Consortium members conduct all training workshops. Workshops are individually scheduled for faculty, teachers, and student teachers. As works shops progress, training materials are developed and serve as online references. A project web site is implemented to share information among students, teachers, and faculty.

Maryland State Department of Education

Maryland State Department of Education project is found on the web at **Error! Reference source not found.**. This is a statewide initiative, which includes a partnership between St. Mary's College of Maryland, Salisbury State University, Towson University, Bowie State University and Annc Arundel Community College. Additional institutions working on this initiative include, Wor-Wic Community College, Anne Arundel County Public Schools, Baltimore County Public Schools, Howard County Public Schools, Montgomery County Public Schools, Prince George's County Public Schools, Johns Hopkins University, and Maryland State Department of Education. Frostburg State University, University of Maryland at College Park, Maryland Higher Education Commission, and Human Resources Research Organization are included in the consortium as well. The primary goal of the project is to align future teacher experiences with the state objectives. Performance based standards and assessments are developed through efforts of the consortia. Future teachers are expected to achieve outcomes outlined by the *Maryland Teacher Technology Outcomes*. Students produce electronic portfolios demonstrating their performance.

Implementation Grantees

New Mexico State University

New Mexico State University focuses primarily on integrating technology into multicultural instruction. The project name is *Preparing Tomorrow's Teachers Today*. The purpose is to restructure the teacher education and bridge the digital gap by placing an emphasis on diversity. Information may be found at **Error! Reference source not found.**. Consortium Members include Scholarly Technology, CETP-Collaborative for Excellence in Teacher Preparation, Gadsden Independent School District, Pathways for Teaching Science for Understanding in Diverse Classrooms, and Las Cruces Public Schools. The project focuses on increasing the number of technology-proficient teachers in the surrounding area to increase achievement among students of diverse ethnic backgrounds.

Bowling Green State University

Bowling Green State University's project found at **Error! Reference source not found.** is entitled *Project PICT: Preservice Infusion of Computer Technology.* Consortium members are Woodmore Elementary, Crim Elementary, Conneaut Elementary, Napoleon High School, Perrysburg High School, and Toth Elementary. The members of Project PICT work with elementary and secondary schools. Plans involve restructuring teacher education programs by aligning the curriculum with Ohio curriculum models, International Society for Technology in Education (ISTE) standards, and National Educational Technology Standards for Students (NETS). Duties are assigned to preservice teachers, cooperating teachers, methods faculty, and curriculum facilitators. Efforts are to develop lcsson plans and activities for implementation throughout the course of study. Faculty members have mentors in whom they meet with periodically to enhance technology skills and activities.

West Virginia University

The project developed by West Virginia University is located at **Error! Reference source not found.**. The project is called *Trek 21: Educating Teachers as Agents Of Technological Change.* Project members work with 21 professional development schools (PDS) which are primarily located in rural settings. Consortium members are Taylor County Schools, Preston County Schools, Technology, Teacher Education, Tomorrow (T3), Harrison County Schools, Marion County Schools, and Monongalia County Schools. The plan is to systematically place a five year program where practice and modeling takes place. The project produces 15 core courses with technologically-enhanced classrooms. Students are placed in learner centered classrooms that aid in providing experiences that are real. Mini conferences are held throughout the semester.

Boise State University

Boise State University's project is located at **Error! Reference source not found.**. This project is called the *Bridges Project:Building Bridges With Technology.* Consortium members are Meridian Joint School District, Middleton School District, Midvale School District, J.A. Kathryn Albertson Foundation, Weiser School District, Boise State University, Payette School District, Homedale School District, Kuna Joint Schol District, and Twin Falls School District. The teacher prep program has online components. The project will focus on three different areas: faculty development, student fieldwork and the development of an on-line pre-serverice. Faculty will be given extensive training and support in skills and integration of technology into the content areas they teach. Students and professors spend time in the field with teachers who have had three years of training and practice with integrating content-based technology activities.

Wichita State University

The project at Wichita State University, found at **Error! Reference source not found.** is entitled *Models, Mentors, Mobility: Tomorrow's Technologically Astute Teachers* (Project M3). This local initiative concentrates on middle schools and elementary schools. Consortium members include: Haddock Computer Corporation, Wichita State University Office of University Computing and Telecommunications, Wichita Public Schools, Wichita State University College of Education, Apple Computer Corporation, Wichita State University Media Resources Center, Wichita State University Center for Teaching and Research Excellence, and Wichita Catholic Diocese. The focus is to model teaching in the classroom, provide mentors to student teachers, and take technology to the classroom as opposed to taking the students to technology. Project M3 provides content area resources on the web site.

Conclusion

The developments and strategies described clearly accentuate, "effective change does not come without adequate planning, vision, professional development, evaluation measures, technology resources and new institutional modes of operating" (OERI, 1999). The projects focus on faculty members at universities and preservice and inservice K-12 teachers on local, state, regional, and national efforts. Activities varied according to site needs including location and demographics. Some institutions promote modeling programs while others rely on training and workshops. Project efforts include giving stipends to participating faculty members. Some sites focus on elementary and middle schools while other focus solely on high schools. Some projects engage students in beginning years of their program with hands on activities along with regular course work. Other institutions simply construct lesson plans for others to implement. The International Society for Technology in Education (1992) affirms proper change will not happen without "restructuring education through the applications of technology." Formulating these developments and strategies prove to serve as the long needed wake up call to the field of education.

This paper provided limited information on PT3 efforts to revamp teacher preparation programs. However, an attempt to briefly describe activities in progress is well worth the effort. Possible future evaluations may perhaps report effectiveness and the impact on student achievement. Researchers might deal more accurately with adjustments surrounding administrative duties and policies. Further exploration should convey how administrators deal with modifications in school structure. Finally, more attention should focus on how teachers deal with the classroom and curriculum revisions.

With steady momentum toward incorporating technology into teacher preparation programs, the PT3 grant developments and strategies guarantee future technology-proficient teachers. The goal of producing talented and competent teachers who include technology into every day practice is now more attainable. As teachers (Puma et al., 2000) are prepared for this new way of teaching, they will no longer serve as the "sage on the stage" but the "guide on the side" where learning will take place by means of practical applications within a technology enhanced curriculum.

References

International Society for Technology in Education (1992). Vsion: TEST (Technologically enriched schools of tomorrow). [Online]. Available: **Error! Reference source not found.**.

McNabb, M. L. (1999). *Connections for school improvement: Teacher's guide.* (Contract No. RJ96006301). U.S. Department of Education. Washington, DC: Office of Educational Research and Improvement.

Moursund, D. & Bielefeldt, T. (1999). Will new teachers be prepared to teach in a digital age? A national survey on information technology in teacher education. Santa Monica, CA: Milken Exchange on Education Technology and the International Society for Technology in Education.

National Council for Accreditation of Teacher Education, Task Force on Technology and Teacher Education. (1997). *Technology and the new professional teacher: Preparing for the 21st Century Classroom.* [Online]. Available: **Error! Reference source not found.**.

Puma, M., Chaplin, D., & Pape, A. (2000). U.S. Department of Education, Office of the Under Secretary, Planning and Evaluation Service. *E-Rate and the digital divide: A preliminary analysis from the integrated studies of educational technology.* Washington, D. C.

U.S. Department of Education. National Center for Education Statistics. *Teachers' tools for the 21st century: A report on teachers' use of technology.* NCES 2000-102. B. Smerdon, S. Cronen, L. Lanahan, J. Anderson, N. Lannotti, and J. Angeles. Washington, DC: 2000.

U. S. Department of Education, Office of Educational Research and Imporvement. (1999). Technology connections for school improvement: Planners' Handbook. (Contract Number RJ96006301). Mary L. McNabb. Washington, D.C.

U. S. Department of Education, Office of the Under Secretary, Adult, and Vocational Division. Planning and Evaluation. (2000). *Case studies-first set of visits: Preparing tomorrow's teachers to use technology*, Washington, D. C.

Wang, Y., (2000). Training teachers using computers; A process of familiarization, utilization, and integration. *The Journal: Technological Horizons in Education* 27 (10), 66-72.

Learning to Integrate New Knowledge and Skills (LINKS): First Year Results from a Systematic Infusion of Technology into a Field-Based Teacher Education Program

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Absract: This paper details the associated research endeavor of a technology program designed to integrate emerging technologies into the teacher preparation curriculum at Texas Woman's University. The objective of this study is to describe changes in behaviors and attitudes as well as changes in institutional processes. Specifically, the study addressed these questions: (a) How was the teacher preparation program adapted to support preservice teachers' technology proficiency; (b) to what extent did preservice teachers build technological skills and demonstrate understanding; (c) how did mentor teachers build technological skills and serve as guides of technology integration for preservice teachers; (d) to what extent did university instructors model technology proficiency in web-based curricular delivery; (e) what concerns were expressed, and how did they change over time; and (f) what early implementation lessons were learned to inform program improvement? The program as well as the accompanying research, is supported by a USDE implementation grant entitled Preparing Tomorrow's Teacher to Use Technology (http://www.pt3.org). Specific program information can be located at: http://www7.twu.edu/~f_snider/links/

Introduction

Learning and Integrating New Knowledge and Skills (LINKS) is a three-year technology project designed to integrate established and emerging technologies into the teacher preparation curriculum at the Texas Woman's University (TWU). The project is supported by a U.S. Department of Education, Preparing Tomorrow's Teachers to Use Technology implementation grant. The LINKS program redesigns the teacher education program within the Professional Development School (PDS) at TWU to address the technology proficiencies desired by the schools, recommended by the National Council for the Accreditation of Teacher Education (NCATE), and delineated by the professional associations. The project supports changes in university faculty involvement and roles, technology curriculum content and delivery, and preservice teachers' performance and responsibilities in field-based locations.

The objective of this study is to describe changes in behaviors and attitudes as well as changes in institutional processes. Specifically, the study addressed these questions: (a) How was the teacher preparation program adapted to support preservice teachers' technology proficiency; (b) to what extent did preservice teachers build technological skills and demonstrate understanding; (c) how did mentor teachers build technological skills and serve as guides of technology integration for preservice teachers; (d) to what extent did university instructors model technology proficiency in web-based curricular delivery; (e) what concerns were expressed, and how did they change over time; and (f) what early implementation lessons were learned to inform program improvement?

Perspective

Recent efforts in the nations' schools have centered on the infusion of technology into classrooms. Although a great deal of training has occurred at the school level, reports suggest that new teachers entering classrooms are not well prepared to use technology (CEO Forum on Education and Technology, January 2000). Currently, the debate centers on the best means to integrate technology into teacher education programs. Approaches range from encouraging students to use e-mail to more advance programs designed to infuse technology into all aspects of the teacher education curriculum. Recent innovations that have been implemented with varying success include electronic contacts via e-mail, listservs, and dialogue (Blake, 1998; McIntyre & Tlusty, 1995); virtual workshops, out-of-field certification, and add-on coursework (Simmons & Linnell, 1998, Veen, Lam, & Taconis, 1998), and more recently, comprehensive, integrated approaches (Dradowski, 1998; Parker & Farrelly, 1994, Schrum, 1998). Concerns about individual attitudes and perceptions that pose significant barriers to technology integration have been the focus of many recent research efforts (Blake, 1998; Buhendwa, 1996, Medcalf & Davenport, 1999; Smithey & Hough, 1999; Strudler & Wetzel, 1999). Though much research has been conducted, according to Shaw (1998) in his Report to the President on the Use of Technology to Strengthen K-12 Education in the United States, "a large scale program of rigorous, systematic research on ...educational technology...will ultimately prove necessary to ensure both the efficacy and cost-effectiveness of technology use within our nation's K-12 schools" (p. 115). Shaw further suggests that the rigorous evaluation of the programs we create is needed.

Project Overview

The Professional Development Center (PDC) manages the field-based teacher education program at TWU, and the LINKS technology integration project builds on the existing curriculum for teacher preparation. Each semester approximately 300 future teachers progress through university coursework, technology seminars, and field-based placements in Intern I, Intern II, and Residency. Responsibility for preparing students is divided among technology seminar leaders, university liaisons, and mentor teachers. The LINKS Technology seminar leaders support the LINKS preservice strand utilizing a distance delivery approach from the TechTrek website designed for use with this population (http://venus.twu.edu/~f_snider/ techtrek/main/index.html). As preservice teachers progress through Intern I, Intern II, and Residency, competencies related to four technology cornerstones (foundations, connectivity, productivity, and integration) are documented through course portfolios, classroom logs, desktop conferencing, and professor validation. Technology lab sessions and one-on-one interventions are offered to interns as they document their progress. All Intern I and Intern II preservice teachers are required to attend three whole-group technology seminars related to the four cornerstones; to participate in bi-weekly desktop conferencing groups that extend discussion related to course readings and indicators; to submit completed technology requirements and weekly reflections through e-mail; and to attend at least one lab session per semester that supports the development of their skills or relates to completion of the required indicators. As students complete coursework in their interdisciplinary major, they document demonstrated proficiencies in their LINKS Technology Passport a comprehensive metacognitive tool.

In addition to the preservice teacher population, full-scale implementation is achieved by orienting mentor teachers to the LINKS project goals and tools, and by extending professional development efforts to instructors on the university campus. Training opportunities, resources, and electronic means are provided to support instructors as effective models of technology use, in web-based course delivery, and in electronic communication with students. The instructor strand of the LINKS project assists university instructors with the preparation of web-based course delivery via Blackboard, the university's web-based course delivery template.

Methodology

In the first year of the project (fall 1999-spring 2000) implementation and outcome data were collected for events involving three populations: preservice educators, mentor teachers, and university instructors. During the fall 1999 semester, the first cohort of preservice students enrolled in Intern I (N=99), and participated in three technology seminars, bi-weekly conferencing groups, and documented proficiencies in the Technology Passport. Pre- and Posttests were administered to assess changes in technological proficiency and use, as well as attitudes and concerns. Nonparametric matched pairs tests were utilized for analyses of quantitative data for 67 students with complete data sets. Within this cohort group, 30 students were placed with mentor teachers in rural districts for field-based internships. Mentor teachers (N=30) participated in six, on-campus training sessions and received assistance designed to enhance positive attitudes and receptivity toward their intern's technology use. Mentor teachers completed pre-and posttests to assess their technological proficiency. Nonparametric matched pairs tests were utilized for quantitative analyses. For both preservice teachers and mentors, qualitative analyses were conducted for open-ended items on session evaluation forms. A volunteer sample of university professors (N=20) agreed to participate in five whole-group professional development sessions. Sessions focused on an orientation to the Links project and resources, and the preparation of web-based course delivery via Blackboard—the University's web-based course delivery template. Pre- and posttest data were collected on the Stages of Concern Questionnaire (SOCQ) and data on the Levels of Use (LoU) were collected by individual interviews after the last of the five training sessions. Due to attrition, the final sample included 13 instructors. Analyses involved descriptive statistics and the creation of profiles.

Data sources

Implementation data were obtained from reviews of project documents, attendance records, evaluation forms, and information on LINKS-related web sites. Complete data sets were available for preservice teachers (N=67), mentor teachers (N=28), university instructors (N=13). The instruments utilized as data sources for the three populations are listed below.

Preservice teachers. Three quantitative measures were administered at the beginning of the fall and spring semesters. The measures included: Basic Technology Competencies for Educators (BTCE); Self-Evaluation Rubrics for Basic Teacher Computer Use and Internet Use, and the Stages of Concern Questionnaire (SoCQ). Nonparametric dependent-sample tests were used to determine whether significant differences existed across semesters. Qualitative data were derived from course evaluations to assess changes in attitudes about technology.

Mentor teachers. Mentor teachers complete the Self-Evaluation Rubrics for Basic Teacher Computer Use, Advanced Computer Use, and Internet Use at the beginning and end of their semester as mentors. Nonparametric dependent-sample tests were used to gauge changes in skills and use. Qualitative analyses were conducted for open-ended items on questionnaires completed by e-mail and on session evaluation forms.

University instructors. The Concerns Based Adoption Model (CBAM) was used to assess university instructors' progress toward the use of Blackboard. Pre- and posttest data were collected for the SoCQ. LoU ratings and open-ended Statements of Concern were collected by individual interviews after the last of the five training sessions.

Results

These findings represent preliminary analyses for the evaluation of the first semester of project implementation under the three-year grant. Results for preservice educators revealed that participants (N=67) considered themselves more technologically proficient after experiencing the integrated technology component of their professional development coursework. There were statistically significant pre- and posttest differences for all domains of the BTCE, 10 out of 11 domains on the Basic Teacher Computer Use, and all domains on Internet Use. Future teachers moved toward high impact concerns and relatively low self-concerns as measured by the SoCQ. Qualitative analyses revealed generally positive responses in relation to acceptance of and comfort with technology, as well as confidence in ability to integrate its use in curriculum delivery. Many preservice teachers were, however, concerned because they seldom saw technology use modeled in public school classrooms, and they believed access to technology would be a significant barrier to technology use.

Mentor teachers showed significant growth toward technology use in the classroom and more positive attitudes toward technology use. Statistically significant pre-and posttest results were obtained for 23 out of 27 domains on the self-evaluation rubrics for Basic Teacher Computer Use, Advanced Computer Use, and Internet Use. Qualitative analyses of open-ended items indicated that mentors were generally positive about program participation. Concerns related to time, scheduling, applicability, and involvement with interns. Mentors reported limited use of technology in the classroom by interns. Therefore, LINKS now plans for joint sessions for classroom pairs of interns and mentors. Mentor training for the next semester will be provided in a two-day workshop held on the TWU campus. Since this revised training provides for direct interaction between the mentor and the intern, it is consistent with the LINKS Management Plan for mentors and the goals of the PT^3 grant. This revised plan addresses the major concerns expressed by the mentors in this pilot and emphasizes the immediate applicability of new learning as well as effective use of professional time. Both mentors and interns indicated their support for working together in such an effort.

The primary goals for the university faculty were introduction of the LINKS standards and resources, and support for instructor delivery of web-based courses as models for the future teachers. The descriptive statistics and profiles for the SoCQ suggested that the instructors had relatively high informational and personal concerns as well as rather intense consequence and collaboration concerns. Changes reflected in exit interviews related to the variance in beginning use and the individual differences in progress attained during the semester. All individual instructors made significant progress in levels of use, although they began at different levels. Qualitative analyses of open-ended evaluation questionnaire items revealed four key instructor concerns (a) the need for, and management of, time, (b) their individual technical proficiencies, (c) the applicability of Blackboard to their own teaching, and (d) their need for continuing support. To address expanded support, 14 training sessions are now projected for 2000-2001. University instructors will be supported over the entire academic year, and they will be provided with laptops for this effort. The outcome in the near future will be a web-based course offered by each participant. Support from the LINKS team during and between training sessions will be expanded and documented for evaluation purposes.

Educational Importance

Findings for the first year of LINKS implementation supported the efficacy of the system and the program being utilized. The three populations (preservice teachers, mentor teachers, and university instructors) made notable strides toward using technology in their own teaching and learning frameworks. All participant groups showed substantial improvement in their technological proficiencies, and participants provided valuable feedback that allowed the LINKS team to refine the program further to address their concerns and needs. These findings provide implications for increasing the technology proficiencies of entry-level teachers as well as providing a model for other universities undertaking similar changes in teacher preparation programs. Further, the resources created by LINKS are available to other institutions on the project web site. Findings have particular relevance to explain how university professors can be supported as effective models of technology use in web-based course delivery and electronic communication with students. The documentation of learner-centered standards for preservice teachers through the Technology Passport provides a much-needed model to monitor and assess changes in preservice teachers' technological proficiencies.

As the PT^3 sponsorship continues, the number of technologically proficient future teachers will increase, more university professors will use technology in course delivery, and ultimately, more future teachers will be prepared to integrate technology in K-12 classrooms. The LINKS team is committed to the facilitation of those changes. The first year's progress is reflected in the quantitative and qualitative findings, in program enrichment and expansion, and in the systematic design of management plans that addressed the identified needs of each population.

References

Blake, S., Holcombe, L., & Foster, D. (1998). Technology and teachers: An investigation of attitudes and beliefs of introductory use by preservice teachers. *Journal of Technology and Teacher Education, 6*(1), 39-49

Buhendwa, F. M. (1996). *Preservice teachers' computer literacy: Validation of an instrument to measure self-efficacy for computer-based technologies.* (ERIC Document Reproduction Service No. ED 405 355)

Drazdowski, T. A., Holodick, N. A., Scappaticci, F. T. (1998). Infusing technology into a teacher education program: Three different perspectives. *Journal of Technology and Teacher Education, 6*, 141-149.

McIntyre, S. R. & Tlusty, R. H. (1995, April). *Computer-mediated discourse: Electronic dialogue journaling and reflective practice.* Paper presented at the Annual Meeting of the American Educational Research Association, San Francisco, CA.

Medcalf-Davenport, N. A. (1999). Historical and current attitudes toward and uses of educational technology: In J. D. Price, J., Willis, D. A. Willis, M. Jost, & S. Boger-Mehall (Eds.), *The Information Technology and Teacher Education Annual* (pp. 1424-1428). Charlottesville, VA: Association for the Advancement of Computers in Education.

Parker, A., & Farrelly, D. (1994). Forced to succeed: Introducing the media to preservice teachers. *International Journal of Instructional Media, 21*, 295-299.

Shaw, D. E. (1998). Report to the President on the use of technology to strengthen K-12 education in the United States: Findings related to research and evaluation. *Journal of Science Education and Technology, 7*, 115-226.

Simmons, J. B. & Linnell, C. C. (1998). New tech ed teachers via the out-of-field permit approach. *The Technology Teacher, 58*(1), 27-32.

Schrum, L., & Dehoney, J. (1998). Meeting the future: A teacher education program joins the information age. *Journal of Technology and Teacher Education, 6*, 23-37.

Smithcy, M. W., & Hough, B. W. (1999). Creating technology advocates: Connecting preservice teachers with technology. *T.H.E. Journal, 26*, 78-79.

Strudler, N. & Wetzel, K. (1999). Lessons from exemplary colleges of education: Factors affecting technology integration in preservice programs. *ETR&D, 47*(4), 63-81.

Veen, W. I., Lam, I., & Taconis, R. (1998). A virtual workshop as a tool for collaboration: Towards a model of telematic learning environments. *Computers & Education, 30*(1-2), 31-39.

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Development of an ePortfolio Builder for Teacher Education

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Abstract: This paper describes and discusses designing and developing a prototype ePortfolio building system called iFolio that supports the online assessment and tracking of a pre-service teachers' ability to meet technology standards throughout their teacher education program.

Introduction

As information technology becomes ubiquitous in our society, schools have struggled to keep pace. While many reasons can probably explain this, one key reason is that teacher preparation programs have not been successful at adequately preparing preservice teachers to integrate technology into their chosen profession. The National Council for Accreditation of Teacher Education (NCATE) in their 1997 report stated: "Bluntly, a majority of teacher preparation programs are falling far short of what needs to be done ... teacher education faculty have insufficient understanding of the demand on classroom teachers to incorporate technology into their teaching." In response to the problem, the Department of Education has launched a major funding initiative, called PT3 (Preparing Tomorrow's Teachers to use Technology), which is directly aimed at supporting "the transformation of teacher preparation programs into a 21st century learning environment" (Department of Education PT3 Grant Overview, 1999).

At the same time, the International Society for Technology in Education (ISTE) has developed technology standards to help prepare teachers for technology-rich teaching and learning. They provide teacher education programs with standards describing what new teachers should know about and be able to do with technology when entering the classroom. These standards are likely to be adopted by NCATE and state and local educational agencies throughout the nation.

In this paper, we describe and discuss the experiences at Utah State University with designing and developing a system to help pre-service teachers document and track how they are meeting technology standards throughout their teacher preparation program. In particular, we describe a prototype ePortfolio building system called iFolio. Funded by a PT3 grant, this tool supports the online assessment and tracking of Utah pre-service teachers' ability to meet national and local teacher-technology standards throughout their entire professional teacher education program.

The design of the system is motivated by several design goals:

1. Provide an ePortfolio assessment system which is linked to national technology assessments standards, and is not limited to a single course, but can track student progress across the entire 2-3 years of their professional program.
2. Provide an online ePortfolio builder and extensive digital library system, which will permit students to easily enter and edit electronic portfolio items over an extended period of time in a password secure environment.
3. Provide a reflection and self-evaluation system that will help students take greater responsibility for their own professional development in meeting technology standards.
4. Provide a peer and professional review system within the iFolio system, where students and teacher education faculty can review and evaluate the technology artifacts and practices included in ePortfolios from other partner institutions.
5. Provide a system that organizes and links the digital artifacts and annotations with the related personal goals, reflections and peer review information.
6. Provide a means to output the resulting portfolio onto a CD-ROM or DVD disk for personal and professional use by the student.

7. Provide a metadata and collaborative filtering system for searching, ranking and recommending specific instructional objects stored within the iFolio digital library.

The project views the development of an ePortfolio by a student as a work in progress rather than a final culminating experience. Meeting the current national teacher technology standards is not an event that has a particular ending – pass or fail – point, but rather the standards become a target that challenges preservice and inservice teachers to constantly improve and update their skills in hitting the center point of the technology integration target. While the iFolio system establishes a minimum level of competency that each preservice teacher will be expected to attain, the system is designed to encourage its users to constantly reflect on the artifacts they have included in their portfolio, and to seek out ways to improve and extend their portfolio throughout their teaching career. The portfolio assessment system is built around a "levels of development" rubric that permits users to assess -- at various points in their program -- where they are in their personal development process.

The iFolio system allows the preservice teachers to:

1. View an online tutorial system that includes: a) instructions for using the ^{i}Folio system, b) context sensitive online help, c) recommendations for developing an effective portfolio, d) samples of model portfolio items, e) copyright and ethical information and guidelines, f) information about the ACOT stages of development.
2. Enter a personal statement containing their related professional goals, and an organizing framework and overview for their electronic portfolio.
3. Enter and edit portfolio artifacts throughout their preservice program within a password secured environment.
4. Include annotations with each artifact describing: where and when the work was done, conditions and constraints in place during the artifacts development, their role in the development of the artifact, and the scope of the overall project the artifact was selected from.
5. Associate artifacts and elements within the portfolio to specific technology standards.
6. Reflect on how each element or artifact represents achievement of the standards/goals and project future direction in advancement of that standard.
7. Reflect on items that are contained in other peer portfolios for useful ideas, and strengths and weaknesses found in those portfolios.
8. Link to the anonymous peer/professional review system.
9. Organize and link the digital artifacts and annotations with the related personal goals, reflections and peer review information.

Each portfolio must also include a statement affirming that each item in the portfolio represents their personal work as indicated in the annotations. Upon completion of the preservice ePortfolio requirement, student will be provided the option to output the resulting portfolio onto a CD-ROM or DVD disk for personal or professional use.

In addition to the student portfolio building components of the system, the ^{i}Folio system will provide:

1. A graphical standards completion tracking system to help individual students monitor their progress in meeting all of the required standards at acceptable levels.
2. A peer and professional review system to provide outside evaluation of student portfolios.
3. A metadata indexing system for items stored within the digital library.
4. A collaborative filtering system for ranking and recommending specific instructional objects stored within the library.
5. A limited authoring environment where the learning objects contained in the iFolio library can be combined and used in a variety of instructional settings

The system is flexible enough to permit students to include a wide variety of print and multimedia instructional artifacts in their portfolios. Artifacts might include such this as: lesson plans, an electronic resume, verification of meeting the university's Computer Information Literacy (CIL) requirements, web sites they have developed, or digital video recordings/case studies of students doing technology related activities. It also might include: audio captures lesson experiences, technology related literature reviews, technology resource collections and instructional objects, exemplary assignments that integrate technology, articles for publication, technology related senior projects, electronic presentations, CBI projects, evaluations and/or technical reports, or conference presentations. Since the university's portfolio requirement will cross both curriculum and K-12 boundaries it is designed to accommodate as wide a selection of technology options as possible within digital storage and Internet delivery limitation inherent in such a system. Artifacts can be stored as Acrobat PDF resources, digital video/audio resources (10MB limit), linked resources, and text items.

The development of the iFolio system relies extensively on prior work in designing and implementing Internet-based educational digital libraries. A primary goal of these libraries is to provide users (including teachers and students) with a way to search for and display digital learning resources commonly called 'learning objects'. Examples of such educational digital libraries include www.smete.org, which offers a comprehensive collection of science, math, engineering and technology (SMET) education content and services to learners, educators, and academic policy-makers (Muramatsu, 2000). In Europe, the ARIADNE project has been developing a Europe-wide federation of repositories of multi-lingual, digital, pedagogical resources (Duval et al., in press).

As part of these efforts, researchers are developing digital library cataloging systems. Much like labels on a can, these labels, or data elements, provide descriptive summaries intended to convey the semantics of the object. Together, the data elements usually comprise what is called a metadata structure (LTSC, 2000). Thus, in typical educational digital library applications, learning objects are stored and labeled with a metadata record. This metadata record usually contains basic information about the object. This may include, for example, a description, technical requirements, rights management, and author demographics. These metadata records support searching and discovery of relevant objects.

We have chosen to view the iFolio system as a kind of educational digital library. As such, we are using the technical infrastructure of the smete.org digital library for our iFolio builder. We are defining student-generated portfolio artifacts as a type of learning object. Thus, throughout their pre-service career, students can contribute to and grow their own digital library collection. The learning objects that they store consist of technology-related projects that they complete during their education. In this way, their individual collection represents a documentation of their growing technology competence.

In addition, ISTE specified technology standards are used to define metadata elements to annotate and describe portfolio learning objects. Thus, as students add objects to their collection within the digital library, they are asked to describe how the object is linked to technology standards. In particular, as objects are added, students use a Web-based fill in form to associate them to specific standards. They are also asked to provide personal annotations (metadata) describing where and when the work was done, their role in its development, and other relevant information. These kinds of meta-comments about object development are stored as metadata for the contributed portfolio object.

For example, a student may choose to include a digital-video-case in their ePortfolio that shows them and their students during their student teaching / internship experience in an exercise where technology is playing a critical role in supporting instruction. The student may choose to annotate various segments of the video-case with short statements of how that portion of the case demonstrates their ability to meet the ISTE standards of: "plan strategies to manage student learning in a technology-enhanced environment," or "use technology to support learner-centered strategies that address the diverse needs of students," or a variety of other related standards. A single iFolio artifact can be used in this way to demonstrate and support the students' ability to meet a number of technology related standards.

As is usual in a digital library, students can search their portfolio collection, as well as those of their peers, to find and display objects. The portfolio metadata provide multiple search mechanisms for finding objects. For example, the metadata elements provide a way to search for artifact elements by standards requirements. In addition, the metadata provide a tangible means for tracking and assessing students' emerging competence in technology standards. Such assessment can be used to devise personal learning plans for meeting unfilled standards. Finally, the iFolio library can be accessed by professionals and/or peers at partner institutions for further review and comment.

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Duval, E., Vervaet, E., Verhoeven, B., Hendrikx, K., Cardinaels, K., Olivie, H., Forte, E., Haenni, F., Warkentyne, K., Forte, M., & Simillion, F. (in press). Managing digital educational resources with the ARIADNE metadata system. *Journal of Internet cataloging.*

LTSC. (2000). IEEE P1484.12 Learning Objects Metadata Working Group homepage [On-line]. Available: http://ltsc.ieee.org/wg12/index.html

Muramatsu, B. (2000). A Digital Learning Space for Science, Mathematics, Engineering, and Technology Education, Invited Talk, *Mathematics/Science Education and Technology 2000 (M/SET)*. San Diego, CA, February 5, 2000.

National Council for Accreditation of Teacher Education (1997). Technology and the New Professional Teacher: Preparing for the 21st Century Classroom. Washington D.C., 1997. Available online: http://www.ncate.org/accred/projects/tech/tech-21.htm

U.S. Department of Education (1999). Preparing Tomorrows Teacher to Use Technology Grant Overview, Washington D.C., April, 1999. Available online: http://www.ed.gov/offices/OPE/PPI/teachtech/00comp.html

High Touch Mentoring for High Tech Integration

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Abstract: The Graduate School of Education (GSE) at George Mason University (GMU) is committed to developing new teachers who not only have the skills they need to develop and teach lessons with technology, but who also have the knowledge needed to distinguish between effective and ineffective uses of technology. In order to help the faculty achieve this goal, a concerted effort was needed to ensure that faculty's use of technology included a variety of advanced learning applications. We submitted a proposal and were awarded a Preparing Tomorrow's Teachers to Use Technology (PT3) Implementation Grant. This project involves pairing GSE faculty with K-12 teachers already proficient in technology for one-to-one mentoring. The K-12 teachers are helping the faculty redesign the teacher education curriculum to include technology, providing models for effective technology use, and demonstrating instructional software programs. The one-to-one support is being supplemented with Webcasts and "best practices" videos on integrating technology.

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Introduction

Despite the increasing demand for technology use in the classroom, many teachers (preservice and inservice) still feel they are ill-prepared to integrate these tools into the school curriculum. The ideal way to prepare teachers for incorporating technology into classrooms is by integrating technology-based learning environments into the college curriculum, with university faculty modeling usage (Sprague, Kopfman, Dorsey, 1998). However, a survey by the Milken Exchange (1999) revealed that most faculty, whether in colleges of education or in the disciplines, do not model the use of technology in their courses.

Even if other faculty do not offer a model of technology integration, it is imperative that faculty in our colleges of education take a leadership role and provide prospective teachers with the opportunity to observe uses of technology in classrooms. However, many faculty members do not know how to effectively integrate technology in their courses. Although they may have basic computer skills, there is a sizable gap between personal technology use and use in teaching. It is much easier to learn basic computer applications, which are often covered in workshops, than to find - or even know where to seek - effective models of technology use that will improve learning. A concerted effort will be needed to move faculty use of technology into a variety of advanced learning applications that can improve education.

Such improvement in education cannot occur through "one-size-fits-all" workshops, especially when it comes to the integration of technology. Faculty members need time to reflect on their own teaching practice and beliefs. They need to explore software appropriate to their content area and need support as they begin to implement new teaching approaches. The most effective way to move faculty members from personal use of computer applications to the integration of technology into their courses is through working one-on-one (mentoring) where individual needs can be addressed (Thompson, Hansen, and Reinhart, 1996).

Mentoring has often been used to provide support for beginning teachers. Mentor teachers take on a wide range of roles in helping new teachers become familiar with procedures and instructional matters and providing emotional support when needed. "Key features of the mentoring approach are that assistance is provided within the context of a personal relationship and focused on the individual needs of the protégé" (MacArthur, et. al, 1995, p. 47). A mentor helps the protégé obtain knowledge or skills needed in order to prosper in their chosen profession. To improve technology usage in preservice education, faculty members need a mentor who can enable them to use technology effectively and understand their anxiety about change. Such a relationship can provide faculty members with the support they need as they move from personal use of computer applications to the integration of technology in their courses (Sprague, Kopfman, Dorsey, 1998).

Preparing Tomorrow's Teachers to Use Technology Grant Project

In June 2000, the Graduate School of Education (GSE) at George Mason University (GMU) was awarded a Preparing Tomorrow's Teachers to Use Technology (PT3) grant by the U.S. Department of Education. The goals of the project are to: (1) fully integrate technology in the instruction of preservice interns; (2) ensure that preservice interns are skilled in and have experience with integrating technology into K-12 classroom instruction; and (3) disseminate broadly the resources and best practices this project develops for integrating technology in preservice teacher preparation.

Through this project, we hope to develop beginning teachers who will be able to distinguish between effective and ineffective models for using technology in education and who are able to develop and teach lessons that include technology as a tool to support teaching and learning.

Providing Mentors

This project involves pairing K-12 teachers with faculty in one-to-one mentoring relationships. The K-12 teachers were selected from three partner school districts (Arlington Public Schools, Fairfax County Public Schools, and Prince William County Schools). They were chosen based upon their effective use of technology to support the learning of their students and were matched with faculty based on content area and grade level. These teachers are providing models for the effective use of technology, are demonstrating various software and web-based programs that can be used in education, and are assisting the Graduate School of Education (GSE) faculty in redesigning their teacher preparation courses.

Each participating GSE faculty member has been assigned at least onc K-12 teacher who serves as a mentor for one year. During the Fall semester, the faculty member spends time during the school day observing the teacher in his/her own classroom. The faculty member witnesses ways of teaching with technology and is exposed to a variety of software and websites. During the teachers' release time, the faculty has the opportunity to discuss what was observed.

Participating faculty will choose one course taught during the Spring or Summer semester that they want to revise to include the effective use of technology. They will spend time looking at resources provided by the teachers and reflect on ways they could use these resources in their course. They will also discuss these resources with the teacher and observe the ways teachers use these resources in their own teaching. During the following semester, the faculty will teach the newly revised course. The teachers will provide assistance to the faculty as they begin to integrate technology ideas in the course. The teachers will attend the course and serve as support for the faculty, providing technical assistance and making suggestions for improvement.

These same K-12 teachers will also work with the preservice interns during their field experiences. While working with the interns, the K-12 teachers will model effective uses of technology and help the interns use technology in their own teaching. This two tier approach will allow the preservice interns to see technology modeled in their teacher education courses by the GSE faculty, see the same kinds of models at their field experience sites, and practice these models with K-12 students. This should allow GSE to produce highly qualified teachers who are knowledgeable about technology and its role in teaching/learning and who have the skills to effectively integrate technology in their own teaching.

In order to ensure participation by the K-12 teachers and GSE faculty, incentives were included in the grant. K-12 teachers are being paid a substantial stipend and awarded three hours of class release time so they can meet with the faculty person assigned to work with them. Classes are covered by two GSE Doctoral Candidates who are assigned to assist with this project. Faculty were offered a course reduction for their participation. Sixteen

GSE faculty members and twenty-one K-12 teachers (some faculty chose to work with more than one teacher) are currently involved in the first year of this three year project.

Webcasts

In addition to the mentoring, training will also be available through the use of Webcasts offered by a local non-profit organization called Kidz Online (http://www.kidzonline.org). Kidz Online's mission is to teach all children about the technologies that will play a major role in their future, so that they will view technology as an opportunity and not as a threat. Its educational programs have "kids teaching kids" and are focused on out-of-school learning. Kidz Online's young volunteers from the suburbs teach at-risk children from inner city after-school programs basic on-linc skills. It also has developed a computer graphics and animation program to teach more advanced multimedia skills for high-demand careers.

Through our partnership with Kidz Online we will produce a series of Webcasts, video-on-demand, and videotapes that will focus on teaching technology skills and integrating technology in K-12 classrooms and university courses. A revolutionary new technology and a key component to the project, Webcasting replaces the production equipment found in a high-end television studio, including multi-camera switching and special effects such as animation. Webcasting provides the power to simulcast live events such as corporate meetings, newscasts, conferences, classroom training, trade shows or even a talk show. These Webcasts may be viewed live which will allow for real-time interaction between the presenters and viewers via e-mail or chat.

The Webcasts will be twenty minutes in length and will focus on teaching technology skills and integrating technology in K-12 classrooms and in university courses. Curriculum for the Webcasts are being developed by K-12 teachers and faculty within the Instructional Technology Program in GSE. Webcasts will begin January 2001 and will be shown monthly. Webcasts will be available for faculty in GSE to use with their preservice students. Preservice students will be able to ask questions and interact with the host of the Webcasts using e-mail and chat. These Webcasts will be archived on the project website (http://www.techmentor.org) so faculty at other universities and K-12 teachers may have access to them.

Currently, we are in the process of developing curriculum for the first series of Webcasts. This series will consist of three 20 minutes segments and will focus on the use of idea processors in K-12 and university settings. The first segment will introduce idea processors and demonstrate the use of *Inspiration.* The second and third segments will focus on the integration of idea processors in Math, Science, Social Studies, and Language Arts curriculum. Discussion by the moderator will be complemented by video footage of K-12 students using *Inspiration* to accomplish curricular goals. Future Webcasts are being planned for WebQuests, On-line Resources, Databases, Spreadsheets, and Virtual Communities.

Recruitment of Participants

In August 2000, the project director (Dr. Debra Sprague) sent an e-mail message to GSE faculty asking for volunteers to participate in the project. Sixteen faculty members agreed to participate (Dr. Steve White was one of them). Dr. Sprague met with the faculty and explained the purpose of the project. She emphasized the importance of using technology to teach in a new way as opposed to adding "technology for technology's sake." She provided the faculty with suggestions of appropriate activities for using technology in their courses. Dr. Sprague asked the faculty to send her an e-mail with the title of the course they wanted to revise and any special considerations they wanted her to take into account when finding a teacher. For example, several of the faculty already knew a teacher in their content area who was using technology and asked to be paired with that teacher while other faculty members supervise interns in a particular school and requested to be paired with a teacher from that school. Wherever possible these requests were honored.

School personal from each district served as the liaison for locating appropriate teachers. The teachers were chosen based on the following criteria. First, they needed to be a good teacher who happened to use technology effectively in their classrooms. Second, to ensure their technology skills and knowledge they needed to have either conducted a technology workshop or taught a technology course for their school, district, or the university; have completed a Master's degree in instructional technology; or obtained a reference from one of the technology coordinators in the district. The twenty-one teachers selected to participate had met the criteria.

Status of the Project

Because of the high number of participants in the project we have run into some unexpected obstacles. First, during the 1999-2000 academic year, GSE redesigned all of its teacher licensure programs due to changes in state regulations. This led to new courses being developed and taught for the first time during the 2000-2001 academic year. Several of the faculty felt they were unable to give up a course due to this redesign. They felt they needed to teach the new courses at least once before hiring an adjunct to cover the classes. As a result, many felt they could not take advantage of the offered course release. This initially discouraged some from participating this first year. To try to assist the faculty and provide incentive to participate, the Dean's office agreed to allow faculty to count the course release toward summer payment (faculty receive summer money as though they had taught a course) or to use the funds for travel money so faculty could share what they had developed in their courses. This led to several faculty members agreeing to participate who had originally declined the invitation.

The second obstacle that needed to be overcome involved the difficulties of schedules. The teachers and faculty often found it difficult to schedule a time when they could meet. Some of the faculty were traveling and were not able to connect with their mentor right away. When they returned their mentor was busy with after school projects and could not always accommodate the faculty's schedule. Some of the pairs chose to meet on the weekends to discuss ideas for using technology.

Another obstacle involved some of the teachers who seemed confused as to the goals of the project. They did not understand that the faculty were going to visit their classrooms. This led to confusion by the faculty and the teacher. Originally, the advisory committee had planned a kick-off reception that would allow the faculty and teachers to get to know each other. This was canceled because the teachers had not yet been identified. As a result, faculty were given the names and contact information for their teachers and were told to contact them and arrange a visit. Had the reception been held, some of the confusion would have been clarified. To solve this problem Dr. Sprague met with the teacher-faculty pair and discussed the goals of the project. A timeline was developed and given to both the faculty and the teachers. This helped to clear-up the confusion.

Despite these obstacles we are seeing some success with the mentoring relations. Several of the faculty participating have expressed satisfaction with their assigned teachers. Two faculty members are in the process of developing new materials for use in their courses. One faculty member who teaches Science Method courses is developing a video on the use of probeware. Another faculty member who teaches Foreign Language Methods is developing a WebQuest to use in her courses. Upon completion of her WebQuest, preservice candidates will create a WebQuest of their own. The rest of the faculty are still exploring various aspects of technology and have not yet decided how they want to integrate technology in their courses. However, the majority of the faculty have expressed enthusiasm and excitement about this opportunity to improve their own teaching.

Because this project is just beginning it is too early to draw any conclusions about its effectiveness. The project is being evaluated by an outside consulting firm, *Rockman et. al.* The evaluation consists of on-line surveys, interviews with the participants, and observations of the university courses. Several PhD. candidates are also conducting research on the effectiveness of this project. Summaries of these research projects will be posted on the project website (http://www.techmentor.org) once they are completed.

Conclusion

This purpose of this paper was to describe the development and implementation of one PT3 grant. The process of developing mentoring relationships between the faculty and K-12 teachers was discussed. Specifically, the selection criteria for selecting K-12 teachers as mentors for university faculty along with the goals and potential outcomes of the mentoring relationships were described. Discussion of the Webcasts that are being developed to focus on teaching technology skills and integrating technology in K-12 classrooms and university courses was shared. Specific obstacles that were encountered by project participants were also discussed. Strategies that were used to address and overcome different obstacles were included to further illustrate how ongoing communication and problem solving has been used to focus on the overall goals of the project.

References:

MacArthur, C. A., Pilato, V., Kercher, M., Peterson, D., Malouf, D., and Jamison, P. (1995, Fall). Mentoring: An approach to Technology Education for Teachers. *Journal of Research on Computing in Education, 28*(1), 46-62.

Milken Exchange (1999). Will new teachers be prepared to teach in a digital age? A national survey on information technology in teacher education. Santa Monica, CA: Milken Family Foundation.

Sprague,D. Kopfman, K. and Dorsey, S. (1998). Faculty development in the integration of technology in teacher education courses. Journal of Computing in Teacher Education, Vol. 14, No.2, Winter 1998, p. 24-28.

Thompson, A., Hansen, D., and Reinhart, P. (1996). One-on-one technology mentoring for teacher education faculty: case study reports. *Technology and Teacher Education Annual, 1996.* Proceedings of SITE 96 - Seventh International Conference of the Society for Information Technology and Teacher Education. Charlottesville, VA: Association for the Advancement of Computing in Education.

Using Technology Camps as Catalysts for Increased Technology Integration

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Abstract: A major challenge in engaging faculty members and K-12 teachers in in-service technology activities is the many demands and constraints on their time during the school year. A summer technology camp offers one approach for addressing this challenge by providing time for participants to interact and focus on technology in a relaxed atmosphere. This paper describes a technology camp that brought faculty members, K-12 teachers, and teacher candidates together for three days of technology related activities. A sampling of participants has been surveyed now that they are back in the classroom to determine the ways and amount they have used information and skills obtained in the camp. Practical suggestions based on the evaluations and the implementation of the camp will be described at the session to assist other educators interested in creating a similar camp.

The capacity building grant awarded by the U.S. Department of Education under the Preparing Tomorrow's Teachers to Use Technology initiative to a consortium led by Harris-Stowe State College provided a variety of professional development activities that brought together preK-5 teachers, college faculty members and teacher candidates. A major challenge in engaging such a diverse group in in-service technology activities is the varied demands and constraints on time combined with different academic calendars and schedules. One professional development activity designed to meet that challenge was the creation of technology learning communities (Stephen & Evans, 2000). A second strategy used to meet the goals related to professional development in the grant was the sponsoring of a summer technology camp.

Participants in Camp ETC, named for the project Edu-Tech Connect, met for three intensive days in August for workshops and hands-on activities designed to increase participants' expertise with technology and understanding of ways to integrate it into instruction. The camp format offered several advantages for the participants. These included a relaxed and casual atmosphere for learning, time to use information learned in workshops to develop materials for use in teaching, and a schedule that allowed participants to choose from a variety of workshops and activities. The camp also provided a setting in which faculty members, classroom teachers and teacher candidates could interact and exchange different perspectives on ways to use what was being learned in teaching.

From the very beginning, members of the camp planning committee found themselves confronted with a series of challenges and decisions that threatened to impact the success of the camp. The two main institutions, Harris-Stowe State College and Gateway Elementary Math, Science & Technology Magnet School are relatively small institutions with different schedules. They are not within walking distance of each other. In addition, while computer platforms at the two institutions are the same, the two institutions do not always support the same software for applications.

The first issue the committee confronted was the selection of dates and location for the camp. Administrators at Gateway Elementary offered to make two state-of-art computer labs available in either of two weeks following the conclusion of their summer school for use in the camp. Unfortunately, the summer session at Harris-Stowe overlapped those two weeks, but one of the college's computer labs was available for use during either week. The dilemma that the members of the camp planning committee faced became how to offer a schedule that would not eliminate participation by Harris-Stowe faculty members and teacher candidates involved in the learning communities, but also involved in the college's summer session. Since few of the college's classes met on Friday and other classes followed a Monday-Wednesday or Tuesday-Thursday meeting pattern, the decision was made to schedule the camp for three days, Wednesday through Friday and to offer camp workshops at both locations on Wednesday and Thursday. This schedule enabled college faculty and students involved in summer school to participate in at least some camp activities.

An even greater challenge arose when the committee tried to plan workshops that would satisfy a range of interests and technological expertise. Since participants did not receive compensation for their involvement in the camp, planners were challenged to be creative in designing three days that would appeal enough to possible participants so they would be willing to commit their time freely to the camp. A variety of strategies was used to accomplish this, including early input from potential participants on topics of interest, a schedule that allowed participants flexibility in selecting topics and activities ranging from in-depth workshops to short activities such as using the computer to make mouse pads, plenty of vendor supplied free items, opportunities for fellowship and even a technology-related version of "Who wants to be a millionaire?" game. A survey of potential participants at both institutions resulted in the identification of some common areas of interest: strategies for using search engines, web page design, creation of electronic portfolios, use of presentation software, and creation of projects using graphics packages. While members of the planning committee had expertise to teach these sessions, the decision was made to contract the teaching of the courses through the director of technology instruction for a consortium of local school districts. This offered several advantages including freeing committee members to participate in sessions and to act as trouble shooters when needed, the ability to use and tailor already created workshops to meet the participants' needs, and the availability of workshop instructors who regularly worked in the prek-12 environment. In cases when the institutions used different software for particular applications, such as web page design, similar workshops were held simultaneously at both sites, but using the software supported at that site. Beginning workshops followed by more advanced workshops were offered on topics where participants had different levels of expertise. In the all-day formats, mornings were devoted to more structured instruction, with the afternoons focusing more on time to develop materials to meet specific instructional needs with the workshop instructor available for assistance.

Members of the technology learning communities were targeted initially for participation, with additional spaces made available to other faculty at the college and magnet school. Student members of the learning communities worked in various capacities at the camp. Resources were available for 50 participants. While members of the planning committee feared that splitting the sessions on the first two days between two different sites might lead to separation of college faculty and students at the college facility and classroom teachers at the magnet school facility, that fear turned out to be unfounded.

Participants were asked to complete evaluations on a daily basis and a summary evaluation form at the end of the camp. In addition, in early November a sample selected from camp participants was asked to comment upon what they had learned at the camp that they have been able to use in their teaching. The evaluation forms indicated that camp participants had found the camp of value for several reasons. Among the reasons cited for the success of the camp were the quality of the workshops, usefulness of technologies introduced, manageable number of participants in each workshop, opportunity for increased collaboration between the schools, and the overall structure of the workshop. All but one participant, who was undecided, indicated that they would like continuation of this project. Each participant selected to participate in the November survey listed specific skills and information they had learned at the camp and were currently using in teaching. Several participants asked that the camp be expanded next year.

A major benefit of the camp, in addition to the practicality of what had been learned by the participants, is the good will and collaboration that was established among the participants. This will serve as a catalyst as additional activities are planned under the consortium's implementation grant.

References

Stephen, M., Evans, G., (2000). EduTech Connect: A win-win endeavor. Paper presented at SITE Conference, San Diego, CA.

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Faculty Teaching Faculty: A Matter of Trust

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Abstract: The primary aim of the Viewing and Doing Technology (VDT) Project was to situate field-based secondary preservice teachers in a learning environment in which university faculty demonstrated skillful teaching with technology and offered students rich opportunities for visualizing and infusing technology in teaching. This project involved 10 secondary teacher preparation faculty who developed and conducted professional development workshops for each other. Workshops included developing online course materials, creating WebQuests, peer editing with word processing software, developing video cases, creating multimedia course materials, and photo editing. Graduate assistants, two computer science majors, provided technology support. Data collection included email messages, faculty created web pages, observations, and interviews. Results of the data analysis indicated the faculty developed a connected community of learners who worked together to learn new ways to use technology and incorporated what they learned into their teaching.

Infusing technology into classes throughout the teacher preparation program assures that preservice teachers experience how technology can be woven into daily classroom activities (Halpin, 1999). This modeling of technology integration provides a foundation for students as they develop the skills and confidence to use technology in their own classrooms. This requires that teacher preparation faculty know how to use technology to enhance their own teaching. However, teacher preparation faculties oftentimes do not receive the professional development, hardware, software, specialized support, released time, and recognition to develop the technological skills needed to infuse technology into their teaching.

In order for teacher preparation faculty to infuse their teaching with technology, they need professional development opportunities to learn to use technology and to learn to teach with technology. Effective technology staff development requires, among other things, immersion in learning over extended periods of time, active involvement, a community of learners, a focus on the learners' needs, and time for reflection (McKenzie, 1991). Additionally, effective professional development focuses on how to use technology to improve teaching and learning (Cottrell, 1999). The workshop facilitators must take into consideration the concerns and feelings of the participants (Linnell, 1994). Using the cognitive apprenticeship approach in professional development assures that instruction is relevant, focuses on authentic problems, and provides ongoing support after the workshops (Ritchie & Wiburg, 1994).

Just-in-time (JIT) direct instruction is one means of providing ongoing support. JIT is assistance that is provided when it is needed, is specific to the learners' needs, and is usually under the learners' control (Willis, Stephens, & Matthew, 1996). Further, JIT direct instruction teaches the learners a basic skill needed to solve a current problem and enables them to move beyond an impasse. This personal support for learners is crucial for faculty members as they learn to use technology. Immediate, specific technology support can be provided by students who know how to use technology and are immediately available to assist faculty members (Gonzales et al., 1999; Hruskocy, Cennamo, Ertmer, & Johnson, 2000; Thompson, Schmidt, & Hadjiyianni, 1995).

Learning to use technology and to infuse it into the curriculum in meaningful ways requires ongoing support from a connected community of learners who use technology. A community of learners provides not only the resources and technical support required to use technology but also the confidence to teach with technology (Ginns, McRobbie, & Stein, 1999; Hruskocy et al., 2000). This community of learners may include both students and teachers. Tom Carroll's, Preparing Tomorrow's Teachers to Use Technology (PT3) Program Director at the U. S. Department of Education, vision for teacher professional development includes intergenerational collaborative learning between teachers and students whereby they learn from one another (Sanford, 2000).

Teacher preparation faculty members do not infuse technology in their classes in part because they lack professional development opportunities, proper equipment, and support. This research sought to determine if providing professional development workshops, proper equipment and a supportive community of learners would create a technology rich learning environment for preservice teachers. Hence, the Viewing and Doing Technology (VDT) Project was conceived as a way to facilitate this process by enrolling select faculty at Southwest Texas State University (SWT) in workshops that would help them learn and practice ways to use technology effectively. The ultimate aim of VDT was to situate field-based secondary preservice teachers in a learning environment in which university faculty demonstrate skillful teaching with technology and provide students with rich opportunities for visualizing and infusing technology in their teaching.

Methodology

Participants

Participants in this study were 10 secondary teacher preparation faculty, 4 males and 6 females, teaching in professional development schools. Faculty members had been teaching at the university level from 6 months to 25 years. They ranged in age from 35 years to over 55 years. All participants except one reported having a home computer that they used on a daily basis, checking their email daily, and using the Internet daily. These faculty members taught field-based courses at four area high schools and one middle school. Because they spend 15-20 hours at their perspective school sites, they had few opportunities to learn and practice new technologies as well as limited time to work together to develop into a community of learners. The establishment of a "Visions Center" at one of the field-based sites served as a model for using current technology and developing constructivist-teaching practices. Participants received a stipend for participating in the workshops.

Procedure

The faculty members engaged in a faculty-teaching-faculty series of workshops. That is, they developed and conducted professional development workshops for each other. The five-hour workshops were held on Fridays during the course of the academic year and were led by one of the 10 faculty members with expertise in a particular area. Prior to the workshops, faculty members communicated by email to discuss the workshops. These email communications provided the workshop facilitator information about the concerns and expectations of the participants and assured that the workshops would meet the needs of the participants. Some faculty members placed workshop materials on-line prior to their workshops. Content of the seven faculty workshops included developing online course materials, creating WebQuests, peer editing with word processing software, developing and using video cases, creating multimedia course materials, and photo editing.

Workshop facilitators provided direct instruction, which included not only the necessary technological skills but also information and examples demonstrating how the technology was incorporated in the facilitator's university classes. Participants were then provided opportunities for guided practice to assure that they not only learned to use the technology but also understood how the technology could be adapted to their own classrooms. Two graduate assistants, computer science majors, assisted the faculty members during the workshops and were also available to assist faculty in their offices and in their field-based placements at area high schools.

One workshop was presented in the "Visions Center;" the others were conducted at a campus computer lab. The "Visions Center" provided faculty with access to the latest technology and was located on site at one of the local high schools where two members of the faculty were field-based. The campus computer lab provided a familiar environment for the faculty members and for some participants, workshops conducted here required less travel time. Coffee, soft drinks, and other refreshments were available to the participants throughout the day. At the start of the workshops lunch orders were placed and lunch was delivered to the site.

Results

Data collection included email messages, faculty and VDT project web pages, observations, and interviews with the faculty members and graduate assistants. Content analysis was used to determine common themes and patterns across the data sources.

The adoption of technology is a complex, nonlinear process that develops over time (Wesley & Franks, 1996) and faculty members involved in this project were cognizant of this fact. They understood that learning to infuse technology in their teacher preparation classes required a long-term commitment, would at times be frustrating, and would require that they become a connected community of learners who would learn together and teach each other. When asked about the impact of VDT on their teaching, faculty members reported that it was a good foundation for the next step. They were looking forward to more technology professional development and receiving additional equipment to use at their field-based schools. Faculty wanted input as to the what technology was to be purchased so they could have a choice in computer platforms and to be able to get what they wanted to use in their classes. Faculty members realized that integrating technology into their curriculum required a long-term commitment and would require them to continually learn new ways to use technology in their teaching.

Workshop topics were selected based on the participants' needs and focused on the effective use of technology to enhance teaching and learning. Participants were actively involved in the workshops and in the adaptation of the skills learned to their own classroom teaching. Faculty members reported that they thought it important that they were able to decide on the workshop topics themselves, as it was important that the workshops be specific to their needs. Not included in the workshops was a session on *PowerPoint*, because as one faculty member noted, "Everyone is using *PowerPoint*." Additionally, it was noted that using *PowerPoint* does not change instruction; professors just put their notes in PowerPoint and continue to lecture to students. Faculty members understood that to effectively use technology in their teaching would require them to change the way they taught.

A connected community of learners was formed as the participants made their workshop materials available on the web, communicated by email, and assisted one another as they encountered problems. Links to workshop materials were available from either the VDT web site or from the workshop instructor's homepage prior to the workshops. Participants were encouraged to preview the materials to assure that they had some understanding of the concepts to be presented and that the content of the workshop met their expectations. For example, prior to the workshop on web forms and web tests a web page was placed on-line with links to some existing web based forms for the participants to preview and the pretest for the workshop. Participants were asked to think about how they could use web forms in their teaching and were asked to bring to the workshop a form or test they would like to deliver via the web.

The faculty instructor for the *PhotoShop* workshop challenged the participants to construct the rationale and the design for the workshop to assure that it would be meaningful to them. To encourage the participants to think about what they wanted in the workshop, he posed a series of questions to them via email. Just as faculty members communicated with one another via email they also used email to communicate with their students. Faculty members commented that students have more access to email than previously and require students to use it for communicating with the professor and with one another.

Faculty members relied on one another for technical support. One faculty member commented that when helping another faculty member with a computer problem it is important to help them develop troubleshooting skills to enable them to solve future problems. This type of assistance empowers the faculty member with the skills to think through future problems and possibly solve them on their own. When teaching faculty about computers this faculty member introduces them to the control panel where they can make simple changes and teaches them about extension conflicts. He also cautions them about what leave alone.

Workshop facilitators were colleagues who took into consideration the levels of expertise of the participants and knew the unique problems faced by faculty members teaching in professional development schools, which assured that the material presented was relevant. Workshops included direct instruction in necessary skills, guided practice with written directions, and opportunities to work together to explore and create materials for use in their classrooms. The presentations were focused, yet relaxed and participant input was encouraged. The facilitator, the graduate assistants, and any participants who were somewhat familiar with the content of the workshop provided assistance.

Time for reflection was an important component of each workshop. Prior to each workshop, participants completed a pretest on the material to be covered in the workshop either online before coming to the workshop or on paper prior to the start of the workshop. At the beginning of the workshop faculty members talked about their expectations for the workshop and reflected on the email messages they had sent to one another about the workshop. They discussed how they thought the skills to be learned in the workshop could be used to enhance their teaching and possible ways to share their new knowledge with their students. As participants worked they shared comments back and forth on how they could use what they were learning as well as concerns about possible problems in using their new skills in their teaching. At the end of the workshop participants completed a posttest on what they had learned. Answers to the questions were discussed and participants reflected on what they had learned and how it could be used by their students. Workshops concluded with a brief discussion of the content and expectations for the next workshop.

Ongoing support for the faculty members was provided by graduate assistants who worked with the faculty in their offices and in their field-based classrooms. The graduate assistants were computer science majors, who provided technical assistance to the faculty and taught them to use various pieces of hardware, such as scanners and digital cameras, and software, such as *PageMill* and *FrontPage*. Their duties also included setting up new hardware as it arrived and loading software on computers. During interviews they commented on teaching the faculty to create web pages. The students preferred to use HTML for creating web pages, but learned *FrontPage* and *PageMill* in order to teach the faculty members how to their own create web pages. They realized that the faculty members would not be able to easily learn to create and maintain their own web pages if required to use HTML. They were pleased that the faculty members could now create and maintain their own web pages. While the graduate assistants were originally dismayed at how little the faculty members knew about computers when compared to their own knowledge of computers, they took great pride in what they had been able to teach the faculty members. They realized that the faculty members were willing and eager to learn about technology. Observations were made of the assistants teaching faculty members to download photographs from a digital camera. The assistants patiently explained the procedure and then allowed the professors to attempt the process on their own. The assistants hovered close by to guide the professors and to answer any questions they had about the process. The assistants were also available to support other university professors not involved in the VDT project. The just-in-time instruction they afforded faculty members assured that as problems and concerns arose they were quickly addressed.

When asked to provide examples of how they were incorporating what they learned in VDT workshops into their teaching, the participants were eager to share their students' work. One professor had students turn their projects into web pages, which were placed on-line to be shared with their classmates. She commented that students "loved" being able to see their projects on-line. Another professor created a *HyperStudio* stack on theories of adolescent behavior. Then, the students added cards to the stack that reflected a practical application of the theory. Their stacks were saved on zip disks, put on the college computer network, and shared with the other students in the class. Another professor shared how he had used *Inspiration* software to create a map of his course materials on moral development. Professors also cited the usefulness of learning to create web pages and creating web pages for their professional development sites. Not only were the university students using the web pages to check for their assignments, but so were the cooperating teachers, who wanted to know what they should be expecting from the students. Some professors stated that they had not been able to use all of the things they learned in the workshops because they did not have access to the equipment and software at their professional development schools. The lack of time to incorporate all they had learned was also noted.

Faculty members commented that each year the students they teach are coming to them more computer savvy than the last group and that students manage to find access to technology when it is required for their courses. They also recognize that as professors it is their responsibility to know about software and be able to guide students as they learn to use various pieces of software in their teaching. They keep examples of past students' work to show their present students possible ways to use different pieces of software in their teaching.

Conclusions

Faculty members and graduate assistants formed a connected community of learners who provided each other the technical support and the confidence to teach with technology assuring that their preservice teachers learn in a technology rich environment for visualizing and infusing technology in their teaching. This connected community of learners challenged each other to use technology and supported each other as they worked to use technology to improve teaching and learning. The VDT project provided participants opportunities to immerse themselves in learning to use technology relevant to their needs over an extended period of time, through active hands-on workshops followed by ongoing support provided by other participants and graduate assistants. Additionally, VDT workshops allowed participants time to share and reflect as they learned to infuse technology into their teaching. The workshops provided faculty members time to visit and share success stories and challenges encountered in their field-based teaching.

Faculty members found the workshops relevant to their teaching and cited examples of how they were able to incorporate what they learned into their classes. Some noted that the lack of resources at their professional development sites prevented them from incorporating all that they had learned. However, not being able to immediately implement something in their teaching did not affect their enthusiasm for learning about technology. One indication of the success of this project is that once the funding ended faculty members decided to continue their collaboration in order to further develop their technology expertise.

References

Cottrell, J. R. (1999, Fall). Information literacy, computer literacy, and good teaching practices: Firm foundations for faculty development. [26 paragraphs]. *Academic Exchange Quarterly*, *3*(3). [On-line Serial]. Available: http://www.newcastletreatment/ar/AEQ/V3-3/V3-3-Focus-5.htm.

Ginns, I., McRobbie, C. J., & Stein, S. J. (1999). An authentic learning environment in a design and technology subject for preservice primary teacher education students. [60 paragraphs]. Centre for Mathematics and Science Education. [On-line]. Available: http://www.aare.edu.au/99pap/gin99260.htm.

Gonzales, C. L., Hill, M., Leon, S., Orrantia, J. F., Saxon, M., & de Montes, L. S. (1999). Faculty from Mars, technology from Venus: Mentoring is the link. [24 paragraphs]. *Computers in the Social Studies Journal*. [On-line Serial]. Available: http://www.cssjournal.com/gonzales.html.

Halpin, R. (1999). A model of constructivist learning in practice: Computer literacy integrated into elementary mathematics and science teacher education. *Journal of Research on Computing in Education, 32*(1), 128-138.

Hruskocy, C., Cennamo, K. S., Ertmer, P. A., & Johnson, T. (2000). Creating a community of technology users: Students become technology experts for teachers and peers. *Journal of Technology and Teacher Education, 8*(1), 69-84.

Linnell, C. C. (1994). Facilitating curriculum change: Teacher concerns as a factor. *Journal of Industrial Teacher Education, 31*(3), 93-96.

McKenzie, J. (1991, April). Designing staff development for the information age. [44 paragraphs]. *From Now On The Educational Technology Journal*. [On-line Serial]. Available: http://www.fno.org/fnoapr91.html.

Ritchie, D., & Wiburg, K. (1994). Educational variable influencing technology integration. *Journal of Technology and Teacher Education, 2*(2), 143-153.

Sanford, S. (2000, July). Tom Carroll: Constructing a new culture of learning. *Converge, 3*(7), 70-71.

Thompson, A., Schmidt, D., & Hadjiyianni, E. (1995). A three-year program to infuse technology throughout a teacher education program. *Journal of Technology and Teacher Education, 3*(1), 13-24.

Wesley, M. T., Jr., & Franks, M. E. (1996, November). Advanced adoption of computer technology in the classroom and teachers' participation in voluntary innovation adoption activities. Paper presented at the annual meeting of the Mid-South Educational Research Association, Tuscaloosa, AL.

Willis, J., Stephens, E., & Matthew, K. (1996). *Technology, reading, and language arts*. Needlham Heights, MA: Allyn & Bacon.

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Preparing Pre-service Teachers for Integrating Technology into Science Instruction: a PT3 Project

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Introduction

This paper reports on the first year of a Preparing Tomorrow's Teachers to use Technology Capacity Grant Project designed to provide preservice teachers greater exposure to the instructional uses of technology (Maddux, 1984). Skills in the application of communication, presentations, microworlds (Jonassen, 1996) and CLE technologies are explored to bring to the classroom real-life examples (Cognition and Technology Group at Vanderbilt, 1990) and situations that provide the contextual framework so important to learning (Brown, Collins, and Duguid, 1989).

Goals for the project include:

- curriculum revision for college science methods courses to integrate more use of technology,
- integrating similar technology into both college and public school instruction,
- providing technology training and pedagogical mentoring for college teacher education faculty and participating public school teachers,
- exposing students and faculty at both the college and public school to current software and hardware offerings,
- providing leadership for technology rich instructional unit development, and
- enhanced experiences for pre-service teachers in teaching with technology in the classroom.

The participants in the consortium consisted of three professors at Westminster College, and two science and three math instructors, the technology specialist, and the principal at Bryant Intermediate School. This paper will report on the attitudes, experiences, and techniques of the science methods professor and the project administrator at Westminster College (who are co-authors of this paper), the two science instructors at Bryant Intermediate School, and elementary and secondary pre-service teachers.

Background Narrative

The overarching plan for the project involved the following timeline. During August participants met to discuss individual broad goals, and to discuss technology needs and skills to be developed before curriculum revisions. A final timetable of meeting dates, workshops, and assignment due dates was established. September brought the initial workshop to help develop skills for all consortium partners in technology applications integrated with instructional and learning methods. Participants explored issues of computer anxiety in students (Maurer and Simonson, 1994), factors contributing to successfully evaluating software, computer simulations in the classroom (Jonassen, 1996), and principles of instructional design (West, Farmer, and Wolff, 1991).

Through October to December participants met as a consortium, with the project director facilitating meetings, every other week for about three hours. As participants developed their curriculum, changes were reviewed with suggestions made as to how to further integrate technology.

As this period unrolled participant's roles evolved. The project director administered the grant and scheduled and provided technical assistance and teaching with technology expertise. Westminster science faculty became mentors for school participants, and school participants either bought into the project and found ways to challenge themselves in their curriculum revision or did not. Each meeting was conducted in a manner conducive to free and open democratic discussion and input. This was a key feature of the design of the grant so that the public school teachers who became consortium partners would feel, and be, in a true partnership. As this period progressed it was planned that students from the college who were enrolled in the fall educational technology course would demonstrate the use of educational technology instructional strategies to the consortium members to help them make informed decisions about the curriculum change process. In early December the consortium met to decide on conferences that would further enable the learning process and to plan technology purchases funded by the grant. Purchasing decisions were made by common open vote with an attempt at equality of access to the purchases by all participants. Before Christmas the developed unit plans and curriculum changes were reviewed by all and technology purchases began. Presenting and teaching these enriched units was planned for specific days in the next year so that preservice teachers could attend. The goal here being preservice teacher exposure to classrooms where real teachers were teaching real technology enriched lessons.

From late January to May participants taught their revised curriculum with other consortium members and/or preservice teachers in attendance. The goal was then to deconstruct the curriculum and revise as necessary. These revisions would then become models from which to draw expertise for further more extensive revisions the following year with even more technologies learned, and integrated into practice.

Method

All partners in the consortium were required to keep journals detailing their experiences, thoughts, and actions as they engaged in the project. Additionally participants were surveyed and interviewed at the beginning and end of the school year about their inclinations and abilities to use technology, and to use it in teaching. The interviews were audiotaped and transcribed for analysis. Additionally, the project's outside evaluator (a co-author of this paper) conducted classroom observations in methods courses and intermediate school classrooms and informal interviews with consortium participants. Data from these sources provides the basis for formal evaluation of the effectiveness of the grant, and for this paper.

Narrative

Between October and December 1999, the consortium met regularly to revise curriculum. Our hope, both at the college and intermediate school level, was to infuse meaningful technology into similar units of study. Through our collaborative meetings in late 1999, we found that the science methods professor and the science instructors at Bryant were planning units of study focusing on various ecosystems. This resulted in significant changes in our teaching practices. In the science methods course, pre-service teachers set up experiments that addressed questions concerning animal and bacteria life on the Great Salt Lake. In order to conduct the experiments, the pre-service teachers used an array of technologies including field microscopes, conductivity meters, temperature probes, water testing kits, video microscopes, and several web sites.

Each of the pre-service teachers worked with the technologies during the science methods class sessions; however, the three pre-service teachers who had field placements at Bryant were also able to assist the science instructors there when the same technologies were introduced in their units on ecosystems. Eventually, two of the pre-service teachers helped facilitate "stations" on a culminating eighth grade field trip to the Great Salt Lake, to study ecosystems. At each station the students used temperature probes and conductivity meters to ascertain the temperature and salt concentration of water and soil in the surrounding area. Additionally, the students used the water testing kits to gather data on the pH of the water and soil at each station. The field microscopes were used to observe salt crystals, brine shrimp and algae. At a later time, the students videotaped these organisms with the video-microscopes.

All pre-service teachers in the secondary methods course were required to create a lesson on the Great Salt Lake using many of these technologies for their final assignment. These pre-service teachers were then able to experience teaching with technology when 70 eighth grade students came to Westminster College to participate in the pre-service teachers' lessons.

During this period from January through May technology purchases were made according to our plans and by a collaborative decision making process. Participants attended conferences partly funded by the grant and where necessary substitute teachers were provided to allow further workshops to take place. It was also during this period problems began to arise. Though the planning for the project called for a very democratic partnership it became evident teacher participants struggled with this notion of equality. With their years of experience advising teachers to defer to authority, whether it is real, or assumed through presumed superior knowledge, the teachers were unable to maintain a democratic partnership. In instances of planning curricular change the teacher participants deferred continually to their college peers. They were often late to meetings sometimes expressing a subservient truculence to perceived authority. As this continued science faculty and the Project Director did in fact assume more authority to get the project completed. This became an issue as the year came to a close and the teachers were largely left on their own to deconstruct and revise their new curriculum. Where college faculty naturally assumed this task as part of the grant project agreement, perhaps because such acts are a regular part of their profession, the teachers did not push forward with revisions without heavy encouragement to do so from the project director.

Another issue revolved around issues of control dictated by the school district of which Bryant is a part. When Westminster donated ten Pentium computers to Bryant the district would not support the machines by providing technical assistance. The machines were examined by a technician who claimed they were stripped and needed hard drives when in fact only the operating system needed to be loaded. To overcome this problem one teacher, perhaps used to handling such issues, with the full support of the other teachers, did the work herself. This was done surrepticiously so not to offend district technology personnel. Effectively, while technology shortages existed at the school, the district would not supply support for donated hardware nor provide timely support for district approved hardware purchases. Though the district was supposed to be an active partner of support for the grant, they provided very limited support for their teachers involved in the grant. Further problems arose through the billing practices of the district. Routinely it took the district several months after the receipt of purchased items to bill the grant. Though efforts were made to correct this problem, several months after the grant expired the district forwarded bills totaling in the thousands for hardware purchased ten months earlier.

Results and Implications

The opportunity to participate in a coordinated technology rich experience between their methods course and their field placement, allowed pre-service teachers to focus on the issues of teaching with technology rather than on just becoming familiar with the technology. Pre-service teachers expressed an increased awareness of the parameters involved in using and teaching with technology. They found the experience of first learning with and then teaching with the same technologies to be an important influence on their thinking about integrating technology into the curriculum. This was reflected in their post interviews and surveys, as well as in the final units of instruction they created and taught.

This said there were problems. Scheduling the preservice teachers to be in the participant teachers at times when the technology enriched lessons were taught proved difficult. An issue evolved around the selection of a faculty member to supervise these students as they visited classrooms. Unfortunately the faculty member with this charge had a very limited understanding of the value of technology for teaching and learning. She encouraged the students to be very critical in their observations of classroom practice. This negativity resulted in a number of preservice teachers jaundicing their view of technology as useful to teaching and learning. A key issue here is to be sure when engaged in a collaborative project, such as this, that both formal and informal participants buy into the goals of the project. A single negative perspective can induce problems of lasting longevity for new teachers, and influence the whole nature of a collaborative experience in an unwanted direction. More and better exposure to the planning involved in making the classroom experience a rich learning milieu for both participating preservice teachers and attendant faculty might have reduced this problem. For the following year plans were laid for the project director to work closely with students and faculty intent on visiting these technology rich sites. It is hoped that by making the students part of the curriculum design experiment they will view the project as theirs and thus view the classroom teacher's efforts in a more positive light.

Trying to provide a truly democratic partnership through collaboration also proved problematic. While levels of previous experience with technology varied, initial enthusiasm for teaching with technology united instructors at the college and intermediate school as they began this project. These instructors were convinced that integrating technology into their curricula would enhance learning experienccs for their students, i.e. the pre-service teachers and the 8th graders. However, what was intended to be a democratic partnership with all members of the consortium participating equally in curriculum design and development, and in mentoring pre-service teachers, evolved into something lcss. As stated earlier, as the school year progressed, collaboration diminished. To overcome this problem the consortium chose to put in place a video conferencing system to enhance communication and perhaps to view into each other's classrooms. Through sharing successes and trials a bond of common ownership for the process of teaching with technology will be attempted.

Another issue here is the role of the school principal. Through the year of the grant project the principal remained a peripheral player. Through the request of preservice and teacher participants the principal and other key personnel in the school and from the college will be asked to make a much stronger effort to watch teachers and faculty at work teaching with technology. Beside the "feel good" gain of being in the spotlight, teachers and faculty expect this move to make their efforts on behalf of the school, the college, or future teachers, recognized and valued. There will be a major effort to this end in future years of the consortium.

Another significant issue for the preservice teachers was the minimal measure of technology support from the district for the participants. It was widely understood that hardware and software purchase and support for the intermediate schoolteachers was not timely or sufficient. This could have been remedied through increased guidance and effort from the technology support personnel from both the college and school district. Preservice students questioned the level of support they could reasonably expect to receive when they became practicing teachers. After all, why learn to teach with technology, spending hours revisiting traditional curriculum, if district technology support fails to permit timely use of hardware. A further issue is that the preservice teachers observed that participant teachers felt a lack of preparation for using and teaching with the technology. This will improve as the instructors at both schools continue with the project. Finally, Bryant teachers did not fully understand their expected role in mentoring pre-service teachers, and college based partners were not sufficiently involved in the actual classroom experiences of the pre-service teachers at Bryant. Careful planning should overcome these issues.

What next?

First year jitters associated with using initially unfamiliar technology, teaching a newly revised curriculum, and forging a partnership between college and public school instructors is now behind the partners in this project. The participants now intend to develop more curricular units that will provide pre-service teachers more opportunities to experience and participate in teaching with a greater variety of technologies. They also will be adding more public school teachers to their partnership in order to provide exposure for more pre-service teachers to this coordinated experience in learning and teaching with technology.

This growth in project team members, and their locations in additional public school sites, creates new challenges in administration and communication. The consortium has stepped up their communication technology capability to address the potential problems in coordinating efforts between members of a larger group. An issue in the year of this grant was that the Project Director, was the administrator, workshop leader, curriculum designer, peacemaker, purchaser, and arbitrator, without decrease in faculty load. For the coming year an Assistant Director as well as a technician has been hired as the project continues as an Implementation grant. Also, decreasing required faculty load has increased project administrator involvement time. Additionally the project administrator's responsibilities have also shifted toward more specific direction of the project activities.

It is this year when the outcomes to the consortium project will affect preservice teachers more broadly. Faculty who participated in the consortium last year is being joined by others with expertise in language arts and creative arts in revising their curriculum to a technology rich standard. Incoming faculty has been apprised of the trials and successes of last year's efforts and are reaping the benefits of what we now refer to as our pilot year. Along with this the educational technology course that all preservice teachers must take to complete and earn their teaching license is under full revision to include the lessons learned by the consortium about teaching with technology. This means more in-depth exposure to video-conferencing as a communication tool, greater emphasis upon the web as a source of data for lesson development, and most importantly a shift in perspective from teaching in a traditional fashion with technology replacing a text or the chalkboard, to teaching with technology as a metaphor for teaching as a curriculum designer. This change may positively akter many teachers' views of continuing in their profession. If so, this approach may indeed have consequences upon teacher socialization and teacher desire to continue to practice.

Project goals for years subsequent to this reflect the findings ground out through careful planning, happy circumstance, and sometimes unrealistic expectations. More data is needed to ascertain just how effective this project becomes in providing preservice teachers the knowledge, skills, and desire to use technology in their practices. To this end Westminster College has dedicated time and faculty to follow teacher candidates as they begin their practice. Through personal contact, further mentoring, and surveys details of the role of technology in teaching for these graduates will emerge, be presented and published.

Further research will focus on the working partnerships between college and public school instructors that develop as a result of this project. Also, findings from the initial year of the project will be used to guide further research into the effects of specific aspects of the project on pre-service teachers' inclinations and abilities to integrate technology into their teaching, as well as to how this process affects their inclination to continue as teachers.

References

Brown, J.S., Collins, A., and Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher*, 28, 32-42.

Cognition and Technology Group at Vanderbilt, The. (1990) Anchored instruction and its relationship to situated cognition. *Educational Researcher*, 19, 2-10.

Jonassen, D.H. (1996). *Computers in the Classroom: Mindtools for critical thinking*. Columbus, Ohio: Merill

Maddux, C.D. (1984). Educational microcomputing: The need for research. *Computers in the Schools*, 1(1), 35-51.

Maurer, M. & Simonson, M. (1994) Reduction of computer anxiety. *Journal of Research on Computing in Education*, 26(2), 205-219.

West, C.K., Farmer, J.A., and Wolff, P.M. (1991). *Instructional design: Implications from cognitive science*. Englewood Cliffs, New Jersey: Prentice Hall.

Faculty Mini-Grants: A Key Piece of our PT3 Puzzle

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Abstract: The mini-grant concept, used at many universities, was identified as a "best practice" in a study of teacher education programs deemed exemplary in their integration of technology (Strudler & Wetzel, 1999). It is designed to address the obstacle identified by faculty as the biggest impediment to technology integration--*time for professional development.* Planned in collaboration with UNLV's Teaching and Learning Center, our mini-grant program provides faculty time outside of their normal work schedule to gain new skills and plan and develop technology-enhanced learning activities for their classes. Ten mini-grants were awarded last summer as part of our PT3 Capacity-building grant. Now, our Implementation grant includes 36 mini-grants per year for three years--24 within the College of Education and 12 to faculty in other colleges across campus. Overall, we feel that the mini-grants offer a wonderful "next step" as a follow-up to the faculty workshops that we've offered. This paper will document the process and outcomes of our mini-grant program to date. For more information and examples of faculty projects please see: http://www.unlv.edu/projects/THREAD/.

Introduction

Project THREAD, funded through a PT3 Implementation grant at the University of Nevada, Las Vegas (UNLV), was designed to make technology infusion a systemic part of preservice teacher education. One key ingredient necessary to accomplish this goal involves a range of professional development activities for UNLV faculty. In addition to providing a series of workshops and follow-up support, a mini-grant program has been initiated to provide faculty with the time and support necessary to integrate technology into courses in significant ways. This paper will describe our efforts to implement this mini-grant program, document outcomes achieved thus far, and discuss future directions for the initiative.

Background

A needs assessment was conducted in fall, 1999 that documented the attitudes towards technology by UNLV College of Education (COE) faculty and their use of technology in teaching. Virtually all faculty rated technology in teacher education as "very important" (68%) or "somewhat important" (30%). Despite this finding, survey results indicate that faculty use of technology in teaching is limited. When asked what factors restrict or constrain their use of technology in teaching, 63% of the COE faculty cited *time for professional development.* This finding is consistent with the literature pertaining to impediments to technology integration in teacher education (Strudler & Wetzel, 1999). By and large, UNLV College of Education faculty have stated in a series of planning meetings that with the provision of time, professional development, access to technology resources, and follow-up support, they will commit to moving forward with technology integration in the COE.

Time for Professional Development

The literature on technology implementation in schools is unequivocal--professional development is critical to achieve widespread technology integration. While workshops and follow-up support are key components of our professional development program, they do not directly address the number one need identified by faculty--*time*. Whereas in early technology integration efforts access to technology resources was cited as the major obstacle, time has emerged for many educators as the most pervasive impediment (U.S. Congress, 1995). To address this need we are implementing a *mini-grant* program that provides faculty time outside of their normal work schedule to gain new skills and plan and develop technology-enhanced learning activities for their classes.

About the Mini-grants

This mini-grant concept, used at many universities, was identified as a "best practice" in a study of teacher education programs deemed exemplary in their integration of technology (Strudler & Wetzel, 1999). Planned in collaboration with UNLV's Teaching and Learning Center, our mini-grant program provides a $1500 stipend for selected applicants to work on campus when school is not in session--during winter break or during the summer. Ten mini-grants were awarded last summer as part of our PT3 Capacity-building grant. Now, our Implementation grant includes 36 mini-grants per year--24 within the College of Education and 12 to faculty in other colleges across campus. Contingent upon continued funding, the mini-grant program is planned through the 2002-2003 school year.

To obtain a mini-grant faculty must submit proposals that identify how they plan to enhance components of their courses with technology. A review committee composed of project staff and members of Project THREAD's Advisory Board review the proposals. Criteria for rating the first round of proposals were based on the quantity and quality of learning for the faculty involved in the project, the degree to which the proposal meets specified ISTE/NETS for Teachers' standards and addresses gaps in preservice teachers' learning experiences, and the expected impact the mini-grant will have on preservice teachers. To foster integration in coursework and throughout programs, faculty may submit collaborative mini-grant proposals. Support for the mini-grants is being provided by Project THREAD staff as well as by UNLV's Teaching and Learning Center.

Results

Our first call for mini-grants was posted in Spring 2000 and was promoted in the various Project THREAD workshops. We received proposals from 15 faculty, 10 of which were accepted based on the criteria discussed above. In a few instances, before accepting the proposals, Project THREAD staff "negotiated" with the applicants and suggested revisions that would help the proposals better meet the project's goals. In the case of applicants whose proposals were not accepted, feedback was given and applicants were encouraged to revise and resubmit their proposals during future iterations of the mini-grant program.

Applicants whose proposals were accepted were sent an agreement form that specified the expectations for the award. Upon signing that form, participants were given an initial payment of $500 in the form of stipends or equipment. The remaining $1000 was held pending completion of the proposed activities. Documentation of completion included a written lesson plan, revised syllabus, and a brief presentation to members of the Project THREAD staff. The presentations, which were approximately 20-30 minutes long, gave recipients the opportunity to show and discuss what they had accomplished as a result of the mini-grant. Project THEAD staff also had the opportunity to ask faculty about their experiences as mini-grant recipients.

Descriptions of each of the mini-grants can be found at: http://www.unlv.edu/projects/THREAD/mg/rapss00.html. At the bottom of each of the mini-grant pages is also a detailed evaluation of the syllabus that was revised as a result of the project. In addition, the requests for proposals are available in the Mini-grant section of the Project THREAD web site: http://www.unlv.edu/projects/THREAD/.

Lessons Learned

The actual implementation of the mini-grant program presented a myriad of challenges for recipients and project staff. In some instances, the professional development needs pertaining to the proposals took project staff to the edge of their experience and expertise. This was especially true in the case of digital video projects. In addition, we experienced our share of challenges in procuring some of the equipment and getting it all installed and functioning in a timely way.

We are currently completing in-depth interviews with the mini-grant recipients to learn more about their experiences with the mini-grants and how they may have affected faculty's knowledge, skills, and dispositions. Results of these interviews will be reported at our SITE 2001 presentation.

Our second call for mini-grants incorporated some revisions based on our experiences. For one thing, we opted not to include equipment procurement as part of the program. Thus, while we will continue to consult with faculty about what software or equipment may contribute to their proposals, faculty will be responsible for purchasing the materials themselves with the stipends that they receive. We anticipate that this change will free up time for the Project Coordinator to focus on her main role in the mini-grant--professional development.

Other enhancements of the mini-grant process include clearer expectations for program priorities. For one thing, the revised RFP requires faculty to complete a planning form that asks them to identify what National Educational Technology Standards for Teachers are addressed in their courses. Since the mini-grants have proven to be a viable incentive for faculty, we are trying to be sure that we take advantage of this "carrot" to support the implementation of some of the less desirable elements of our project—namely, being systematic in our planning. Other program priorities encouraged in the RFP include projects that: (a) are outcomes-based, model technology integration for preservice teachers, and expand students' opportunities for active learning; (b) meet goals established by faculty the curricular areas; (c) are designed to affect systemic change—e.g., projects with potential to impact *multiple sections* of a course or programmatic changes; and (d) use some of the new technology resources of the College of Education including our portable, wireless lab of I-Books that were purchased for the project.

Spreading the Word

One strategy that we've used to "spread the word" has been to highlight the accomplishments of mini-grant recipients at College faculty meetings. In two successive meetings this fall, we've arranged for short presentations (15-20 minutes each) in which faculty demonstrate what they've done and talk about their experiences. We believe that our recent mini-grant recipients are serving as our best ambassadors and doing an excellent job of spreading their enthusiasm. Since many of the presenters are not seen as *techies*, they serve to dispel the notion that our professional development activities are geared only those who are technologically inclined. Following these faculty presentations, we've received many questions and inquiries from faculty about future mini-grant offerings.

Overall, we are thrilled with the results of the mini-grants thus far. We believe that they offer a wonderful "next step" as a follow-up to the many workshops that we've offered. While workshops can be very effective in helping faculty establish a vision for what they might do with technology in their classes, a substantial investment of *time* is necessary for faculty to expand their skills and plan changes in their courses. When compared to other professional development models, we believe that the mini-grants provide a cost-effective way to carve out time for faculty to extend their work with technology in substantial ways.

References

Strudler, N., & Wetzel, K. Lessons from exemplary colleges of education: Factors affecting technology integration in preservice programs. *Educational Technology Research and Development, 47*(4), 63-81.

U. S. Congress, Office of Technology Assessment. (1995). *Teachers and technology: Making the connection* (OTA-EHR-616). Washington, D.C.: U.S. Government Printing Office.

Integrating Technology into the K-6 Classroom

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The United States Department of Education has made clear the growing need for well-prepared, technology-proficient educators. The need is greatest among low-income communities, rural areas, minority groups and areas characteristic of what is now known as the "digital divide." The situation for Valley City State University (VCSU) and its partners within the Sheyenne Valley fits this description in every way.

The strategic theme at Valley City State University the last eight years has been dramatic change to help meet the needs of students and the state. Such a change began in 1996, when all students and faculty gained access to full-time use of a laptop computer, with networked facilities and renovated classrooms to promote maximum use of the computers as tools for learning. VCSU was the second four-year university in the nation to take this initiative. More importantly, VCSU was the first teacher preparation institution in the United States to implement a universal laptop initiative. With the administrative structure in place, the learning tools in use, and faculty with over four years of laptop experience in the classroom, we have moved to the next educational step—a collaborative experience with K-6 schools to better meet the needs of our preservice teachers.

To respond to this need to produce technology proficient teachers, the VCSU Elementary Education program has formed a partnership with six other educational entities to strengthen and improve learning with technology and to ensure that there is continuity between the VCSU Elementary Education technology requirements and K-6 needs. To help achieve this continuity, the VCSU Elementary Education Department applied for and received PT^3 implementation grant from the U.S. Department of Education.

One of the main goals of the grant is to provide opportunities for VCSU Elementary Education faculty, preservice teachers and inservice teachers from the consortium to work together to integrate technology into their courses and to create a learning community among themselves for the purpose of using technology to improve learning and develop complex reasoning and problem solving skills.

Cooperating teachers representing the various consortium school buildings are collaborating with VCSU faculty and preservice students to restructure learning experiences in their classrooms that reflect current best practices for using instructional technology strategies and tools. Curriculum teams begin by choosing one unit of study. They develop and organize units that focus on cross-discipline, student-centered projects that use technology to enhance and expand student experiences. These restructured units are being put in place and working to change the way education is delivered not only in the K-6 consortium classrooms, but also in the practicum and student teaching experiences of the preservice teachers. Maximum use of web and communication technologies is also in the process of being implemented.

The teams consist of one K-6 teacher, at least one university teacher, VCSU students and a Center for Innovation and Instruction (CII) advisor. The teams select specific projects to work on and develop. The teams also develop a formative and summative evaluation process that takes place throughout the projects. The design of the evaluation process is project specific. The projects are implemented and evaluated in the classroom and are published on the grant web site (http://www.vcsu.nodak.edu/projects/pt3_grant/).

Teams of VCSU and K-6 faculty will also be participating together in an intensive three-day session focusing on technology integration and collaborative project building in the classroom. The session will move them through levels of awareness, application, integration and assessment. This will expose the educators to a combination of technology use and integration methods and ideas, including instructional strategies for complex reasoning and problem solving, telecommunication resources, multimedia hardware and software, cross-discipline and project-based content, and authentic assessment.

Elementary Education students will also create material specified by K-6 teachers to be used in the collaborative projects and other classroom activities. These products will include multimedia, CD-ROM, web pages, digital portfolios, and other information technology products. Each product will follow a real world production model: planning, producing, implementing, evaluating (both formative and summative) and revising.

VCSU faculty will develop on-line, asynchronous support material using courseware blackboard (Bb). The modules will be available to preservice and inservice teachers to help them improve learning. For example, a language arts teacher may produce a module on the writing process as a problem solving strategy or the educational technology teacher may develop a module on a Bb to develop a complex reasoning activity.

The Elementary Education faculty will undergo extensive training on the design process for course software for developing on-line methods distance education modules. Faculty will be provided with release time or other appropriate incentives to develop the modules. Each module will be pilot tested with a sample group, evaluated, revised and published on the grant web site (http://www.vcsu.nodak.edu/projects/pt3_grant/).

Another goal that we are working toward is directed specifically toward the preservice teacher. We would like each Elementary Education graduate to be able to use technology to help their students improve learning by developing complex reasoning and problem solving skills. To achieve these goals the following objectives have been established.

1. The consortium partners will compile a web-based, fully accessible annotated research base consisting of current successful practices for developing complex reasoning and problem solving skills in collaborative and non-collaborative environments on line and off line. University faculty, K-6 faculty, VCSU students, K-6 students, and the CII will be involved in the research and assessments. The software evaluation process will use a standard evaluation form from CII. The evaluation will also include a descriptive tool for evaluating computer-based instruction. The research base will be available on the grant web site. The research base will be used to inform all the grant projects.

2. Faculty will integrate complex reasoning and problem solving projects into their courses. Students in their regular coursework must be engaged in higher order thinking skills in order to develop their own projects. University faculty must be models for the students and their course assignments must engage students in higher order thinking skills. Projects created in this integrated curriculum will require students to apply the university's abilities to more complex problems (http://www.vcsu.nodak.edu/offices/titleiii/guide/cdport.htm).

3. Students will design and develop their own projects to demonstrate using technology in teaching complex reasoning and problem solving skills. These projects will be designed to help the preservice teacher to become more effective and efficient in their teaching with technology. Students will use a process based on the following steps.

a. determine goals and objectives
b. identify potential projects
c. select projects to be developed

d. develop formative and summative evaluation process
e. select products from the research base to use with project
f. develop project
g. implement project
h. evaluate and revise
i. publish on web site

The success of the PT^3 grant is a reflection of the direction Valley City State University has been moving the past eight years. VCSU has been a national leader in instructional technologies and the resources available at VCSU ensure that successful efforts will be continued and the university will be an example for others to follow.

Furthermore, *Technology and the New Professional Teacher: Preparing for the 21st Century Classroom*, a report of an NCATE Task Force on Technology and Teacher Education, recognizes and underscores the influence that the VCSU teacher education program and its faculty members exert at the national level. Referencing the report, Arthur Wise, President of NCATE, sent VCSU President Ellen Earle Chaffee a letter dated September 11, 1997, that states, in part:

> The report derives its credibility from the expertise of its members and their selection of exemplary practices to highlight. The task force cited a project at your institution as a case illustration. Your selection makes clear that you are at the cutting edge of teacher preparation practice. Your inclusion in our report should extend your influence and help to change the norms of practice.

Pre-service Teacher Responses to the Restructuring of the Traditional Educational Computing Course

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Abstract: The primary focus of this paper is the perceptions of currently enrolled students regarding a new course format. Data has been gathered from students currently participating in CUIN 3111, Technology in the Classroom, through a qualitative ethnographic interview process and through the medium of a web-based newsgroup application. Through this data we will understand the perceptions of our pre-service teacher students regarding their experience of the new technology course and will then be able to incorporate any changes necessitated by these observations into designs for future classes in the upcoming Spring semester.

Context

Educators involved with the preparation of new teachers throughout the final decade of the Twentieth Century have repeatedly recognized the need for a strong technology component for pre-service programs. They have experimented with a variety of learning models that integrated technology (e.g., Beichner, 1993; Carr, 1992; Falba et al., 1999; Munday, Windham, & Stamper, 1991; Persky, 1990; Rodriguez, 1996; Smith, Houston, & Robin, 1994; Thompson, Schmidt, & Hadjiyianni, 1995; Willis, 1997). While some successful projects have indeed been celebrated, there is agreement that new teachers are generally not being prepared to effectively integrate technology into their future classrooms (Office of Technology Assessment, 1995; Strudler, Quinn, McKinney, & Jones, 1995; Willis & Mehlinger, 1994). There is agreement on the following inadequacies of the efforts of pre-service programs:

- It is no longer enough to prepare new teachers only with one disconnected technology-in-education course; introductory courses should instead be project-based and meaningful, followed by appropriate modeling and use in content methods courses and field experiences (Handler, 1993; Wetzel, 1993).
- True modeling of how objectives can be accomplished by using technology for instruction is rare in pre-service programs (Bosch & Cardinale, 1993; Office of Technology Assessment, 1995; White, 1994).
- Pre-service teachers want to learn strategies for integrating technology tools into their teaching (Mowrer-Popiel, Pollard, & Pollard, 1992; Oliver, 1994), and expect to use computers in their teaching (Marcinkiewicz & Wittman, 1995) but express their feelings of frustration at their lack of technology proficiency (Francis-Pelton & Pelton, 1996) and a lack of understanding of effective technology use in contemporary classrooms (Balli, Wright, & Foster, 1997).

In response, a standards-based movement has developed which brings a clearer vision to the preparation of pre-service teachers. Teacher education programs across the country must finally acknowledge the long trend of research findings and recommendations in order to design appropriate learning environments that challenge long-standing curriculum structures through the cooperation of all faculty involved with teacher preparation. Without the purposeful creation of collaborative, authentic, and content-focused learning environments in which future teachers are empowered to develop content, pedagogy, and technology strategies concurrently, new technology standards will be meaningless.

Process and Procedures

Our appointment as Technology Fellows for the PT3 grant at the University of Houston began in the Summer of 2000. At the outset, we were charged with responding to the problems described in the preceding paragraph. The development of CUIN 3111, Teaching with Technology, required that we create a course which was standards-based and yet true to constructivist principles, which allowed pre-service teachers to develop their technology skills while accommodating many different levels of technology expertise, and which enabled us to gather input from our students to better structure the course to their needs. The course would also be given meaning by linking it to the content methods courses in which pre-service teachers were concurrently enrolled. Given the number of objectives involved, this commission seemed somewhat daunting at the outset.

Course Design

Prior to Fall 2000, the College of Education at the University of Houston required its undergraduate education majors to enroll in a three-hour course, CUIN 3312, "Information Technology for Young Children." In an effort to fulfill grant objectives, the original one semester course was divided into three one-hour courses spanning three semesters. The elimination of prescribed assignments stands as a major change in the requirements for the newly structured technology course. In the new model, technology assignments support required education course activities, thereby demonstrating through practical applications how technology should be integrated into classrooms. Students are searching out ways to meet course requirements using technology even when they are not specifically required to do so by their professors. Early student responses indicated that this model fulfilled the intent of the restructuring effort.

> I think that I am finally beginning to understand these high tech computers. Hopefully by the end of this course, I will be able to get an even better understanding than the understanding I have today! I am looking forward to a great semester!! (Hypergroup posting, student, September 18, 2000)

Student enthusiasm for the new course design was apparent almost immediately. The students liked being given the freedom to design their own learning. One way in which we allowed for student input in the design process was through collaborative development of the rubric, the evaluation mechanism used for each of the reflective papers the students submitted.

> ...the majority of you have been exposed to the standards and the rubric development process. I'd be really interested to know your honest opinions on both. Do you think you would develop rubrics in conjunction with your students? As a teacher it can be a really scary process because you never know what your students are going to come up with. We should have a working prototype of the rubric to show you by next class and you should definitely see the influence of your ideas within it. (Hypergroup posting, tech fellow, September 8, 2000)

As instructors, we felt that we had achieved the initial goals that we had set forth at the outset of this experience. The structure had been established; it was now essential to record student responses, both positive and negative, to that structure.

Hypergroup

Established at the beginning of the semester, the Hypergroup allowed for ongoing exchange between students and instructors as well as facilitated the development of peer relationships. Through this medium, we encouraged feedback and collaboration among our students throughout the semester.

> This is your online discussion group. You will use this area to ask questions, share ideas, and communicate with your peers and instructors...Your instructors will be reading and posting discussion topics to help you get started. We are looking forward to working with all of you this semester. (First Hypergroup posting, Tech Fellows, August 23, 2000)

For instructors restructuring their undergraduate technology courses for pre-service teachers, an important consideration should be the inclusion of a communication tool that promotes positive peer interactions. By the second month participation in the Hypergroup was going strong with future teachers sharing ideas, posting resources, and communicating common concerns. The Hypergroup, originally intended as an example of a mode for teacher communication, has turned into a true community-building tool.

> Don't panic! I know it seems a little confusing but you can handle it. The structure of the class has been a little confusing and you kind of have to do things on your own. If you take time to read the ISTE indicators you can break things down and develop a 1-page reflection. I will be more than happy to help you in any way I can. Feel free to e-mail me and ask for suggestions. We might just be able to help each other out with the class (Hypergroups, student, November 16, 2000)

Interviews

Interviews conducted at the middle and end of the semester by a research associate affiliated with the PT3 grant but not directly involved in the instruction of CUIN 3111 allowed instructors to gather anonymous input regarding course structure. Interview transcripts, summarized and presented to the instructors, revealed that students were deeply invested in their progress and roles as co-developers of the course format.

> I'm a student in the CUIN 3111. I would like to thank you for coming in to interview the students in the class because it really [gave] us a[n] opportunity to give our input about

the course. Also with this program being new, I think the interview will allow the students a chance [to] take part in molding the course (Hypergroups, student, October 11, 2000)

One student, when asked to develop a metaphor to describe the experience of the new course design, stated:

> It's like jumping on a boat not knowing how to sail but someone more experienced will help you along, so it isn't like sink or swim (interview, student, September 25, 2000)

Skill Development

Our development as instructors in this course correlates directly to student feedback from two qualitative research methods: ethnographic interviews conducted by an outside interviewer and from a web-based newsgroup application (Hypergroups). Because this class is based on the ideas described by action research, we seek to provide an atmosphere of trust and openness that allows us to record, evaluate, and respond to student perceptions regarding their own learning (Lawler, 1985; Stringer, 1999).

Direct Instruction

Student interviews revealed a wide range of perceptions regarding the new class structure. Some students indicated that the structure of the course allowed freedom to work at their own pace, whereas others felt that the class was directionless and lacking in focus.

Students who are not accustomed to the process of defining their own learning are likely to feel a sense of frustration because they are not receiving the direct instruction with which they have grown familiar. In that sense, student responses are somewhat encouraging in that we have remained true to the constructivist principles. While we wish to maintain the constructivist approach we also acknowledge that student expectations play an important role in their success. Our students have asked for and will receive more direct instruction. Our plans for future semesters will include scheduled mini-workshops based on needs expressed by students. Students will have the option to participate in these lessons based on their needs.

Connections

One of the stated goals for the new course was to connect technology experiences in CUIN 3111 to methods courses in which students were concurrently enrolled. Some success in this effort is apparent, however, student responses still indicate a significant gap between technology expectations in the new course and those of instructors of their methods classes. While we have attempted to ameliorate this discrepancy by allowing students to complete projects for personal use rather than direct relationship to other coursework, our ultimate goal remains unfulfilled. We will continue our efforts to increase technology diffusion throughout the pre-service education program and hope to see the effect of these efforts in future semesters.

Deadlines

At mid-semester, it became painfully apparent to both instructors and students that a schedule for submitting the reflective papers was necessary and advisable. This requirement was expressed numerous times during student interviews, through Hypergroup postings, and in conferences with the instructors. Therefore, the decision to require that half of the reflections be submitted by mid-semester seemed intuitive.

Resources

Students also indicated a need for resources related to the course to be located at a central site for easier access. To that end, construction of a course web site that includes all current resources has been ongoing. This web site will be launched at the beginning of next semester and will include items requested by students such as examples of model reflective papers, ideas for project completion, tutorials for basic applications, and helpful websites. The site will be updated according to the needs expressed by the students. As such, the web site will become another tool for student response to the structure of the course. In addition, a textbook containing examples of technology-based lessons and ideas will be adopted.

Hypergroup

Interviews revealed that the Hypergroup established for the students was accepted favorably. Students stated that the Hypergroup gave them access to information and helpful web sites as well as allowed them to communicate regularly with instructors and peers. Due to these resoundingly positive responses, the Hypergroups will stay intact for these pre-service teachers throughout their teacher education program and into their first year of teaching where it is hoped that these teachers will become a part of other online peer resource groups.

Future Goals

According to action research methodology, the recording of student response requires evaluation, synthesis, and response by the instructors. As described above, we have distilled student responses and formulated our own response that will become the kernel around which the next semester's course will develop. Summarized below are the actions that will be taken to change course design; all of these changes are based on student responses.

- Continue working to achieve concurrency between methods courses and CUIN 3111.
- Publish a course web site which provides greater access to resources.
- Provide direct instruction by way of mini-lessons and hands-on workshops on a bi-weekly basis.
- Incorporate concrete deadlines for blocks of reflections.
- Continue utilization of the Hypergroup.

The expected outcome of these changes should yield a new series of responses which can then be employed to further refine the structure of the new computer course.

References

Balli, S. J., Wright, M. D., & Foster, P. N. (1997). Preservice teachers' field experiences with technology. *Educational Technology, 37*(5), 40-46.

Beichner, R. J. (1993). Technology competencies for new teachers: Issues and suggestions. *Journal of Computing in Teacher Education, 9*(3), 17-20.

Bosch, K. A., & Cardinale, L. (1993). Preservice teachers' perceptions of computer use during a field experience. *Journal of Computing in Teacher Education, 10*(1), 23-27.

Carr, L. L. (1992). Integrating technology into preservice education: Determining the necessary resources. *Journal of Computing in Teacher Education, 9*(1), 20-24.

Falba, C. J., Strudler, N., Bean, T. W., Dixon, J. K., Markos, P. A., McKinney, M., & Zehm, S. J. (1999). Choreographing change one step at a time: Reflections on integrating technology into teacher education courses. *Action in Teacher Education, 21*(1), 61-76.

Francis-Pelton, L., & Pelton, T. W. (1996). Building attitudes: How a technology course affects preservice teachers' attitudes about technology. Retrieved March 3, 2000 from the World Wide Web: http://www.math.byu.edu/~lfrancis/tim's-page/attitudesite.html

Handler, M. (1993). Preparing new teachers to use computer technology: Perceptions and suggestions for teacher educators. *Computers in Education, 20*(2), 147-156.

Marcinkiewicz, H., & Wittman, T. (1995). From preservice to practice: A longitudinal study of teachers and computer use. *Journal of Computing in Teacher Education, 11*(2), 12-17.

Mowrer-Popiel, E., Pollard, C., & Pollard, R. (1992). An analysis of the perceptions of preservice teachers toward technology and its use in the classroom. *Journal of Instructional Psychology, 21*(2), 131-138.

Munday, R., Windham, R., & Stamper, J. (1991). Technology for learning: Are teachers being prepared? *Educational Technology, 31*(3), 29-32.

Office of Technology Assessment (1995). *Teachers and technology: Making the connection*. Washington, D.C.: U.S. Government Printing Office.

Oliver, R. (1994). Factors influencing beginning teachers' uptake of computers. *Journal of Technology and Teacher Education, 2*(1), 71-89.

Persky, S. E. (1990). What contributes to teacher development in technology? *Educational Technology, 30*(4), 34-38.

Rodriguez, S. (1996). Preparing preservice teachers to use technology: Issues and strategies. *TechTrends, 41*(4), 18-22.

Smith, R. A., Houston, W. R., & Robin, B. R. (1994). Preparing preservice teachers to use technology in the classroom. *The Computing Teacher, 22*(4), 57-59

Stringer, E. (1999). *Action research: A handbook for practitioners. (2nd Ed.)*. Thousand Oaks, CA: Sage.

Strudler, N., Quinn, L. F., McKinney, M., & Jones, W. P. (1995). From coursework to the real world: First year teachers and technology. In D. A. Willis, B. Robin, & J. Willis (Eds.), *Technology and teacher education annual, 1995*. Charlottseville, VA: AACE.

Thompson, A., Schmidt, D., & Hadjiyianni, E. (1995). A three year program to infuse technology throughout a teacher education program. *Journal of Technology and Teacher Education, 3*(1), 13-24.

Wetzel, K. (1993). Teacher educators' uses of computers in teaching. *Journal of Technology and Teacher Education, 1*(4), 22-27.

White, C. S. (1994). Technology in restructured preservice education: School/university linkages. *Journal of Technology and Teacher Education, 2*(2), 119-128.

Willis, E. M. (1997). Technology: Integrated into, not added onto, the curriculum experiences in pre-service teacher education. *Computers in the Schools, 13*(1-2), 141-53.

Willis, J., & Mehlinger, H. (1994). Information technology and teacher education. In J. Sikula & T. Buttery (Eds.). *Handbook on research in teacher education*. (Chapter 46). New York: McMillan.

Pilot Results of a Teacher Education Infusion Model

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Abstract: This paper is a report on the results of a pilot project funded through Preparing Tomorrow's Teachers to Use Technology (PT3) Initiative. Project PICT (Preservice Infusion of Computer Technology) was piloted during the 1999-2000 academic year and focused its efforts in technology infusion on the elementary education program. The project is described in the context of the ISTE (2000) Essential Conditions for technology integration. This paper describes ISTE's essential conditions for technology integration, how Project PICT fulfills these conditions, evaluation methods utilized by PICT, pilot results, and implications for further research and practice.

Introduction

As educational institutions have attempted to utilize technology as a learning tool, researchers have consistently identified numerous barriers that impede the training, development, and implementation process of technology infusion (Parker, 1996; Seminoff & Wepner, 1994; Wetzel, 1993). With these results in mind, ISTE has identified ten essential conditions —shared vision, access, skilled educators, professional development, technical assistance, content standards and curriculum resources, student-centered teaching, assessment, community support, and support policies--that "are required to create learning environments conducive to powerful uses of technology" (ISTE, 2000). These conditions form the framework for Project PICT (Preservice Infusion of Computer Technology), an initiative that seeks to prepare preservice teachers to effectively use technology as a learning tool by infusing technology in Bowling Green State University's teacher education programs. Funded through the Preparing Tomorrow's Teachers for Technology (PT3) initiative, Project PICT was piloted during the 1999-2000 academic year and focused its efforts in technology infusion on the elementary education program.

Creating a *shared vision* of technology infusion among stakeholders and leaders has been difficult for many institutions due to the evolving nature of technology and subsequently the varying purposes for using technology in the classroom (Valdez, et al, 1999). However, as research on the impact of educational technology use has been conducted and disseminated, policymakers, funding agencies, administrators, and educators are espousing a vision in which technology is a tool used to engage students in meaningful learning, understanding, and exploration (Cifuentes, 1997; Nicaise & Barnes, 1996; Perkins, 1992). Thus, Project PICT sought to facilitate a dynamic and constructivist vision of technology infusion where an assortment of technologies and applications were used to enhance the creation of products, facilitate problem solving, and assist exploration. This vision was introduced to Project PICT participants (HE faculty, K-6 educators, K-6 administrators, technology coordinators, and preservice teachers) at the very first workshop where technology-using educators presented example lessons and products that demonstrated how they had effectively used technology as a learning tool. Participants were directed to resources that exemplified constructivist uses of educational technology. Training sessions also facilitated discussion on meaningful uses of educational technology and appropriate instructional methods for technology infusion. Activities that established this shared vision were cited by PICT participants as the most motivating among the project.

Despite the billions of dollars spent annually on technology in our nation's schools, *access* continues to be a barrier for many educators and students (USDE, 2000). Access has been cited as a primary impediment to faculty development of technology infusion since faculty may not have the necessary equipment, software, or network acccss to practice applying skills and methods learned during training (Parker, 1996). Such on-going training and practice is necessary for educators to feel comfortable with the newly learned technologies and confident in implementing them in the classroom. Project PICT addressed the issue of access by providing each participant with a laptop computer that included all the necessary software as well as modem and network cards. K-6 teachers had laptop use only during their participation in the grant; whereas, HE faculty were allowed to keep their laptops after they completed one year in the project and continued as BGSU faculty. Another area of access pertinent to HE faculty was classroom access. Although BGSU has numerous computer labs, access to these labs is difficult due to class demands. Consequently, Project PICT in collaboration with BGSU developed five electronic classrooms in the College of EDHD. Each classroom housed a cciling mounted projector, a laptop, and Internet connection. The electronic classrooms allow HE faculty to demonstrate and model effective technology uses. A portable system (laptop and projector) is also available to faculty not scheduled in an electronic classroom.

Professional development was a primary focus of Project PICT as it sought to the train general faculty, education faculty, and K-6 teachers in methods of technology infusion. Project PICT's Training Model sought to prepare technology-using HE faculty and K-6 teachers, who would model effective technology infusion by demonstrating technology applications and facilitating student use of technology. The training model was based on several beliefs and research findings: 1) Professional development should "center on creating sustained learning communities where participants have an active voice in determining goals and activities of the project" (Beyerbach, Walsh, & Vannatta, In Press); 2) Training should be focused and on-going; 3) One-on-one mentoring programs have effectively prepared education faculty for technology enriched instruction (Thompson, Hansen & Reinhart, 1996); 4) Training programs should consistently communicate expectations and requirements (Topp, Mortenson, & Grandgenett, 1995; Vannatta, 2000). Consequently, the Project PICT Training Model included the following components:

- Creation of *shared vision* of technology infusion through workshops on meaningful technology use, NETS-Students, NETS-Teachers, and performance-based assessment.
- *Team collaboration* in which team members supported one another in lesson development and implementation. Each team was required to develop and present a team plan for technology integration. Teams were formed by participants and consisted of K-6 teachers, preservice teachers, education faculty, and arts & sciences faculty.
- *One-on-One mentoring/collaboration* in which preservice teachers were assigned to K-6 teachers for methods and student teaching. During this year-long placement, pairs completed training together and were required to develop and implement four technology-enhanced lessons.
- *Focused technology training* on applications and methods for technology infusion. Participants were required to attend five sessions on multimedia and Internet applications. During sessions, participants were presented numerous examples of technology-enhanced lessons, discussed classroom management issues and methods of implementation and assessment.
- Since PICT participants volunteered, consistent *communication of expectations* was integral in recruitment and retention efforts. Participants were required to attend all training sessions; participate in team collaboration activities (development and presentation of team plan); development and implementation of two technology-enhanced lessons/units; submit technology rich course syllabi, lesson plans, and student products; and participate in data collection activities. These expectations were communicated with the long term goal of systematic technology infusion throughout the teacher education programs.

Technical assistance is such a crucial component of any technology endeavor. For technology infusion within teacher education, technical assistance must be provided at nearly every aspect of the process: orientation, training, practice, development, implementation, and revision. Project PICT utilized several methods to provide technical support. Optional Tech Support Nights were provided, in which project participants could attend to receive one-on-one assistance on equipment, applications, and/or instructional methods. Another method of support was providing participants with access to several technology-savvy graduate students, who could attend technology-rich lessons or events. Their presence often alleviated a great deal of anxiety among the novice-level educators. Finally, project staff were available on an individual basis to answer questions or visit classrooms.

The preparation of teachers requires the instruction of a multitude of *content areas*. Consequently, effective training on methods of technology infusion must address these content areas. Project PICT provided numerous technology-rich examples (lessons, products) for various content areas and grade levels. These examples were presented within training as well as the Project PICT website. The project website also provided numerous links to other educational technology-rich sites by content area. The website continues to grow as participants continue to submit appropriate lessons and products. Participants also received a copy of *Connecting Curriculum* to guide lesson development and implementation.

Facilitating a constructivist vision of technology infusion includes the adoption of *student-centered teaching*. Within training sessions, participants learned about ways in which technology could facilitate active, cooperative, and project-based learning (ISTE, 2000). Example lessons and products demonstrated student-centered approaches. Implementation of student-centered teaching and technology infusion often raises concerns regarding *assessment* among educators. Project PICT addressed the issue of assessment from several directions. First, participants were introduced to methods of performance-based assessment. In addition, appropriate assessments were required of all lessons submitted to the project. Second, participants were introduced to the NETS-Students, which allowed them to develop grade-appropriate lessons and assessments. Finally, participants were introduced to the NETS-Teachers. Since a long-term goal of the project was to create an assessment system of technology infusion for preservice teachers based upon rcstructured teacher education curriculums, HE faculty needed to become aware of how these teacher technology standards could be addressed and assessed within their courses. The pilot of Project PICT allowed for curricular experimentation among HE faculty.

Although instruction and modeling of technology infusion within the university setting is necessary to develop technology-using educators, future teachers also require the opportunity to observe, develop and implement technology-enhanced lessons in the K-12 classroom. Such *community support* can only occur with adequately trained K-12 teachers, who effectively use technology as a learning tool. Consequently, Project PICT also sought to better prepare area K-12 teachers for technology infusion. As these classroom teachers begin to integrate technology into the classroom, their growing expertise assists education faculty in understanding K-12 technology use and ultimately infusing technology in their education courses. Such assistance/collaboration may be demonstrated by: education faculty utilizing K-12 technology-rich lessons as models and examples; fieldtrips to the K-12 and/or university classroom; K-12 teacher presentations to preservice teachers; video-conferencing between the K-12 classroom and the university classroom.

Finally, developing *support policies and providing incentives* is essential to gaining support and momentum among educators. PT3 funding allowed Project PICT to provide a reward structure for participants that not only provided incentive but also alleviated several barriers to technology infusion that are often cited in the literature. For educators, one of the primary barrier to learning and implementing an innovation is lack of time ((Parker, 1996; Seminoff & Wepner, 1994; Wetzel, 1993). While the idea response to this barrier would be to provide time through course release, unfortunately a faculty shortage does not allow this. To address the issue of time, participants are paid a stipend for the time that they commit to the project. K-6 teachers received $2,000 per year, while HE faculty received the equivalent of teaching one course during the summer (10% of base salary). Another incentive that addresses the barriers of time and access is providing participants with laptop computers. The laptop provides convenience for practice and development. Although the pilot project did not provide laptops to the participating preservice teachers, incentives included: advanced training on technology infusion, opportunity to collaborate with a K-6 teacher for the year, experience in developing and implementing technology-enhanced lessons that could be exhibited in one's professional portfolio, and a $200 stipend. Finally the project also provided stipends of $500 to the technology coordinators at the participating schools, since they supplied additional support for participants.

Evaluation

Research Questions

The following questions guided the evaluation of this project.

1. Do technology training and planning activities increase technology proficiency and implementation among HE faculty and K-6 teachers?
2. How does the experience of serving as a preservice technology collaborator impact technology proficiency and view of technology infusion?
3. Does technology integration in methods courses increase preservice teachers' technology proficiency?
4. Does technology integration in methods courses impact preservice teachers' view of technology infusion?

Participants

Eight HE faculty members participated in the pilot of Project PICT. These instructors varied in rank and were from either the division of teaching and learning or the college of arts and sciences. Ten K-6 teachers also participated in the project and taught at two well-established professional development schools. Ten preservice teachers majoring in elementary education also volunteered to participate as technology mentors/collaborators. Finally, nearly 125 preservice teachers enrolled in elementary methods participated in numerous technology-related activities throughout spring 2000. Ninety-five completed pre and post surveys.

Methods

Evaluation activities were conducted throughout the grant period. Quantitative and qualitative methods were utilized to fully understand the project and its impact on participants. Pre and post surveys were administered to all participating HE faculty (N=8), K-6 teachers (N=10), preservice technology collaborators (N=10) and selected preservice teachers enrolled in methods courses during the spring semester (N=95). These surveys measured technology proficiency, use of technology by instructor, and use of technology by student. Survey results were analyzed using descriptive and inferential statistics. T test of related samples were conducted to examine pre and post differences. In addition, preservice teachers were asked to describe their vision of technology integration. HE faculty, K-6 teachers, and preservice technology collaborators also participated in focus group interviews at the conclusion of the project. Interview questions elicited information regarding the technology activities they implemented, the degree of support they received, the grant activities that most facilitated their technology integration, and their vision of technology infusion. Group interviews were conducted by a project co-director with 3-5 individuals from each group (i.e., faculty, K-6 teacher, preservice technology collaborator). Observations were conducted of technology activities implemented in the education courses and K-6 classrooms. In addition, lesson plans, student projects (preservice and K-6) were analyzed.

Instrumentation

Two instruments were utilized in the evaluation of this pilot project: the Faculty Technology Survey and the Preservice Teacher Technology Survey (Vannatta, 2000). Both instruments were similar in content and format as they measured technology proficiency and integration/experiences in courses. While the directors recognized that development of individual technology proficiencies does not necessitate a constructivist environment, proficiency of at least 1-2 applications coupled with an understanding of instructional methods is essential for constructivist integration. In addition, the directors were interested in determining which proficiencies and uses were targeted by the participants. Consequently, nineteen items asked participants to report current proficiency using computer equipment, applications, and instructional methods for integrating technology. These items utilized a Likert scale of 1-4 in which 1 represented no proficiency and 4 represented high proficiency. Participants were also asked to identify, from a list of seventeen computer applications/activities, which specific activities were currently being utilized by the instructor in their classrooms. These items utilized a Likert scale of 1-4 in which 1 represented no use and 4 represented frequent use. Participants also reported the degree of student use of technology in the classroom . These seventeen items applied a Likert scale. HE faculty and teacher participants were also asked to report the degree to which they use technology for six different administrative tasks; a Likert scale was also applied. Finally, an open-ended questions was posed to all the participants as they were asked to describe their vision of a technology-rich classroom.

Due to the various participant groups, surveys were administered in different settings. Participating HE faculty, K-6 teachers, and preservice technology collaborators completed the pre survey in September 1999 and the post survey in April 2000 during project meetings. Preservice teachers enrolled in methods courses during spring 2000 were administered pre (January 2000) and post (April/May 2000) surveys during their methods courses.

Results

Impact of HE Faculty and K-6 Teachers

Participating in training together, collaborating to develop and implement technology-enhance lessons, and teaming to support one another in the professional growth process, HE faculty and K-6 teachers reported significant increases in overall proficiency and infusion in the classroom. Proficiency significantly increased in all but five (distance education, database, spreadsheet, website development, and Internet) of the nineteen technology areas (see Table 1). Instructor use in the classroom significantly increased in ten of the seventeen technology areas as well as overall infusion (see Table 2).

	Faculty & Teachers (n=18)	Preservice Tech Collaborators (n=10)	Methods Students (n=95)
Computer	-3.674**	-5.292**	-3.242**
Digital Camera	-6.548**	-10.539**	-2.018*
Scanner	-3.556**	-4.264**	-2.804**

Projector	-5.551**	-4.128**	-2.106*
Distance Ed	.563	1.000	.000
Word Processor	-2.256*	-1.512	-1.639
Database	-1.835	.800	-.177
Spreadsheet	-1.825	.359	-.198
Drawing/Graphics	-4.583**	-1.000	-.183
Website Development	-1.702	-.426	-1.290
Electronic References	-3.674**	-1.941	-2.926**
Listserves/Disc groups	-3.568**	-2.828*	-3.516**
Instructional Software	-3.389**	-1.348	-2.246*
Presentation Software	-7.122**	-5.547**	-2.221*
Multimedia	-7.483**	-5.774**	-2.761**
Email	-4.000**	-.555	-1.481
Internet	-1.286	-2.101	.000
Assistive Technologies	-2.188*	-1.000	-.771
Instructional Methods	-8.411**	-4.472**	-2.419*
Overall	-6.764**	-4.510**	-4.394**

Note: *p<.05, **p<.01

Table 1: t-test Related Samples Results for Technology Proficiencies

	Pre		Post		*t*	*p*
	M	SD	M	SD		
Digital Camera	1.333	.816	2.467	.834	-5.264	<.001
Scanner	1.267	.458	1.867	.743	-3.154	.007
Projector	1.400	.633	2.867	.916	-6.813	<.001
Distance Ed	1.133	.352	1.200	.775	-.292	.774
Word Processor	2.867	1.356	3.800	.561	-2.357	.034
Database	4.133	10.769	2.067	1.033	.759	.460
Spreadsheet	1.467	.640	1.800	.775	-1.435	.173
Drawing/Graphics	1.467	.640	2.600	.986	-3.371	.005
Website Development	1.000	.000	1.133	.352	-1.468	.164
Electronic References	1.667	.976	2.400	.910	-6.205	<.001
Listserves/Disc groups	1.333	.817	1.733	.594	-1.382	.189
Instructional Software	2.200	1.265	2.600	.986	-1.871	.082
Presentation Software	1.267	.594	2.133	.743	-4.026	.001
Multimedia	1.400	.737	2.933	.961	-5.002	<.001
Email	2.000	1.254	3.400	1.121	-4.010	.001
Internet	2.133	1.126	3.000	1.195	-2.229	.043
Assistive Technologies	1.133	.352	1.286	.611	-.694	.500
Overall Use	29.200	15.558	39.200	4.443	-2.737	.016

Table 2: Teacher-Technology Use in the Classroom Reported by Participating Faculty and Teachers (n=18)

Analysis of observations, lesson plans, and student artifacts revealed that participants were able to transfer many of the technology ideas presented to them in training to their classrooms. Example lessons for K-6 teachers addressed: creating trading cards of historical figures, events, and/or innovations using KidPix; developing book reports using HyperStudio; creating student "yellow pages" using digital camera and word processing; creating presentations using HyperStudio. Readers are encourage to visit the Project PICT website (www.bgsu.edu/colleges/edhd/LPS/EDFI/PICT/) to view lessons that resulted from the pilot. Example lessons integrated in education courses included: creating community profiles using a digital camera and PowerPoint; having elementary students visit the university classroom to train preservice teachers on KidPix; using the Internet to find technology-enhanced lessons; simulating several of the K-6 technology-rich lessons.

Focus group interviews revealed evolving views of technology use in the classroom. Prior to involvement in Project PICT, the majority of teachers indicated a perspective limited to drill and practice applications. After participation, teachers and faculty expressed a more constructivist view in which technology was used as an instructional tool to facilitate student motivation, exploration, creativity, communication, and problem solving.

"Technology can open up doors where some students may never get an opportunity." Although HE faculty were familiar with a constructivist perspective of technology infusion even before the project, they indicated that their participation made them realize that "the vision is something that could be accessible for both classroom teachers and methods students."

Impact on Preservice Technology Collaborators

The preservice technology collaborators played a unique and integral role in this project. Ten preservice teachers volunteered to be placed with a K-6 teacher for both methods field experience and student teaching. These students completed a typical elementary methods block that consisted of four elementary methods courses during the first eight weeks of the semester and full time fieldwork in a K-6 classroom during the second eight weeks. In addition, the preservice technology collaborators attended all technology training and team meetings with their cooperating teacher. Spring semester provided a twelve-week student teaching experience. These participants were expected to develop and implement at least two technology-enhance lessons/units during student teaching. Since the preservice technology collaborators worked so closely with their cooperating teachers to infuse technology in the classroom—an amazing relationship was revealed. While the cooperating teachers were extremely knowledgeable of classroom curriculum and management, the preservice technology collaborator was somewhat more knowledgeable about technology applications and definitely more of a technology risktaker. The marriage of these strengths developed a supportive, creative, and exciting classroom environment for technology development and implementation.

Analysis of the focus group interviews with cooperating teachers and PT collaborators revealed two primary themes—emotional support and instructional support—that describe how this relationship was essential in facilitating technology infusion. Several of the participants cited how important it was just having a second teacher in the room to manage the various activities (e.g., cooperative learning groups, learning centers, troubleshooting) involved in a technology-enhanced lessons. The collaborative process also provided a great deal of emotional support. Participants cited a sense of security and comfort in working with someone else while trying something completely new. One teacher stated, "Working with my intern [PT collaborator] was the component that meant the most to me. To have someone who knows more than I do and who's there to help lead me into finding the answer made all the difference for me!"

This experience had a profound impact on the preservice teachers serving as technology collaborators. Survey results revealed significant increases in overall technology proficiency, knowledge of instructional methods, and proficiency of 7 of 18 technology applications among the PT collaborators (see Table 1). However, the greatest impact came in how these future teachers view technology infusion and their prospects in the classroom. Prior to PICT, nearly all the technology collaborators viewed technology use in the classroom as using games, drill and practice, and possibly the Internet. Following PICT, several participants indicated that, "I now see technology as a key facet in the information age. I hope to have my student using computers as a tool to collect data, organize information, and create product."

Impact on Preservice Teachers Enrolled in Methods Courses

Participating HE faculty were required to develop and implement at least two technology-enhanced lessons for their methods courses. The impact that this infusion had on preservice teachers enrolled in these courses was measured through pre and post surveys. Survey results indicate that technology infusion in the methods courses had a significant effect on technology proficiency (see Table 1). Overall proficiency as well as nine of the nineteen areas of technology proficiency significantly increased during the semester. Changes in vision of technology use were also assessed through open-ended survey questions. Responses indicated that the majority of students felt that technology is an important instructional tool, however, most were still vague about how technology could be used to facilitate learning. Several comments focused on the hardware necessary to have a technology-rich classroom and not the pedagogy in using it as a learning tool.

Conclusions

The pilot of Project PICT had an impact on technology proficiency, infusion, and vision among the participating HE faculty and K-6 teachers. In addition, project activities had a significant effect on technology proficiency among methods students. Project PICT has received funding through PT3 to expand its endeavor to secondary and special education programs. ISTE's essential conditions continue to serve as the foundation of the project's activities.

References

Beyerbach, B., Walsh, C. & Vannatta, R.A. (In Press). From teaching technology to using technology to enhance student learning: Preservice teachers' changing perceptions of technology infusion. *Journal of Technology and Teacher Education.*

Cifuentes, L. (1997). From sages to guides: A professional development study. *Journal of Technology and Teacher Education, 5*(1), 67-77.

International Society for Technology in Education. (2000). *National educational technology standards for students: Connecting curriculum and technology.* Eugene, Oregon: Author.

Nicaise, M., & Barnes, D. (1996). The union of tcchnology, constructivism, and teacher education. *Journal of Teacher Education, 47*(3), 205-212.

Parker, R.D. (1996). *Integrating faculty use of technology in teaching and teacher education.* Paper presented at the Annual Meeting of Mid-South Educational Research Association, Tuscaloosa, AL. (ERIC Document Reproduction Service No. ED 406 341).

Perkins, D.N. (1992). Technology meets constructivism: Do they make a marriage? In T.M. Duffy & D.H. Jonassen (Eds.), *Constructivism and the technology of instruction* (pp.45-55). Hillsdale, NJ: Erlbaum.

Seminoff, N.E., & Wepner, S.B. (1994, February). *Does the use of technology for scholarship and teaching really interface with tenure and promotion?* Paper presented at the annual meeting of the American Association of Colleges for Teacher Education, Chicago.

Thompson, A., Hansen, D., & Reinhart, P. (1996). One-on-one technology mentoring for teacher education faculty: Case study reports. *Technology and Teacher Education Annual.*

Topp, N.W., Mortenson, R., & Grandgenett, N. (1995). Building a technology-using faculty to facilitate technology-using teachers. *Journal of Computing Teacher Education, 11*(3), 11-14.

U.S. Department of Education. (2000). *Catalyst and implementation grants: Preparing tomorrow's teachers to use technology.* Washington, DC: U.S. Department of Education.

Valdez, G., McNabb, M., Focrtsch, M, Anderson, M., Hawkes, M, & Raack, L. (1999). *Computer-based technology and learning: Evolving uses and expectation.* Chicago, Illinois: North Central Regional Educational Laboratory.

Vannatta, R.A. (2000). Integrating, infusing, modeling: Preparing technology-using educators. *Journal of Computing in Teacher Education, 16*(2), 6-14.

Wetzel, K. (1993). Teacher educators' uses of computers in teaching. *Journal of Technology and Teacher Education, 1*(4), 22-27

Technology Chalkboard: Building a Collaborative Model to Integrate Technology in the Classroom

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Abstract: Integrating technology into the classroom is an evolutionary (if not revolutionary) process for most educational institutions. In rural Western Pennsylvania three State System of Higher Education universities formed a consortium to address the need to increase faculty understanding of the advantages of using technologies in teaching, their competencies in specific technological applications, and their level of comfort in using them. The universities created learning and technology centers to provide technology-rich learning environments for university faculty and K-12 teachers.

A $1.7 million Preparing Tomorrow's Teachers to Use Technology (PT3) implementation grant provided funding for new methodologies for infusing technology in the classroom. A "technology chalkboard" model was developed to provide diverse classroom learning opportunities. Technology modules incorporated foundation training on specific software or technologies, application training on how the technology is applied in the classroom and integration training on how the technology enhances student-centered learning.

Introduction

The Advancing the Development of Educators in Pennsylvania through Technology Training (ADEPTT) consortium, representing three public universities (Clarion, Edinboro and Indiana Universities of Pennsylvania) in rural, economically disadvantaged communities is implementing a model for infusing instructional technology throughout the teacher preparation curriculum. Initially funded by a 1998 $500,000 Bell Atlantic grant, the universities created learning and technology centers to provide technology-rich learning environments for university faculty and K-12 teachers. Each ADEPTT center is comprised of a core team including a director, instructional designers, administrators, and faculty representatives from disciplines in the colleges of education, arts and sciences and business. Over the past three years the core teams have assisted one another in establishing centers devoted to teaching excellence, instructional design and the use of instructional technology to move from a teacher-centered to a student-centered learning environment. Through the ADEPTT consortium the universities have formalized their relationship and greatly expanded their ability to work together to develop materials and training for all faculty at each institution.

The ADEPTT Centers provide basic and advanced training in computer literacy and numerous software applications and web tools. The first year the centers focused primarily on foundation training for faculty offering a total of 182 workshops across the consortium in eleven key competencies (Fig. 1). However, it became apparent that knowing *how* to use the technology was not enough to effect change in instruction and that incentives were needed to break down the barriers to widespread participation.

Eleven Key Competencies

Operating System Management	Word Processing	Spreadsheets	Web Browsers
Email	Presentation Software	Databases	Multimedia Packages
Videoconferencing	Chat and Threaded Discussion	Internet in Teaching	

Figure 1: Key competencies address basic needs for infusion of technology into the curriculum.

Barriers and Challenges to Integrating Technology in the Classroom

- Faculty and K-12 teachers have little time to develop technology-based instructional materials, which reduces the likelihood they will integrate technology into their courses.
- Relatively few teachers are prepared to integrate educational technology into the classroom. In a 1990 national survey, 81% of the student teachers surveyed rated their undergraduate preparation in technology use as inadequate (Fratianni, Decker & Korver-Baum 1990). Even though schools are slowly increasing the amount they spend on training, just eight percent of schools say the majority of their teachers have advanced skills and are able to fully integrate technology into the curriculum (Weiner 2000).
- An Office of Technology Assessment report revealed that while half of recent teacher education graduates reported being prepared to teach with technology in drill and practice, tutorials, games, and writing and publishing centers, less than one in ten felt they could use such formats as multimedia packages, electronic presentations, collaborations over networks or problem-solving software (Thomas, Larson, Clift & Levin 1996).
- New technology standards (NCATE/ISTE) at the state and national level are leading schools and universities to realign their teacher education curricula to include technology components.
- Universities and schools are reluctant to offer release time due to the difficulty in obtaining replacement instructors and substitute teachers for their classes.

Preparing Tomorrow's Teachers to Use Technology

Overcoming the barriers to integrating technology necessitated the pursuit of additional funding. Through collaborative efforts the consortium received a $1.7 million Preparing Tomorrow's Teachers to Use Technology (PT3) implementation grant in 1999 to infuse instructional technology into the teacher education curriculum. The goals of the PT3 grant complemented the ADEPTT strategies already in place to support faculty and K-12 teachers in integrating technology. The goals--to infuse instructional technology more deeply into the teacher education curriculum, to integrate instructional technology in the consortium's pre-service observation and field experiences, to provide a variety of professional support opportunities for faculty and pre-service teachers, to enhance the technological infrastructure of the consortium members to better support the project objectives--are being addressed in a number of ways.

The PT3 funds provide professional development opportunities and instructional design support for education core/methods faculty and personnel to deliver application and integration training for faculty and pre-service teachers. Application and integration training facilitates the development of lesson plans, materials, and resources to infuse technology in the classroom. Modest numbers of early adopters are beginning to add technology-enhanced assignments to their courses and are serving as models and trainers for both their colleagues and their students. The barrier of time and scheduling, however, continued to be a problem for faculty. A new model was conceptualized to deliver an intensive technology-rich experience during the summer, at a time when faculty are more likely to be available for training opportunities. Thus, the "technology chalkboard" model was born.

The Technology Chalkboard Model

Technology chalkboard was initially developed for education core and methods faculty as a week-long immersion in technology applications that includes foundation, application, and integration strategies for the classroom. Its modular approach was designed to lower the entry level for faculty and teachers to enable them to be comfortable in exploring the technologies. No prior experience in using technology was required.

The model incorporates the use of a combination of educational technology applications. The nine technology modules (Fig. 2) each focus on three areas:

1. foundation training on the basics of the software or technology
2. application training on how the technology is applied in the classroom
3. integration training on how the technology enhances student-centered learning

For example, the videoconferencing module includes an explanation of videoconferencing as a type of distance education. The opportunities, theories, and applications of videoconferencing in K-12 education are presented and case studies are examined where videoconferencing has been used successfully. Pre-service teachers and their cooperating teachers learn how to use the equipment and demonstrate this knowledge in the creation of a videoconferencing event.

Technology Chalkboard Modules

Reshaping Classrooms Using Technology	Developing Instruction Online	Electronic Communication and Collaboration
Videoconferencing for K-12 Education	Mindtools	WebQuests
Digital Imaging to Enhance Instruction	Developing Multimedia Presentations	Integrating Electronic Spreadsheets

Figure 2: Nine technology chalkboard modules incorporate foundation, application and integration of technology.

The format for the technology chalkboard model is based on a hands-on approach with workshops, demonstrations and practice during a one-week period. The Learning and Technology Center at Clarion University held the first technology chalkboard series for education faculty July 17-21, 2000 in a smart classroom equipped with 30 Macintosh PowerBook computers, ethernet connections, and a teacher station with a laptop, projector and smartboard. The workshop schedule featured two technology chalkboard modules each day that were divided into the three focus areas: foundation, integration and application. To augment the classroom experience, participants were enrolled in a specially created online course supplement using Blackboard's CourseInfo software that provided them with a student's perspective to using online courseware. The online component provided participants with a syllabus, course documents, discussion areas and links to related information that they could continue to use after the workshop ended.

Lunch was provided each day and speakers were invited to discuss current topics on technology. The on-site lunches promoted discussions and sharing in ways technology could be used in the classroom. It was hard to get participants back to the workshops on more than one occasion. The presentations reflected the daily technology themes; for example, Dr. Gail Grejda, Dean of the College of Education and Human Services, "Educational Standards: A Changing Mosaic"; John Sikora, Apple account executive, "Integrating Digital Video into the Curriculum"; Sonja Heeter, technology coordinator, Riverview Intermediate Unit 6, "Seeing is Believing!?"; Dr. Helen Barrett, University of Alaska, "Creating Electronic Portfolios: Building a Standards Based Portfolio" and Dr. Sanjay Rebello, physics department faculty member, "Student Surveys on Web-Assisted Instruction".

Presentations by outside speakers and members of the consortium were found to be an important component in the model by providing valuable insight into how technology can be used in the classroom. In particular, Dr. Barrett's presentation executed via desktop video, the Internet and conference phone enabled the participants to interact with her while she was at home in Alaska at 6:00 a.m.

One of the participants evaluated the experience in this way; *"The entire week was the most beneficial of all the computer course work I have had to date. I just wish I could have yet another week to become more proficient. Thank you so much for being patient and helping me to become more aware of what is available to me with technology in my classroom."*

Due to the success of the technology chalkboard model, funding is being pursued to create an online module for each of the technology chalkboard components that will be used to supplement the pre-service teacher curriculum. The modules will be Web based to allow for anytime, anywhere learning, meeting the needs of the pre-service and in-service teachers. The modularized units will be based on International Society for Technology in Education (ISTE) standards to promote the use of technology in the student's field experience and make connections between the technology and the curriculum.

Implementing The Online Model

Three faculty from each consortium member institution, working closely with the ADEPTT centers, will develop nine technology-rich online modules based on the "technology chalkboard" model. The modules will incorporate International Society for Technology in Education (ISTE) standards of instruction providing foundation, application and integration skills through a common design. The modules will incorporate three basic components:

- foundation – tutorial format – "how to" use the technology
- application – align lesson creation with state/national standards
- integration – student created technology-rich lesson plans

Each of the nine modules will be shared among the institutions. They will be developed for Web delivery (Blackboard, WebCT, etc.) and shared through the consortium's ADEPTT/PT3 Web sites. Three cooperating faculty at each institution will incorporate one of the online modules in their courses during the Fall 2001 semester. To facilitate the course development process, faculty will attend sessions held by their respective ADEPTT centers on creating online courses. To encourage participation, cooperating faculty will receive a small honorarium. At the completion of the course, faculty will review the modules through the completion of a short survey and a written evaluation.

Students will complete at least one of the online modules as part of the teacher education curriculum prior to their student teaching experience. Cooperating teachers will be paired with pre-service teachers and complete the modules online during the same period. To encourage participation in the project, the cooperating teacher will be paid a stipend to participate in the program and may also receive ACT 48 credit. Both the pre-service and cooperating teacher will be required to create a lesson plan for the module based on ISTE standards that will then be used in the K-12 classroom during the student teacher experience.

Exemplary lesson plans that have been developed by the pre-service and in-service teachers will be included in an ADEPTT database developed at Edinboro University and on the consortium's ADEPTT/PT3 Web sites to provide K-12 teachers in Pennsylvania with technology resources. Technology modules will be available to all faculty at the consortium institutions. All nine modules may also be developed into a special topics course culminating in the creation of student electronic portfolios. The program model may also be disseminated through the State System's Center for Distance Education and through presentations by ADEPTT/PT3 locally and at state and national conferences.

References

Fratianni, J. E., Decker, R. H., & Korver-Baum, B. (1990). Technology: Are future teachers being prepared for the 21st century? *Journal of Computing in Teacher Education*, 6 (4), 15-23.

National Educational Technology Standards for Teachers (2000). International Society for Technology in Education. Eugene, OR. <http://www.iste.org>

Thomas, L., Larson, A. Clift, R., and Levin, J. (1996). Integrating Technology in Teacher Education Programs: Lessons from the Teaching Teleapprenticeships Project, *Action in Teacher Education*, 17(4). 1-8.

Weiner, R. (2000, November). More Technology Training for Teachers. CyberTimes. *New York Times on the Web* [On-line] <http://www.nytimes.com/2000/11/22/technology/22EDUCATION.html> [2000, Nov. 22]

A Faculty Development Plan For the Successful Integration of Technology Into Teacher Preparation Courses

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Abstract: With unprecedented emphasis being placed on preparing pre- and inservice teachers to integrate technology into their classrooms, schools of education are facing increasing pressure to provide students with experiences and faculty who can adequately prepare them for this task. This paper presents details on how one college of education in a small liberal arts university is meeting this challenge. Using the National Educational Technology Standards for Teachers (NETS-T) as a basis, education faculty worked together to implement a faculty development program that culminated in the measurable integration and utilization of technology in the program's professional studies classes. The outcome of this semester-long collaboration was that the methods faculty involved were better prepared to (a) utilize technology as a tool for instruction, (b) train their students/preservice teachers to utilize technology in the classroom, and (c) serve as technology mentors to other methods faculty.

Introduction

As a member of a statewide consortium of Alabama schools of education, the University of Montevallo received PT3 grant funding to create and implement a faculty development plan designed to lead to the successful integration of instructional technology in professional studies methods classes in its Teacher Education Program. Additionally, the implementation, evaluation, and refinement of this structured technology integration plan could potentially serve as a model for other schools of education throughout the state. This plan was based on the National Educational Technology Standards for Teachers (NETS-T) as offered by the International Society for Technology in Education (ISTE).

Through this project, one faculty member from each of two methods classes, math and social studies, and the college of education's director of instructional technology worked together to implement a series of planned steps designed to culminate in the measurable integration and utilization of technology in teacher preparation classes. The two methods faculty met biweekly for one semester with the technology director in a series of discussions and hands-on lessons related to technology integration. In addition to these regularly scheduled meetings, the technology director routinely assisted the two faculty members in developing various technology-based projects.

For the two methods faculty involved, the commitment was the same. Both would attend all seven of the scheduled meetings, work collectively and individually on assigned projects, keep a journal of their reactions to the overall experience, and be willing to serve as technology mentors to other faculty in the future. Each also received paid release time from one fourth of their required academic responsibilities. The technology director's responsibilities were to develop and facilitate the training sessions and to work as needed with the two participating faculty members on the creation and integration of their projects. The scheduled topics for each session were as follows: Equipment Setup and Operation, Using PowerPoint for Instructional Support, Planning for Effective Technology Integration, Incorporating Educational Software in Teaching and Learning, Incorporating the Internet in Teaching and Learning, and Resources for Teachers.

About the Project

From the beginning, each scheduled meeting during the project was characterized by an active exchange of information and concerns involving the use of technology in the college and elementary classroom. While both methods faculty were excited about utilizing technology in their courses, each remained very practical in their intentions for its use. Whether the topic was equipment setup and operation or the advanced features of PowerPoint, both educators consistently directed the conversation toward issues of practicality and educational effectiveness. This became an underlying theme for all meetings and conversations regarding technology throughout the project. Too often, training programs aimed at helping teachers with the integration of technology focus solely on technology operation while overlooking the practical matters of successful integration, leaving the teacher no more prepared to integrate technology than he or she was prior to the training. It is extremely important for anyone considering this type of faculty development program to insure that the training places strong emphasis on practical concerns.

In addition to the hands-on training, much time was spent sharing ideas and examples of the successful use of technology. For instance, during the sessions covering PowerPoint, both methods professors were provided with a disk containing unique or atypical examples of PowerPoint presentations. This served as a springboard for the two faculty members to begin discussing and formulating plans for their own presentations. The examples clearly helped them break away from thinking of PowerPoint merely as a tool to present lecture notes to students, which is the only way they had used Power Point prior to this experience. Throughout the project, this sharing of ideas and the discussions that ensued had a pronounced impact on the faculty member's plans and consideration for technology integration. In fact, this type of sharing and opportunities for technology-related discourse were perhaps the most valuable component of the entire program.

Another important facet of the program was its flexibility. As previously stated, specific session topics were scheduled, however, the group frequently deviated from these planned topics. It did so to accommodate the needs and interests of the two methods faculty. For example, their curiosity regarding unique uses of PowerPoint required several sessions as opposed to the single session planned. The group decided that rather than rushing through a topic merely for the sake of covering it, its time would be better spent by providing more in-depth coverage of those topics perceived as most useful. They felt that they would rather walk away from this project with one good technology tool for classroom use instead of several superficial projects that would never be implemented.

In the final activity of the project, the three group members, using the NETS for teachers, discussed and developed course syllabi that contained specific NETS performance indicators. This culminating activity was very useful in that it allowed the two methods faculty to begin planning the implementation of their newly developed skills, knowledge, and ideas relevant to technology.

Conclusion

The results of this semester-long collaboration were that the selected methods faculty were better prepared to utilize technology as a tool for instruction in their own classrooms and to train their students/preservice teachers to utilize technology in their classrooms. Additionally, with the knowledge, skills, and confidence gained through the project, these educators can now serve as effective technology mentors to other faculty.

In addition to increased skills, knowledge, and attitudes regarding technology use, the project yielded many other more tangible outcomes. For example, both professors have now set up their own faculty web page, created and posted online materials for their courses using Blackboard.com, and have a variety of projects and presentations ready for implementation. These types of products will not only be useful in the immediate future, but will also promote the continued development and modeling of technology-based instructional tools. Perhaps the most gratifying outcome of the entire project, however, was that it simply provided time, incentive, and opportunity for those involved to think about and discuss technology use in the classroom.

State-wide Collaboration among Three PT3 Grant Recipients

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Abstract: The PT3 Utah consortium includes Brigham Young University, Utah State University, and Westminster College. It provides members with unique advantages: opportunity to be informed of each other's projects to the subsequent benefit of all; to share resources of local expertise and material assets; to strengthen inter-college activities through joint publications and presentations; and to help each other out when moments of challenge arise. The leaders hope to impact teacher preparation and technology use in schools across the state of Utah. This panel discussion will focus on areas of common interest, and how the collaboration has strengthened their work.

Introduction

Brigham Young University, Utah State University, and Westminster College have joined together collaboratively as they implement their PT3 grants. The leaders have discussed the similarities and differences in their grants, and have worked to support each other rather than duplicate effort. They hope to impact teacher preparation and technology use in schools across the state of Utah. This panel discussion will focus on areas of common interest, and how the collaboration has strengthened their work. Nancy Wentworth and Rodney Earle are co-principal investigators for the Brigham Young University implementation grant. They are working to systemically restructure the Brigham Young University Teacher Education Program to meet the proposed NCATE Standards for technology in teacher preparation programs. The participants are working to design technology-rich curriculum for both the teacher education program and K-12 schools and the mentor BYU faculty and BYU students in the use of the technology-rich curriculum. Steven Soulier is the principal investigator for the Utah State Implementation Grant and Tim Smith is the co-director of the School for the Future at Utah State University. They are working to ensure a fully collaborative, technology-infused curriculum across 31 academic majors in five university departments. David Stokes is the director of the Westminster PT3 project. Wanda Carrasquillo is the project manager. After a year of working on a PT3 Capacity Building grant, Westminster has an implementation grant that will emphasize student participation in integrating technology into content courses, student teaching experiences and the first year of teaching. The ultimate goal is to turn Westminster College's 250 teacher candidates into active technology users and improve student achievement for K-12 students in the Jordan and Salt Lake school districts.

PT3 Grant of Brigham Young University

The purpose of Brigham Young University's implementation grant is to systemically restructure the teacher education program to meet the proposed NCATE Standards for technology in teacher preparation programs. This will require the design of technology-rich curriculum for both the teacher education program and K-12 schools and the mentoring of BYU faculty and BYU students in the use of the technology-rich curriculum. It will also require on-going collaboration of all participants in sharing successes in curriculum development and implementation. These goals are addressed through three major project activities: (1) creating design and mentoring teams, composed of university education faculty, content specific methods teachers, cooperating teachers, and instructional design and technology specialists who will simultaneously re-design our current teacher preparation curricula and public school K-12 curricula, (2) using teacher-student electronic networks (email listserves and website development) that will allow project participants to share newly developed curricula, and (3) holding yearly summer institutes focused on the infusion of technology into learning. These three activities are shaped by a philosophy that emphasizes curriculum integration, problem solving, data collection, information management, communications, presentations, and decision-making in teacher preparation and public school curriculum.

Design and Mentoring Teams

The McKay School of Education created design and mentoring teams of faculty and technology specialists to mentor undergraduate and graduate students in the development of K-12 curriculum that meets the National Education Technology Standards for Students (NETS). The NETS Project (1998) is an International Society for Technology in Education (ISTE) initiative funded by the U.S. Department of Education, the National Aeronautics and Space Administration (NASA), the Milken Exchange on Education Technology, and Apple Computer, Inc. The primary goal of the NETS project is to guide educational leaders in recognizing and addressing the essential conditions for effective us of technology to support PreK-12 education.

The first objective of the teams is to "plan and design effective learning environments and experiences supported by technology" (NETS Standard II). BYU student and faculty are examining Utah State K-12 Core Curriculum for lessons rich in uses of technology. BYU students and faculty are developing lessons for a McKay School of Education Webpage that meet the Utah State K-12 Core Curriculum and that "use technology to support learner-centered strategies" and "develop students' higher order skills and creativity" (NETS Standard III). BYU faculty and technology specialists are mentoring BYU students on how to evaluate the lessons based on the NETS standards. BYU undergraduate and graduate students will review each other's learning activities based on the NETS standards. As a result of the mentoring program BYU undergraduate and graduate students will produce 120 learning activities for the David O. McKay School of Education Curriculum Webpage that meet the NETS Standards.

The second objective or the teams is to help BYU students integrate technology into curriculum and instruction in the public schools. BYU students are implementing at least one technology-enhanced activity while they student teach in the public schools. With the help of a faculty and technology specialists

BYU students will produce an electronic portfolio of teaching with technology during their student-teaching experience. The technology specialists and graduate assistants will mentor them in this process. BYU graduate students are reviewing the electronic portfolios of undergraduate students based on the NETS standards. As a result of the design and mentoring program BYU students will produce 60 electronic portfolios of teaching with technology in a public school classroom.

The third objective is to mentor graduate students and undergraduate students in the research of technology on teaching and learning. Mentoring teams are defining research questions on the effects of technology on teaching and learning. Mentoring teams are collecting and analyzing data to answer the research questions on the effects of technology on teaching and learning. BYU undergraduate and graduate students have submitted research proposals on the integration of technology in curriculum to regional and national conferences including Northern Rocky Mountain Educational Research Association, Utah Association of Supervision and Curriculum Development, Society for Information Technology and Teacher Education, and International Society for Technology in Education. As a result of the mentoring program at least 10 BYU undergraduate and 6 graduate students will present at regional or national conferences.

Electronic Networks

All participants in the grant are being linked through listserves and websites to provide continuing support for the curriculum development and technology integration. Models for such websites have been drawn from other efforts around the country in which electronic dialogue complements classroom learning. Excellent website examples include The Utah Education Network Olympic site, http://www.uen.org/2002/, and the NASA Learning Technology site, http://learn.ivv.nasa.gov/. The teacher preparation program will include requirements of students to develop technology integrated curriculum that could be included on a refereed BYU problem-based learning website. BYU faculty can submit curriculum ideas and research on integrating technology into teacher preparation to the website. Teachers from around the country will be able to upload curriculum to a data base where technology specialists in the Partnership will review and select curriculum to be included on the site.

An ongoing network of teacher graduates from BYU will be created for further sharing of technology-rich curriculum. Approximately 100 BYU preservice teachers do their student teaching in the inner city of Washington, D.C, Mexico, the South Pacific, and China. The electronic network will connect them and their students to developed curriculum and to other students using technology in their classrooms. BYU will supply laptop computers to these sites.

Summer Institutes

Schools of education and public schools will draw upon the creative work of all design and mentoring teams as they bring technology integrated curriculum and cohort participants together. Summer institutes will provide an excellent environment for mentoring BYU faculty from one cohort to another and from one year to year. Students will learn from other students and faculty as they focus on effective approaches to technology integration in learning. Participants in the institutes will become part of the creative energy of the overall project as they work with mentors, especially Clinical Faculty Associates, to create their own inquiry-based approaches for their classrooms. The summer institute will involve all cohort participants in the teacher education program and will be extensions of the design teams. They will collaborate with project staff in pilot-testing newly designed instructional approaches. Nationally recognized leaders in technology integration, including Dr. Brian Page (Apple University Consortium) and Dr. Michael Connell (Society of Information Technology and Teacher Education), and Dr. LaMont Johnson (Editor, *Computers in the Schools*) will participate in the institutes. External evaluators will collect data from participants during this time.

PT3 Project at Utah State University

Steven Soulier is the principal investigator for the Utah State Implementation Grant and Tim Smith is the co-director of the School for the Future at Utah State University. They are working to ensure a fully collaborative, technology-infused curriculum across 31 academic majors in five university departments. The consortium of participants at Utah State University is working to (1) establish a staff development plan to train teacher education faculty and give further support through a Teacher-Education Faculty Assistance Center; (2) create a standardized, online assessment tool to track student progress in meeting technology standards; (3) insure that the responsibility for meeting technology standards extends to the entire campus; (4) develop an online resource bank and an online, collaborative learning community; (5) use video conferencing to expose students to model K-12 classroom practices; (6) ensure the use of technology in student field experiences; (7) upgrade teaching stations; and (8) require students to document their technology skills in an electronic portfolio.

PT3 project at Westminster College: Content Methods Curriculum Revision

This project represents an instructional model designed to provide preservice teachers at Westminster College in Salt Lake City, more opportunities to integrate educational technology into all content areas during their teacher preparation program and first year of teaching. The project is a joint venture of a consortium comprising Bryant Intermediate, Clayton Middle, and Lincoln Elementary Schools from Salt Lake City School District, Majestic Elementary School from Jordan School District and Westminster College.

With current funds from a Capacity Building Grant, classroom teachers from one consortium school and faculty members who teach math and science methods formed a cohort to engage in collaborative curriculum development. Common hardware and software were purchased for both sites. New syllabi that incorporate the use of educational technology for the methods courses and school courses were designed and are being co-taught and revised through a formative evaluation process. The Implementation Grant extends the opportunities for the math/science cohort to do further curriculum revisions and allow all faculty members who teach language arts, creative arts, reading and social science methods to form similar cohorts with classroom teachers who teach these subjects in the three additional consortium schools.

The School of Education at Westminster College has placed preservice teachers at these consortium sites for several years. Many teachers in these schools serve as mentors during semesters of early field experiences as well as student teaching. The principals serve as a part of *Westminster's Local Partnership Oversight Committee* to examine existing and future collaborative initiatives among these sites and other partnership sites we are developing. Faculty at these consortium sites and Westminster College are coming to understand the power computer based technologies provide for achieving the goals of the cognitive movement in education. They know that skills and knowledge are too often taught out of context, as ends in themselves. To overcome this, there is a growing recognition that computer based technology and particularly multimedia bring to the classroom real-life examples and situations that provide the contextual framework so important to learning (Brown, Collins, & Duguid, 1989). Anchored instruction (The Cognition and Technology group at Vanderbilt, 1990), the capability to demonstrate real world applicability of knowledge, is less prevalent than hoped. Findings that suggest computer-based learning environments reduce learning time significantly (perhaps as much as 80%), and that achievement levels are more than a standard deviation higher (Kulik, et.al. 1991, 1985) have been largely ignored, if known.

As more understanding about how technology tools can distribute learning across persons and expand a more diverse group's capacity for innovation and invention, the need to explore the performance and pedagogical uses of technology are clear. Even though teacher education faculty and their students regularly discuss the role of social interaction in knowledge construction (Vygotsky, 1978), faculty feel there has been insufficient planning to ensure preservice teachers the opportunities to work with veteran teachers and together help K-12 students meet content standards through the use of instructional and learning technologies. At Westminster educational technology applications are formally presented in a required course for all teacher education students, but often the preservice teachers separate these applications from educational practice. Additionally the classrooms where preservice teachers complete their field experiences for content methods often do not have hardware and/or software which promotes application of strategies learned on campus. In short our preservice teachers tend to view what they learned on campus about educational technology as not relevant to the practical world of K-12 teaching when it is not integrated into the formal methods course work and related field experiences. The application of this grant was hoped to alleviate this problem.

Project design

After review of the recently completed Capacity Building Grant project to develop a new instructional model to improve the quality of teaching and learning in math and science methods with Bryant Intermediate School, the consortium set out to: 1) complete the instructional model that has been developed in math and science with Bryant Intermediate School; 2) extend the model to the content areas of Language Arts, Reading, Social Science and Creative Arts methods with 3 additional consortium schools (Clayton Middle School, Lincoln Elementary and Majestic Elementary). To bring this about the consortium developed a four phase project.

Year 1 (2000-2001)

The math/science cohort have moved into their second phase of continued curricular revisions in the science and math methods courses on campus and the science and math courses at Bryant Intermediate School. The model provided by this cohort will be replicated by language and creative arts faculty and consortium teachers. Each will in turn investigate technology as an instructional and learning mechanism and develop new technology enriched units for an extensive curriculum revision. While this is happening the math/science cohort will target the following as means to further integrate technology into their curriculum.

- Providing for a networked learning community; affordable configurations of portable computers and wireless connectivity
- Providing video-taping conferencing services so that preservice teachers will be able "sit in" on practicing teachers' classes
- Emphasize development of "Project Based" curriculum to integrate content
- Explore on-line courses
- Integrate more fully the technology enhanced components of special education and diversity into methods courses
- Provide preservice teachers with technology rich experiences in methods classes, field experiences and student teaching

Additionally during this phase funds provided by the grant permit a technology center designed specifically to the needs of the grant. With information technology support and cxpcrtisc from the educational technology specialist in the School of Education, preservice teachers, faculty and partner teachers will have the means to move through phase one, to phases two and three. Each phase brings its own unique technology needs, from software particular to a method cohort, to vital online communication equipment allowing development of real time field project units. These needs are partly to be fulfilled by the creation of the technology center. The technology center will be: 1) a place for development of integrated technologies into curriculum; 2) for practice in teaching with technology; 3) an active classroom demonstrating technology enhanced curriculum; 4) a video-conferencing center; 5) a place where pedagogical and technological theories can be effected into learning; 6) a place where web based instruction will be developed.

Year 2 (2001-2002)

The math/science cohort will move to the third phase that includes teacher induction and supported use of the technology center. The language arts cohort and the creative arts cohort will move to the second phase which includes continued, focused curriculum revision, and the reading/social studies cohort will begin the first phase of the project to explore technology tools. The education technology center will continue to serve all the subject area cohort participants, preservice teachers and first year teachers.
The math/science cohort participants will make decisions about their continued work together. The grant funding will no longer support their time for curriculum revisions. To promote their continued dialogue and ability to access information that will continue to technologically enrich their curriculum and instruction, the cohort participants will be encouraged to use the technology center. The technology center will provide

instructional support staff services on a daily basis. Some of the services that they will provide are: 1) a place to test the effectiveness of curricular change; 2) technology staff support to help with additional curriculum changes; 3) a place that creates and sustains web pages that reflect the progress of consortium outcomes.

Year 3 (2002-2003)

The language arts cohort and creative arts cohort will move to the third phase with the math/science cohort who have already reached that phase. They will no longer have grant funding to support their time for curriculum revisions, but they will have access to the technology center for continued support. The reading/social studies cohort will move into the second phase for continued curriculum revisions.

Year 4 (2003-3004)

All consortium members will be in phase four of the project. This allows for continued mentoring of graduated first year teachers and provides access to the technology center which will continue to be funded by Westminster College.

Project activities to support goals

It is important to note that during the each phase of the project, every subject area cohort will impact approximately 500 students at a school site and 40 preservice teachers from Westminster College as they are actively involved with the methods courses and field experiences. At the end of the three-year period, all of the 250 preservice teachers at Westminster College will complete technology-enriched content methods courses and many will have enriched field experiences. Approximately 2000 K-12 students and their teachers will be working with our preservice teachers using technology enriched curriculum and instructional practices each year. Drawing upon multiple sources of information these future teachers should be able to:

- Promote real-world collaborative inquiry
- Attend to multiple learning styles
- Explore content applications related to standards and the core curriculum
- Use media in new assessment models that enable educators to assess the application of learned skills and concepts in authentic settings
- Develop multimedia portfolios
- Create web based learning experiences
- Use modeling and simulations as teaching strategies
- Extend the power of inquiry-based learning, and multiple forms of reasoning through content-based activities that utilize various appropriate technologies (e.g. use of field microscopes, probes, graphing calculators, computers, e-mail).

Conclusion

Math and science faculty through the Capacity Grant experience have found their perspectives of teaching and learning to be fundamentally changed. Using KaleidoMania and Shapemakers, Geometers Sketchpad, video microscopes, along with virtual labs has demonstrated student engagement and learning. Technology applications are now clearly understood to allow students multi-tasking capabilities as they engage in real work oriented projects. Math and science faculty now look to technology as a means "not to an answer but a way to find answers." And further, "Every time we create an integrated unit in our methods courses, we now look for a way to incorporate a piece of technology to add depth to understanding and create questions. As an example, because of our use of the CBL to measure the rebound of a [bounced] ball, we have more questions to ask about the graphing of data". Math and science syllabi now reflect this change. It is our expectation that similar changes will take place in other content areas.

The project remains on track to effect lasting substantive change in ways school of education faculty, preservice teachers, and consortium teacher participants view technology applications for the acquisition of knowledge, teaching and probably professional lifestyle. Evaluations as they progress are expected to bring rich data to the fore useful in the form of technology rich teaching units, assessment methods congruent to this new mode of teaching and learning, and perhaps a handy prescriptive record of changing faculty views towards technology for teaching.

Summary

The organization of the PT3 Utah consortium provides each member with unique advantages. These include: opportunity to be informed of each other's projects to the subsequent benefit of all; to share resources of local expertise and material assets; to strengthen inter-college activities through joint publications and presentations; and to help each other out when moments of challenge arise.

References

Brown, J.S. Collins, A., and Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher*, 28, 32-42.

Cognition and Technology Group at Vanderbilt, The. (1990). Anchored instruction and its relationship to situated cognition. *Educational Researcher*, 19, 2-10.

Kulik, J.A., Kulik, C.L., and Bangert-Drowns, R.L. (1985). Effectiveness of computer based education in elementary schools. *Computers in Human Behavior*, 1, 59-74.

Vygotsky, L. (1978). *Mind in society: Development of higher psychological processes*. Cambridge, Mass: Harvard University Press.

The Implementation of Change in Technology Rich K-8 Classrooms

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Abstract: This qualitative study reports on the Arizona Classrooms of Tomorrow Today project, a component of a Preparing Tomorrow's Teachers to Use Technology project. In conjunction with five partner school districts, Arizona State University West developed five technology-rich K-8 classrooms that serve as models for preservice students and university instructors. This study reports on the changes occurring as the AZCOTT teachers learn to teach in technology rich classrooms. Changes were described in teacher practices, student attitudes, and classroom management. Generally, the researchers found that technology has become an integral part of each classroom. Factors contributing to implementing change in these classrooms are discussed. The researchers also discuss the progress made toward using these classrooms as models for preservice students.

Introduction

Buying technology for K-12 classrooms is expensive, but a relatively straightforward procedure. Much more difficult is changing the way teachers teach so that they use technology effectively. This is one purpose of the Arizona Classrooms of Tomorrow Today (AZCOTT) project, a component of Arizona State University West' Preparing Tomorrow's Teachers to Use Technology Project (PT3).

Educational changes can involve products such as computers or processes such as constructivist teaching. Also, change often is not centered on one innovation but many (Hall & Hord 2001). Similarly, Fullan (1991) describes three components to the implementation of change: (a) the possible use of new or revised materials, (b) the possible use of new teaching approaches, and (c) the possible alternation of pedagogical beliefs. The three aspects are necessary because together they represent the means of achieving a goal. In this study the authors will describe changes occurring as experienced elementary teachers learn to teach in technology rich classrooms.

Another purpose of the AZCOTT program is to improve the preparation of preservice students to integrate technology in their future classrooms by inviting their university instructors to participate in the AZCOTT training because they in turn encourage their students to visit and participate in the AZCOTT classrooms.

Program Description

In conjunction with five partner school districts, ASU West developed five technology-rich K-8 classrooms that serve as models for preservice students and district teachers. Five college of education instructors participated in at least two days of the AZCOTT training along with the K-8 teachers. These instructors as well as the student placement coordinators encouraged preservice students to observe in and select these classrooms for practicum experiences.

AZCOTT teachers were selected based on their answers to key questions about potential student use of technology in the classroom. In January 2000, children began participating in five Arizona Classrooms of Tomorrow Today (AZCOTT). In addition to the technology already in their classrooms, these teachers have received 4-5 multimedia computers with Internet access, software, some type of projection system, and technical support from our school district partners, and they have received more than 100 hours of training from the PT3 project.

The Spring semester and summer training consisted of an initial two day workshop followed by four half days of training throughout the semester and three days in June. The curriculum addressed new technologies and creating and implementing the curricular units called Units of Practice (UOP) (Sandholtz, Ringstaff, & Dwyer 1997) that integrated technology into elementary content areas. Participant's UOPs and the rubric can be viewed at www.west.asu.edu/pt3. Time was also provided to share ideas and reflect on practice. Between sessions, participants communicated using an on-line conference. The second semester of training began in September 2000 and consisted of every other month half-day meetings and participation in a graduate course on using the Internet in the classroom.

Methodology

Using qualitative techniques, the authors describe changes resulting from the teachers' participation in the AZCOTT program.

Subjects

Five teachers, one from each school district that is a university partner, were selected to participate in the first cohort of the AZCOTT program. These teachers were initially selected because it was thought that they would provide exemplary models of technology integration for preservice teachers and district teachers. A brief description of each classroom follows.

Mr. B taught 27-second grade English as a Second Language learners in an urban inner city school where all of the students are receiving free or reduced lunches. His students stay with him for two years beginning with second grade. He has been teaching for 4 years and is a technology mentor for his school. As a technology mentor he helps other teachers with technology before and after school.

Ms. Lo taught 120 sixth graders science and language arts in an urban school with 35% of students receiving free or reduced lunch. She was a technology mentor for her school.

Ms. T taught 110 seventh graders mathematics and pre-algebra. Fourteen percent of these students were receiving free or reduced lunch.

Ms. Li taught 31 fourth graders in an urban elementary school with 50 percent receiving free or reduced lunch. She is a technology mentor for her school.

Ms. V Taught 100 seventh- and eighth-grade, gifted students in urban schools with few students receiving free or reduced lunch.

Data Collection

The data for the study came from multiple sources. First, during the AZCOTT workshops participants shared their questions, concerns, curricular ideas, and implementation attempts. These teacher reflections and discussions were audio or videotaped and transcribed. In addition participants participated in a FirstClass on-line conference that provided support as they implemented technology use in their classrooms. Between each workshop session participants used this on-line conference to react to a chapter in *Teaching with Technology* (Sandholtz, Ringstaff, & Dwyer 1997) often comparing their situations to those described in the chapter. These messages were aggregated using a summarize feature of FirstClass, printed and analyzed. Also an external evaluator visited several classrooms and collected data as he observed in the classrooms and interviewed the teachers. The external evaluator submitted a report summarizing his findings. Additional data sources were video vignettes taken in each classroom of the AZCOTT teacher and students, and the impressions of the PT3 project manager who visited each classroom and took notes on her visits.

Data Analysis

Using the constant comparative method (Strauss 1987), data analysis began as data were first collected and continued throughout the study. The first and second authors independently read the transcripts and on-line conference printouts and identified patterns and categories. Subsequently they met to discuss patterns they observed in the data and questions that arose after the readings.

After collecting this data, the authors re-read all the transcripts and re-categorized the data. Each highlighted the portions of the transcripts addressing each category. They met to compare the answers to the questions and the categories that arose as they read. Then they compared key categories and re-read the transcripts to see if the selected categories worked to describe the experiences of the AZCOTT teachers. The themes that emerged were: teacher change, student change, classroom change, and school change.

Results

The data from selected aspects of the themes (teacher change, classroom change, student change) will be reported in this section.

Teacher Change

The researchers found the following types of teacher changes: changes in teaching methods, curriculum (UOP), and teacher leadership. Changes in teaching methods will be discussed below.

Changes in Teaching Methods

As teachers became involved in the training, workshop reading and sharing with peers, they questioned their approaches to teaching. For example:

"What AZCOTT is forcing me to do is to look beyond what is comfortable and ask where and if my current practices fit and if they don't what can I do to alter them so that they do fit. It is a very reflective practice that can be a little scary. I try to accept that I may not have all the answers and hope that I am flexible enough to accept any needed changes." (March 9 Online Discussion, Ms. T Gr. 7 math)

Changes in teaching methods included movement from a teacher-oriented approach to other approaches that involved student collaboration. A teacher explains,

"Instead of doing a lecture where I used to stand there and just give them scads of notes and they would all walk out grumbling, I give them the study guide research sheets and in groups they work to find the answers using the [computer] program. (March 11 Discussion, Ms. Lo Gr. 6 science)

Classroom Change

The researchers found changes in the area of classroom management, student engagement, and levels of classroom noise. Using the actual words of teachers, student engagement and noise levels are discussed below.

Student Engagement

AZCOTT teachers arranged for students to help each other and describe students working together within the context of projects that captivate their attention. For example:

"Today I was watching students working in all corners of the room. While I was helping one (group of) students edit their animal report, I looked around and everyone was busy, helping each other with typing, getting ideas synthesized into paragraphs or finishing up poems and drawings for their reports. There was plenty of activity and noise, but everyone was on task." (February 25 Online Discussion, Ms. Li Gr. 4)

"I have students now getting involved that were not before." (February 25 Online Discussion, Ms. Li. Gr. 4)

"I see 110 seventh graders comfortable working with each other . . .. They became the experts. Collaboration was amazing between them. . . .They are willing to take risks. They are on-task, engaged." (April 29 Workshop Sharing,, Ms. T Gr. 7th math)

Noise Levels

However, with the student engagement and conversations, there was also a general unease over the amount of noise in their classrooms. For example:

". . . I now see the value of students sharing. My classroom is noisier." (April 29 Workshop Sharing, Ms. Li Gr. 4)

"It's a tremendous amount of conversation. The noise level is always up. I don't have a problem with that. It bothers some of my colleagues, so I have to deal with that, and I do." (February 26 Discussion, Ms. T Gr. 7 math

"I feel I'm heading in the right direction. My kids are younger, so self control is hard for them. The noise level grows and the kids will argue. I'm having to get used to this. I get impatient." (April 29 Workshop Sharing, Mr. B Gr. 2-3 looping)

Student Change

Student changes were noted in the areas of student learning, student attitudes, student collaboration, and students as helpers. Student attitudes in regard to collaboration and helping are discussed below.

Student Attitudes

AZCOTT teachers discussed attitudes students acquired that illustrate their disposition toward learning and helping others. For example:

"Students come up with ideas on how to use the laptops and software (Inspiration). Thcy always go beyond what I asked them to do." (Workshop Sharing May 20, Ms. Lo. Gr. 6)

"Already the kids have said, "Well, you know, can we stay after school sometimes and do the extra work?" (Workshop Sharing, Sept. 23, Ms. Lo Gr. 6)

"The biggest impact has been socially. It has allowed them to do projects for other teachers and they are now role models . . . last year my students helped build the school web site . . . this year I don't have time to maintain that. Two of my students called me during the summer and asked me for a letter of recommendation to take a college course on programming. I approached them at the beginning of the year and I said do you want to be the web masters. How would you like to maintain the web site? It is already built and talk to the new teachers on campus and . . . coach some teachers along on how to build their own web pages . . . They are thrilled to death those two kids . . . even though I am not there, they are . . . talking to teachers now and giving them suggestions for getting them set up. That's very exciting for me to empower students to take a technology lead at the school and sort of model that. . . ." (Workshop Sharing, Sept. 23, Ms. V Gr. 7-8 gifted)

Discussion and Implications

In this study we found change occurring in areas that are similar to those discussed by Fullan (1991): new teaching approaches, new or revised materials, and the alternation of pedagogical beliefs. Aspects of each of these areas are discussed below.

Teaching Changes

The regular AZCOTT meetings provided time for teachers to learn new technologies, design lessons, share ideas, and reflect on their teaching approaches. Often the participants noted changes in their approaches to teaching that were less lecture oriented, more project oriented, more collaborative allowing students to work in small groups, and more collegial in that students became experts and worked with other students and teachers.

Curriculum Development

Teachers created curricular plans (Units of Practice) and implemented them. The workshops were effective in helping the participants prepare their Units of Practice. At the conclusion of each workshop day participants completed evaluations called exit tickets. These comments exemplify the value of the training:

"Collaborative/sharing set-up was extremely helpful and useful."

"We (as a group) have so much to say—we should (as a group) try to use FirstClass more to share all these great ideas and focus more on the topic at hand."

""Just speaking for myself, I would like to have our Saturdays be longer, perhaps six hours. I would use the extra time to work with my group on our project."

All teachers appreciated the training provided by the AZCOTT program. It helped them think about all of the components of a planned learning activity and thus prepared them to implement the integration of technology in their curriculum.

Student Engagement

Across the classrooms, we found positive changes in student engagement. Teachers noted that students were excited about learning. They displayed initiative by going beyond the assignment and by asking to use computers during free-time and after school. We also found general teacher concerns about noise levels in their classrooms or at least the beliefs that others would find the noise levels in their classrooms inappropriate. First it should be noted that these AZCOTT teachers had been in the program for only one year and were learning new classroom management techniques needed to organize student use of the added technology. Second the noise that accompanies student engagement may be a good problem, but it also was a real issue that continues to be on the minds of the participants.

Student Learning

Teachers described many forms of student learning from students doing better on tests to the students with difficulties who were able to learn more than before. Examples of the later included improved students writing, improved comprehension by deaf students, and improved relations among emotionally handicapped students in part because they brought technology expertise to their groups and other students wanted to participate with them.

Teacher Leadership

Initially when this group of teachers applied to become AZCOTT teachers, the school district and university partners looked for candidates who would be leaders in their schools. It is quite clear that these teachers were taking what they had learned and sharing it with other teachers. They teach after school technology classes and often assist their peers to solve technology-related problems. This was primarily evident at the school level, but it also occurred at the district level. For example, at a district technology staff development event, the superintendent of a school district with an AZCOTT classroom remarked "What a difference Ms. T's room has made to the district" and said they would find teacher substitutes for those wishing to visit and participate in that classroom. In another district, one teacher was selected to become a district technology integration specialist as well as continue teaching a section of her grade 7-8 gifted class.

Beginning Preservice Participation

One of the disappointments of these teachers is that more ASU West student teachers and practicum students hadn't visited and participated in their classrooms. They expressed the hope that they would be able to provide models for them and inspire them too. It should be noted that the PT3 project leadership, now in the second semester of the project, is aware of this issue and is working on marketing strategies. One unexpected outcome of the project is that each AZCOTT teacher has been invited to talk to preservice students as part of their university courses or workshops and share scenes from their classrooms through videotaped vignettes. Recently, an AZCOTT teacher took part in early childhood workshop for preservice students. After the workshop the students were asked to complete evaluation questions. They found the AZCOTT teacher sharing helpful and requested additional opportunities to dialog with other AZCOTT teachers.

What Worked?

It appears that technology has become an integral part of each classroom rather than a time set aside to go to the computer lab 40 minutes a week. We think this early success is due to the project's ability to address multiple interventions. Hall and Hord (2001) point out that change often is not centered on one innovation but many. In this case AZCOTT teachers had the support of their principals, participated in over 100 hours of high quality workshop training distributed over the course of a year, attended two local educational technology conferences, received technical support from their school districts, benefited from online support through interactions with their peers and PT3 project staff, enjoyed technical and curricular support from the project manager and her site visits, and received adequate access to technology and the internet. Additionally, the teachers were selected because they were experienced teachers who were interested in constructivist philosophies associated with active student participation, collaborative workgroups, and meaningful projects. Although we noted signs of early success, experts on the change process have found that the implementation of change often requires 3-5 years (Fullan, 1991; Hall & Hord, 2001). We plan to revisit these classrooms after the second and third years of the project and trace the developments of the teachers and the preservice students influenced by the AZCOTT classroom examples.

References

Fullan, M. (1991). The new meaning of educational change. New York: Teachers College Press

Hall, G., & Hord, S. (2001). Implementing change. Needham Heights, MA: Allyn and Bacon.

Sandholtz, J., Ringstaff, C., & Dwyer, D. (1996). Teaching with technology: Creating student-centered classrooms. New York: Teachers College Press.

Strauss, A. (1987). Qualitative analysis for social scientists. New York: Cambridge University Press.

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Helping Higher Education Faculty Model Use and Integration of Technology in Teaching

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Abstract: A large-scale faculty development project focused on the integration of technology for teaching and learning in Marquette University's Colleges of Letters and Science, Communication and School of Education is described. The project includes 1) a website with multiple resources to help faculty integrate technology into their teaching 2) faculty consultants for technology planning; 3) "just in time" support; 4) workshops that promote technology integration for learning 5) mini-grants for course redesign.

Despite the explosion of technology in schools as well as the huge volume of knowledge available electronically, most teachers still use a limited number of technological tools in fairly traditional ways. In a recent survey on technology use in classrooms (Milken Exchange on Educational Technology, 1999), for example, it was found that typically teachers use video to present information and computers for basic skills practice and word processing. Newer technologies like desktop publishing, computer simulations, multimedia projects, videoconferencing, electronic chats, and electronic information gathering are much more rarely used (Office of Technological Assessment, 1995) even though these technologies offer great potential to enhance student engagement and achievement (O'Neil, 1995; Tharp, Estrada, Dalton & Yamauchi, 2000).

Numerous studies of technology in teacher preparation point out that future teachers cannot learn how to use and integrate technology effectively in a single course. They need a technology-infused program that involves not only entire schools of education but faculty in the humanities and sciences who can collectively model technology integration for future teachers. For this reason, we have begun a long-range faculty development effort at Marquette University that focuses on 1) helping professors in arts and sciences, communication as well as education integrate technology into their instruction to improve student learning and 2) expanding leadership roles among faculty to model and mentor integration of multiple technological tools into student-centered instruction.

Currently, this staff development program includes: 1) a website with multiple resources to help faculty integrate technology into their teaching 2) faculty consultants for technology planning; 3) "just in time" support; 4) workshops that promote technology integration for learning 5) mini-grants for course redesign.

Faculty Website

The goal of this recently launched faculty website has been to create an ongoing, dynamic, web-based educational portal for university faculty that will include online tutorials, listservs and online discussion forums; examples of faculty technology integration projects; and links to web resources for curriculum design and pedagogy that integrates technology. Current and planned tutorials on the website include how to integrate electronic data bases, e-mail, desktop publishing, presentation managers, multimedia, electronic portfolios, videoconferencing, computer conferencing, the Internet, digital and video cameras, and assistive technologies into teaching and assessments. After reading and discussing articles on the application of constructivist and brain-based learning principles into teaching, professors taking the tutorials are expected to experiment with the integration of the technology in a course and use both faculty consultants and a faculty listserv for support and discussion about the technology. Currently, for example, the faculty listserv includes faculty members who teach courses in the arts and sciences as well as courses in education who are implementing the use of Blackboard, an online courseware package, into their courses.

Faculty Consultants For Technology Planning

Two full time faculty consultants lend their technical expertise to help faculty members identify and acquire the technology they need to meet educational objectives. The Learning Technology Consultant helps faculty members address instructional design and curriculum integration issues and the Technology Coordinator helps faculty members address and troubleshoot all of the technical issues related to the particular hardware or software technology they are trying to implement. For example, currently two professors in the Foreign Language Department are designing a project for their Spanish History course which requires students to create a multimedia presentation. They needed advice on both the purchase of a multimedia workstation as well as various curricular aspects of the project. Both of the consultants met with the professors to determine their needs and were able to recommend the purchase of necessary hardware and software with very detailed information about specifications. At other times, technology planning involves making mid to long-range decisions about how existing curriculum may be improved through the integration of educational technology. In such a situation a faculty member and the Learning Technology Consultant can combine their expertise in both content and technology to make decisions about integrating technology in the curriculum in ways that improve learning. For example, an Education professor had used journals to encourage students to reflect on their impressions of schools they were visiting. In an attempt to enhance the effectiveness of this course requirement, the professor sought a technological solution that would allow students to share their experiences and reflections with other students in the class. The Learning Technology Consultant was able to suggest a number of web-based applications such as e-mail, threaded discussions and discussion boards and explain the pros and cons of each. Given the situation, the professor was then able to determine that the discussion board would work best in supporting the particular educational objective.

Just in Time Support

When the integration of technology is used to enhance the learning experience, even more preparation time is required to schedule and set up equipment or to create multimedia or digital presentations. "Just in time" customized faculty support provides the resources necessary to integrate technology into a learning experience on short notice (Oblinger, 1998). The Learning Technology Consultant is available on-demand to provide strategies and guidance for technology use that support learning objectives and the Technology Coordinator is able to allocate and set up necessary equipment just in time for class. In short, just in time support, with its commitment of personnel and equipment, facilitates the serendipitous use of educational technology.

Workshops

In addition to the wide range of technology knowledge and use among faculty at Marquette, there is also a wide range of how faculty thinks about teaching and learning and how technology can be used to enhance particular paradigms of teaching and learning. For example, one teacher who sees teaching as largely the transmission of information might use PowerPoint to build better lectures, while another teacher who subscribes to a more constructivist (Driscoll, 2000; Perkins, 1991) view of teaching and learning might offer students the opportunity to use PowerPoint to share and engage others in what they have learned.

Based on faculty interest, the Learning Technology Consultant has been conducting workshops for small groups of faculty on technology topics that go beyond a purely "how to use" approach. Workshops promote the use of technologies like PowerPoint and web pages to create complex learning environments with activities that are relevant to the learner (Driscoll, 2000), ample opportunity for social negotiation of meaning (Persichitte, Caffarella & Tharp, 1999; Vygotsky, 1978), multiple ways to learn (Gardner, 1983), metacognition (Duffy & Cunningham, 1996) and student-directed learning (Perkins, 1991).

Mini-Grants for Course Redesign

Over a three year period (2000-2003) faculty members in the Colleges of Arts and Sciences and Communication as well as the School of Education will be given the opportunity to apply for summer mini-grants as an incentive to redesign a course in a way that models the use of technology to support teaching and learning. To obtain the grant, faculty members are required to submit a proposal that presents a significant plan for technology infusion in a course that they teach to future teachers; demonstrate interest and involvement in technology; and explain how the revised course will model good teaching and learning principles. Currently, faculty members in Biology, Chemistry, Physics, English, Mathematics, Communication, Foreign Languages, Philosophy, Theology and Education are using these grants to revise their courses.

References

Driscoll, M. (2000). *Psychology of learning for instruction* (2nd ed.). Boston: Allyn & Bacon.

Duffy, D.M. & Cunningham, D.J. (1996). Constructivism: Implications for the design and delivery of instruction. In D.H. Jonassen (Ed.). *Handbook for research for educational communications and technology.* NY: Macmillan.

Eisner, E. (1994). *The educational imagination: On the design and evaluation of school programs.* (3rd ed.). Upper Saddle River, NJ: Prentice Hall.

Gardner, H. (1983). *Frames of mind: The theory of multiple intelligences.* New York: Basic Books.

Milken Exchange on Educational Technology (1999). *Will new teachers be prepared to teach in a digital age? A national survey on information technology in teacher education.* Santa Monica, CA:Author.

Office of Technology Assessment, U.S. Congress (1995). Teachers and technology: Making the connection. [Online]. Available:
http://www.wws.princeton.edu/~ota/disk1/1995/9541.html.

Oblinger, D. (July 21, 1998). Testimony of Diana Oblinger, Manager, Academic Programs and Strategy, IBM Global Education Industry, Before the Subcommittee on Technology, Committee on Science, U.S. House of Representatives. [On-line] Available:
http://www.house.gov/science/oblinger_07-21.htm

O'Neil, J. (1995). Teachers and technology: potential and pitfalls, *Educational Leadership*, *53*, 10-11.

Perkins, D. (1991). What constructivism demands of the learner. *Educational technology*, *31*, 19-21.

Persichitte, K.A., Caffarella, E.P., Tharp, D.D. (1999). Technology integration in teacher preparation: A qualitative research study. *Technology and teacher education*, *7*(3), 219-233.

Tharp, R.G., Estrada, P., Dalton, S.S. & Yamauchi, L.A. (2000). *Teaching transformed: Achieving excellence, fairness, inclusion, and harmony.* Oxford: Westview Press.

Vygotsky, L. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

Technology Integration in K-12 Classrooms: Evaluating Teachers' Dispositions, Knowledge, and Abilities

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Abstract. As part of thc cvaluation of PT3 sponsored technology integration workshops conducted at Arizona State University West, a Likert-type questionnaire was developed to collect information about teachers' beliefs and skill levels related to technology integration. This presentation will include a description of the questionnaire that is being used to collect pre-test and post-test data from preservice and inservice teachers. The instrument contains several subscales targeting teachers' perceptions of their confidence and skill level for using technology, knowledge of technology standards and the Unit of Practice (UOP), and beliefs about the best use and effects of technology integration. The focus of the presentation will then shift to the results obtained from its first administration. Quantitative results and conclusions about the effects of the technology training are presented.

Introduction

Background

In the PT3 grant developed at Arizona State University West, we devised three separate, but related components. First, we devised a professional development component, which focuses on university faculty development. Second, in partnership with local school districts, we established model technology-using classrooms, which our students and local teachers can visit to observe high-level technology use and integration. Third, and the focus of this paper, we included a professional development component for inservice, mentor teachers and preservice teachers who work together in field experiences and student teaching. We believe the third component is critical for ensuring that students in our programs see and have opportunities to employ technology in classroom settings as they proceed through our program. These initial experiences and opportunities to see and use technology are critical to subsequent use of technology because future educators are influenced by what they observe in practicum classrooms or by their own school memories (Darling-Hammond, 1995, 1998).

Rationale/Need

Advances in teaching expectations outlined by various professional organizations, which require teachers to integrate curriculum and incorporate technology into instruction attest to the continuing need for professional development (AAAS, 1993; NCTM, 2000; NRC, 1996; Thomas [NCATE], 1995; Wiebe & Taylor [ISTE], 1997). For example, NCTM (2000) guidelines prescribe hands-on, student-centered teaching and authentic, performance-based, instruction-driven assessment. Similarly, AAAS's (1993) *Benchmarks* stipulates both the content and the nature of instruction that are to be employed in science learning. Because both require a substantial focus on problem solving and active participation by students, meeting these guidelines will require substantial professional development.

Finally the need for professional development is particularly substantial when one considers the issue of integrating technology into current instructional endeavors. Thomas (1995) and Wiebe and Taylor (1997) have written extensively about the integration of technology into instruction. In their presentation of the revised ISTE Standards, Wiebe and Taylor (1997, p. 7) discuss the importance of technology integration when they state, "candidates will apply computers and related technologies to support instruction in their grade level and subject areas. They must plan and deliver instructional units that integrate a variety of software, applications, and learning tools."

Although such mandates ultimately will prove to benefit students, inservice teachers are not currently prepared to meet the mandates. For example, research summarized by the United States Congress, Office of Technology Assessment report (USCOTA, 1995) indicates teachers are not prepared to integrate technology into instruction. More recently, the CEO Forum's *School technology and readiness report: Year 2* builds a strong case for providing additional professional development for inservice teachers so they can use technology more effectively during instruction (CEO Forum, 1999).

Method

Subjects

Participants (N = 21) consisted of two groups, 13 university students who were completing their professional education preparation program as student teachers and 8 inservice teachers. The majority of students were in Elementary Education programs including Elementary, Bilingual, ESL, and Early Childhood Education. The inservice teachers had been teaching 13.4 years on average. The eight inservice teachers were serving as mentors to eight of the student teachers.

Technology Questionnaire

A 42-item questionnaire, which assessed teachers' beliefs and skill levels related to technology use and technology integration was developed. Respondents rated each item on a 6-point Likert scale, where 1= strongly disagree, 2=disagree, 3=somewhat disagree, 4=somewhat agree, 5=agree, and 6=strongly agree. Higher scores indicated greater skill or more positive attitude. Examples of items follow. "I can develop lessons that integrate the use of video, digital cameras, or scanners." "I can use the National Educational Technology Standards (NETS) to design instruction." "Computers are an integral part of classroom instruction." In addition, one open-ended item assessed participants' "vision" for using technology by asking, "Over the next five years, how do you see yourself using technology in your classroom?"

The questionnaire was based on one developed for the Interactive Video Project (Wetzel, Zambo, Buss, & Arbaugh, 1996). In that study, the researchers developed a technology questionnaire to evaluate preservice students' preparation to teach with technology. For the present study, that questionnaire was revised to: (a) reflect the recent National Education Technology Standards for Teachers (ISTE, 2000); (b) ensure appropriateness for both preservice and inservice teachers; and (c) include items which assessed participants' knowledge and beliefs about the Unit of Practice (UOP) and the integration of technology.

Items were developed to provide coherent sets, which formed subscales that could be more readily analyzed. Twelve subscales were developed including: general confidence in using technology, confidence in computer setup and general operation, confidence in using non-computer equipment, confidence with software selection and use, confidence in addressing students with particular needs, confidence in developing lessons with technology, beliefs about appropriate use of computers, beliefs that computers are integral to classroom instruction, perceived cost effectiveness of computer integration, knowledge and beliefs about the technology standards, knowledge and beliefs about UOP, and level of technology use observed in university courses. In addition, a total questionnaire test score was computed.

Procedure

Participants completed the questionnaire on two occasions. They initially completed it in January 2000 prior to their participation in a set of workshops (18 hours of workshop and follow-up meetings) delivered to increase participants' skills in using technology and integrating it into the classroom setting. Participants completed it a second time in May 2000. For the students, this administration followed the completion of their student teaching semester.

Workshops consisted of learning about the Unit of Practice and using it as a basis for developing a curricular unit, which integrated technology, and which was implemented during the student teaching experience. In addition, other topics addressed by the workshops included: National and State Standards for content areas including technology, Website evaluation strategies, school district resources, internet resources, preview of various software and video discs, use of the digital cameras, use of PowerPoint for presentations, and management techniques for limited computer classrooms.

Results

Using pre-test data, Cronbach's alpha for the total test was .93. Individual subscale alphas, with the exception of one outlier ($\alpha = .55$), ranged from $\alpha = .69$ to $\alpha = .90$ with a median of .81.

Results showed mean scores were relatively high for all subscales, both pre-test and post-test, generally ranging from 3.8 to 5.0 out of 6. There were significant between-subjects differences for group (student teachers vs. inservice teachers) and significant within-subjects differences for time-of-testing (pre- vs. post-test) for subscale and total test scores.

Differences in group (student teachers vs. inservice teachers) scores were noted for two variables. The effect for group was significant for knowledge and beliefs about UOP, $F(1, 19) = 4.59, p < .045$. Teachers, $M = 5.32$, felt more positively disposed toward the UOP and its benefits for instruction than were student teachers, $M = 4.80$. Moreover, the effect for group was significant for level of technology use observed in university courses, $F(1, 19) = 38.65, p < .001$. Student teachers, $M = 3.79$, indicated they had observed more use of technology in university classes than their inservice counterparts, $M = 1.43$.

Mixed ANOVAs indicated three subscale scores increased significantly from initial testing, prior to the workshop, to testing at the end of the semester. Confidence in using non-computer equipment such as laser disc players, digital cameras, capturing video, etc. increased significantly, $F(1, 19) = 6.70, p < .018$. Means for the two times of testing were 4.06 and 4.44. Similarly, confidence with software selection and use increased significantly, $F(1, 19) = 6.15, p < .023$. The pre-test mean was 4.25 and the post-test mean was 4.72. Confidence in addressing students with particular needs (i.e., second language learners and students with special needs) increased significantly, $F(1, 19) = 15.93, p < .001$. Means for the two times of testing were 3.87 and 4.71. Finally, there was a significant difference on the total test score for the initial as compared to the final administration, $F(1, 19) = 5.82, p < .026$. Mean item scores for the total test score were 3.81 and 4.06 for the initial and final time-of-testing, respectively.

Participants' pre- and post-test vision statements were analyzed to determine whether changes occurred. Fifty percent of the participants exhibited a post-test vision statement that demonstrated a higher degree of technology integration compared to their pre-test vision about the integration of technology. For example one participant provided the following pre-test and post-test responses, respectively: "I do not see myself designing lessons with technology in mind..." and "I would like to use technology on a regular basis as a method of teaching in my classroom. I would also use technology as a resource for information for my students."

Discussion

Results showed that the overall questionnaire was reliable. Further, the subscales, which were developed to assess specific areas related to technology use, technology attitudes, technology integration, and so on, were consistent and coherent as demonstrated by the strong reliabilities. The subscales allowed the researchers to explore components of technology use and integration with a greater level of specificity.

Such specificity provides a more detailed view of inservice and preservice teachers' beliefs, attitudes, and skills regarding technology use and integration.

Group differences were apparent on the subscale for the Unit of Practice. Teachers were more positively disposed to the UOP and its benefits for instruction compared to students. This may be attributable to the fact that the experience of inservice teachers provides them with a greater knowledge of planning at the long-term, unit level; whereas, relatively inexperienced, preservice teachers may be operating on a short-term, day-to-day basis. Moreover the effect for group was significant for level of technology use observed in university courses. This is not surprising, given that the inservice teachers who had been teaching on average 13.4 years, would not have observed substantial levels of technology in their coursework.

Significant increases occurred in confidence using non-computer equipment, confidence in software selection and use, and confidence in addressing students with particular needs. These increases could be attributed to three factors. First, participants were provided with opportunities during the workshops to learn about technology materials related to these three areas, for example, specific training was provided on the use of non-computer equipment such as video discs and digital cameras. Second, this new knowledge was directly applicable to classroom settings, as a result participants tended to incorporate this new knowledge and adapt it to their specific needs as they developed their UOPs. Third, students and their mentors had the opportunity to put into practice their new knowledge during the student teaching semester as they implemented their UOPs. Consistent with the professional development literature, opportunities to learn, adapt, and implement technology innovations are essential to fostering change and to promoting the integration of technology in classroom settings.

References

American Association for the Advancement of Science. (1993). *Benchmarks for science literacy: Project 2061.* Washington, DC: Author.

CEO Forum. (1999). *The CEO Forum school technology and readiness report: Year 2.* Author.

Darling-Hammond, L. (1995). Changing conceptions of teaching and teacher development. *Teacher Education Quarterly, 22*(4), 9-26.

Darling-Hammond, L (1998). Teacher learning that supports student learning. *Educational Leadership, 55*(5), 6-11.

National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics*, Reston, VA: Author.

National Research Council. (1996). *National science education standards.* Washington, DC: National Academy Press.

Thomas, L. (1995). NCATE releases new unit accreditation guidelines: Standards for technology are included. *Journal of Computing in Teacher Education, 11*(1), 5-7.

U. S. Congress, Office of Technology Assessment. (1995). *Teachers and technology: Making the connection.* (OTA-EHR-616). Washington, DC: U.S. Government Printing Office.

Wetzel, K. A., Zambo, R., Buss, R. R., & Arbaugh, N. (1996). Innovations in integrating technology into student teaching experiences. *Journal of Research on Computing in Education, 29*(2), 196-214.

Wiebe, J. H., & Taylor, H. G. (1997). What should teachers know about technology? A revised look at the ISTE foundations. *Journal of Computing in Teacher Education, 13*(4), 5-9.

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Problems and Pitfalls of Directing a PT3 Grant

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In June 2000, President Clinton announced the award of $43 million to fund 122 new grants to train future teachers to use technology effectively in the classroom. These PT3 grants (Preparing Tomorrow's Teachers to Use Technology) are to be administered by the U. S. Department of Education. James Madison University will receive $493,554 over a three-year period to produce 36 digital video units that will eventually be placed on the World Wide Web.

This presentation will follow this project from initial writing of the grant, through organization of the personnel tapped to participate in the production of the digital video units to the production of the learning activities that will be placed on the Web. Various problems encountered by the project director while working with the various individuals will also be summarized.

Three school divisions from the Harrisonburg City/Rockingham County area have contributed nine elementary school teachers to work on teams, led by four faculty members from the JMU Early Education Program. One of the nine teachers will work with the JMU Center for Assessment and Research Studies to design and implement assessment rubrics to be applied to each of the 36 instructional units. Central to this assessment will be the National Educational Technology Standards for Students and for Teachers. At the local level (i.e., Virginia) assessment standards will include the Virginia Technology Standards for Instructional Personnel and the Virginia Standards of Learning. We believe these web-based video models can serve not only Virginia educators, but also pre-service teachers and teacher preparation faculty throughout the US and beyond.

This presentation will include examples of the video units produced to-date as well as "out takes" to demonstrate the challenges of videotaping students in the elementary classroom.

Collaborative Action Communities for Preservice Technology Integration

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Abstract: With a successful field-based preservice program aimed at effective strategies for teaching diverse urban youth, the University of Houston is implementing an action research process to actively collaborate with area school districts to establish networked learning communities of university faculty, preservice teachers, and school-based educators to support the development of future teachers. The College has restructured its required 1 semester, 3-credit-hour technology course to a series of 3, 1-credit-hour technology sections tied directly to methods courses to allow students to develop appropriate content methods-based technology proficiencies based on ISTE standards. To ensure that all members of our learning community are effectively prepared for appropriate inclusion of technology in content methods courses, faculty and students participate in a comprehensive support model of classroom instruction, workshops, and field-based experiences with the aid of a cadre of trained Technology Fellows.

Educators involved with the preparation of new teachers throughout the final decade of the Twentieth Century have repeatedly recognized the need for a strong technology component for preservice programs. They have experimented with a variety of learning models that integrated technology (Falba et al., 1999; Willis, 1997). While some successful projects have been implemented, there is agreement that new teachers are generally not being prepared to effectively integrate technology into their future classrooms (Office of Technology Assessment, 1995; Strudler, Quinn, McKinney, & Jones, 1995). It is no longer enough to prepare new teachers only with one disconnected technology-in-education course; introductory courses should instead be project-based and meaningful, followed by appropriate modeling and use in content methods courses and field experience. True modeling of how objectives can be accomplished by using technology for instruction is rare in preservice programs (Office of Technology Assessment, 1995). Professional development opportunities are needed for College of Education faculty to effectively integrate relevant technology use into their curriculum strategies and content standards (Office of Technology Assessment, 1995; O'Bannon, Matthew, & Thomas, 1998; Sprague, Kopfman, & Dorsey, 1998). Preservice teachers want to learn strategies for integrating technology tools into their teaching (Oliver, 1994), and expect to use computers in their teaching (Marcinkiewicz & Wittman, 1995) but express their feelings of frustration at their lack of technology proficiency (Francis-Pelton & Pelton, 1996) and a lack of understanding of effective technology use in contemporary classrooms (Balli, Wright, & Foster, 1997).

The Twenty-first Century finds us poised for widespread, concerted action on the subject of effectively preparing future teachers as complete professionals who are able to adeptly use and integrate into the curriculum all available learning tools. State and national organizations are leading the accountability push by implementing standards for the use of technology by teachers (Handler & Strudler, 1997; Wiebe & Taylor, 1997). In 2000, the International Society for Technology in Education (ISTE) brought this trend to a culmination with the release the National Educational Technology Standards for Teachers (NETS•T), a blueprint for the design of preservice technology programs developed through the extended collaboration of representatives from various stakeholder groups with interests in how new teachers use technology (Thomas, 2000). As this standards-based movement brings a clearer vision to the preparation of preservice teachers, teacher education programs across the country must finally acknowledge the long trend of research findings and recommendations in order to design appropriate learning environments that challenge long-standing curriculum structures through the cooperation of all faculty involved with teacher preparation. Without the purposeful creation of collaborative, authentic, and content-focused learning environments in which future teachers are empowered to develop content, pedagogy, and technology strategies concurrently, new technology standards will be meaningless.

The PUMA Program

The University of Houston (UH) College of Education has a history of providing innovative teacher education programs, grounded in research and effective practice, for urban, at-risk populations. UH is located in the heart of Houston, the nation's fourth largest city, in the Third Ward, an inner city poverty area of Hispanic and African American cultures, which has been identified as a federal Empowerment Zone. Approximately 450 elementary and secondary teachers graduate from UH each year, with minority students constituting 37% of the College's undergraduate enrollment.

The UH teacher preparation program is predicated on a belief of learning throughout the career of a professional educator, beginning with effective preservice preparation and successful entry into the teaching profession. To that end, the Pedagogy for Urban Multicultural Action (PUMA) program was designed to develop new teachers who can demonstrate current best practices, understand the needs of diverse youth within a constantly changing society, and reflect on their own learning and experience. Based at Professional Development Schools (PDS), PUMA provides authentic classroom settings in which preservice teachers can learn and practice effective teaching strategies, while working with university faculty and qualified School-Based Teacher Educators (SBTEs).

The four-semester sequence of PUMA is offered in three phases: Pre-PUMA, Phase I PUMA, and Phase II PUMA. The Pre-PUMA program, the two junior year semesters, includes courses in the theories and practices of effective classroom management, and understanding the psychological needs of learners.. Phase I PUMA consists of a one-semester set of field-based courses that focus on the basic study of the history and philosophy of American education, and the development of professional planning, instruction, and evaluation skills. Phase I preservice teachers are placed at PDS schools to participate in methods courses and classroom placements on alternating days, permitting students to integrate theory directly with practice. Students who successfully complete Phase I are approved for admission into Phase II, a 14-week student teaching/internship placement, in which students demonstrate those sets of knowledge, skills, and attitudes reflective of a beginning professional.

Areas of Need

Despite receiving both local and national acclaim, several significant challenges remain related to improving the coherence of the entire PUMA program through the integration of technology in appropriate ways to meet the needs of our diverse student population. Using an approach grounded in the tradition of community-based action research (Stringer, 1999), we identified key technology leaders in the Houston-area school districts and invited them to identify and propose solutions to these challenges. We believe that for lasting program change to occur, this effort needs to be collaborative, rather than directive from the university perspective. Long-standing collaborative relationships among the 32 schools in the Houston Area Teacher Center served as the foundation of this focused and recursive inquiry and decision-making process. Our plan for program evaluation, rather than being an afterthought external to program activities, is integral to the collaborative decision-making among stakeholders.

As we analyzed baseline data from extensive surveys and focus group interviews of representative participant groups, a set of challenges became clear. The first challenge we face is identifying the best ways to create access to technology among our widely diverse urban student population. Although 73% of our students have home access to computers, only 3% own a portable computer that can be used in flexible groupings with other students and teachers for both campus and field-based coursework.

Another challenge is a lack of coherence and the disconnection between the Pre-Puma courses and the rest of the PUMA program. Little across-course planning among the instructors gives our students the impression that these courses are separate entities - merely a set of academic hurdles, rather than a meaningful sequence of preparation. Furthermore, unlike the highly structured field experiences of PUMA Phases I and II, there is no field-based experience and sparse technology integration in Pre-PUMA. When queried, our students indicated a strong need for accessible networking for communication between campus-based and field-based experiences and resources. The third challenge that consortium members identified is that in our current plan, we address educational technology with a single course taken typically during the Pre-PUMA phase of the program. This placement is not ideal for several reasons, including the fact that such a "one shot," disconnected course does not allow students to see ways in which technology can be seamlessly integrated into content area strategies. When surveyed, UH preservice teachers perceived the importance of technology, but were unsure as to the benefit derived from the single course currently required. A majority reported, however, that they are rarely required to use technology in any other methods courses.

The fourth challenge facing our college is a lack of faculty confidence and skill with technology. Although data from a faculty survey revealed 100% computer ownership for 5 years or more, actual instructional computer use in the classroom dropped dramatically. A majority of faculty expressed a desire to utilize more technology tools to improve their classroom teaching, however even those faculty members who are technologically proficient express concern about teaching technology strategies in addition to their already very full curriculum. Further, little effort has been made to collaborate with faculty in other colleges across campus that teach preservice teachers prior to acceptance into the PUMA program.

Design for Improvement

Our plans for program improvement emerged from the needs identified by our stakeholders. Those needs led to revised program goals and objectives, which led to proposed actions, anticipated outcomes, and ultimately, multifaceted, interpretive, and participant-focused evaluation strategies. The process we strive to build is an inclusive action research-based model that spirals from our initial need through the stages of *Listen*, *Think*, and *Act*, with the logical subsequent dissemination stage of *Share* to complete the sequence and feed the next spiral in the process. We define *action research* as a systematic process through which stakeholders work together to frame questions about teaching and learning, to problem-solve, to implement proposed solutions, and to document and evaluate the subsequent results of their actions (Stringer, 1999). This process embodies the reflective decision-making among learning communities, which is integral to the PUMA program.

Goals of this Project

Networked learning communities provide collaborative and supportive environments in which preservice teachers share and develop content, pedagogical, and technological expertise.

Learning communities (Fullan, 1999) of preservice teachers, university faculty, and K-12 teachers are in the process of being established to support beginning teachers from initial coursework through induction teaching years. Students entering the PUMA program are invited into these smaller, more nurturing subsets of the larger program, giving immediate support to new members and a virtual place to learn that is available from anyplace and at anytime. More experienced members can offer guidance and insight to new students, while newer students can constantly challenge more experienced members to reconsider previous conceptions. Technology will play an invaluable role by connecting those at various distant locations and asynchronous occasions. All community members have opportunities to learn and practice effective online communication strategies through e-mail, Web-based discussions, video conferencing, and chat. An additional benefit of constructing strong and progressive learning communities is that students can remain in contact throughout the student teaching experience, a time when students often feel isolated from campus colleagues.

All students have access to current-model portable computer technology on a regular, immediate, and flexible basis.

Preservice teachers use computers both as students in university-based courses and as teachers in their field-based classrooms, however we strongly believe that technology will prompt changes in teaching and learning habits only when it is available regularly and immediately for flexible learning opportunities. We consider laptop computers to be the most effective way to encourage spontaneous learning anywhere at any time. In fall 2000, wireless hubs were installed in classrooms through the College of Education building. Three 10-unit mobile, wireless, laptop stations were purchased for use by PUMA faculty and Technology Fellows in campus-based courses in conjunction with the hubs in any classroom in the building. Our goal is for students to regularly experience the versatility of portable computers, thus creating an understanding of the need for portable computers in their learning and teaching. PUMA admissions guidelines for school year 2001-2002 will require the lease or ownership of a laptop computer; reasonably-priced laptops with accessible leasing and financing plans will be made available to students through COE relationships with relevant business partners.

The College offers a comprehensive, connected and extended technology experience.

To provide an environment, in which our future teachers can come to see the appropriate and exemplary use of technology in education, we have implemented structural changes to our technology component. We have restructured our current three-credit hour required technology in education course into three one-credit-hour sections to be taken over the three-semesters leading up to the student teaching experience. Campus-based students are exposed to technology appropriately in methods courses, and also attend a one-hour weekly lab to reinforce content-related technology strategies, while field-based PUMA I and II students will receive site-based workshops and electronic support. PUMA I students will additionally be placed in classrooms with identified technology mentors when possible, and when not, will have access to technology mentors within the district. By extending the exposure to technology interwoven with pedagogical strategies, we believe our preservice teachers will more thoroughly integrate technology into their future teaching.

Students have comprehensive and coordinated opportunities to develop standards-based technology proficiency.

Entering PUMA students will be required to demonstrate basic technology proficiency, so that efforts during PUMA can focus more effectively on the use of technology in instruction, rather than taking precious time to instruct on basic operations. Recommendations for such general preparation for students is found in the new ISTE NETS standards (ISTE, 2000), and we have found, as have others (Kirby & Schick, 1998), that students are now entering preservice programs with some experience with basic word processing and communication technologies. To ensure that students possess general technology skills sufficient to participate in the program (Rodriguez, 1996), their skills will be assessed through a performance-based pre-test. Those who are lacking the required skills will have ample opportunities to develop basic skills prior to PUMA admission through a series of topic-specific workshops, recommended courses, and other support. Throughout PUMA, students see and use various technologies, in the context of methods strategies, to reinforce basic skills, personal and professional productivity, and effective instruction.

Students compile and maintain electronic portfolios throughout their preservice experience.

While traditional grades are still required by the university, an electronic performance-based portfolio system has been established to allow students a venue through which to reflect on and demonstrate growth, the development of pedagogy (Carroll, Potthoff, & Huber, 1996), and a professional voice (McKinney, 1998). Portfolios have been shown to be a flexible assessment format capable of addressing criteria not a part of traditional assessments, such as continuous student reflection, individual assessment of growth and change, iterative evaluation of learning goals, and the contextual examination of created products in relation to complex teaching processes (Levin, 1996; Snyder, Lippincott, & Bower, 1998; Wade & Yarbrough, 1996). Not only will portfolios give students an authentic example of assessment that they might use in their own teaching, but students will graduate with a tangible record of their experiences and a better understanding of their own abilities. Students might also include representative examples of work produced by the students they teach (Hoelscher, 1997). Faculty and Technology Fellows will work with students to design content products that reflect both discipline-specific and technology standards. Students will receive instruction on technical procedures, style guidelines, and ethnographic strategies for selecting representative examples their own work.

Virtual field experiences are being developed for campus-based students.
Unique campus resources are being developed for field-based students.

Video experiences are being developed to provide campus-based methods instruction with real classroom contexts. A collection of virtual field experiences using a variety of traditional and emerging video technologies is being developed, implemented and evaluated. Methods and IT faculty are in the process of identifying exceptional teaching and technology integration examples in collaboration with SBTEs. IT graduate students and staff are collaborating to plan, record, prepare, and compile high-quality video scenarios for use in on campus-based classes and in online training. While preservice teachers participating in the field-based PUMA programs benefit greatly from being immersed in authentic classroom settings, there are instances when the widely distant PDS locations prove problematic. It is difficult, for example, for certain expert speakers to regularly travel to all field sites. Certain courses deemed unique and valuable will be taught to students in the field by campus-based experts through technologies such as video, online streaming video, videoconferencing, and web-based communication. IT graduate students and staff are collaborating with faculty experts to plan, record, and prepare the presentations.

Faculty and students are participating in new models of teaching and learning for the purpose of developing technology proficiency.

Faculty are being assisted in developing skills and confidence in appropriate uses of technology for content areas through short workshops during the semester, and intensive workshops during intercessions, summer, and weekends.

Handler and Strudler (1997) suggest a collaborative process in which content methods faculty work with instructional technology faculty to align content strategies and resources with technology standards using a matrix technique. We feel such a collaborative alignment process not only capitalizes on our faculty's full range of expertise, but helps to establish our collective meaning of technology integration for everyone involved with teacher preparation at the University of Houston. Faculty also have opportunities for continued support through the Academic Technology Support Center (ATSC), being developed to provide all UH faculty with training and support to enhance teaching and learning with new technologies.

Of prime importance to the success of this program is the one-on-one collaboration that PUMA faculty have available from Technology Fellows, who are Instructional Technology graduate students specially trained in such skills as content-area technology integration, mentoring, and adult learning theory. Similar to student-faculty mentoring plans proposed by others (Sprague, et al., 1998) Technology Fellows collaborate with and support PUMA faculty members in content areas to identify technology strategies that can be used to teach and demonstrate content-related concepts, to assist with set up and operation of necessary technology, and to generally help faculty gain confidence in their own personal technology skills. In addition, Technology Fellows are accessible to students in campus-based methods courses, during weekly computer lab workshops, and electronically via e-mail. After the first year, the Technology Fellows will commute to PDS sites with the PUMA students to maintain consistent student contacts, ensure properly functioning technology, and facilitate university-school relationships onsite. Completing our learning community concept, such relationships make a school-based learning environment feasible and at the same time give our IT graduate students valuable experience in authentic teaching environments.

Ongoing Assessment of Program Success

These program change efforts were designed to increase the technological readiness of future teachers through an action research-based process. We recognize that any changes to our current program will also simultaneously cause other, unintended changes, both welcome and otherwise. To monitor and continually adjust our efforts, we have developed an evaluation plan to address both process and product outcomes according to our inclusive action research approach. First, we established baseline data by having preservice teachers, university faculty, and SBTEs complete a questionnaire on attitudes toward technology, use and perceived skill, and learning style with technology. Technology representatives from consortium school districts participated in focus groups to identify needs and propose solutions. Data from these multiple forms of needs analysis will be used to provide baseline data. Then during the first year of this program, working with action-research consultants and through a collaborative stakeholder effort, we will identify more in-depth, qualitative assessment strategies to reassess the need and the strength of our research process. In our action research-based framework, formative evaluation is a key and ongoing process that will involve all stakeholders.

To ensure that the program is progressing toward the goals, we will: (1) ensure that national and state standards concerning content, pedagogy, and technology integration are met; (2) demonstrate that program curriculum supports the standards; and (3) base student assessment on the standards, through state assessment instruments (EXCET test) and local assessments, such as rubrics (developed collaboratively by preservice teachers, faculty, and the evaluation team). Questions to be considered during formative assessment will also be derived directly from program goals and outcome measures, as well as identified through ongoing community-based collaboration with consortium members. The process itself will be repeatedly assessed so that it accurately represents stakeholder needs, interests, and strengths. We consider this unique teacher preparation approach ideal for the longitudinal study of the development of pedagogical skill and technology proficiency of new teachers. The rich context will support numerous research projects, yielding data from a wide range of procedures and instruments, including questionnaires, performance assessments, examination of student- and teacher-produced products, learning and teaching journals, observations, interviews, focus groups, video and audio recordings, anecdotal records, and open-ended critiques. Other data will include course syllabi and evaluations, documentation of professional development and support available to PUMA faculty, documentation of support provided to PUMA students, archived electronic communication, and databases of instructional resources. Finally, we plan to follow our graduating teachers out into the field to assess the effect such a comprehensive preparation program has on their ability to effectively teach in 21st Century classrooms by collecting state ExCET scores, electronic portfolio rubrics, and teacher evaluations at the end of the induction year.

Conclusion

Our program was redesigned to include several critical factors for success. The use of an action research approach ensures that progress towards goals and objectives will be continually assessed and evaluated. The purposeful creation of collaborative, authentic, and content-focused learning environments in which future teachers are empowered to develop content, pedagogy, and technology strategies concurrently is a critical factor in the design of preservice teacher education programs. Modeling strategies for accomplishing objectives by using technology for instruction is a significant part of the instructional process, addressed through a variety of professional development opportunities for both faculty and preservice teachers. Finally, technical support is available both for on-campus courses and field-based experiences. The University of Houston's history of innovation and leadership in teacher education, as well as on the close working relations established with relevant stakeholders committed to improved education of urban, low-income, at-risk children and youth, gives us great optimism that these program improvements will have tremendous potential for long-range, systemic reform.

References

Balli, S. J., Wright, M. D., & Foster, P. N. (1997). Preservice teachers' field experiences with technology. *Educational Technology, 37*(5), 40-46.

Carroll, J., Potthoff, D. & Huber, T. (1996). Learnings from three years of portfolio use in teacher education. *Journal of Teacher Education, 47*(4), 253-262.

Falba, C. J., Strudler, N., Bean, T. W., Dixon, J. K., Markos, P. A., McKinney, M., & Zehm, S. J. (1999). Choreographing change one step at a time: Reflections on integrating technology into teacher education courses. *Action in Teacher Education, 21*(1), 61-76.

Francis-Pelton, L., & Pelton, T. W. (1996). Building attitudes: How a technology course affects preservice teachers' attitudes about technology. Retrieved March 3, 2000 from the World Wide Web: http://www.math.byu.edu/~lfrancis/tim's-page/attitudesite.html

Fullan, M. (1999). *Change forces: The sequel*. London: Falmer Press.

Handler, M. G., & Strudler, N. (1997). The ISTE Foundation Standards: Issues of Implementation. *Journal of Computing in Teacher Education, 13*(2), 16-23.

Hoelscher, K. (1997). The road ahead: Pre-service educators' ideas for using technology in K-6 classrooms. *Computers in the Schools, 13*(1/2), 69-75.

ISTE. (2000, March). International Society for Technology in Education (ISTE) National Educational Technology Standards (NETS) and performance indicators. Retrieved March 20, 2000 from the World Wide Web: http://cnets.iste.org/

Levin, B. (1996). Using portfolios to fulfill ISTE/NCATE technology requirements for pre-service teacher candidates. *Journal of Computing in Teacher Education, 12*(3), 13-20.

Marcinkiewicz, H., & Wittman, T. (1995). From preservice to practice: A longitudinal study of teachers and computer use. *Journal of Computing in Teacher Education, 11*(2), 12-17.

McKinney, M. (1998). Preservice teachers' electronic portfolios: Integrating technology, self-assessment, and reflection. *Teacher Education Quarterly, 25*(1), 85-103.

O'Bannon, B., Matthew, K. I., & Thomas, L. (1998). Faculty development: Key to the integration of technology in teacher preparation. *Journal of Computing in Teacher Education, 14*(4), 7-11.

Office of Technology Assessment (1995). *Teachers and technology: Making the connection*. Washington, D.C.: U.S. Government Printing Office.

Oliver, R. (1994). Factors influencing beginning teachers' uptake of computers. *Journal of Technology and Teacher Education, 2*(1), 71-89.

Snyder, J., Lippincott, A., & Bower, D. (1998). The inherent tensions in the multiple uses of portfolios in teacher education. *Teacher Education Quarterly, 25*(1), 45-60.

Sprague, D., Kopfman, K., & Dorsey, S. L. (1998). Faculty development in the integration of technology in teacher education courses. *Journal of Computing in Teacher Education, 14*(2), 24-28.

Stringer, E. (1999). *Action research: A handbook for practitioners. (2nd Ed.)*. Thousand Oaks, CA: Sage.

Strudler, N., Quinn, L. F., McKinney, M., & Jones, W. P. (1995). From coursework to the real world: First year teachers and technology. In D. A. Willis, B. Robin, & J. Willis (Eds.), *Technology and teacher education annual, 1995*. Charlottesville, VA: AACE.

Thomas, L. (2000, March). NETS project update. *ISTE Update, 12*(6), 1, 5.

Wade, R. C., & Yarbrough, D. B. (1996). Portfolios: A tool for reflective thinking in teacher education? *Teaching and Teacher Education, 12*, 63-79.

Wiebe, J. H., & Taylor, H. G. (1997). What should teachers know about technology? A revised look at the ISTE foundations. *Journal of Computer in Teacher Education, 13*(4), 5-9.

Willis, E. M. (1997). Technology: Integrated into, not added onto, the curriculum experiences in pre-service teacher education. *Computers in the Schools, 13*(1-2), 141-53.

Reading, Language Arts & Literacy

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Collaborative, innovative ways to use technology to support literacy teaching and learning are examined in these papers. Software applications have been designed and developed to enhance instruction for students who are learning foreign languages including Japanese, Chinese, Portuguese, Spanish, French, and English. Some papers focus on learning workplace literacy skills for communicating with technology. University faculty members teaching reading and language arts classes to preservice and inservice teachers describe how they have provided their students with multiple opportunities to collaborate with each other and K-12 students as they explore ways to seamlessly integrate technology into their classrooms. Researchers discuss the online communities of K-12 learners that have been created to furnish students' opportunities to respond to literature in collaborative ways. Web-based resources to enhance literacy learning are described in some of the papers. Papers in this section cover a wide range of literacy topics of interest to faculty members teaching students in kindergarten to graduate level classes.

Fukuda and Nakamura describe the trials and tribulations of designing a learning system to teach middle grade Japanese students Kanji. Their original attempts involved a PDA and eventually the system evolved into a web-based program. The program is designed for either self-study or as an enhancement to classroom teaching and learning. Senquan uses technology to teach reading and listening comprehension strategies in Chinese with *KEY* software. *KEY* is a multimedia reading comprehension tool, which includes a Chinese/English dictionary and a text to speech module. *EquiText*, an interactive groupware tool, allows foreign language learners to participate in collaborative writing activities on the web. Costa, Galli, de Almeida, and Guedes used *EquiText* with Brazilian college students who were learning French, English, and Spanish. Students worked in teams using *EquiText* to produce significant written discourse. This paper reports on promising research using collaborative writing to support students as they learn a foreign language.

Slobodina reports on the integration of technology in a business English class for the English for Specific Purposes (ESP) practitioner. To participate in the world business community, university graduates need to be proficient in both English and technology. In this class students use software and hardware for a variety of authentic learning activities to assure that they are well prepared to meet the challenges of the English speaking international business community. Slobina also explains how movie excerpts are used to demonstrate authentic examples of real-life business communication. Electronic business communication is the focus of Hemming, Symons, and Langille's paper. Their paper describes a course that teaches students workplace literacy skills for communicating via email and discussion groups. Direct instruction is given for electronically explaining/expressing a viewpoint, asking pertinent questions, and writing effective responses. Through guided and independent practice students use the strategies in their coursework.

Bhattacharjee and Chen compiled a list of software available for use in bilingual classrooms. While working with preservice and inservice bilingual teachers as well as parents of bilingual children, these authors discovered that teachers and parents need information about using the computer to support bilingual students' learning. The authors describe software applications to support the literacy learning of bilingual students.

Akanbi has placed graduate course materials for Reading Strategies for the Content Fields in WebCT. Additionally, the WebCT communication tools have been used to establish an online learning community for the teachers enrolled in the class. Glassman shares his experiences with using the web to conduct his undergraduate reading course and explains his distinction between teleteaching and telelearning.

Understanding that preservice teachers need field based opportunities in order to develop their expertise in technology integration, Royer developed a telecollaborative project between preservice teachers and inservice teachers and their students. In her study preservice teachers moderated an online writing project for K-12 classroom students and through the experience learned how to integrate technology into the classroom to accomplish curricular objectives. Winters' preservice teachers also had opportunities to experience integrating technology into the classroom curriculum. His students used web-based technology to create reviews of children's books and they corresponded by email with students as they both read and responded to the same novel. The results of these authors' projects indicate that participating in these technology experiences increased the likelihood that their students integrate technology into their future classrooms.

Nolte, Leech, and Monteagudo report on Vermont's innovative online project that provides support and resources for teachers and students. The goal of the project is to improve student performance in the arts, humanities, and social sciences through the collaborative efforts of an online learning community. Another innovative online project is Literacy Junction, an interactive web site for students in third through eighth grades. Cuper, Spires, and Crissman report on how Literacy Junction enhances students' achievement in reading and writing while increasing their technology skills. Hofmeister and Thomas share their research on using Virtual Literature Circles with third and fourth grade students. After reading a shared text, the students responded to the text on an Internet message board. They report on the cognitive complexity of the posted messages and the intellectual continuity of the threaded discussions. Broad and Labercane also used the computer to engage students in collaborative responses to text. The fifth grade students in their study used networked response-based reading and writing activities to extend their learning. They offer useful ideas for others who may be interested in conducting similar research on effective ways to use technology to enhance reading and language arts in the classroom.

Reynolds and Reynolds describe the Literacy Desktop Publishing course designed for high school students. This course offers students advanced opportunities to use technology to improve their reading, writing, listening, and speaking skills. The course content includes graphic arts communication skills required by local business and industry.

These papers examined the multiple literacies required in the classroom and in the workplace. They focused on a variety of ways that technology enhances literacy teaching and learning. A common thread throughout many of the papers is the importance of collaborative online learning.

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Improving the Teaching of Reading, Language Arts and Literacy through WebCT: A Work in Progress

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Abstract: This paper is a description of how WebCT is being used to enhance the delivery of a graduate reading course -- Reading Strategies in the Content Fields – that is part of a Reading Endorsement program for PreK-12 classroom teachers. The course is the third and final reading course in a program designed to address the need to improve reading instruction in pre-kindergarten through grade twelve in the State of Georgia. The course is being delivered online via WebCT, with some "face time" on campus.

Introduction

In 1999 the University System of Georgia, in conjunction with the Georgia Professional Standards Commission, formed the University System of Georgia Reading Consortium. The consortium was created in response to the state's need to improve reading instruction in PreK-12 schools. Toward this end, the consortium developed the Reading Endorsement to enhance professional development in literacy teaching and learning for practicing PreK-12 educators. Two models, the Reading Institute Model and the Teaching Reading Distance Learning Model, emphasize classroom application and address three strands: Understanding Readers and the Reading Process, Linking Literacy Assessment and Instruction, and Instructional Strategies in the Content Areas Across PreK-12. WebCT was chosen as the vehicle for the distance-learning model. In this model, each course is offered online. In the Summer Institute Model, the major content for all three strands of the program is presented in a three-week format.

Kennesaw State University utilizes a combined delivery model. The first two strands listed above are emphasized in a Summer Reading Institute, and the third strand is the focus of a separate course offered online in the fall. A Literacy Action Plan developed by the teachers at the end of Summer Reading Institute 2000, and tied to their schools' performance goals, serves as the foundation for the Fall semester course– EDUC 7718: Reading Strategies for the Content Fields. The remainder of this paper will be devoted to a description of the design of this course, which is a work in progress even as it is being taught, and a discussion of how WebCT is being used to facilitate its delivery.

Course Design

This graduate reading course -- *Reading Strategies for the Content Fields* -- is a study of the concepts and specific processing strategies involved in reading and writing in the content areas. It emphasizes development and teaching strategies appropriate for the specific content area and grade level. The purpose of the course is to provide a learning-support network through readings, course seminars, online dialogue and supervised field experience, for reading professionals to examine their philosophies and beliefs, and to apply newly acquired conceptual knowledge as to what constitutes effective literacy instruction for their grade level and/or content area. Teachers are required to collect data to show evidence of student learning, analyze these data, reflect on their teaching and develop strategies for improving learning. These data will be included in a portfolio that teachers must submit at the end of the academic year, indicating that they have successfully met all the requirements for receiving a Reading Endorsement.

Course Participants

The teachers enrolled in the course represent elementary, middle and high school levels, as well as both public and private schools. One of the elementary practicing professionals is a reading teacher, and so are two of the middle school teachers. There is one male teacher in the group. Two of the teachers are also pursuing a Master of

Education degree in Early Childhood Education (P-5), and they will be able to add the Reading Endorsement to their certificate. The number of years of teaching experience of teachers enrolled in the program ranges from three to fifteen, with the average being five years. The diversity of grade and subject levels, school systems, teaching experience, advanced preparation, and gender represented in the class, lends itself well to the sharing of knowledge and perspectives on different classroom applications of reading and language arts instruction.

WebCT Course Delivery

Except for three initial class meetings where teachers were oriented to the requirements of the course, trained in the computer lab to use WebCT and Power Point, and two other campus meetings where they had to make class presentations, the teachers have been meeting online for class and to access the content of the course. The instructor utilizes the 3.1 version of WebCT, which includes the following tools: Course Content, Communications, Study Tools and Evaluation Tools. The Course Content tools used in this course consist of the syllabus, calendar, content module, and glossary. The Communications tools utilized include mail, chat and discussions. Study Tools is a feature accessible only to students. The only Evaluation tool currently used by the instructor is the assignment tool. In addition to the primary tools listed above, the instructor has added the following links to the course home page: Reading Online, which is the online journal of the International Reading Association, the International Reading Association organization, the Georgia Department of Education, and the *Atlanta Journal Constitution's* News for Kids. The instructor has also added two pages to the discussions tool under Communications. One page is for teachers to post their teaching reflections, and the other page is for them to post literacy teaching tips that they discover, including useful web sites.

These tools have been used to create an online learning community. Through the WebCT communication tools, which are the most used tools in the course, teachers are able to share their teaching reflections with one another as they try to implement their Literacy Action Plans, learn what is occurring in literacy classrooms different from the level that they are teaching as well as in other classrooms at their own grade level, ask questions and offer one another support. Since all the reflections and responses are made public, by agreement, teachers are also able to read the instructor's reply to each reflection. In addition to reflections, the WebCT communications tools are being used to post discussion questions and responses based on assigned readings, hold online class dialogues and send E-mail. WebCT content modules designed by the instructor, are used to supplement instruction. The other links added to the course home page provide extra resources for teaching; including children's book lists, lesson plans and teaching strategies. In addition, teachers can keep up with the latest trends and research in the field, which helps them to further their professional development in the area of reading.

Conclusion

Glatthorn (1995) states that there are three groups of factors that seem to influence teacher development: those involving the teacher as a person, those relating to the context in which the teacher lives and works, and those involving specific interventions to foster teacher development (p. 42). The support that teachers receive from one another online and from the instructor makes them feel valued as individuals and helps give them the inner strength and confidence they need to pursue the attainment of their professional development goals.
The teachers' classrooms where they live and work provide the context for the online reflections, and finally, the content of the course provides specific interventions to enhance the teachers' ability to teach literacy. Improved student achievement in reading will be the ultimate criterion measure for the success of this program.

References

Glatthorn, A. (1995). Teacher Development. In L. Anderson (Ed.), *International Encyclopedia of Teaching and Teacher Education (p. 42).* Great Britain: Cambridge University Press.

A Survey of Computer Software Available in the Current Market for Hispanic Families and Bilingual Educators

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Abstact This paper concerns computer software currently available in the market for bilingual children. The purpose is to survey the software options available to bilingual children, parents, and teachers. This paper will approach the topic from the following perspectives:

- Sources for Purchasing Software
- Bilingual Reading and Writing Software
- Bilingual Educational Games/Tutorial/Drill, and Practice

Introduction

During the last decade of the millennium, we have already witnessed a drastic increase in the number of bilingual students in the United States. To face this new change, many school districts are holding school-community activities such as Houston Independent School District's (HISD) Community Parade, featuring the theme, "Education: We Are All In This Together". The goal of these activities is to enhance, support, and encourage parent involvement with schools. Schools all recognize that parents are valued partners in the educational process, serving as the child's teacher in the home. Parents play an important role in reinforcing effective learning strategies and early intervention. Like many other immigrant parents, many Hispanic parents are eager to coach their children at home to adapt to the American culture and new school system, while keeping their cultural heritage.

Keeping their heritage alive and adapting and learning the ways of the American culture increase access to bilingual materials. Nearly 10 % of children ages 5-17 nationwide speak Spanish at home, and as many as 22 % in California and Texas. Teachers today face a challenge of ensuring that students are given a variety of opportunities to be successful in school settings. However, the interaction with new immigrant parents, student teachers in the bilingual education program, and teachers who are currently teaching bilingual students reveals that computer use is one of the topics which is in strong need of clarification and support for this special population. There are many misunderstandings regarding the use of computers in bilingual education. Proper use of computers, however, can not only help bilingual students to fit into their new community and become more productive citizens, but also is an effective tool to retain their cultural heritage.

This paper concerns computer software currently available in the market for bilingual children. The purpose is to survey the software options available to bilingual children, parents, and teachers. This paper will approach the topic from the following perspectives:

- Sources for Purchasing Software
- Bilingual Reading and Writing Software
- Bilingual Educational Games/Tutorial/Drill, and Practice

Sources for Purchasing Software

The first place to locate software titles for bilingual students is still the local computer software stores. The author found that in the Houston area, surprisingly, OfficeDepot carries far more children's titles than any other software store. Although Spanish software is hard to find in this kind of general computer software store many educational titles can be "repurposed" to fit the needs of bilingual students. The term "repurpose" has been used widely in the educational multimedia field for identifying old video clips and reusing them in different settings. The same idea can also be used to turn a piece of software currently available in the market into useful instructional material for bilingual classrooms. Repurposing a popular software title in the current market to fit the special needs of bilingual students probably is the most efficient way for identifying software titles for bilingual classrooms: the price will be cheaper, the software will be more compatible with the exiting bilingual classroom collection, the option is wider, and the software will be more up-to-date.

A pre-service teacher in the bilingual education program, for example, proposed a great idea of repurposing the software, the *Explore Yellowstone* program, by MECC. This software allows a student to take the role of a tourist in the 3,500 square miles national park and explore the mammals, birds, plants, earth science, reptiles and other habitats in this area. The activities offered in the software include interactive virtual trip, field station, experiments, and visitor guidance. The pre-service teacher used *Explore Yellowstone* to plan a lesson. The objective for the lesson was to improve the reading and writing skills of 4th grade bilingual students and to expand vocabulary through reading, writing and listening. According to the lesson plan, the teacher presents a poster board with animal drawings and the definitions or explanation about them. The teacher then directs the attention of students to the advantages they can have with technology by demonstrating the versatility and effectiveness of the software by projecting to the screen a colorful photo of a wild animal and its habitat. The teacher then models for students how this is achieved by clicking different animal names on the menu of the software. A new wild animal and its own characteristics then can be viewed on the screen. The teacher then repeats this step with two or three animals to be sure students understand what the software provides. The activities and procedures proposed in the lesson plan include several steps. Teacher divides the class into small groups of two to three students. Each group selects two to three animals to investigate using the software. The students then discuss several characteristics of each animal (i.e.) color, size, food they eat, weather, habitat peculiarities etc. As a group they pick two characteristics of each animal and write a summary of their findings.

The use of "repurposing" existing software may be the best alternative for bilingual children, parents, and teachers. As this market has developed, more specialized traditional bookstores are carrying software titles that can be integrated with classroom instruction.

Another way to access software is through mail-order that is now popular among teachers. Mail-order from another country sometimes takes time and planning. Special-purposed software and many teacher-created materials can also be purchased either on-line or through catalogues. General online bookstores such as Amazon.com and Borders.com now also carry software titles along with book titles and music titles. Type in the keyword "Spanish" and a list of selection with detail description, user reviews, and screen shots of the software can be viewed. Educational titles online bookstore and software vendors such as Sunburst (at www.sunburst.com), Software World (at www.sofware.com/spanish.htm), and Soleil (at www.soleil.com) have created web sites to offer information and take orders. Users can also purchase from the print-version of the educational software catalogues. However, the software products offered by these companies are mainly for learning the Spanish language. Only www.softonic.com offers a few titles that have instructional application.

Bilingual Reading and Writing Software

For Hispanic families and bilingual educators, the most basic as well as the most widely used software suites probably is the international version of *MS Office* which includes word processor MS Word, spreadsheet program *MS Excel*, presentation program MS PowerPoint, and database maintenance system *MS Access*. If the whole set of the international version of MS Office is not available, the user can also pay approximately $75.00 to get a Spanish spell checker as an add-on to the English-standard *MS Office* suite. These add-on modules allow one to easily extend *MS Word's* proofing facilities to new languages. They are simple to install, and fully integrated with all of *Word*'s normal proofing facilities; spelling and grammar are checked as a document is typed. Unknown words can be easily added to a customized dictionary. These are the same high quality proofing modules Microsoft includes with versions of Word that are sold outside the U.S.

Software has been developed also to support the Reading/Writing Workshop. This approach to teaching reading and writing has gained favor and fervor within the educational community in the last decade (Maddux, Johnson, Willis, 1997). Basically it is a way of teaching reading and language arts as an active, student-centered process. It gives students, individually and in groups, much of the responsibility for making decisions about what will be studied and why. It is also an approach that emphasizes the social and collaborative nature of learning. As with most methodological or pedagogical innovations, the reading/writing workshop has been redefined, realigned, and renamed on its journey toward widespread acceptance. Its early predecessor was perhaps the writing workshop in the 1970s. Reading workshops then developed to complement the writing workshops and the term "reading/writing workshop is now used mainly because writing is an important aspect of learning to read. Also, because these workshops encompass reading, writing, speaking, and listening, they are also referred to as literacy workshops (Chen, 1998).

Collaboration in the workshop entails sharing responses, ideas, drafts, and finished written products through conferences with the teacher, conferences and journal exchanges with peers and the teacher, and with members of the student's wider, non-classroom, and community such as parents. Collaborating to make meaning, rather than summarizing or reiterating teacher-held interpretations, is the function of small-group discussion and whole-class discussion. The teacher in these classrooms takes many roles including that of a learner. The teacher collaborates with students in constructing meaning through reading, writing, speaking, and listening.

The examples of reading/writing workshop activities below illustrate the possibilities of this approach. *Just Grandma and Me* from the Living Books series published by MECC, is an example of a electronic book for the reading workshop. Children's electronic books often have detailed color illustrations on each screen along with text. But they can also be quite different as well. For example, some electronic children's books give readers the option of having the story read to them in any of several different languages. Some also give students the option of clicking a word or phrase they cannot read and both hearing it as well as hearing a definition or explanation. The colorful drawings on each screen of children's electronic books may contain many "hot spots," objects that react when they are clicked with the mouse cursor (Maddux, Johnson, Willis, 1997).

Electronic children's books are one of the most popular types of software today. The best known of this genre is MECC's the Living Books series including: *Just Grandma and Me, Arthur's Teacher Trouble, The New Kid on the Block, Little Monster at School, Ruff's Bone, Arthur's Birthday*. Each page contains detailed illustrations and some text. But electronic books like *Grandma and Me* can also be used in interactive ways. For example, the child can select to have the story read in English, Spanish, or Japanese (see Figure 1), and the drawings on each page contain many "hot spots" that react whey they are clicked.

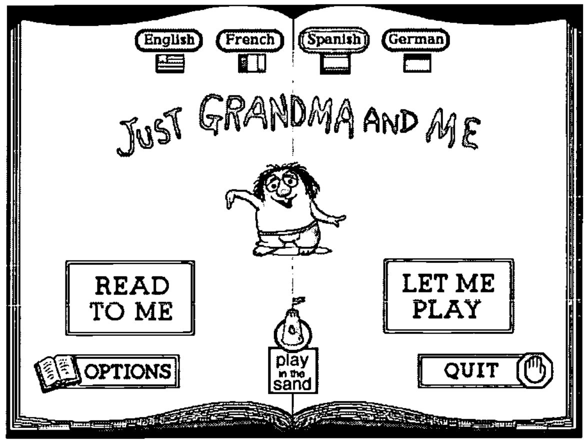

Figure 1: Just Grandma and Me allows users to choose from four different languages

Story Weaver Deluxe from MECC is an example of the electronic writing workshop program currently available in the market. It also allows users to switch languages between English and Spanish (see Figure 2). From a blank page, the student have a wide selection of background pictures, sounds clips to add on as sound effects or background music, clip arts, objects, text to speech, and many other features as their building blocks to create their own "books".

Figure 2: A screen shot of the writing workshop program *StoryBook Weaver Deluxe*

Bilingual Games/Tutorial/Drill & Practice

Drills are software designed to allow the user to practice a skill that has already been acquired or taught (see Figure 3). A common type of drill and practice software involves practicing math skills such as multiplying two digit numbers. There are thousands of drill and practice programs that teach everything from math facts to sight vocabulary, parts of speech, names of the fifty states, and many other types of facts or basic skills.

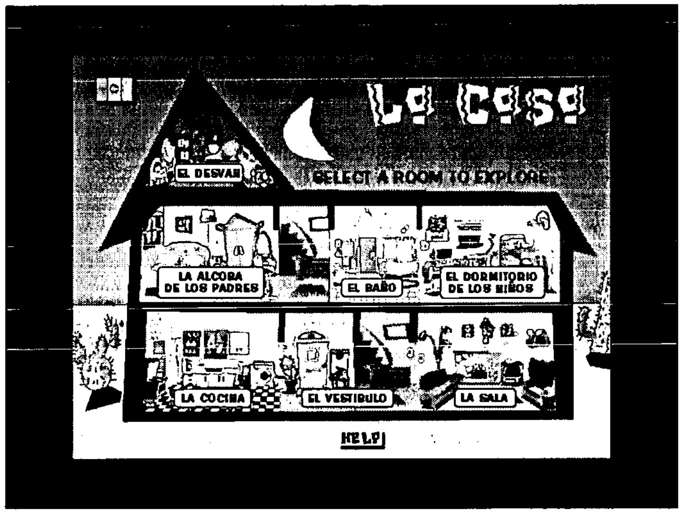

Figure 3: A screen shot of the drill and practice program *Multimedia Spanish*

Whereas drill and practice software is designed to provide a way to practice a skill that has already been learned, tutorial software is designed to teach the skill in the first place by direct instruction methods. While tutorial software may include elements of drill and practice and assessment, it is unique in that it presents new information and may be represented as providing an independent teaching environment. In its purest form, tutorial software is the embodiment of the teaching machine. The software takes the learner through a sequence of steps by first, present a new idea, concept, or task; present a query designed to assess the student's grasp of the new idea; provide feedback on the student's response; and finally branch the learner to a different sequence based on his or her performance. Computer games are a type of direct instruction program that can be adapted for use as a preparatory activity. Many types of interesting games are available. They generally involve a scenario such as saving a planet or discovering a treasure through knowledge and understanding some skill.

There are some collaborative efforts by scientists, educators, and professional video game and educational software developers who have come together to do research on and develop teaching materials that integrate games and computer-based explorations with learning (Chen, 1998). Their research activities focus on the human-computer interaction issues associated with learning in an electronic game environment. Specific topics include studying which game formats (fast-action, simulations, puzzles, etc.) can be used to carry math-science educational content, which formats are most attractive to students, and which formats are most conducive to learning. They are also investigating methods to integrate electronic games with more traditional classroom learning environments. The effect of collaborative play and how collaborative work can be incorporated into electronic games, and the role of mediation by teachers. Scholastic offers a great selection of software products (http://www.scholastic.com/kids/games.htm) some of the products are: *Royal Makeovers, Meet the first winners!, Animorphs Hawk Rescue, Captain Underpants Name, Goosebumps Sandwich Builder, Goosebumps Hare-Brainers,* Scholastic's *The Magic School Bus,* and *Maze Craze.*

Conclusion

In conclusion, the availability of software products in Spanish is very limited. Bilingual teachers, parents, and children have very a few opportunities to read stories, play games, or have tutorials in Spanish. However, the need to have access to these materials is critical in the USA. Research indicates that children who come to the USA with a strong literacy level in the first language will achieve also higher literacy level in the second language quicker. Therefore, bilingual children need to have access to materials that will support their academic success in first language so that they can also achieve successful in their educational career.

Reference

Chen, Linlin (1998). *Design and Development of a prototype electronic textbook for teacher education.* University of Houston. Unpublished Dissertation.

Maddux, C. D., Johnson, D. L., & Willis, J. W. (1997). *Educational computing: Learning with tomorrow's technologies*. Boston: Allyn & Bacon.

Reader Response in the Information Age

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Abstract: This paper reports an investigation into the use of web-based, interactive computer technologies in the achievement of curricular outcomes in reader response-based literature instruction. The primary purpose of the study was to explore the use of computers as tools for implementing classroom reader response instruction. Rosenblatt's (1978) *Transactional Theory of the Literary Work* and pedagogical approaches developed from this theory were used as the basis for developing and implementing computer-based literature exploration. The study used a network-based software application called Zebu as a venue for conducting reader response-based instructional initiatives. A portrait of fifth grade student's reading, writing and responding in computer environments is presented. The nature of students' responses is discussed and key characteristics of effective web-based reader response environments are outlined. Findings suggest that computer environments represent one venue where students can engage in collaborative conversations about literature.

Introduction

The 1990s have seen computers and other digital technologies gradually pervading our schools and classrooms (Coley et al, 1997). Consequently, as we step into the new millennium, the use of technology has become an integral component of students' and teachers' lives. This focus upon technology raises important issues for teachers because they are being asked to find ways to effectively utilize computers in their day-to-day instructional programs.

Much of the educational thrust in the development of initiatives for using computers in classroom settings has focused upon integration of computer-based activities into existing curriculum (Alberta Education, 1997). The research discussed here embraces this integrative approach by exploring the integration of computer-assisted instruction within the boundaries of established pedagogical practice – namely reader response-based pedagogy.

Research Background

This study emerged from the researcher's interest two areas: reader response theory and practice; and, computer-assisted instruction, in particular computer applications that allow students to interact with one another in a discussion forum setting.

Reader response instruction has its roots in Louise Rosenblatt's (1978) *Transactional Theory of the Literary Work.* According to Rosenblatt, the act of reading is a transactional relationship between the reader and the text. "An element of the environment (marks on the page) becomes a text by virtue of its particular relationship with the reader, who in turn is a reader by virtue of his [her] relationship to the text. And at the same time the term transaction, as I use it, implies that the reader brings to the text a network of past experiences in literature and life" (Rosenblatt, 1985, p. 35). Thus, the transaction involves the feelings and images conjured up by the words in the mind of the reader. Literature instruction based upon reader response theories attempts to encourage and nurture student's articulation of the feelings and images that are evoked by the text – their aesthetic response.

Some reader response researchers (e.g. Leal, 1993; Eeds and Wells, 1989) have focused upon the role of literature discussion groups and how students collaborate in shared construction of meaning. Researchers contend that in such groups, students become involved in "a conscious weighing and discussing of one's own and others' responses" (Berg, 1987, p. 271) to text. Generative conversations like these are suggested to enhance and diversify student's personal responses to text.

Research that connects computers and literature instruction is limited, with small pockets existing in particular areas (e.g. Shen, 1995). Much research to date has been conducted with university students (e.g. Evans and Pritchard, 1995). This may be due in part to greater availability of networked computers in higher education institutions. By comparison, school-based settings have only recently acquired the resources necessary to implement computer-based networked literature study. Previous studies have focused upon connecting historical, authorial, semantic, and stylistic information to literary texts (Smith, 1996, Landow, 1989). Evans and Pritchard (1995) suggest, "no single extended work examines the implications that such [reader response] theories have for teachers and students who work in a computer-assisted classroom" (p. 4).

The two research areas discussed above relate directly to what happens in today's classrooms. Research in the area of reader response presents a vision of reading that sees the reader an active participant in negotiating their personal understanding about texts. Research relating to computer-based instruction uncovers the beginnings of investigation into use of computers in the implementation of reader response-based instruction.

The Research Context

This research was conducted at an elementary school in Alberta, Canada. The school opened in early 1997 and currently serves kindergarten to Grade 6 students. During the initial designing of the school, incorporating computers into the infrastructure of the school was considered an important factor. Being a new school allowed for the construction of a learning environment incorporating the latest in educational technology, rather than cobbling new infrastructure around the established superstructure of an older school. The student population of the school was socio-economically diverse while being ethnically homogeneous. The vast majority of students attending the school were Caucasian and spoke English as their first language. The participants for this research came from one fifth grade class. During the course of the research 12 students participated in the computer-based instructional events. The balance of the class completed similar events in traditional pencil and paper format. Thus, students' participation in the research was condisered an integral component of the classroom instructional program. The students selected to participate were considered by the teacher to be representative of the cross-section of abilities in the classroom.

Exploring the Possible Worlds of Computer Response

During the period of the research, the class was reading the novel *The Sign of the Beaver* (George Speare, 1983). Six instructional events were conducted that related to this novel. The global objective for these events was for students to develop literary understanding by "crafting it out of the raw material of their experiences, the text, and their discourse with other students, teachers, and writers" (Probst, 1990, p. 29). For this type of engagement to occur in the computer environment (and traditional environments for that matter) research suggests that teachers develop "tasks without single answers to encourage articulation, discussion and debate" (Oliver et al. 1997, p. 979). A computer application called Zebu was used as the venue for the students' participation in computer-based literature exploration.

Zebu

In this research a computer application called Zebu was used to create and conduct the computer-based instructional events. Zebu was developed to enhance what the creators term "collaborative project-based learning" (Ward and Tiessen, 1997b, p. 22) in the computer environment. According to Ward and Tiessen (1997b), teachers can develop environments in Zebu where students engage in "social interactions aimed toward the development of understanding" (p. 22). Zebu is accessed via a web browser, either Netscape or Internet Explorer. "Technically the software is a set of CGI enhancements to a standard HTTP server, which allows users to construct and edit pages and other objects within a secure WWW site" (Ward and Tiessen, 1997a, p. 3). In Zebu, users can develop interactive web pages without the need to know HTML. The user is provided with a variety of page templates and editing tools to affect this process. A number of the features available in Zebu were particularly beneficial for this research:

- Information can be easily input, arranged and edited in the Zebu pages;
- Students' responses are easily tracked because responses are automatically labeled with the student's name; and,
- Discussion objects offer an interactive venue where students can read and respond one another's contributions.

Discussion Objects

Discussion objects are simply on-line discussion forums where students submit written information that is then posted on the page for the rest of the group to read and respond to. Once students make their response, they submit it using a button directly below the response area. The response is then posted for the rest of those working in the project to read. As students became comfortable with how the discussion forum worked, students' back and forth responses became conversational in nature. This domain also allowed all students to comment at once rather than waiting their turn, as is often the case in effective face-to-face group conversations. Often a number of strings of discussion unfolded simultaneously. The students' engagement with and conversations about a variety of text in discussion objects became the focus of this research.

Instructional Events

Instructional events in this project were designed to challenge students to revisit excerpts from the text and address open-ended questions and response starters. Revisiting allows students to develop a greater understanding of the text by re-engaging with the text. Hartman and Hartman (1993) recommend re-reading texts as a means of "expanding the role of the reader" (p. 202). The passages that were chosen to be re-read focused upon specific events or issues in the text that the teacher or students wish to explore more deeply. Then, questions and response starters were crafted to guide the students' exploration of the excerpts. Each instructional event was crafted to "encourage curiosity, activate prior experiences and feelings, [and] help students connect personally with characters, themes or issues" (Pritchard, 1993, p. 31).

Each instructional event was developed in such a way that students firstly made an initial response to a question or response starter that addressed the part of *The Sign of the Beaver* they were reading at that time. For example, in one instructional event, students were asked to explore the nature of the relationship that was developing between the two protagonists in the story. Students were asked to look at this relationship in light of which protagonist they thought was gaining or learning more from the relationship.

During each event, students engaged in two types of on-line response – initial responses and dialogic responses. Responses were contributed via discussion objects.

Initial Responses

Initial responses refer to the students written contributions that were made in response to their reading of excerpts and response starters. The nature of the initial responses varied across instructional events. As students became more comfortable with the Zebu environment their responses increased in length and depth.

Dialogic Responses

Once students had made their initial responses to the response starter they would submit their response and update the page so they could then see the initial responses of their peers. Students would then read and make comments about the responses of their peers. In the initial events, these responses were rather cursory and many focused primarily upon grammar and spelling errors rather than the ideas and opinions that students were articulating. However, in the later events, students' focus shifted to center upon content. This was in spite of some student's responses containing numerous spelling errors. It appeared that with appropriate guidance in expectations for response and increased familiarity and confidence in the discussion group environment students engaged in generative conversations about text. The responding process became recursive in nature there was semantic contingency across strings of responses as one built upon another in conversational fashion. When this occurred students became engaged in collaborative knowledge building as each student's contribution added to the shared pool of understanding.

Selected Findings

This study indicates that networked computer environments like Zebu offer a setting where the boundaries of reading and writing blur. Reading and writing become coactive partners in the response process. In Zebu, the line between reading and writing merges in the response process along with the reader's thinking, which is woven across the response process. Thus, no one aspect can be viewed as a separate entity but rather each component (reading, writing and thinking) is coactive with the others. This coactive nature of the response process was demonstrated in Zebu as students moved seamlessly between reading, writing and thinking about texts and their personal experiences.

The impact of networked programs like Zebu is most noticeable when environments are created where a number of students can interact simultaneously. This allows students to access multiple perspectives by viewing and responding about the variety of rcsponscs contributed by their peers. Students in this research took an active role in constructing and negotiating literary understanding in the communal environment that Zebu offered. Students' literary engagement was characterized by their suspension of judgment in return for the opportunity to embark upon a generative journey of literary exploration. Students used the text and their peers as sounding boards for exploring ideas about the text.

Many similarities were recognized between the responses collected during this research and the nature of responses reported by previous researchers (e.g. Cox and Many 1992). The students' responses demonstrated that they:

- Use the text to support their assertions;
- Use one another's responses to support their assertions;
- Make connections with personal experiences;
- Empathize with characters in the text; and,
- Make tentative predictions about their understanding of the text.

The development and articulation of intertextual connections has been posited as an integral aspect of the aesthetic reading act (e.g. Beach, 1993). This study further demonstrated the importance of connection making in students' negotiation of literary understanding as students created responses that were interwoven with their autobiographical experiences. They played with the text, sometimes 'giving in' to what the text appeared to make obvious, then pulling away into statements of tentativeness as they balanced their experience of the text with their personal experiences of literature and life.

This study reaffirms the teacher's role in developing and delivering classroom reader-response pedagogy. In the computer, this role is particularly crucial because teachers must develop instructional events that first, live out the goals of reader response and second, effectively utilize the tools computers have to offer to attain those goals.

During this study, students responded to a variety of questioning approaches. Observations made during this study provide further evidence as to the critical role that the nature and delivery of questions play in educational settings. Just as in the conventional instructional environment, articulation of aesthetic responses will only be realized if students' exploration of text is orchestrated in ways that encourage aesthetic engagement with text and provide avenues for effectively articulating response. In computer environments, reader response-based instructional events should be formulated in ways that constitute a "continuing reinforcement of habits of sensitive and responsible organization of literary experiences" (Rosenblatt, 1968, p. 344).

The use of computer technology in the classroom cannot be approached as a 'passing fancy.' In this study, as students became accustomed to engaging with text in Zebu, their "capacity for literary experiences of higher and higher quality and the capacity to reflect on these experiences with increasing insight and maturity" (Rosenblatt, 1968, p. 341) appeared to develop. To realize the computer's fullest potential, computers must be woven into the fabric of the daily classroom curriculum. Otherwise, teachers may not see the achievements students are capable of when they have the opportunity for ongoing experiences with the technology.

The development of computer-based initiatives in education should be a collaborative endeavor between educators and computer technologists. In the case of reader response-based initiatives, theories of how reading and writing unfold must form the basis for the development of reader-response-based computer initiatives. So, "instead of having technology shape the form and content of education, the educator has the responsibility of making education shape the form and content of technology" (Hazari, 1992, p. 145). Only when technology becomes advantageous should it be introduced into the reading and responding process. "Educators need to be particularly careful about choosing when virtual environments are more appropriate than actual physical experiences" (Winslow (1996p. 817). This cautionary note was heeded in this study by having students read *The Sign of the Beaver* in traditional format. This allowed students to enjoy the physical experience of reading - curling up on a couch, lying on the floor or huddled under a desk or table.

Some researchers (e.g. Clifford et al, 1997) have lauded computers as providing an equitable environment where all students can experience success. Observations made during this study indicate that this is not always the case. In fact, some aspects of the on-line environment can have a deleterious effect upon some students' engagement in this environment. For example, some students' ability to type and navigate within the environment impacted upon their opportunity to participate in the instructional events. Also, the ability to read excerpts and instructions also presented a barrier for some students. In addition, on-line discussion spaces have been posited as presenting a democratizing discussion environment where all students have the opportunity to contribute to classroom conversations (e.g. Cooper and Selfe, 1990). Online discussions in programs like Zebu do appear to allow all students to contribute to discussions about text. However, the freedom to have all students contribute simultaneously may result in numerous parallel discussions where no clear synthesis of understanding evolves from the conversation. Furthermore, this study demonstrated that although students do have the opportunity to contribute, that does not mean that others will hear their 'voice' in the group.

Conclusions

In this project, the computer became a conduit for orchestrating conversations with and about text. Findings suggest that networked discussion forums present an environment where engagement with text using reader response approaches can be implemented. The study does not contend that programs like Zebu offer a panacea for implementing reader response pedagogy. Instead, the study indicates the possibilities that networked applications offer to augment instruction in this area. The collaborative venue created in Zebu opened up opportunities for students to read, write and respond about text in a shared context.

Overall, this study has proved to be a successful investigation of young readers' experience of reader response instruction in the comparatively new domain of the computer. As computer capabilities in schools continue to develop, there will be more opportunities to explore this growing area of educational research.

References

Alberta Education (1997). *Information and communication technology: Kindergarten to grade 12, an interim program of studies*. June. Edmonton, Alberta.

Beach, R. (1993). *A teacher's introduction to reader-response theories*. Urbana, IL: NCTE.

Berg, T. (1987). Psychologies of reading. In J. Natoli (Ed.), *Tracing literary theory* (248-77). Urbana,IL: University of Illinois Press.

Clifford, P., Friesen, S., and Jacobson, M. (1998). *An expanding view of literacy: Hypermedia in the middle school. Ed-Media & Ed-Telecom*, 1998, Association for Advancement of Computing in Education, Frieberg, Germany. http://www.rockyview.ab.ca/bpeak/research/galileo/edmedia.html

Coley, R., Cradler, J. and Engel, P. (1997). *Computers and classrooms: The status of technology in U.S. Schools*. Policy Information Report. Princeton, NJ: Educational testing service.

Cooper, M. and Selfe, C. (1990). Computer conferences and learning: Authorities, resistance, and internally persuasive discourse. *College English, 52*, 8, 847-869.

Cox, C. and Many, J. E. (1992). Toward an understanding of aesthetic response to literature. *Language arts, 69*, 1, 28-33.

Eeds, M. and Wells, G. (1989). Grand conversations: An exploration of meaning construction in literature study groups. *Research in the teaching of English, 23*, 4-29.

Evans, J. and Pritchard, R. (1995). *A computer-assisted pedagogical model for transacting with literature*. NCTE concept paper No. 15. Urbana, IL: NCTE.

Hartman, D. and Hartman, J. (1993). Reading across texts: Expanding the role of the reader. *The reading teacher*, 47, 3, 202-211.

Hazari, S. (1992). Multimedia: Is it the right tool for your instructional application? *Journal of educational multimedia and hypermedia*, 1, 2, p. 143-46.

Hercz, R. (1995). Wired child. *Canadian business*, Fall, 22-32.

Landow, G. (1989). Hypertext in literary education, criticism and scholarship. *Computers and the humanities*, 23, 173-198.

Leal, D. (1993). The power of literary peer-group discussions: How children collaboratively negotiate meaning. *The reading teacher*, 47, 2, p. 114-120.

Oliver, R., Omari, A., and Herrington, J. (1997). Exploring Student Interactions in Collaborative World Wide Web. *Ed-Media & Ed-Telecom, 1997*, Association for Advancement of Computing in Education, Calgary, Alberta, Canada. 978-84.

Pritchard, R. (1993). Developing prompts for reading response and analysis. *English journal*, 82, 3, 24-32.

Rosenblatt, L. (1985). The transactional theory of the literary work: Implications for research. In C. Cooper (Ed.), *Researching response to literature and teaching literature: Points of departure* (p. 33-53). Norwood, NJ: Ablex.

Rosenblatt, L. (1978). *The reader, the text, the poem: The transactional theory of the literary work*. Carbondale: Southern Illinois University Press.

Rosenblatt, L. (1968). A way of happening. *Educational record*, 49, 3, 339-346.

Rosenblatt, L. (1938). *Literature as exploration*. New York, NY: Appleton-Century.

Shen, T, (1995). *Reading hypertext: The role of hypertext links and social interaction in fifth grade students' meaning making*. Unpublished Ph.D. dissertation. University of California at Berkley.

Smith, J. (1996). What's all this hype about hypertext? Teaching literature with George, P. Landow's *The Dickens Web. Computers and the humanities, 30*, 3, 121-29.

Speare, Elizabeth. (1983). *The sign of the beaver*. New York, NY: Dell.

Ward, D. and Tiessen, E. (1997a). *Supporting collaborative project-based learning on the WWW*. Paper presented at the annual meeting of the American educational research association, San Diego, CA.

Ward, D. and Tiessen, E. (1997b). Adding educational value to the web: Active learning with AlivePages. *Educational technology*, 37, 5, 22-31.

Winslow, J. (1996). Multimedia and virtual reality in instruction: Some risks of virtual learning. *Educational Multimedia and Hypermedia, 1996*, Association for Advancement of Computing in Education, Boston, MA. 817.

Towards a reading and text production practice with FL learners: a collaborative text construction with FL groups of French, English, and Spanish in the Web via the EquiText

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Abstract: An FL pedagogy, integrating reading and writing skills in foreign language teaching, associated with Web resources, may contribute to the development of those skills while producing collective texts. The EquiText, a collaborative writing tool, allows for innovations in text production either through teamwork or individually, mostly asynchronously. The readers/writers' participation in text construction may promote virtual interlocutions among the writers (FL learners), and their readers (the lecturer, the other fellow writers, researchers/observers). Another perspective of the current sole text reader, writer and evaluator is suggested. We propose to analyze the usefulness of the Equitext in significant written discourse as a result of the interactions in the tool. Three foreign language productions sustain our assumptions: texts produced by intermediate Brazilian college learners of French, English and Spanish as FLs, either individually, in paper, or in teams, using the EquiText, with significant results.

Introduction

The purpose of this work is to find new manners to teach reading and writing in a Foreign Language (FL) that may contribute to the development of abilities needed to construct more significant and discursive texts. Support was found in the software of collaborative writing text - the EquiText - developed in the Post-Graduate Program of Computer Sciences in the Education of the Universidade Federal do Rio Grande do Sul (UFRGS). It is a useful tool to aid FL teachers and learners to go beyond the traditional school pedagogy that, historically, has been treating reading and writing activities as exclusive classroom practices.

Our proposal is to look at text production as a collective and public act. Therefore, the text is open to insertions, alterations, substitutions even deletions as well as further comments. This environment may consequently contribute for collaborative text practices as it provides a virtual bond among the participants – the writers (learners) and their readers (other learners and teachers) – thus diluting the teacher's sole role as reader and evaluator. The text is discussed and built collectively on the Internet.

Linguistic and conceptual exchanges, experienced by more than one participant or collaborator, reduces the legitimated role of the teacher as the only source of knowledge, and enlarges the dialogic dimension in the discursive production, either in reading or in writing. For that reason the theoretical foundation is based on authors such as Mikhail Bakhtin (1999ed.), whose *Marxism and Philosophy of Language* stresses the collaborative experience and this reflection on such experiment. In addition, Possenti (1993), Foucambert (1994), Coracini (1995), Paulo Freire (1996), and others, guide the theoretical perspective of this analysis.

The idea of using the EquiText emerges from the possibility of rethinking the traditional teaching of reading and writing skills. Three (3) FL languages teachings were experimented with the following method. Intermediate level learners of an FL produced Three (3) texts individually and three (3) other texts were produced by collaborative construction on the EquiText, in French, English, and Spanish.

Three texts with the same topic were produced both individually and on the EquiText, in each of the selected foreign languages. Thus, "Likes and dislikes" were produced by students participating in an English course, coordinated by Janete Sander Costa; "Ce que j'aime et ce que je n'aime pas" were elaborated by the students of a French course, under the coordination of Joice Armani Galli; finally, "Hablando de gustos" were produced by students of a Spanish course, under the coordination of Lara Oleques de Almeida.

We present a more general and qualitative view that considers the formation of the reader/writer in the construction of the meaning of the text. We recognize the limitations of this first experience, whose results already point toward a different collaborative production that should provide easier access to writing and reviewing, not only for collaborators but also for the evaluator.

The reader/writer's formation in text construction

Relationship interaction between reading and writing

Classroom reading and writing teachers traditionally display a paternalistic attitude. However, current tendencies favor less passive imitation and more autonomic thinking by students. Any reading, including FL, is seen as an active process where the reader participates in turning the text into a meaningful proposition. So, writing I part of the reading process, making the reading class a special class of elaboration of meaning.

Justifying the present work, starting from the experience with students of French, English, and Spanish as FLs, we pondered on the practice of teaching reading and writing in FL. As described in (Foucambert 1994) the growing procession of the excluded ones proclaims the end of the literacy era. However, this certainly does not eliminate reading and writing. But freed by other media from the task of preserving the oral word, reading and writing were never so present, abundant, necessary, and decisive. In cultural, political, informative, and scientific fields, both reading and writing are the privileged means of exchanging, sharing, reflecting; of readiness, studying and option. In this sense, Foucambert, op cit, claims that if fifty years ago the percentage of the literates was a good indicator of industrial development, the readers' percentage reveals today, in the developed world, the real degree of democracy.

Under such perspective the text is conceived as an entrance to the reading act, a space of confluence and of divergence of ideas that are covered not simply by a certain linguistic code, but by a conception different from what originated in the mother tongue, or L1. Paraphrasing Foucambert, to read means to be questioned by the world and by self; it means that some answers can be found written; it means to have access to that writing and to create an answer that integrates with the existing text. To read is to interrogate the writing; therefore promoting an extra-curricular activity that allows solidifying the narrow relationship between reading and reading production, i.e., the writing, is meaningful.

Reading construction is an indispensable theoretical notion because it allows surpassing the challenges of most learners in an intermediate level in LF. At this point, the student seems to be "gagged" by the FL impediment. We can then compare reading construction and the moment of FL skill. Foucambert argues that literacy is over; it was necessary but the student is invited now to converse critically in an FL class. He no longer compares the literate with the illiterate, but rather the reader with the non-reader. Reading is not the acquisition of a mechanism, inasmuch as we would not dare teach the mechanism of speech.

From the first, or ascending, reading model we identify a non-concern with the readers' formation, since its practice denounces merely decoding the text. Also known as *bottom-up*, this reading searches for graphics that correspond to phonic units that the teacher had requested , a mere reproduction of the written material.

As announced previously, we conceived the space of the FL classroom as a special place of meaning elaboration, mentioned in Coracini (1995). " So the text (...) loses its essential function of provoking meaning effects in the reader/student, to be just the place of recognition of units and linguistic structures whose functionality seems to do without the subjects".

On the other hand, the second reading model, descending or *top-down* model invites the reader to participate in the process of construction of meaning, allowing the learner to anticipate the meaning that they are predisposed to find. Thus, they formulate hypotheses on the written forms that will appear and they will go in search of a minimum of indexes to verify them. This alters the focus of reading since it goes from the reader to the text, and perhaps it is for that same reason that it is criticized, because it equally departs from an unilateral approach, minimizing the intense exchange tenor which is possible by the precedent model.

The interactive reading model, the third one, presupposes that to learn to read is not to receive an existent knowledge, but to transform the unknown situation into knowledge acquisition. A great turning point of that school is the encounter between text and reader, reading being a two-way process that joins linguistic competence to previous knowledge. Next step up is then the interactive reading in which a number of people cooperate to discover the meaning of the written text.

Foucambert argues that reading is a social learning similar to learning of oral communication. Furthermore, "The relationship that the individual establishes with the environment, the perception that he has of it, the action that unfolds in it, the affective tint projected on it, the knowledge exercised in it, the personalities acquired in it, all this is unavoidably social and not at all natural".

Thus, we would offer a reading and writing project to a group of intermediate level students and find that they interact in cooperative writing. We would see that not only in the group, but mainly in each participant's individual production, as in Foucambert's words: "knowledge is not in what one receives, but in what one constructs collectively". It clearly sustains the pertinence of works that rethink the reading and writing.

Through the EquiText it was possible to rehearse that process by means of a tool capable of registering in its historic function the many a time one writes a piece of thinking. In this direction we believe that the reader is compromised with his/her being in the world and his/her transformation as well as the other(s).

This work has been guided considering that the entrance in the reading experience to be fundamental, since it was from the reading that the writing acquired its statute of a means of detachment. We believe that one only writes starting from what one thinks one understands in the reading while an active process of integration with the writing and vice-versa. Under this viewpoint we started to search for a more critical FL learner's education. In this sense, the reading and writing pedagogies are linked: by the nature of the communication situation and not just for the used code. To write is precisely to work on the written language to discover what one has to say.

> "Writing is a thinking and communication tool that (...) allows to build a theoretical model starting from the real and expresses the coherence of this model inventing the relationships among the elements. (...) the writing resource, via the text production or via the reading, is an essential and specific moment of any elaboration of a point of view on the world, a means of detachment and of theorization, that allows to pass from the conjunctural, generated by the oral, to the structural, expressed by the text. Every individual that intends to take the power on the world should throw hand in that way of thinking and, therefore, to find the writing."

Those Foucambert's words sustain the experience accomplished by the three FL groups of students. Writing is not the use of a tool to express something preexisting; and this question seems to duplicate when we speak about FL, since the work on a raw material, and the confrontation with the language comes in the first place. It should be clearer though that as well as in the L1, reading and writing in the FL should prioritize meaning, not form, once language is not separated from thought nor from the production of meaning. The construction of the essential relationship between reading and writing resides in the perception that meaning depends on the conditions of production of the text, articulating reading and writing in the FL. Like this, the registration of the writing or of the reading is not the cause for the textual production, but the consequence of a balanced articulation between both. The critical reader/writer is well aware of that, because he understands, or better, s/he is in a constant search for the understanding of the meaning of his/her text. It is not reducing the importance of the linguistic fact, but suggesting its discussion in a production arena, characterized by its being historical and social.

Under such perspective, we summarize the impossibility of assuming the power of the language without understanding the social relationships that grants its power. It is in that sense that the conception of languagc in Possenti (1993) rebounds in a widest space than of the reading and writing abilities: Possenti suggests an entire social universe, individual and linguistic, that is put upon during the accomplishment of acts that demand a critical posture towards decision making. Inserted in that net of reflections, we establish a relationship between the formation of the reader/writer and the handling of a new way of dealing with thinking. To become a reader, it means to have access to the social writings. In other words, it means to be capable of dealing with collective tools.

And, as an echo to Foucambert's quotations, the proposal of our work with these three FLs brings new dynamics to the reader/writer's formation in the new communication circumstances, as described in the next part.

Integrating or interacting reading and writing through a collective tool

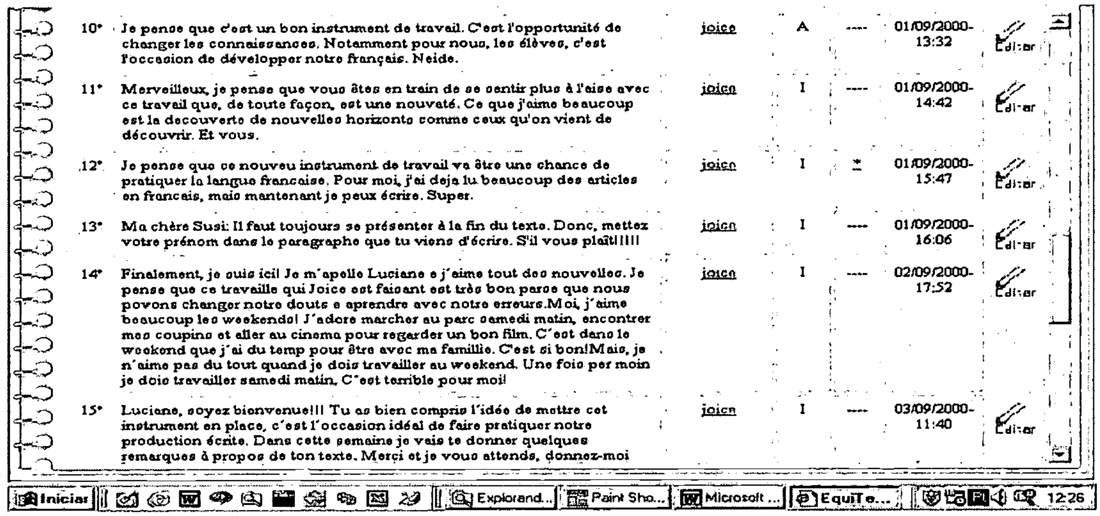
We should recognize at first on how this new writing procedure - with a connecting view in the reading and vice-versa - when interfering in a relatively recent arena, it causes strangeness, since other forms of organization of knowledge in a traditional classroom other than the textbook being still ignored. Then we consider pertinent to trace a short report regarding the experiment integrating reading and writing in a virtual environment which demands a new interaction mode.

The proposal initially launched to the groups, required that a text should be written about the learners' or the participants' likes and dislikes. The titles "Likes and dislikes", "Ce que j'aime et ce que je n'aime pas" and "Hablando de gustos" announced objectively what had to be developed. And from the very beginning, improvements promoted by the use of the EquiText - a collaborative writing tool in the Web - were evidenced.

During the elaboration of those individual texts, more than one of the participants looked for the mediator/FL teacher to explain how to write what h/she had in mind. The main orientation was to make it possible to promote as much autonomy for the search of the "good expression" structures in the FLs, emphasizing the fluency in detriment of the correction. In addition, we proposed to observe marks of rewritings, after the withdrawal of that material, like registrations accomplished possibly due to the (re) readings of their textual productions while interacting on the Equitext.

After having finished the individual works, compositions on the same topic "Likes and dislikes" in the three FLs, which took place in less than two weeks. The EquiText was then presented as a tool for the collective text production in the Web, a totally strange experience altogether. It was requested that each one of the students began his/her collaboration, elaborating and inserting their ideas in the paragraph format tool lay out, starting then a team text construction. It has been noticed that the sentences employed before, in the individual texts, were modified in the spaces offered by the EquiText, not only getting adapted to a new context, but also creating a new context. As Possenti points out, "The effect of meaning is not the same, because the game of images of the speaker gets explicit: it is a constant adjustment."

The first contact with the collaborative writing in the Web, being introduced initially as a participative writing, is worthy of comment, once relevant observations are made for reflection. Reflecting over the connected writing and reading processes evidenced by that first experiment with FLs students. "To produce a discourse is to continue acting with that language not only in relation to a speaker, but also in the language itself." (Possenti, 1993, p. 57). Language is not just seen as a tool to organize thought, nor as a means of communication. It is recognized as a form of action, a process of establishing relationships, of creating closeness among interlocutors. (See Guedes, 1999, 2000).



10*	Je pense que c'est un bon instrument de travail. C'est l'opportunité de changer les connaissances. Notamment pour nous, les élèves, c'est l'occasion de développer notre français. Neide.	joice	A	----	01/09/2000-13:32	Editar
11*	Merveilleux, je pense que vous êtes en train de se sentir plus à l'aise avec ce travail que, de toute façon, est une nouvaté. Ce que j'aime beaucoup est la decouverte de nouvelles horizonts comme ceux qu'on vient de découvrir. Et vous.	joice	I	----	01/09/2000-14:42	Editar
12*	Je pense que ce nouveu instrument de travail va être une chance de pratiquer la langue francaise. Pour moi, j'ai deja lu beaucoup des articles en francais, mais mantenant je peux écrire. Super.	joice	I	*	01/09/2000-15:47	Editar
13*	Ma chère Susi: Il faut toujours se présenter à la fin du texte. Donc, mettez votre prénom dans le paragraphe que tu viens d'écrire. S'il vous plaît!!!!!	joice	I	----	01/09/2000-16:06	Editar
14*	Finalement, je suis ici! Je m'apelle Luciane e j'aime tout des nouvelles. Je pense que ce travaille qui Joice est faisant est très bon parse que nous povons changer notre douts e aprendre avec notre erreurs.Moi, j'aime beaucoup les weekends! J'adore marcher au parc samedi matin, encontrer mes coupins et aller au cinema pour regarder un bon film. C'est dans le weekend que j'ai du temp pour être avec ma famillie. C'est si bon!Mais, je n'aime pas du tout quand je dois travailler au weekend. Une fois per mois je dois travailler samedi matin. C'est terrible pour moi!	joice	I	----	02/09/2000-17:52	Editar
15*	Luciane, soyez bienvenue!!! Tu as bien compris l'idée de mettre cet instrument en place, c'est l'occasion idéal de faire pratiquer notre production écrite. Dans cette semaine je vais te donner quelques remarques à propos de ton texte. Merçi et je vous attends, donnez-moi	joice	I	----	03/09/2000-11:40	Editar

Iniciar | Explorand... | Paint Sho... | Microsoft ... | EquiTe... | 12:26

Unnecessary to register the resistance in handling a new writing environment, once it exposes the way of thinking added to the reading and writing style of the peer contributions in their FLs. The interacting itself in this new arena turns it even more visible to the fact that the text is in fact the individual's institutionalizer. The resistance can be identified in the 'historic' function, one of the resources of the EquiText, an important source of data collection; it allows nodal points to be identified in the production of each participant's paragraph. This historic function also shows evidences in the attempt of correcting each other's contributions or, otherwise, the mutual support as if they were in the old classroom context. An interesting point is that those moves cannot take place in the mother tongue (L1), forcing them to dive unavoidably in the form of thinking of that other LF.

In other words, during the writing process through the Web, the attitude of having to write "Comment on dit ça?" or "Correct my mistakes, please", registered in the 'Comments" function, next to a paragraph, for instance, are moves which take place clearly, visibly, and directly during the textual production, contrarily to the individual model. There, in the final text, or in its final product, it is presented without any possibility of recurrence to the difficult points expressed in that form of construction of meaning. "The interlocutors are neither slaves nor masters of their language. They are workers". (Possenti, p. 58).

As the experience ended, though it could have been extended for a longer period of time, it was requested that each participant presented his/her conclusions on the proposed tasks, comparing the individual and the collaborative productions, in order to compare some results in the use of the EquiText, once through him one had experienced a group of work with and on the language, in a space in which all the mechanisms worked in favor of a significance.

We recognized that at this time the participants felt more confident, an unfolding characteristic of exposing ideas different to the traditional, where it is possible to try the power of facing the world as a thinking being, active and, therefore, qualified to read and write as a free, autonomous citizen.

We equally identified that the status of each one of the students grew progressively in every moment of the negotiation of meaning. The explicit negotiations among them and their management as if in an intense game made possible through their exchanges towards the construction of their readings and writings. The two-way road imposed by the task proposal, resulted from the tension between the individual and the collective, in a demand of its sedimentation and a change or adaptation attempt as in Possenti's view of the double face of language. Also, the teaching/learning interrelation as the production of knowledge originated from the dialogical teacher/student relation, to "bring the other one closer to the movement to his/her thought".(Freire, 1996, p. 132).

We noticed that this type of activity employs an author/reader status to the learner from the beginning, matching Foucambert's assertion that "The way of learning is what gives power, much more than what one learns. (p. 36). This is illustrated in paragraphs 10, 11, and 12, highlighting the peers' contributions. (Fig. 1)

Final considerations for the beginning of a debate about similar experiences

It could be verified that, through the action of transforming the writings and the readings, it was being built the understanding, the knowledge, the 'savoir faire', at last, of the three FLs. The same space referred by each of the participants were being shaped as their writing and reading apprehensions were unfolding as well as

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the dissolving dicotomies in the teacher and student roles, reading and writing, teaching and learning, individual and collective.

According to Foucambert, the pedagogical rule, adapted here to FL teaching is the research-action, because we can only understand what we can transform; "an understanding that is built by the own transformation action and by the analysis of the processes and results of that transformation. (p.63). Because still the "access to the reading" of new social layers implies that reading and text production become tools of thought of a renewed social experience, since this presupposes the search of new points of view about a wider reality, that the writing, according to the author, helps to conceive and to change, through the simultaneous and reciprocal invention of new relationships, written and new readers.

We thought that the link with the reading, privileged in this space, deserves our work to conclude by now. The discussion on what one understands for reading in FL is, in fact, a fight for democracy, since it seeks the collective domain of the means of production of meaning. We will not just propose to increase the number of readers already existent, but to reflect on reading as a social change, a thought that rebounds unavoidably in the practices of teaching and learning of reading and writing in a FL. Writing and reading cannot lose their dynamic character, on the contrary, to look for alternatives that make possible the interactive/integrated writing of thinking and critical students in their FLs classes or groups.

In that way, reading classes and of textual production they should be the space to leave besides the information to the student, making possible them a more appropriate formation to your glance for the world, dinamizando the entrecruzamento of glances belongs to the writers, then, authors, belong to the readers, belong to the teacher inserted in this new reflection space and of action. According to the words of Coracini, the teacher should be a facilitator and not a simplificador of the compound process that is to teach one READS, propitiating spaces, be them virtual or real so that the student can be established how to be thinking - that is - in the construction of the sense. Like this, through EquiText, we saw him/it as the production conditions went decisive for the critical construction of the sense that each autor/escritor supplied your readers.

References

Bakthin, M. (1999). *Marxismo e filosofia da linguagem.* São Paulo, SP: Hucitec.

Coracini, M. J. (1995). *O jogo discursivo na aula de leitura: língua materna e estrangeira.* São Paulo, SP: Pontes.

Freire, P. (1996). *Pedagogia da autonomia.* São Paulo, SP: Paz e Terra.

___. (1993). *A importância do ato de ler em três artigos que se completam.* São Paulo, SP: Cortez.

Foucambert, J. (1994) *A leitura em questão.* Porto Alegre, RS: Artes Médicas.

Lévy, P. (1999). *As tecnologias da inteligência.* São Paulo, SP: Editora 34.

Possenti, S. (1993). *Discurso, estilo e subjetividade.* São Paulo, SP: Martins Fontes.

Rizzi, C. B. et al.(2000a). *EquiText: the helping tool in the elaboration of collaborative texts.* Annals of the Conference Site 2000, San Diego, CA.

____. (2000b) *Collaborative writing via web - EquiText.* 7o.International Congreso of Computer Science en Educacion, Habana, Cuba.

Vygotsky, L.S. (1993). *Obras escogidas.* V. II. Madrid: Visor.

The self learning system to support the teacher of Japanese language education

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In the countries except Japan, according to Japanese government investigation in 2000, learner of Japanese language are about 2,090,000 people. However, most of these learner are beginner grade. Middle grade learner are an extremely little.

In a beginner grade, they learn the character of kind of "Hiragana" of a phonogram. It is easy to understand this Hiragana which is the simple character. Other way, middle grade learner must learn the character of kind of "Kanji". "Kanji" is the ideograph character. And it is a hieroglyph of one kind of Chinese.

In Japan, the communication that we used only Hiragana for is difficult. In a field of Japanese business, people must use 2,000 kinds of Kanji characters. It is a big burden for the learner to memorize many complicated Kanji. In addition, Japanese language teacher oneself do not understand all Kanji characters, too.

So we developed the Kanji learning systems which worked with the PC. We were able to do "Memorizing by Writing" not to use handwriting input device in this learning system. This learning system is a system for self-study, we think that we let Japanese language teacher reduce the burden of education.

Introduction

At present, in 114 countries of the world, Japanese language is learned. In the countries except Japan, according to Japanese government investigation of this year, learner of Japanese language are about 2,090,000 people. As for the number of learner of Japanese language, 30% increase than the number of the learner of 1993.

However, most of these learner are beginner grade. Middle grade learner are an extremely little. In a beginner grade, they learn the character of kind of "Hiragana" of a phonogram. It is easy to understand this Hiragana which is the simple character.

However, middle grade learner must learn the character of kind of "Kanji". "Kanji" is the ideograph character. And it is a hieroglyphist of one kind of Chinese. In Japan, the communication that we used only Hiragana for is difficult. In a field of Japanese business, people must use 2,000 kinds of Kanji characters.

It is a big burden for the learner to memorize many complicated Kanji. This big burden is the reason with a little middle grade learner. In addition, Japanese language teacher oneself do not understand all Kanji characters, too.

The system that the learner can learn Kanji by the high efficiency by oneself is necessary in order to increase the Japanese learner of middle grade. The system is to let you reduce a big burden of a Japanese language teacher.

Progress of Research

We have researched the efficiency method how we could take good care of learning of Kanji. First of this research, we have connected the handwriting input device to Macintosh first. And we set program to recognize a handwriting character and developed the system can execute "Memorizing by Handwriting".

In the next study stage, we shifted platform to the PDA to have a handwritten character rccognition function from Macintosh. By this stage of research, we could develop the portable learning system.

We have used 4 kinds of platforms from Macintosh to PDA. It is to use a recognition function of handwriting character that these are common to in 4 kinds of development. However, PDA did not spread in the Japanese language school, Furthermore, there is not the possibility that PDA will spread in future either. We judged that it was not suitable to use PDA as a platform of the learning system in future.

So we considered learning environment in various countries and developed the learning systems which worked with the PC such as Windows or Macintosh. By developing this learning system, we gave up the connection of the handwriting input device and PC. Because, handwritten character recognition program in input device generate do freeze of the learning system frequently. Perhaps we think that the conflict between programs occurred in main memory.

So we were able to do "Memorizing by Writing" not to use this device in this learning system.

We developed this system by type of WBT(Web based Training System). Because, this system can work by any kinds of computer. And the operation of this learning system is possible with Internet.

Outline of the Learning System

There are 3 kinds of learning problems set by the learning system. They are "how to read of Kanji", "how to write of Kanji" and "listening". The learner chooses an answer to these problems(Reading, Writing) on the screen with the mouse.

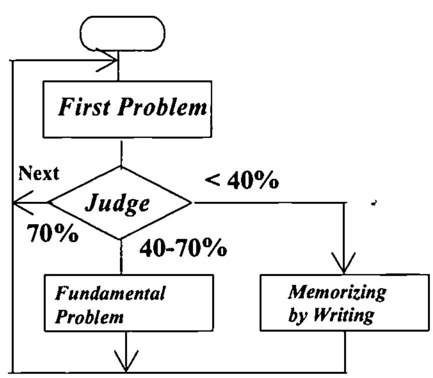

Figure 1: Flow Chart of Learning System

Evaluation of result that the learner replied is totalized automatically. And, according to evaluation of answer of a learner, the next problem is displayed automatically.

When evaluation to the learner is equal to or more than 70%, the learning system displays a page of "problem of next unit."

When evaluation to the learner is range of 70% from 40%, learning system displays a page of "fundamental problem" that a degree of difficulty is low.

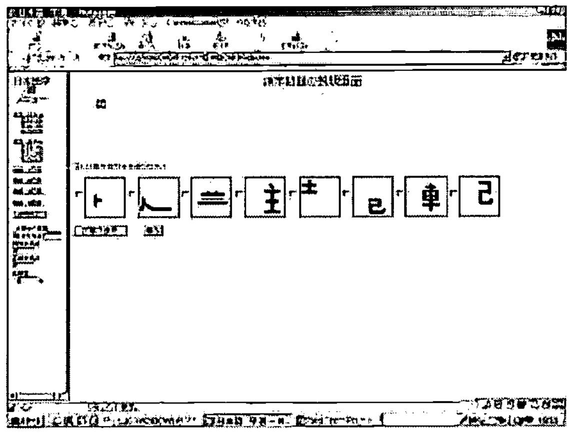

Figure 2: Memorizing by Writing

And learning system displays a page of "Memorizing by Writing" if evaluation is less than 40%. In this page, multiple pieces are constituting one Kanji character is displayed. Furthermore, few wrong pieces mixes wittingly, too. We let the learner select right pieces in this page. By this learning method, the learner can learn the Kanji character that he seem to write.

In the page of "listening", conversations and questions of Japanese taped beforehand are played back. And the learner chooses an answer for the question that played back conversation. The learner chooses it among answer group in page.

Conclusion

We developed this learning system by "Front Page of Microsoft".

By using this software, the Japanese teacher who did not know a lot about computer can maintenance of learning data comparatively easily. The learner can learn difficult Kanji by the situation that resembled handwriting learning. And, the learning system which we developed this time is a system for self-study, we think that we let Japanese language teacher reduce the burden of education. We hope that the Japanese language teacher use this learning system as the system to supplement their class.

This learning system can be used with either Internet or CD-R. As a plan of the duration, we distribute CD-R of the learning system to the university and the Japanese school of Asia / Pacific region where there are the middle grade learner. And we get evaluation of the learning system to us from Japanese language teacher and learner.

We will make use of those evaluation in improvement of the learning system.

Literacy Junction: Exploring Narrative Theory and Books for Youth in a Cyberworld

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Abstract: This paper describes the development of *Literacy Junction*, which is an interactive web site for teachers and students in grades 5-8. Using an interdisciplinary approach to learning, *Literacy Junction* offers two distinct features: technology-enhanced experiences with outstanding young adult literature and cybercharacters who serve as both academic models and technology guides. A pilot study was conducted in which 8 students created their own cybercharacters after interacting with the site's cybercharacters as well as text-based literary characters. Through qualitative analysis of students' character drawings and oral and written discourse, several themes emerged depicting the role of cybercharacters in conjunction with students' aesthetic responses to narrative texts. Based on these preliminary findings we anticipate that future studies will contribute to narrative transactional theory as it is recontextualized from print-based to web-based learning environments.

Introduction

Literacy Junction (www.ncsu.edu/literacyjunction) recently funded by BellSouth and the Kenan Institute, is an interactive web site for teachers and students in grades 5-8. Based on a ten-month iterative design process with input from a teacher advisory board, *Literacy Junction's* purpose is to encourage teachers to accelerate the integration of new and emerging technologies into literacy instruction. By offering the opportunity for both face-to-face and virtual meetings, this networked professional community provides the mentoring and continued support that teachers need to initiate and sustain new teaching practices. Over time, we expect *Literacy Junction* to help teachers' integrate technology, to increase students' capacities to use technology as a learning tool, and to enhance student achievement.

What Are the Theoretical Underpinnings of *Literacy Junction*?

Using an interdisciplinary approach to learning, *Literacy Junction* offers two unique features. First, the site includes technology-enhanced experiences with outstanding children's and young adult literature. For example, as students read Christopher Paul Curtis's, *Bud Not Buddy*, they select from a variety of activities to explore the thematic layers of the book. They might then create a WebQuest, audio-documentary, or participate in a Socratic seminar. Tutorials created specifically for the site provide support for both teachers and students new to these technologies and strategies. A second feature of the site is the Cyber Heights Middle School. This fictional middle school offers an online community of cybercharacters who serve as both academic models and technology guides as teachers and students interact with the offerings on *Literacy Junction*. Cyberteacher Jan Rosenberg models online teaching strategies while students Anjoli, Garret, JC and Claire model participation in the reading-related activities on the site (see Fig. 1). All of the characters reflect real world personalities so students who visit the site can identify with both the character's strengths and weaknesses. Students are also given the opportunity to examine and critique the academic work of the cybercharacters.

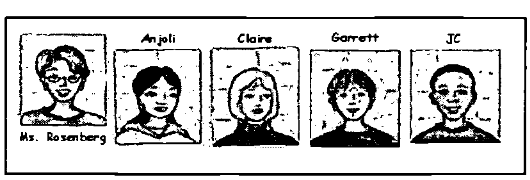

Figure 1: Cybercharacters in *Literacy Junction*

The creators of *Literacy Junction* endorse the time-honored pedagogy underlying Louise Rosenblatt's (1978) transactional theory as a platform for student engagement with narrative text. This theory suggests that within any reading experience, a reader's stance may fluctuate along a continuum between aesthetic and efferent. Readers taking an aesthetic stance bring their own personal meaning to the text, in effect "living through" the textual event. Rosenblatt argues that, to optimally experience narrative texts, students should take an aesthetic stance when reading. By extending Rosenblatt's theory to *Literacy Junction's* cyberworld, students are invited to engage aesthetically not only with the featured novels in a *primary transaction* but also with the site's cybercharacters and their cyberworld in a *secondary transaction*.

Pilot Study

Considerable research has been conducted on primary transactions with text (see Marshall, 2000) articulating spontaneous and idiosyncratic associations with personal experiences of the reader. However, extending transactional theory into cyberspace has yet to be fully explored (see Turkle, 1995; Tapscott, 1998 for a related discussion on parallel identities in virtual spaces). Our qualitative pilot study investigated the consequences for this type of secondary transaction, specifically examining the nature of students' relationships with the cybercharacters in the *Literacy Junction* environment. Guiding research questions included the following: How do students react to cyberpeers? How do they position these peers within the virtual/actual continuum? How do they identify with the personality traits of their cyberpeers? How are students' primary transactions with literature affected by their secondary transaction with cyberpeers reacting to the same literature? The participants consisted of eight 6th grade students (i.e., 2 African Americans and 6 Caucasians; 4 males and 4 females). Over a period of six weeks, the participants met with a researcher for six one-hour sessions as they read a sample novel and interacted with the primary characters from the novel, engaged with the site's cybercharacters through a series of oral and written activities, and finally created their own cybercharacters related to the novel.

Preliminary Findings and Future Research Directions

Through qualitative analysis of students' character drawings and oral and written discourse, the following themes emerged. First, the highest level of student engagement, interest, and motivation occurred when students were given the opportunity to create their own cybercharacters. Of particular interest to the students was the worldwide publishing capacity afforded by the Web. They wanted their actual peers to become familiar with the virtual characters they had generated. Second, students projected their personal idiosyncrasies and attributes onto the characters they created, signaling their capacity to objectify significant issues and experiences they face as adolescents. Third, the process of comparing and contrasting the cybercharacters' engagement with the actual characters from the novel (i.e., secondary transaction) appeared to entice students to revisit their initial aesthetic transaction with the text. Based on these preliminary findings, we anticipate that future studies using the unique features of *Literacy Junction* will amplify narrative transactional theory as it is recontextualized from print-based to web-based learning environments.

References

Marshall, J. (2000). Research on response to literature. In M. Kamil, P. Mosenthal, P.D. Pearson, R. Barr, (Eds.), *Handbook of reading research, vol. III* (pp. 381-402). Mawah, NJ: Lawrence Erlbaum.

Rosenblatt, L. (1976). *The reader, the text, the poem: The transactional theory of the literary work.* Carbondale: Southern Illinois University Press.

Tapscott, D. (1998). *Growing up digital.* New York: McGraw-Hill.

Turkle, S. (1995). *Life on the screen.* New York: Simon & Schuster.

The Creation of a Nexus between Telelearning and Teleteaching

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Abstract: There is a group dynamic that occurs in a synchronous "face-to-face" university classroom environment (Johnson & Johnson, 1975). At times, this dynamic is an appropriate and authentic method of teaching. However, the prosaic nature of how we have viewed this sort of academic interaction up to the present time has both literally and virtually opened the door to the creation and implementation of dynamic computer-mediated web-based courses. This paper discusses the "links" between telelearning and teleteaching, and also recounts the "rites of passage", both intentional and unintentional, in the creation and implementation of seven university level Web-based courses.

Genesis

Many have questioned the validity of a university experience that has students learning via a direct lecture-based form of communication from a professor, AKA "the sage on the stage" (Hullfish & Smith, 1961; Moffett, 1968; Rogers, 1969; Hirst &Peters, 1970; Becker & Gersten, 1982; Weingand, D.E., 1984; Joyce and Calhoun, 1998). Personally, I have learned a great deal in just this sort of format, and have even utilized this pedagogy for part of my university teaching career. However, I have begun to question and rethink this form of instructional design and professional development, somewhat along the lines of thought presented by Roberts and Ferris (1994) and Boddy (1997), all of who dealt with the issues of time and knowledge acquisition/delivery.

During the 1980s, the Faculty of Education at Memorial University of Newfoundland (MUN) (http://www.mun.ca/educ/) became a leader in the utilization of distance education utilizing a province-wide teleconference system. I had the opportunity to develop three undergraduate courses for this teleconference system, which were offered collectively a total of twenty-one times during the period from 1981-1991. The synchronous nature of teleconferencing required that the students registered for one of these three courses be at one of the 38 teleconference sites located throughout the province of Newfoundland and Labrador. However, in a Canadian province three times the size of the state of California, this form of distance education was considered vital in enabling pre-service and in-service teachers opportunities to take university courses as a means of fulfilling degree requirements, or for professional development. The "seeds" of my understanding on the development and implementation of distance education courses was "sown" during this ten-year period. Yet it would not be until 1996 that these "seeds" would germinate into the early design for a computer-mediated web-based university course.

Serendipity

With encouragement from the Dean of the Faculty of Education, MUN, I undertook the task of creating my own web page (http://www.ucs.mun.ca/~glassman). I saw this form of communication as a means of providing my students with some insight into who I was as a professor and a person. Also, if the truth were known, I did not want to be considered an "Information Technology Luddite". This web site initially became the conduit for my course outlines.

One day, a student who was scheduled for surgery, asked me if I could put certain of my class notes and lectures onto my personal web site. It was at this point that I realized the potential for web-supported course material. I created a dedicated web site for each of the undergraduate and graduate course I taught, with hyperlinked course outlines, class notes/lectures, diagrams/charts, writing guidelines for their assignments, along with other web sites of relevance to the course. Based on the immediate positive responses from my students, I discovered pedagogy appropriate to both the current technology and my personal style of teaching.

Exodus

I once saw a bumper sticker that read "Students need to help their teachers find the on ramp to the information highway." My students helped me "see" and understand the potential for web-supported course material, and now I was ready to "journey into cyberspace" with the creation of a self-contained, non-linear telelearning/teleteaching environment.

With the approval from the Dean of the Faculty of Education, MUN, and technical support from MUN's School of Continuing Studies (http://www.ce.mun.ca/), I began the creation of a "mediacentric" classroom environment, which utilized the potential of multimedia and computer technology to "deliver my message".

Teleteaching

Specific pedagogical concerns were the focal points in the creation of my two initial web-based courses "Current Approaches to the Teaching of Reading in the Primary and Elementary Grades", Ed.3510 and Ed3520.. The "transmissional" model of instruction, where content is the primary focus of all concerned, was a teaching strategy I was utilizing less and less in my on-campus courses. My web-supported courses had lecture notes uploaded onto our Faculty's server, where students could download these notes either prior to or after in-class discussions on their content. The "transactional" model of instruction, where interaction is the focus of the presentation of selective content, was a process that I was effectively utilizing in my on-campus teaching (Routman, 1991; Graves, Watts-Taffe & Graves, 1999). However, I saw the inherent need in the creation of these initial web-based courses to implement a "transformational" model of instruction, with its focus on a holistic, interdisciplinary curriculum and a social identity structure based on each student's own learning style. I did not want to create a telelearning environment that had a format founded on a sense of "Social Darwinism", where only the technologically "fittest" students survived. I wanted to develop a course where active involvement in the synthetic process of knowledge construction and the analytic process of understanding could be experienced by all, with each person enabled to achieve their personal potential (Lefrancois, 1991).

This teleteaching experience needed to become a guided discovery into learner-centered instruction. To accomplish this task of creating a self-contained, non-linear telelearning environment, I was forced to consider the paradox of "time/space binding". The asynchronous nature of this course required a format that enabled active on-line involvement from persons far removed from where I was located. Support services to assist any one learner had to be built into this system. These support services took the following forms:

- Detailed prerequisites were provided prior to any student registering for the course, as a "fail safe" measure to inform students of the technological necessities of the course (e.g., access to e-mail messages, an ISP account, a VCR, etc).
- Specific instructions were provided on-line as to how to access, register for and successfully log on to the Alta Vista Forum component of this course.
- Specific "finder-friendly" hyperlinked navigational icons were provided to assist each learner in their "journey" throughout the various components of this web-based course (e.g., a glossary was created for the various terms that were utilized throughout the on-line manual, with "hot spots" embedded within the on-line text to ease the navigation from the text, to the glossary and then back to the text).
- Direct e-mail contacts on a daily basis were established during the first week of this course, so as to ensure that any problems could be overcome immediately. Frustration on the part of students is the death of any distance educational format.

At the core of this teleteaching experience was the necessity to create instructional content that had relational value when compared to traditional on-campus course. The traditional correspondence-genre of readings and worksheets/assignments is, in my opinion, not the best way to design web-based course material. The telelearner needs to feel a real sense of involvement and accomplishment from the onset to the conclusion of this experience. Such learners need to consider this form of learning "worth the effort". Thus, there had to be a relevant use of the on-line text materials, with on-going interactions between professor and student, and then among all students registered for the web-course.

Telelearning

I make a distinction between teleteaching and telelearning. Teleteaching requires the instructor to design experiences that will enhance a learner's knowledge and understanding via an analytical and critical engagement with various mediums. This cannot take the form of impositional teaching, which is the direct teaching of some form of knowledge without regard for the learner. The effective teleteacher needs to "think like a telelearner", envisioning as many potential sources of problems and frustrations as possible. As well, the teleteacher needs to consider what I call the "addendum factor". Classic lines from the Broadway play "Oliver" best sums up this addendum factor -- "Please, sir. I want some more." An efficient telelearning environment will contain components of what an instructor considers to be needed by a learner, along with components of what learners perceive as being relevant.

The telelearning experience, if designed well, provides for self-paced independent learning with remote feedback and assistance. However, telelearners need to fully understand their role in this new teaching/learning experience. Telelearners must assume some responsibility for their own learning. A sense of autonomous individuality and a unique form of self-affirmation need to be present in each learner. Such learners must work well alone, due to the flexible asynchronous schedule of this experience. The intrinsic motivation of these learners must be strong enough to overcome the sense of virtual abandonment. The teleteacher can provide "scaffolding", with clear-cut directions and electronic feedback (i.e., e-mail guidance), but the emphasis is on learner-centered experience.

Convergence

During the winter semester of 1997, Ed. 3510/3520 "Current Approaches to the Teaching of Reading in the Primary/Elementary Grades", the first totally web-based undergraduate course for the Faculty of Education, MUN, went on-line, with an initial enrollment of 29. This brought together (i.e., convergence) the various relevant elements of a traditional teaching/learning experience within a technology-based distance-learning environment.

The course combined an on-line textbook, which I authored, as well as a supplementary traditional textbook (Blount, 1994), along with a two-hour videotape, e-mail and an interactive discussion component utilizing the Alta Vista Forum.

The on-line textbook that I had written specifically for this distance education format provided the specific theoretical information and practical instructional techniques that I would share with these students if they were taking this as an on-campus course. This information was collated around the four "current approaches" of reading/writing instruction (e.g., the Literature-Based Curriculum, the Writing/Reading Connection, the Integrated Thematic Curriculum and Computer-Managed Instruction) that comprised the focal points for the course. This was to be a non-linear intertextual experience for the telelearners since they were required to relate this on-line material to teaching/learning in the "real world classroom".

The Alta Vista Forum (AVF) was the medium I utilized to assist me in my role as an instructional facilitator. I attempted to maximize student interactions with an asynchronous reflective format. I posed specific questions on the AVF that were to be answered by the telelearners. These questions were specific, but open-ended, to help create a "risk-taking" on-line environment where students felt that they were able to express their thought freely. Initially, I utilized a Socratic questioning technique, providing positive feedback with each of their responses and then posing additional questions for their reflection. In each of these individual responses I made reference to the comments of other students, encouraging inter-student commentary and replies. Eventually, this interaction came about naturally, with students freely commenting on the replies made by each member of this virtual "cyber family". Students posed their own questions and this, in turn, added greatly to this interactive reflection. I provided a specific site on the AVF for exchanges of a non-academic nature. This site, the Café Chez Marc, was a "meeting place" where the participating students exchanged views on such diverse topics as the state of the Newfoundland economy, the trends in fashions found in today's schools, the weather, the Stanley Cup, et al.

I posted "E-mail Office Hours" when students could e-mail me a question and expect a fairly instantaneous reply. However, I found that students were e-mailing me their questions at almost every hour of the day. I attempted to access my e-mail from home each night at 8PM and midnight for those who posted their messages late at night, or for those who read my replies very early in the morning.

The videotape contained a visual collection of what I considered to be ten effective educational CD-ROMs. The videotape was professionally produced by the Center for Academic and Media Services (http://www.ce.mun.ca/cams/video.html) here at MUN. As I utilized each educational CD, the images and sounds on the screen of the computer monitor was fed directly into a video camera, along with a "voice-over" to describe what I considered to be the strengths and weaknesses of each CD, from an educational frame-of-reference.'

Assignments, such as the WWW Learning Logs, the Interdisciplinary Literature-based Unit, a Reflective Final and the qualitative participation on the Alta Vista Forum, were submitted in a variety of ways. Other than the AVF interactions, the other three assignments could be submitted in hard-copy form via mail or hand delivered to my office, or on-line in the form of an attachment to a note sent via e-mail. Students submitted sample drafts of their writing on-line, and I commented, via e-mail attachments, on these on-line drafts the same day they were received. Thus, just as a student on-campus could come in and see me for specific guidance on an assignment, the web-based student could also access me and receive feedback on their assignment, albeit in a virtual format.

Eureka

At the conclusion of this initial WWW course, I realized that I had "discovered" a way to deliver university level courses utilizing the WWW in a pedagogically appropriate manner. From this experience came the impetus to create another five additional WWW courses. To supplement Ed.3510/3520, which is intended for undergraduate students enrolled in our primary/elementary grade education program, I set out to create three other undergraduate web-course intended for students enrolled in our primary/elementary and intermediate/secondary school program (e.g., Ed.3040 "The Assessment of Language Problems"; Ed.4350, "Content Area Reading in the Intermediate and Secondary Schools"; Ed.4920 "Literacy in the Rural School). As a means of providing computer-mediated options for our graduate students, I created two web-based graduate courses in the area of literacy (e.g., Ed.6641, "Writing in the Primary, Elementary and Secondary Schools" and Ed.6647 "The Diagnosis and Assessment or Reading and Writing Difficulties"). By the conclusion of the fall semester, 2000, there will have been total enrolment of 255 students for the seven web courses I have created and implemented. In the four years I have been teaching web-based courses, I have had students from three US states, five Canadian provinces and two territories, and the United Kingdom.

While the five additional WWW courses have a structure that is similar to my initial course, taking into account a totally different content, there have been technologically significant additions to each of these courses. These additions were the use of PDF formatting for the on-line supplementary textbook, "streaming video", CD-ROMs, and the use of the SiteScape Forum, and enhanced version of the AltaVista Forum.

PDF formatting, utilizing an "Adobe Reader", can provide a students with a "printer-friendly" format for downloading and printing off a personal copy of the on-line supplementary textbook for off-line reference. The main advantage of streaming video is that in many of my on-campus education courses I provide demonstrations and simulations that are best understood if they are seen and heard, rather than merely read about in text form. Thus, any student can "observe" these demonstrations and simulations (e.g., how to administer and analyze a miscue analysis form of oral reading proficiency) at any time. This form of "narrowcasting" is aimed at a telelearner with the lowest common denominator technology (e.g., 28.8 modem, a Pentium or mid-range 486 PC with a soundboard and a good video card), so as to make the streamed video accessible to the vast majority of telelearners. An alternative to this streamed video is the creation of CD-ROMs containing the same content as would be presented in the streamed video.

Excelsior

Having been born and raised in New York City, I learned early on in public school that the motto of the State of New York was "Excelsior" (i.e., "Always Upward"). It is only now that I understand the complexity of that term. From my first teleconference course back in the Winter of 1981, to the e-mail note I received from a student I had never met, telling me how "great" it was to be able to take my course on-line, I now had a sense of the meaning of this continual upward momentum. What made that e-mail note so significant was that the student who wrote the note was located in Nain, Labrador. In relative terms, the distance between St. John's, where I was located, and Nain, Labrador, where she was taking the course, is comparable to the distance between New York City and Chicago.

When I consider the link between telelearning and teleteaching, I envision an environment with a revised paradigm of the teacher and learner. In this environment, the use of instructional technology "re-places" (as opposed to replacing) both the teacher and learner. In this zone of possibilities, both the teacher and learner are actively involved in a process of re-inventing their roles in the instructional/learning encounter.

References

Becker, W. & Gersten, R. (1982). A Follow up of Follow through: The later effects of a direct instruction model. *American Educational Research Journal,* 19(1), 75-92.

Blount, R.H. (1994). *Implementing Literature-Based Instruction and Authentic Assessment.* Grand Rapids, MI: TS Dennison.

Boddy, G. (1997). Tertiary Educators' Perceptions of and Attitudes Toward Emerging Educational Technologies. *Higher Education Research and Development,* 16, 343-357.

Graves, M., Watts-Taffe, S. & Graves, B. (1999). *Essentials of Elementary Reading.* Boston: Allyn and Bacon.

Hirst, P. & Peters, R. (1970). *The Logic of Education.* London: Routledge & Kegan Paul.

Hullfish, G. & Smith, P. (1961). *Reflective Thinking: The Method of Education.* New York: Dodd, Mead & Company.

Johnson, D. W. & Johnson, F. (1975). *Joining Together -- Group Theory and Group Skills.* Englewood Cliffs, NJ: Prentice-Hall.

Joyce, B. & Calhoun, E. (1998). *Learning to Teach Inductively.* Boston: Allyn and Bacon.

Lefrancois, G. (1991). *Psychology for Teaching.* Belmont, CA: Wadsworth, Inc.

Moffett, J. (1968). *Teaching the Universe of Discourse.* Boston: Houghton Mifflin Company.

Roberts, N. and Ferris, A. (1994). Integrating Technology into a Teacher Education Program. *Journal of Technology and Teacher Education,* 2, 215-225.

Rogers, C. R. (1969). *Freedom to Learn.* Columbus, OH: Charles Merrill.

Routman, R. (1991). *Invitations -- Changing as Teachers and Learners K-12.* Toronto: Irwin Publishing.

Weingand, D.E. (1984). Telecommunications Delivery of Education: A Comparison with the Traditional Classroom. *Journal of Education for Library and Information Science,* 25(1), 3-12.

Workplace Literacy with Online Discussions

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Abstract: Many workplaces require individuals to collaborate electronically to solve on-the-job problems with others who may be down the hall, in a building close-by, or in another geographical place altogether. As a consequence, adult literacy programs need to be developed based on effective ways to teach individuals to use literacy skills in a technological context. This paper discusses the importance of integrating electronic writing into workplace literacy programs, describes an approach to instruction based on reciprocal teaching, situated learning and strategy instruction and offers some evaluative commentary on the effectiveness of the program.

Introduction

More and more workplace literacy skills involve electronic communication. Employees in a wide spectrum of contexts are expected to use computers efficiently and effectively to communicate with others and find information. As a consequence, adult literacy programs need to be developed based on the findings of research aimed at understanding effective ways to teach individuals to use literacy skills in a technological context. In this program we developed an instructional approach to teaching adults strategies for participating in electronic discussion groups

Workplace skills that demand some knowledge of technology with regard to information processing are steadily increasing; in 1995, an Allstate Forum on Public Issues claimed that an estimate of 65 percent of all U.S. workers are affected by this increase of technology in the workplace and by the year 2000, this figure was estimated to increase to 95 per cent (Verville, 1995). The potential of electronic communication is unlimited. Conceptions of adult literacy education are undergoing rapid change (Dirkx, 1999) and with that, there is a need to understand changes in the knowledge and skills of practitioners that are necessary to provide effective adult literacy programs.

Currently, literacy programs and other forms of literacy support for adults are primarily based on traditional classroom practice and face-to-face tutorial-type programs (Malicky, 1990). While these programs have made an impact, obvious limitations exist within such frameworks of delivery including issues of accessibility and flexibility for learning. Geographical location, for example, may exclude one entirely from the opportunity to access literacy programs. It is no surprise that inadequate funding and understaffing has left some rural communities without literacy programs or with programs that are located too far away to serve the rural poor (Sparks, 1998). Further, the need to provide child-care in the home, one's work schedule, or lack of transportation may prevent attendance at literacy support programs. Organizations and employers might be willing to provide opportunities to support literacy development if more was understood about effective, flexible delivery of instruction. Additionally, many adults with low literacy skills may have had negative experiences with face-to-face instruction and continue to carry feelings of resentment, failure and poor academic motivation into their adulthood (Lavery, Townsend & Wilton, 1998) and therefore may welcome an alternative method of instruction. Moreover, computer-assisted instruction may in fact be especially well-suited for adult learners. It has been found that computer-assisted instruction "allows students to work at their own pace and level, which may be particularly effective for learners who exhibit great heterogeneity due to factors such as their wide age range (a common feature of adult programmes), varied levels of competence, and the time elapsed since their last formal instruction (Buckley & Rauch, 1981, Culclasure, 1982)" (Lavery et al., 1998).

Reciprocal teaching may be seen as an effective instructional strategy with adult learners in a computer-mediated learning context. Reciprocal teaching has been used previously in a study designed to teach students the cognitive strategy of generating questions about the material they had read. The results of this study showed that there were definite gains in comprehension, as measured by the tests given at the end of the intervention (Rosenshine, Meister, & Chapman, 1996). There are other instances where reciprocal teaching has been found to improve comprehension. In a study designed to explore the effects of a reciprocal teaching intervention created to enhance the lecture comprehension and comprehension monitoring skills of college students, the results of reciprocal teaching were encouraging (Spivey, 1995). The low-verbal ability subjects receiving the reciprocal teaching method significantly increased their lecture comprehension, as well as their detection of errors presented from text (Spivey, 1995). Based on previous research conducted on reciprocal teaching, it can be seen that it is an effective teaching strategy for learners of various levels. Reciprocal teaching provides an interactive link between student and instructor that may also involve teacher-led discussion, explanation, and modeling of strategy use to scaffolded attempts to use the strategy. However, reciprocal teaching may be even more effective if used specifically in a situated learning context, especially for adult learners who share a variety of diverse needs.

Today's workers need reading, writing, and math skills; computer skills, including knowledge of different software; problem-solving skills; the ability to participate in meeting; report-writing skills; the ability to read blueprints; and other skills and knowledge (Askov & Gordon, 1999). However, it is also felt that these workplace skills are better learned in the context of the workplace, rather than in contexts unrelated to actual workplaces. Further, Askov and Gordon (1999) suggest that because situated learning involves contextual instruction, based on real-world knowledge and experiences, it encourages transfer of knowledge and skills from the classroom to the job. Askov and Gordon (1999) suggest that computer-assisted instruction is one approach that educators may take to customize instruction to suit the needs of adult learners. Specifically, Askov and Gordon (1999) offer e-mail as an effective mode of communication for adults in workplace literacy programs, suggesting that learners can further communicate with others and workplace literacy programs, as well as write about their jobs and workplaces. Situated learning provides learners with a context that is meaningful to them. A workplace literacy program based on situated learning may include group discussions, instruction, and practice that focus on interpersonal and communication skills, solving work-related problems, and other pertinent challenges found in the workplace. It is essential that workplace literacy instructors acknowledge the fact that adult learners bring already existing knowledge and skills to workplace literacy programs. Askov and Gordon (1999) suggest that the integration of work-related materials and instruction in basic skills builds on workers' background of experience and knowledge while developing their abilities to use communication and computational skills more effectively in the workplace. Further, situated learning is an effective mode of instruction for adult learners enrolled in workplace literacy programs because it is directly applicable to their chances of finding and maintaining employment.

Overview of the Instructional Approach

There has been a proliferation in the use of electronic discussion groups (EDGs) in many forums (Bonk, Appelman & Hay, 1996, Hemming, 1999, Kuehn, 1994, MacKinnon & Hemming, 1998). EDGs require participants to use writing in online discussions, a potentially effective avenue for enhancing literacy. Electronic discussions can provide opportunities for participants to reflect, pose questions, and examine content (Brett, Woodruff & Nason, 1997). Electronic discussions were used during the instructional phase of the program that took place at the Annapolis Valley Work Centre (AVWC), a place that provides support to adults with attitudinal, social, and educational barriers.

To qualify for the various programs offered at the AVWC, participants must live in West Hants, Kings, or Annapolis County, be at least 18 years of age, have an identifiable barrier to employment, and be referred by either a community service organisation or a professional. The participants of this study were enrolled in various programs offered at the work centre to develop necessary skills that may lead to increased access to educational, vocational, and employment opportunities within the community. The AVWC provides its participants with instruction in real kitchens, offices, and shops so the participants receive actual on-the-job training. In addition to job skills training, the participants are required to attend classes on personal development and academic upgrading. The participants who took part in this program ranged in ages 18-48 years. Further, the participants of this program were experiencing difficulty finding and/or maintaining employment, due to various obstacles whether they may be academic, emotional, or behavioural. Regardless of their unique challenges, all of the participants have varying levels of difficulty with literacy skills. This is consistent with the fact that "adults who have a history of not being in paid employment represent a critical group for education in basic literacy skills" (Lavery et al., 1998). Thus, the adults at the AVWC could benefit from an effective literacy program that may improve their chances of finding and maintaining employment.

There were 22 participants from the Annapolis Valley Work Centre who were involved in this program. At the beginning of the program, each participant completed a computer usage survey to reveal the extent of his/her experience with computers, as well as his/her attitudes toward computers prior to the program. In addition, each participant was asked to complete a written sample based on the content of a selected case study, without the use of a computer. Then, the participants received basic computer instruction using IBM Thinkpads, which would be used throughout the program. After all of the participants were comfortable with using the laptop computers, they began the instructional phase of the program, when they participated in a reciprocal model of instruction involving eleven (40 minute) sessions that taught three writing strategies for making entries into electronic discussions.

During the instructional phase of the program, the participants received a protocol of direct instruction on three specific writing strategies: explaining/expressing a viewpoint, asking pertinent questions, and writing effective responses. The strategies focussed primarily on writing, since many jobs require employees to communicate in written language and difficulty expressing events, for example, in writing may lead to problems with regard to finding and/or maintaining employment (Gregg, Sigalas, Hoy, Wisenbaker, & McKinley, 1996). The participants worked in heterogeneous small-groups with a research assistant during their regular class hours at the Annapolis Valley Work Centre. In addition to using the laptop computers to make electronic discussion entries, they also provided the instructions for each strategy, as well as the case studies, which provided situated scenarios based on workplace preparation, that were used throughout the sessions. Each writing strategy involved three sessions: an introduction to the strategy where the strategy is modelled (the use of modelling as a teaching strategy is one of the approaches heavily promoted in the National Literacy Survey (Lewis & Wray, 1999)), an application A where the participants receive some guidance, and an application B where the participants use the strategy independently. Each of these sessions consisted of the use of worksheets and study guides followed by the entry of the participants' response into the electronic discussion group. After the participants completed the nine sessions, there were two additional sessions that required the participants to work through a case study using all three of the writing strategies. The first of those sessions included guidance and support from the research assistant while the second session required the participants to use all three strategies independently.

A reciprocal model of instruction allows participants to gradually gain independence with regard to strategy use. Based on previous research conducted on reciprocal teaching (Rosenshine, Meister, & Chapman, 1996, Spivey, 1995), it can be seen that it is an effective teaching strategy for learners of various levels. Reciprocal teaching provides an interactive link between student and instructor that may also involve teacher-led discussion, explanation, and modeling of strategy use to scaffolded attempts to use the strategy. Thus, reciprocal teaching seemed to be an appropriate instructional strategy for teaching in a situated learning context to adult learners, who share a variety of diverse needs. The three sessions on each writing strategy throughout the instructional phase explicitly depict a model of reciprocal instruction. During the first session, the research assistant provided an overview of the strategy, a rationale for learning the strategy, and a thorough modeling of the strategy. For example, after discussing the strategy in depth, the instructor read the case study aloud while the participants followed along on their laptop screens. Then, the questions at the end of the case study were addressed. Each step throughout the strategy was verbalized and discussed so the participants became increasingly aware of the various steps and procedures involved.

As the instructor talked through the steps, the worksheet was completed based on the open dialogue with the participants. Once the worksheet was complete, it was time to make an entry into the electronic discussion group. While this was being done, the instructor talked through all of the steps involved. The second session consisted of a review of the strategy before the participants were asked to work through a case study using the strategy with the guidance and support of the instructor. The third session included the participants using the strategy, independent of the instructor. These three sessions provided participants with the ability to gradually gain independence in using each of the three strategy, thus preparing them for the final two sessions where they were required to use all three of the writing strategies.

In addition to the reciprocal model of instruction used throughout this program, situated learning provided a strong foundation for the program. Each instructional session was based on specific case studies. These case studies involved real life scenarios situated in various workplace contexts, relevant to the participants involved in the program. Additionally, within the various workplace contexts of the case studies, there were other issues being addressed such as personal development, problem-solving, interview skills, anger management, and other pertinent skills that may be required in the participants' future workplaces. Thus, the design of this program enabled adult learners to use their already existing knowledge and experience throughout the instructional phase of the program, which was further based on content that was both relevant and meaningful to the participants involved.

Observations and Reflections

The computer usage surveys revealed that 68 percent of the participants had used e-mail and 41 percent of the participants had used chat groups prior to this program. Additionally, 14 percent of the participants considered themselves to be heavy computer users (many hours per day) whereas an additional 14 percent of the participants considered themselves to be light computer users (approximately once per week). After receiving the reciprocal model of instruction, 95 percent of the participants' online discussion entries showed evidence of using the worksheets and study guides. Further, after receiving this form of instruction, 55 percent of the participants showed a significant increase in electronic discussion entry length (number of words/number of sentences). Additionally, qualitative data was gathered based on observational information throughout the duration of the study, as well as interviews conducted by the research assistant after the participants' completion of the program.

Throughout the instructional phase, there were notable changes in many of the participants. With the initial introduction of the study, many participants showed enthusiasm with regard to using computers for discussion as opposed to face-to-face class discussion. One participant, after the introductory session of the first writing strategy, shared a personal story of his childhood memories of being ridiculed in front of the entire class for not knowing the answer to the teacher's question. He further added that since then, he did not like to participate in class discussions. Because of this, he was very interested in the alternative form of discussion through the use of computers. Also, personal thoughts and feelings may have been more readily offered through the less threatening form of electronic communication. Additionally, the content of the case studies used in this study was an important aspect of the program. The case studies used throughout the program were relevant to the lives of the participants. The case studies allowed the participants to build on their already existing knowledge and experience when working through the three writing strategies. Moreover, the participants gained useful practice in problem-solving, personal development in areas such as self-awareness, self-esteem, and anger management that are essential components of their own lives, both at home and in their future workplaces. Further, realising the various interests of the participants involved in this program, the case studies were situated in a variety of workplace contexts. Furthermore, the participants claimed to acknowledge the direct connection between the writing strategies being learned in the context of the case studies and their chances of successfully finding and maintaining employment. Since finding and maintaining employment is a common goal between all of the adult learners who participated in this program, this seemed to have been a driving force of motivation for many of the participants.

In addition to the increased amount of writing in many of the participants, it was also evident that there were other noticeable changes in some of the participants over the duration of the program. For example, one participant said on the first day that he "never liked writing, did not like writing, and never will like writing." When asked why he felt that way, he put his head down and muttered, "'cause I'm no good at it." However, after receiving the reciprocal model of instruction in a situated context, this same participant was heard telling another student about the program. He expressed with enthusiasm that he "gets to write lots using a cool computer so everyone else can read [his] stuff!" In addition to this obvious change in attitude toward writing, he showed a particularly significant increase in the amount of writing he produced over the duration of the program.

On the last day of the program, after the participants had finished their final session, they were asked for their honest feedback regarding the program, whether or not they found it useful, and if they would be interested in participating in a similar program in the future. All of the participants responded positively to all three questions addressed. More specifically, when speaking about the reciprocal model of instruction on which the program was based, one woman added, " I liked that you didn't just throw us in there and expect us to know what to do right away – it was really straightforward" while the others agreed. With regard to the use of the case studies, many of the participants claimed that they were interesting and useful because, "you never know when something like that could happen to you" and participating in this program resulted in increased confidence in their abilities to problem-solve in their future workplaces. Although all of the participants stated that they felt comfortable using all three of the writing strategies on their own, many of them requested copies of the worksheets and study guides to show others and to use in the future.

Concluding comments

This program was designed to use a reciprocal model of instruction on the adult learners. We were interested in assessing the effectiveness of the program with regard to how they viewed themselves as literacy learners, as well as whether or not their electronic discussion entries were influenced by the instruction. Reciprocal teaching has been used extensively in the past in studies designed to examine the effectiveness of teaching cognitive strategies (Palinscar & Brown, 1984). Results in many studies suggest that reciprocal teaching has potential to be an effective instructional approach to teaching workplace literacy skills. In addition, this also examined the effectiveness of situated learning in workplace literacy programs. Gershwin (1996) documented workplace literacy instruction based on situated learning led to skills transfer among learners. It is also believed that these workplace skills are better learned in the context of the workplace, rather than in contexts unrelated to actual workplaces. Further, Askov and Gordon (1999) suggest that because situated learning involves contextual instruction, based on real-world knowledge and experiences, it encourages transfer of knowledge and skills from the classroom to the job. The adult learners who participated in this program benefited from using their already existing knowledge and experience while developing their abilities to use communication and computational skills more effectively in the workplace. Further, this program showed that the use of electronic communication in the instruction of writing strategies to adult literacy learners may be an effective means of customising instruction to suit the needs of adult learners.

References

Askov, E.N., Brown, E.J. (1991). Workplace literacy instruction and evaluation: R.O.A.D. to success. In B.L. Hayes and K. Camperell (Eds.), Yearbook of the American Reading Forum. Vol. XI: Literacy: International, National, State, and Local. Logan, Utah: American Reading Forum.

Askov, E.N., Gordon, E.E. (1999). The brave new world of workforce education. New Directions for Adult and Continuing Education, 83, 59-68.

Bonk, C. J. Appelman, R. & Hay, K. E. (1996). Electronic Conferencing Tools for Student Apprenticeship and Perspective Taking. Educational Technology, 36(5), 8-18.

Brett, C. Woodruff, E.& Nason, R. (1997). Communities of Inquiry among Pre-Service Teachers Investigating Mathematics. Paper presented at the Annual Meeting of the American Educational Research Association, Chicago.

Buckley, E. & Rauch, D. (1981). Pilot project in computer-assisted instruction for adult basic education students. (ERIC Document Reproduction Service, ED 197 202).

Culclasure, D.F. (1982). A pilot project to evaluate the use of low-cost microcomputers to improve the effectiveness of ABE services provided mentally handicapped adults. (ERIC Document Reproduction Service, ED 228 542).

Dirkx, J.M. (1999). New skills for literacy educators. New Directions for adult and Continuing Education, 83, 83-94.

Gershwin, M. (1996, Fall). Workplace learning: Reports of change from supervisors and learners. Workforce skills: Newsletter of Educational Partnerships in Colorado. Denver, Colo.: Community College and Occupational Education System.

Gregg, N., Sigalas, S.A., Hoy, C., Wisenbaker, J., & McKinley, C. (1996). Sense of audience and the adult writer: A study across competence levels. Reading and Writing: An Interdisciplinary Journal, 8, 121-137.

Hemming, H. (1999). Online teaching and learning and learner-centred pedagogy. In J. Price, J. Willis, D. Willis, M. Jost and S. Boger-Mehall (Eds.) Proceedings of Society for Information Technology and Teacher Education (pp. 176-179). Charlottesville, Virginia: AACE.

Kuehn, S. (1994). Computer-mediated communication in instructional Settings: A research agenda. Communication Education, 43, 171-183.

Lavery, L., Townsend, M., & Wilton, K. (1998). Computer-assisted instruction in teaching literacy skills to adults not in paid employment. New Zealand Journal of Educational Studies, 33(2), 181-192.

Lewis, M. & Wray, D. (1999). Secondary teachers' views and actions concerning literacy and literacy teaching. Educational Review, 51(3), 273-281.

MacKinnon, G. & Hemming, H. (1998). The Acadia Advantage: Linking pedagogy and computer training. In J. Gil-Mendieta and H. Hamza (Eds.) Proceedings of the IASTED International Conference, Computers and Advanced Technology (pp. 89-192). Anaheim CA: IASTED Press.

Malicky, G. (1990). The what and why of school literacy. Reflections on Canadian Literacy, 8, 136-138.

Palincsar, A. S., & Brown, A. L. (1984). Reciprocal teaching of comprenhension-fostering and comprehension-monitoring activities. Cognition and Instruction, 1, 117-175.

Rosenshine, B., Meister, C., & Chapman, S. (1996). Teaching students to generate questions: A review of the intervention studies. Review of Education Research, 66(2), 181-221.

Sparks, B. (1998). The impact of welfare reform on adult literacy programs survey. Unpublished report.

Spivey, N.R. (1995). Reciprocal teaching of lecture comprehension and comprehension monitoring skills in college students. Dissertation Abstracts International Section A: Humanities and Social Sciences, 55(9-A).

Verville, A. (1995). What business needs from higher education. Educational Record, 76(4), 46-50.

Virtual Literature Circles: Message Board Discussions for Strengthening Literacy

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Abstract: This paper reports current findings from an ongoing research project that is an offshoot of a three-year, $155,000 "Best Practices in the Use of Technology" grant awarded to one of the co-authors, 1998-2000. The portion of the study reported here focuses on the cognitive complexity of student written responses in *Virtual Literature Circles* or electronic message boards utilized according to the structure of more traditional classroom literature circles. The ex-post-facto research question examined was: Did the cognitive complexity of student responses increase with continued use of Virtual Literature Circles? The findings of this simple study suggest that this research question is best answered in the negative, and shed light on existing higher-order literacy theory and on the effectiveness of Virtual Literature Circles in their current pilot state. Additionally, knowledge was gained in this study regarding new instrumentation being developed to help with the unique challenges of assessing student message board responses.

Background

Message Boards: Elementary students find message boards to be unique web-based forums to engage in asynchronous discussions with other students. While current communication tools emphasize chat, instant messaging, and desktop video conferencing for real-time communication, message boards allow individual teachers to engage students from different schools on the same topic while maintaining autonomy in how each teacher schedules the day in individual classrooms. This connectivity along with individual flexibility provides teachers with the opportunity to integrate computer technology and the Internet within the reading program.

Literature Circles: The instructional process named "Literature Circles" by Harvey Daniels has produced significant improvements in various literacy outcomes (Daniels, 1994). Literature Circles are a combination of reading for interest, cooperative learning, and independent study. Teachers introduce Literature Circles by providing various literature sets of up to five books each. From this variety of books, students personally select the book of greatest interest. Based on the book selected, students form study groups to read and discuss various aspects of the literature. Once each student in the group reads a preset number of pages, the group members come together for discussion. Within the group, cooperative learning roles are assigned to each student. Within these roles, students engage each other in discussion, with the goal being to understand the literature as deeply and meaningfully as possible. During student discussions, the teacher remains engaged by facilitating the conversation. The teacher's role is to intervene only when students get off the subject, cannot settle a dispute, or seem stymied by the task.

Virtual Literature Circles: Combining message boards with the basic principles associated with Literature Circles created the phrase "Virtual Literature Circles," coined by one of the co-authors.

Challenges in Assessment: Assessment of cognitive complexity of student message board responses is important in determining the effectiveness of Virtual Literature Circles. However, this sort of assessment is difficult. There are few measures of cognitive complexity available for rating written responses in traditional writing environments, especially for the shorter responses common to many elementary-aged students. This challenge is magnified in Virtual Literature Circles where student written responses are rather like unique hybrids between short contributions to group conversations and traditional written responses. In order to help address this challenge in their on-going Virtual Literature Circles grant and research projects, the authors are developing a simple cognitive complexity rating scale that it is hoped will continue to be refined, especially for use in the message-board environment. It is the earliest version of this rating scale that was used for the data analysis in this report, and will be explained in slightly more detail ahead.

Purpose of the Study, Research Question, Design, and Significance

This study was conducted to examine the depth of student reading and writing experiences in Virtual Literature Circles. An overall goal for the grant involved in this study was that students who participated in Virtual Literature Circles would be able to interact with other students at advanced (or at least advanc*ing*) levels of cognition and that message board response threads would maintain the intellectual continuity of the discussions, similar to a regular classroom discussion (or maybe even be enhanced by the asynchronous environment). This paper has been undertaken in order to *begin* to examine these issues and one research question was examined. This question was crafted ex-post-facto, but prior to formal data analysis and is as follows: "Did the cognitive complexity of the student responses increase with continued use of Virtual Literature Circles?"

This research question was examined by first dividing in half the multiple written responses chronologically posted by each student. Then the mean cognitive complexity of the first half of each student's responses was compared with the second half, looking for mean score gains from the first half to the second half, in order to demonstrate that the cognitive complexity of student responses increased with continued use of the Virtual Literature Circles.

This study is small in scope, but may be significant because the findings provide educators with a clearer understanding of the potential educational outcomes that may result from the fusion of two seemingly complimentary and potent educational tools: Literature Circles and Internet message boards. This is an important step in continuing to delineate the results of combining traditional literacy instruction with the technological tools of 21st Century.

Method

Subjects: During a two-week study in the spring of 2000, 125 third and fourth grade students from five rural schools in central Missouri, USA, participated in reading and discussing *Fig Pudding* by R. Fletcher. All students listened to the reading of the story or personally read it. The text was discussed on a chapter-by-chapter basis in Virtual Literature Circles formed through message boards maintained by one of the authors. The discussions from a random sampling of 25 participants make up the population for this study. Students made different numbers of responses, but all responses were collected and analyzed per student in chronological order in order to evaluate possible gains due to continued use of the Virtual Literature Circles.

Data Analysis: The message board discussions were quantitatively examined for levels of cognitive complexity with a simple 4-point scale developed by one of the authors. See Table 1.

Table 1: Cognitive Complexity Rating Scale

Reconstructive Responses		Constructive Responses	
1	2	3	4
Very Simplistic Text-Dependent Response	Text-Dependent Response	Text-Independent Response	Text-Independent Response with Complexity

This Cognitive Complexity Rating Scale was an attempt by one of the authors to create an instrument useful to the particular needs of assessing message board responses. They attempted to create an elementary message board rating scale somewhat akin to aspects of the McDaniel's Cognitive Complexity Scale (McDaniel & Foss, 1992, unpublished, as reported and published in Foss & Stensvold, 1994) by creating a scale from the core dichotomy of the hierarchy of annotation types presented in the Read-Encode-Annotate-Ponder (Eanet & Manzo, 1976) reading, writing, and thinking strategy. The two authors independently rated the student responses according to this new rating scale, and the means from these two sets of ratings were used for the student cognitive complexity scores. The traditional psychometric interrater reliability in this pilot study was only .37, considerably lower than would be desired or pcrhaps even considered acceptable. However, according to Sax (1997), in some situations, especially where limited testing options are available, or the costs required to increase reliability may be prohibitive, even tests yielding low reliabilities may be useful, especially when they are used in exploratory or probative research with groups, rather than individuals. Additionally, when analyzing how often the rater mean scores for individual students were within 1 point (on the 4-point scale) of each other, there was an interrater agreement of 88%. For these reasons, it seemed reasonable to the authors to continue to report these findings, as probative as they may be.

Each student received two cognitive complexity scores: a mean of the first half of their message board responses and a mean of the second half of their message board responses. The scores were calculated according to the 4-point scale described above. Each student's score was the average of the two raters' assessments. The research question was analyzed by comparing the group means between the first and second half of the individual student responses, in order to see if cognitive complexity increased with continued use of Virtual Literature Circles.

Results

The absolute differences between the group means of the first and second half of the student responses were quite small (Half 1 = 2.23 and Half 2 = 2.38). A paired-samples T-test was calculated between the group means of the first half and the second half of the student responses and did not show statistical significance at the .05 level. Additionally, using the effect size measure of Cohen's *d* (Cohen, 1977), the difference between the means was relatively small (Cohen's $d = .27$).

Discussion

The results presented abovc suggest that the research question of this study should be answered in the negative. It seems reasonable to claim that the cognitive complexity of the student responses did *not* meaningfully increase with continued use of Virtual Literature Circles. Although this finding is small, it is not without importance. It bears upon existing theory about cognitive complexity and higher-order literacy, and it sheds light on what we may hope to find as valuable in using electronic message boards. Additionally, knowledge has been gained regarding the rating instrument used in this study, allowing for future refinements.

The results of this study support the descriptive theories of higher-order literacy of Manzo and Manzo (1995) and Thomas (in process), most notably the argument that higher-order responses to text are often dispositional, or driven by orientation and will. It is embedded in this theory that higher-order responses to text, or responses of higher cognitive complexity, seem to be highly related to one's desire, tendency, or will to respond in such a way, and that this response tendency is not often impacted by external factors. Some have a tendency to respond in higher-order ways, and others do not. In this study it is apparent that the cognitive complexity of student responses was predictable between halves; the response tendencies of the students at the beginning of their involvement in the Virtual Literature Circles was very similar to their response tendencies throughout their continued involvement in the project. Therefore this study suggests that the students' tendency toward cognitive complexity seems embedded in the students themselves, more than in a stimulus provided by the message board environment.

This then, sheds important light on some of the educational dynamics that may be (or may not be) inherent in Virtual Literature Circles and other similar uses of electronic message boards. Since observation reveals that elementary students find message boards to be stimulating forums to engage in asynchronous discussions with other students, it is reasonable to hope that this would have an impact on helping to increase the cognitive complexity of written responses. It would be hoped that the more engaging and interactive the learning activity, the greater the increase in cognitive complexity. This, however, in these immediate findings, does not seem to be the case for Virtual Literature Circles, at least not in their present pilot-study form. It is possible that other, more finely tuned aspects of stimulating Virtual Literature Circle discussions are needed. It is possible, for instance, that focusing specifically on the types of question prompts used by the discussion board moderators may be the key to eliciting higher-levels of cognitive complexity, as may be suggested by the "Just-Ask-For-It" hypothesis of Manzo and Manzo (2001). Future studies of Virtual Literature Circles should perhaps focus on intervention strategies, perhaps as simple as question prompts, in order to find ways to help Virtual Literature Circles increase student cognitive complexity.

Finally, this study has led to the initial stages of developing a much needed instrument for assessing student responses in message board environments. Although the interrater reliability of the author-created rating instrument was low, it at least provided a starting point for attempting to meaningfully assess and analyze the hybrid response forms unique to message board environments. Future studies using this instrument in Virtual Literature Circles should help refine this instrument, potentially providing an important tool for use in the inevitable merger of the Internet environment with traditional literacy practices.

Summary

This study is small in scope, but still may be seen as important because the findings provide educators with more information to help with understanding the potential from the fusion of two seemingly complimentary and potent educational tools: Literature Circles and Internet message boards. This is an important step in continuing to delineate the results of combining traditional literacy instruction with the technological tools of 21st Century.

References

Cohen, J. (1977). *Statistical power analysis for the behavioral sciences*. New York: Academic Press.

Daniels, H. (1994). *Literature circles*. York, Maine: Stenhouse Publishing Company.

Eanet, M.G., & Manzo, A.V. (1976). REAP—A strategy for improving reading/writing/study skills. Journal of Reading, 19, 647-52.

Foss, M. L. & Stensvold, M. (1994). The modified ordered tree technique: A measure of organization in thinking. Journal of Research and Development in Education 28 (1), 22-30.

Manzo, A.V., & Manzo, U.C. (1995). *Teaching children to be literate: A reflective approach.* Fort Worth, TX: Harcourt Brace College Publishers.

Manzo, A.V., & Manzo, U.C. (2001). *Content area literacy: Fusing curriculum, culture & community in the wired classroom, 3rd ed.* New York: John Wiley & Sons, Inc.

Sax, G. (1997). *Principles of educational and psychological measurement and evaluation, 4th ed.* Belmont, CA: Wadsworth Publishing Company.

Thomas, M. M. (in process). *The relationships among reading ability, higher-order reading, proficient reader subtypes, reading maturity, and overall intellectual maturity.* Unpublished doctoral dissertation in process, University of Missouri-Kansas City.

Art Responding Through Technology (http://www.vtartt.org)

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Abstract

The VT ARTT Project (http://www.vtartt.org) is an online arts mentoring program now in its 5th year. Begun as an initiative of the WEB Project, ARTT has given Vermont art teachers and students access to training with state of the art web-based technology in order to improve student learning. It now continues beyond the Web Project's TICG funding as a non-profit with sister music project - VT MIDI (http://www.vtmidi.org) - serving students and teachers of Vermont through online arts mentoring, collaboration, and professional development in music composition and the visual arts.

Introduction

VT music teachers began sharing student work online in an effort to meet the new composition standards in the VT Frameworks and Standards. Those who had not been prepared to compose, or teach composition, felt that by enlisting the aid of professional composers they too could meet the new teaching standards. Vermont is a mountainous state, where severe weather can disrupt travel at any time during the school year. Teachers in districts unable to afford to bring composers into classes on a regular basis, or to take their students on out of school fieldtrips in order to visit the artists in their studios, looked to technology for a solution to these geographic and monetary barriers. Initially, student compositions from a few schools were shared via email with professional composers through a VT State seed grant. This trial met with success and in 1995 WEB Project support helped to redesign the process as a threaded discussion. Visual arts teachers receiving grants of multimedia equipment from the WEB Project grant saw the promise that this online critique process held and so developed the ARTT Project connecting visual arts students with artist/mentors. Self examination of ARTT practice reveals that the strength of the network lies in all participants - students, teachers, and mentors - learning and growing through conversations focused on student work in progress. Through ARTT a dynamic multi-generational, multi-media, and multi-cultural community has grown. A recent key note address at our annual meeting of MIDI/ARTT given by Frank Watson, a state leader in technology, pointed out the 5 stages of technology integration identified by ACOT (Apple Classroom of Tomorrow http://www.apple.com/education/planning/profdev/index4.html) in their 10 year study of technology implementation. That study delineated the stages as entry, adoption, adaptation, appropriation, and invention. Our speaker pointed out that MIDI/ARTT has gone through those initial stages and is now focused on inventing new uses of the technology to advance the primary goals of teaching and learning for students and educators. This paper will explore the professional and technological growth that three members - mentor, teacher, and student - have personally experienced through their work with ARTT.

Backgrounds

Graciela Monteagudo is an Argentinean puppeteer and performer with Bread and Puppet Theater of Vermont, she creates her own shows incorporating both larger-than-life-size and hand puppet formats. She has done extensive work in Arts in Education, conducting residencies in schools that culminate in big puppet shows with over a hundred children on stage. Her puppets are made out of recycled materials, sticks, paper mache and found objets. Graciela has studied Photoshop and web design through ARTT programs, and has begun exploring photography and digital imaging.

Marty Leech teaches a broad spectrum of visual media at Missisquoi Union High School in Swanton, located in an underserved region of northwestern Vermont. Marty began her work with ARTT as a full time art teacher - as a result of pursuing her interests in technology through ARTT Marty is now also teaching technology courses both at MUHS and at the graduate level. She has actively involved the integration of technology into the artroom.

Majken began her work with ARTT as a junior at MVUHS. She was interested in digital imaging and website design, and shared her work online for school assignments as well as original pieces created on her own. She has graduated now, and will be participating online as a mentor to other students.

Online practice

Mentor: When Graciela logs on to the ARTT site, she first clicks on its 3D section. She tries to comment on every new piece that has been recently uploaded. When time allows, Graciela visits the Digital Image area and then the Traditional Arts section. Although her main area of expertise is not in those two media, she offers critique on composition and other design aspects of the students work that are universal. New messages posted on the threads she commented on are automatically emailed to her. This allows her to respond in a timely manner to any new developments in those threads.

Throughout the three years of Graciela's involvement with the project, she has attended a number of conferences and retreats in which the online community spends 'real time' together. Her focus during these meetings is not only to learn techniques for manipulating digital images, but specifically to develop a dialogue with the art teachers, students and administrators who make up the online community. She has been interested in the process of learning how to ask the right questions and how to provide critique. She feels the ARTT site has improved greatly as students and teachers have learned how to ask for specific comments and feedback as opposed to asking general questions like: "Do you like my work." which are not conducive to in depth critique. The ARTT group has also learned that it is most helpful for a student to describe the process of their work as much as possible, clearly stating what they feel works and what they would like help with.

Teacher: Marty writes that one of the benefits for our rural student community is the wider view often offered online by artists, teachers, and students from all over the state.

Students initially learn the "language of art" (art terminology,
elements and principles of design) in the classroom, then hear it again
in the mentors comments on their work. This successfully reinforces what is being taught.

The online process offers another means of achieving specific Vt
standards from the VT Frameworks of Standards, i.e.:
"Artistic Proficiency, 5.28 Students use art forms to communicate,
showing the ability to define and solve artistic problems with insight,
reason, and technical proficiency."

Student: Majken describes herself as an 'internet nut' - ARTT was her introduction to message boarding online, since starting she has expanded her experience and is now the administrator of her own message board. She adds, "I post my digital artwork on the internet all the time on a few different message boards as well, just for fun. ^_^"

Benefits of commenting online

Mentor: Graciela says that students who live in rural areas and have artistic interests feel isolated in their communities. The online critique experience opens up a world of peers for these art students. The attention paid by a professional artist to their work can enhance the real value of their artwork, for themselves and for the community, and even for their fellow students.

Teacher: Marty thinks that one of the most important and dramatic effects to participation is student validation. Often students are so used to their teacher's comments or encouragement concerning their work that it does not have the same effect that a new individual's insight may have. The mentors also give a more in-depth critique than is possible in the busy classroom. They may take an entirely different skew on a project and offer interesting facts that may not have been considered before, such as an historic perspective in terms of past artists or eras.

The online experience addresses the issue of literacy: as students articulate their intent online, they must communicate effectively. The ensuing dialogue encourages growth in written expression and also addresses Communication Standard 1.16 "Artistic Dimensions" which encompasses skill development, reflection and critique (students improve upon products and performances through self reflection and outside critique, using detailed comments that employ the technical vocabulary of the art form), and making connections.

Student: Majken feels that posting artwork online opens up the forum to a wide variety of people. The wonderful thing about the internet is that it is available to everyone, everywhere. Artists and students from all over the world can converge on a website and share ideas and techniques, all for free, and without having to move from their chairs. It reminds her of the title of a CD by Jamiroquai, "Traveling Without Moving." She sees resources and personal connections as being a lot easier to come by now that the internet is in use.

Drawbacks

Mentor: Monteagudo feels that the online critique process works best when teachers in the schools have enough time to follow up on the students work and are able to post the images with the changes they have produced as a result of the dialogue with the mentors. However, it is a sad reality of the Vermont school system, that the art departments are under funded and teachers have on average 500 students visiting the art room for approximately 45 minutes of instruction each once a week. This makes it very difficult for students to actually post images of finished work. Without that final viewing of the student work, the mentors do not have a clear idea of how their feedback was received and processed by the student.

Teacher: Marty finds similarly, that the only drawback for her is lack of time, "I get so wrapped up in the day to day activities that time slips away and we don't get the cycle completed - a disappointment for all - the student, the teacher, and I think, mostly the mentor who has put a lot of time and thought into the response."

Student: Majken sees amother failing in internet communication, especially through message boards, as lacking an ability to get across what you mean right on the spot. She explains that "when you talk with someone face to face, you can understand what they're saying a little better based from inflections in their voice and such... not available on the internet, in a text-based forum."

Innovation

Mentor: One of the formats that Graciela sees has been highly successful was created by art teacher Jan Danzinger. Her students take a two week Art Challenge class, and are free to create what they choose to, in any available medium, with the express purpose of posting it online while in progress for mentor critique. Because the process is geared toward offering their work for the professional artists, the students have the time and the interest to post their final projects as well as images of second or third drafts. In this way, the mentors can clearly see how their critique affected the creative process and learn from that for future reference.

Another innovative use of the ARTT project that incorporates both online and real time critique is the after school format developed by Rebecca Raymond at Manchester Middle School. Rebecca enlisted the aid of parents and mentors to provide students with a regularly scheduled after school ARTT activity, built on the models already in place for after school intramural programs.

Teacher: Marty's participation in ARTT has led her school board and administration to approve a new art/technology course - Digital Imaging in which her students not only create traditional art work, but have an additional focus on technology as they learn to digitize, scan, and manipulate their work. She is finding this to be a wonderful opportunity for students to expand their knowledge of technology while developing their artistic abilities and appreciation.

Student: Majken feels that the online ARTT program is especially beneficial to students like herself, either who have just started, or are already well-versed in digital media. She sayd online message boards are ideal to share graphic artwork, as one gets to see the original product, and not a scanned copy.

Summary

VT ARTT's strengths are multiple. The technology has developed which allows us to easily share student artwork online through password protected discussion forums with attached files. In the early days of ARTT a two day training with follow-up instruction was needed just for participants to learn how to capture a still digital image from video using Premier. With the invention of the Sony Mavica camera - using a floppy disk to take stills that are immediately readable and uploadable - teachers were able to immediately move their ARTT time away from learning to use the technology toward teaching their students how to take effective images using the Mavica, and how to manipulate images using Photoshop.

The network has also grown stronger through action research conducted by WEB Project, VT MIDI, and ARTT participants has lead to practices that include new ideas about how to critique and receive critique online. ARTT recently added the prompt, "What Works Well?" in addition to a general request for description of the student work - this in response to mentors finding they were inadvertently hurting the students feelings by suggesting changes to parts of their work that the students actually felt were the most successful. The 'safe' environment, where students are able to post artwork and ask for help without fear of getting "dis-ed" is highly prized by the ARTT community, which self-monitors postings of questions and responses.

The Post-Respond-Reply cycle, first developed in VT MIDI under the WEB Project, is another key to making ARTT an effective tool for teachers and students. Original art is Posted while in progress, mentors Respond, and students Reply to the mentors' suggestions - posting new versions of their work as it progresses. When students have real questions that concern them about the art, mentors respond in a timely fashion and with specific suggestions, and students reply to let the mentors know how their advice was incorporated - or why it was not - the cycle is complete.

Of the original seven participants in ARTT, five are now trainers who provide workshops and assistance to the newest members of the network. Students like Majken have grown up with the project and continue to participate even after graduation or college takes them away from their community. Mentors such as Graciela have developed expertise in the new areas of digital imaging and web design which serve to enrich their personal art and provide new interests which they can share with their students.

Although the active work onsite is password protected, an example of an ARTT discussion can be seen at http://www.vtartt.org/jellyfish.html. Please contact Penny Nolte, ARTT Coordinator, for additional information.

Bibliography

http://www.vtartt.org
http://www.vtmidi.org
Tiplady, J., Tavalin, F., and Roozendall, L. 1999. ARTT Handbook, Art Responding through Technology. (Montpelier: WEB Project)

Taking Language Arts Instruction to the Applied Level Through Integration of Graphic Arts Technology

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Abstract: In order to meet a documented need for more advanced ELA (English Language Arts) electives, the secondary ELA teacher in an isolated rural school in southeastern Wyoming integrated graphic arts technology in a new course, *Literary Desktop Publishing*, to meet advanced students' needs. Students acquired graphic arts communication skills that are currently used in local businesses and met district ELA standards and benchmarks as well. The course is taught to motivate students to think for themselves, to solve problems, and to read, interpret and apply complex operations in computer applications. Other secondary schools in the district have adopted the course, as well.

Introduction

Prior to the inception of *Literary Desktop Publishing* as a district-approved ELA (English Language Arts) class in Albany County School District #1, many students at Rock River High School, one of three high schools in the district, would complete their required English courses by their junior year. Because of mandated Carnegie units, 8 semesters of attendance, these students would face 2-3 study halls in a row, then at least one "teacher's assistant" period to follow while they finished their required courses and electives their senior year. Their time was not being used prudently. Also, it was not possible to hire additional staff to offer more electives, because of Rock River School's unique position of being a K-12 facility under one roof. There is neither room nor time in the secondary and elementary schedules to add sections of secondary courses or specialized electives. Consequently, many of the students were asking to come to the ELA classroom during study halls to work on computers, since no other electives were available in the small, isolated rural school that explains the configuration of RRS. Various classes go as a group to the school's computer lab, which is comprised of one Mac Quadra and 16 Mac LC II's, but students are not allowed to go independently, because there is no on-going supervision in the lab. Additional staffing for on-going care, maintenance, and supervision in the lab is not a probable alternative.

The school serves as an "option" school for students in the district. For a variety of reasons, students can elect to attend Rock River School as a matter of choice. The end result is that RRS has a unique population of students with barely enough classes and services to accommodate the need created by the option of attendance. As one example, RRS has neither the facilities, equipment, nor staff to accommodate a football team. The real bottom line is that the student population of RRS is 40% identified as needing special services, and .06% as qualifying for National Honor Society membership.

The students are introduced to computer applications in their earlier ELA classes (20 percent of instructional time is allotted to computer applications, at the discretion of the ELA teacher). As a result of the exposure in earlier ELA classes, students were looking for electives where they could learn more computer applications and find places to use what they had learned. Over a period of several years, the

English teacher had spent any and all available resources to enhance the technology available in the English room. Because of a recent in-depth study of English language arts in the district, when additional monies are made available for the acquisition of texts, as well as the purchase of new technology, the English classroom is now equipped with a Macintosh G3, a G4, as well as an iMac. Because of the computers being housed in the classroom, a closer scrutiny can be maintained over the student use and (potential) abuse of the equipment. Therefore, supervision is not usually a problem.

Rationale

The impetus for developing, securing approval, and then teaching *Literary Desktop Publishing* at Rock River School for the last two years came from many sources. First of all, because of a close association with the University of Wyoming's Instructional Technology faculty and facility, the ELA teacher has had some first-hand experience with what is possible in an e-classroom that is run the way it should be run. Further, because of personal experiences at SITE 1999 and SITE 2000, it has become clear to the ELA teacher that a constructivist approach to applied communications skills might be just what is needed to breathe some new life into the common core of skills taught at RRS, especially considering the school's diverse, identified population.

The school is undergoing massive school-improvement reconstruction, due to district-wide and state-wide school reform initiatives. The *Literary Desktop Publishing* class was designed to be a part of those initiatives in a substantive way. The same old way of doing "things" simply does not work, any longer. According to the Sept., 1996 report of the National Commission on Teaching and American's future, What Matters Most: Teaching for America's Future, points to the close relationship between students' achievement and the knowledge, skills, and **practices** of the teacher. According to this report, what teachers know and can do is crucial to what students learn. Policy implication #3 from that text says: "School reform cannot succeed unless it focuses on creating the conditions—including the curriculum contexts—in which teachers can teach well." From student feedback obtained in the first two semesters that the *Literary Desktop Publishing* class has been offered, it seems as though students themselves feel that allowing self-paced progress through the various applications, to read what is necessary to make the applications work, is an extremely successful way of enabling students to learn. To teach the class requires a new definition for the term "teaching." The teacher allows the students to discover the secrets of the applications, and then apply those secrets to various projects.

Further, as Richmond said, "Effective use of technology to support teaching and learning across the curriculum has the potential to transform the learning environment." He points out that there is much experimental use of technology in classroom learning and many attempts to implement change are locally conceived. (Richmond, 2000, p.2) While some caution in new approaches is warranted, the ELA instructor felt inclined to follow the advice of Lee Iacocca who said, "Either lead, follow, or get out of my way." The adoption of the class by the other, larger high school in the district this year, is some validation for the course's approach to literary desktop publishing, meeting standards, and teaching the common core of skills and competencies in English/Language Arts.

Richmond stated, "Just as the industrial revolution created tools that served to off-load the physical labor previously carried by both 'man and beast,' the information revolution is creating tools that promise assistance with the intellectual dimensions of our lives. While the technologies of the industrial revolution were at times misused and misapplied, so, too, the technologies of the computer-generation must find their appropriate place within our communities and our schools. " (Richmond, 2000, pg.3) One of the most rewarding assessments of the class this year has been their articles on their perceptions of the utilization of all of the skills that they have learned. One student, who plans to be a lawyer, said that at first she couldn't think of how a lawyer might use the various applications. Then she thought some more, and the ideas for use of the applications by a lawyer just jumped into her head.

In his book Business at the Speed of Thought, Bill Gates, Microsoft CEO said, "The old saying 'knowledge is power' sometimes makes people hoard knowledge. They believe that knowledge hoarding makes them indispensable. Power comes not from knowledge kept but from knowledge shared. A company's values and reward system should reflect this idea." Another remarkable result of the introduction of *Literary Desktop Publishing* as a class for two years at RRS is the amount of sharing, collaboration, and actual talking among students that I have observed. If one student figures out one little quirk in a particular application, all I have to say to one struggling with the same piece is "Talk to Justin. I believe he got that piece figured out." Then the two students will talk to each other, even if they might not have under other circumstances. The magic works.

Background

The ELA teacher had tried for years to systematically incorporate technology integration in her classroom, and English students still felt as though they were not getting enough exposure to various applications of computer expertise. Even though in the regular ELA classes, 20% of the total instructional time was devoted to technology utilization and application, it became obvious that additional exposure was needed. However, as students advanced through Rock River High School, they had to be aware of the need to accumulate "English credits" for graduation. As they got older, they could not have periods allocated to classes that did not count toward graduation.

The idea and motivation for developing the course occurred from a "Schools-to-Careers" job-exploration externship experience in the summer of 2000, that the ELA instructor had. This experience enabled the instructor to explore the expectations of local businesses and industry for entry-level employees in graphic arts communication. Time was devoted to working at the local newspaper, observing a "high tech" graphic communications firm that does business world-wide, a local photo processing business, and a local printing firm.

The instructor discovered that the skills and competencies expected of newly-employed persons in the Laramie area are similar to those being taught in the *Literary Desktop Publishing* class. Although Laramie is certainly the largest population area close to RRS, and Laramie is the location of most available jobs for RRS graduates, it must be noted that "the Laramie area" is a small version of what is available in larger, metropolitan areas, such as Denver and the front range. But it was a start.

The course was taught one semester in 1999, and the second enrollment was finalized in the fall of 2000. For both sessions, students seemed eager to "get into" the class, and underclassmen frequently asked when they would be allowed in.

Because of the "Schools-to-Careers" initiative, and because of additional materials that were procured through a "Schools-to-Careers" mini-grant opportunity, the applied language arts class offered at RRS materialized. It hadn't been done before. The ELA curriculum in the district and certainly in RRS was the very traditional English 7, English 8, English 9, English 10 sequence, with Publications being offered as "junior" English and alternating electives being offered as "senior" English. The electives were standard: Drama as Literature, English literature, Research Writing, Play Productions, and Writer's Workshop. The concept of offering a new English class was pretty much unheard of. In the fall of 1999, 6 students enrolled in the new class, even given the possibility that the class would not be approved by all the various committees and supervisors who would have the opportunity to turn down the initiative. The first six enrolled, knowing that the class may turn into Research Writing, pending the decision of the approval process.

Implementation

In getting the course approved, the instructor related the computer technology components as well as the language arts components of the class to the district and state ELA standards of Reading, Writing, Listening, Speaking and Integration. It should be noted, that in Wyoming the implementation of standards-based instruction and assessment began, state-wide, with English language arts. For that reason, all new curriculum offerings for any school, need to be explicitly aligned to state and district standards. For *Literary Desktop Publishing*, that job was not difficult.

For example, the students are asked to read and comprehend what ever is necessary to make their particular computer application work. No chapters are assigned, but students are asked to read necessary directions to aid in their use of the computer applications. They are also asked to read trade magazines about current technologies and career opportunities involving computer technologies. They then give speeches about what they have discovered. They listen to demonstration CD's that teach the direct instruction of the applications. They listen to each other's speeches. They write a term paper and weekly reports based on their exploration of "techno-trends." They give a major speech to the entire school about their conception of current "techno-trends" They create an original piece of literature, and then they create the graphic to go with the original piece of literature. All of the language arts standards are covered.

After the course was written to align to district and state standards, the approval process was initiated. There were many hurdles to overcome.

It didn't take much convincing to get the principal on the side of the new course. He had to deal with the disciplinary situations that are a natural consequence of students having three study halls in a row. He supported the new class as a solution to a problem that he had to face. Also, the local Site-based council had first-hand experience, through interviews, about the students' views of three study halls in a row. The senior students told the Site-council members that three study halls in a row is a waste of time. Then, the council asked the question, "Why can't there be more electives offered for upper-level, advanced students."

On the district level, the going was not as easy. The business/computer department felt as though the course infringed on their "turf" of teaching computer applications. The ELA instructor was told she would get "no support" for a class that was out of the ELA domain, that she attempted to get approved out of the traditional time sequence, and that students had registered for before it was approved. Those concerns were answered in time. Once in district committee, the course again hit a roadblock. Concern was raised as to how to count it for English credit. The person who raised the concern had not seen the alignment document that specifically answers how it is an English course that meets English standards. The small concession of calling the course *Literary Desktop Publishing* was one solution to those concerns. If the title of the course included an ELA reference, then perhaps it would not be challenged by a college as not having sufficient rigor and relevance as an English course.

Design

Examples of computer applications used by the students in the class included Adobc PageMaker, PhotoShop, Premier, Bryce (a 3-D landscape application), Claris Home Page, and QuickTime VR. Other computer applications that the students were introduced to in the second year of the course included Painter 6, Design Your Own Home, After Effects, KPT 6 (a Photoshop plug-in), Typestyler 3, Textissimo and iMovie 2.

The specific utilization of these applications have included, but are not limited to: design of the cover of the 2001 Longhorn yearbook, design of the 2000 graduation multi-media event, design of the multi-media visual aid that was used to accompany on of the 2000 graduation speeches, design of the school web page, design of the school's first literary magazine, design of the 2000 graduation program.

Students also used multi-media applications such as Hyperstudio to incorporate text, images, and sound as part of the communication process. These tools challenged the students well beyond the usual word-processing and "word art" software used in most classes.

Students are given one week (4 days) to learn the application that they are assigned to. By Thursday of the week in question, they are expected to have a sample project to share with the class. On each Friday of the first quarter of the class, the students are asked to read a trade magazine article and then give a speech discussing the article's presentation of a technology innovation as well as their thoughts about the subject. During the second quarter, students are given time to work on the school's web page, updating what is necessary, securing permission for the addition of pictures of students, creating the next addition to the literary magazine on-line, and then they are given time to work on their term paper. The assignment is based on the predictions in the Daniel Burris book, *Technotrends.*

Conclusion

The *Literary Desktop Publishing* class now being taught at other high schools in the district, as well as at RRS, offers students advanced experiences with complicated computer technologies. It meets district and state ELA standards, and it offers the language arts curriculum in an attractive package that the students actually like. The class proves that English skills and competencies can be taught by using something other than college-prep, literary material. The college-prep literature is taught in the other electives, but for the diverse population of RRS, it seemed important to offer a class with an "applied" approach. Enrollment in the class is high, and students are giving up study hall after study hall to "buy more time" on the machines. Future adaptations to the curriculum might include the construction of professional level advertising for the yearbook, construction of professional level advertising for the newspaper, and the addition of graphic arts projects for the school, whenever possible. The magic works.

References

Abowb, Gregory D. et al. (2000). *Teaching and Learning as Multimedia Authoring: The Classroom 2000 Project.* Atlanta, GA : Georgia Institute of Technology.

Fryer, Wesley A. (2000). *Integrating Technology in the Classroom.* "Tools for Teks." Technology Workshops on Line.

Iacocca, Lee. (1988) *Talking Straight.* Bantam Books: Toronto.

National Commission on Teaching and America's Future. (1996) *What Matters Most: Teaching for America's Future.* Washington, DC.

Richmond, Ron. (2000). *Integration of Technology in the Classroom: An Instructional Perspective.* SSTA Research Center : Saskatchewan, Canada (pp. 1-36)

Use of Telecollaboration to Develop Authentic Learning Experiences for Teacher Candidates

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Abstract: Participation in a telecollaborative project with K-12 students can provide authentic learning experiences for teacher candidates that connect theory with practice. This paper discusses how teacher candidates in a preservice teacher education class moderated a K-12 global telecollaborative writing project. As a result of the candidates' participation as moderators, the candidates gained an understanding of how to integrate technology into the classroom to achieve curricular objectives and became motivated to use technology in their own teaching.

The Redesign of Teacher Education in the state of Maryland as well as the new National Council for the Accreditation of Teacher Education (NCATE) 2000 standards include expectations for increased field experiences for teacher candidates. These organizations, along with educational reformers, believe that teacher education currently lacks sufficient connection with practice. (Lampert & Ball, 1998). Teacher candidates need to connect theory with practice and the consensus is that this is best done in the K-12 classroom. There are difficulties, however, associated with increasing the number and length of field experiences for teacher candidates. It is often difficult to find a sufficient quantity of placements in schools to accommodate methods students as well as student interns. Likewise, it is difficult to find quality placements with teachers who practice new approaches to teaching (Lampert & Ball, 1998). Finally, in education program coursework it is often difficult to discuss field experiences with students who may not share common field experiences. For this reason, many educators are using technology to bring the K-12 classroom to teacher candidates via electronic case studies, in which students examine videos of K-12 classroom instruction. Education, like business, law, and medicine, is realizing the benefits of a case method approach. Electronic cases allow students to examine, reflect, and discuss mutual observations in a time-independent manner (Bonk & King, 1998).

Another approach to creating authentic experiences that connect theory and practice is to use technology to take teacher candidates into K-12 classrooms. With the use of email, listservs, digital cameras, and the World Wide Web, candidates can converse with K-12 teachers and can mentor K-12 students, providing teacher candidates with teaching and learning opportunities without their ever leaving the higher education classroom.

As more and more K-12 schools have become wired for access to the Internet and as their teachers have become more familiar with email, the number of telecollaborative projects which bring together K-12 classrooms from around the world for collaborative study has greatly increased. Teachers are recognizing that telecollaboration is an effective way to create authentic learning experiences for K-12 students as well as increase their motivation. Numerous studies have documented the positive impact of participation in telecollaborative projects on student achievement (Allen & Thompson, 1994; Bagley & Hunter, 1995; Cohen & Riel, 1989; Petko, 1991). Harris (1998) categorized the wide variety of online projects, encouraging K-12 teachers to match classroom objectives with the appropriate type of online project. Web sites such as I*EARN (www.iearn.org), Lightspan's Global School House (www.lightspan.com), and Kidlink (www.kidlink.org/KIDPROJ) offer hundreds of collaborative online projects from which to choose.

The Telecollaborative Study

This study used telecollaboration tools to connect teacher candidates, K-12 teachers, and K-12 students in a global writing project. The university students participated in the online project as moderators and in doing so learned about teaching writing as well as participating in telecollaborative projects. Activities such as the one in this study provide authentic learning experiences and teach candidates not only pedagogy but also technology skills. The intent of integrating technology into the curriculum is to promote the acquisition of technology skills as a secondary rather than a primary instructional objective (Kent & McNergney, 1999). Using technology as a tool for accomplishing other classroom goals gives the technology a purpose. This study examined the use of teacher candidates to moderate a K-12 telecollaborative project. The study posed two questions:

1. Does participation in a telecollaborative project yield understandings on the part of teacher candidates concerning how to integrate technology into the classroom?
2. Does participation in a telecollaborative project result in high levels of motivation on the part of teacher candidates concerning integrating technology into teaching?

Method

Background

Through Our Eyes (TOE) is a telecollaborative writing project run annually on the Kidproj listserv and moderated by the author of this study. Its purpose is to involve K-12 students in the descriptive writing process. K-12 classes register to participate via an email registration that is distributed through various listservs and websites. In the project, K-12 classes choose a location in their area to describe, plan a field trip, complete pre-writing on location, and write collaboratively to create one final descriptive essay. Final essays are submitted to all participants via a listserv and posted on the TOE web site for all to see. The results of each year's project can be seen on the TOE web site (www.kidlink.org/kidproj/eyes00). During the Fall 1999 project, 28 classes from 7 countries participated in the project.

Subjects

This study was conducted by the author in the capacity of instructor to nineteen teacher candidates in the EDUC 471 *Computers in Education* class at Salisbury State University. Some candidates in the class had not yet taken methods courses, while others had already completed their student teaching. Everyone, however, was a beginner in understanding how to integrate technology into teaching and learning. For the past four years, the instructor had moderated the TOE project, sharing the results with candidates as an example of a telecollaborative project. During the Fall 1999 semester, however, the instructor turned the project over to the candidates to moderate, guiding the students through the necessary steps.

Data Collection and Analysis

Prior to the beginning of the course, the instructor posted the call for participation in the TOE project on two listservs and one web site and began to accept registrations. The project design, required activities, timeline, and web site were already established before the first day of the class. When the *Computers in Education* course began, each student in the university class was assigned two K-12 classes to monitor through the project. The candidates sent letters of introduction, announced assignments and due dates, monitored their assigned class' progress through the project, and responded to work submitted by K-12 students with praise and reflection. Communication was maintained through a listserv and email. In addition, all work was posted on web pages along with photos of participants and places for all to see. During the study, classroom discussions at the university identified concerns and techniques for communicating with K-12 participants and maintaining K-12 student enthusiasm for the project. In addition, the instructor monitored the messages sent from preservice moderators to their assigned K-12 schools as they appeared on the listserv. Teacher candidates maintained journals, documenting correspondence sent and received and their reflections on the project.

Moderation of the project

Whenever someone moderates a telecollaborative project, one of the primary objectives is to facilitate the project in such a way that all participants who register to participate go on to successfully complete the project. This is particularly important for the K-12 students who are registered for the project. It can be very disappointing for K-12 students to begin a project with classes from another country, build classroom enthusiasm, begin activities for sharing with participants, and then never hear from them again. While the instructor had been moderating the project for several years, there was some concern that candidates, who were themselves novices in use of technology, could not successfully maintain communication and encourage participants to remain throughout the four months of the project. However, the candidates moderated the project quite successfully. They embraced their roles as moderators and sent directions and encouragement along the way enabling their classes to complete the project. Several of the teacher candidates' comments appear below and serve to document their role as successful moderators of the TOE project. After teacher candidates and K-12 classes introduced themselves, the K-12 students were required to select a place to describe. Teacher candidate moderators sent messages to encourage them to select a place. One candidate wrote to a class in Italy:

> I was wondering if your class has chosen a site for your descriptive essay yet? Since I am of Italian heritage, I am very interested in learning more about Italy and your culture. Many of my family members have been to Italy and have told me how beautiful everything is. They have even shown me pictures of all the beautiful places and sites. I am very excited to find out what site you are going to write about. I look forward to hearing from you soon.

After selecting a place to describe, K-12 students were encouraged to take a field trip to the site for the purpose of completing prewriting activities. In reminding a class in North Dakota to share their prewriting, one candidate wrote:

> I was so happy to see your introduction on TOE this weekend. You sound as if you are very active in many different subjects. I look forward to reading about the place you have picked out for the project. Your prewriting on that place can be in the form of brainstorming a list of descriptive words, a paragraph, a few sentences to get your started, etc... I look forward to seeing your work on TOE soon.

Another student, also encouraging the class in Iowa to complete prewriting activities, wrote:

> It was great to hear from you guys. I've never seen a real prairie before so I can't wait to hear more details about your topic.... If you haven't taken time to go outdoors and write about the prairie you may want to. It's amazing what you notice when you sit there and focus on something more than usual. You may find more details about it you would want to include in your brainstorming and prewriting. Hope to hear from you soon.

Yet another candidate wrote to encourage students in New York to take a field trip to complete prewriting activities:

> You are all ahead of the game since you have a place picked out to describe. I'm sure the pizza place will be lots of fun to visit as a class and describe. Sometime this month you should visit the place and write a list of descriptive words, nouns, verbs and adjectives. I will be waiting to read your list. I have a feeling it will make me hungry. Remember to write if you have any questions. Have fun.

The teacher candidates saw their role as that of teacher and easily transformed that into email messages. They guided their assigned classes through the project enabling them to complete the project. Of the 36 K-12 classes initially registered to participate in the project, 28 remained in the project and submitted a final descriptive essay. When a school did drop out of the project, the university students were very disappointed and voiced their disappointment in their reflective journals. One student wrote:

I was very disappointed that my class from Spain did not complete the project. They were off to such a wonderful start and then they just lost touch.

The candidates not only successfully moderated the project but also wanted more responsibility. Once K-12 classes registered for the project and were given the timetable for activities, there was not much to do as moderators except send weekly reminders of activities due (class introductions, location to describe, prewriting, final essay) and responses of encouragement for work sent. The candidates, however, wanted much larger roles as moderators and more opportunities for exchange of ideas. One student wrote:

> I was most interested in communicating with the students and teachers, which I didn't get to do enough. I realize that everyone is busy, but I would have liked to be a little more personal with my schools.

Along the same lines, another candidate wrote:

> The only thing that disappointed me was that my classes needed very little guidance. I was sort of hoping that I would have more communication with them, but I think that this was a false impression I had of what my job would be from the start. Overall I would love to do this again, and maybe when I start teaching in a year or so I could even participate in TOE.

Findings

Research Question #1

As a result of participating in the TOE project, these teacher candidates understood how to integrate technology into the classroom to accomplish a variety of curricular objectives in core content areas. This understanding was voiced in their reflective journals. One student wrote:

> *Through Our Eyes* is a great way to get students interested in writing, which is definitely hard to do in many classes. Descriptive writing can also prove to be challenging for many children, and this encourages descriptions of places and then using those descriptions to form an essay. A terrific way to put all the steps together is in this manner.

Another candidate wrote:

> I wish I had the opportunity to learn about places all around the world from telecollaboration rather than from a textbook. I know my learning would have been a lot more meaningful for me if I had the opportunity for telecollaboration in grade school.

Another teacher candidate wrote:

> The students benefit by using their critical thinking, cooperative, language and writing skills. They also see the world around them through the eyes of others. By sharing their vision with each other, each is given the opportunity to magically travel the globe to near and distant places. Places that were simply a picture in a book or a graphic on a web site suddenly come alive as if you were right there. The ability to learn from others is a benefit worth wonders.

Another candidate wrote:

> I would want to use a telecollaboration such as TOE because TOE can be used across the curriculum. In Math class the students could calculate how far away the collaborating schools are from our school, the ratio of boys to girls, or ratio of students to our students. In Science we may compare the collaborating schools' climate or landscape to our climate or landscape. In the Social Studies class I would discuss with my students the different events that have shaped the area where our participating school is located. I could also have my students plan a make believe trip to the area where our participating school is located. Finally, in English we could use our

> information to create a very descriptive essay. This is why I feel that telecollaboration can be used across a wide range of subject areas.

These candidates linked technology use in the classroom to achieving curricular objectives using constructivist approaches, demonstrating an understanding of how technology can be used in the classroom to support student achievement.

Research Question #2:

As a result of participating in the TOE project, teacher candidates expressed motivation to integrate technology into the classroom. The goal of including the TOE project in the *Computers in Education* course was not only to teach candidates how to use technology but also to motivate them to want to use technology. Fortunately, the teacher candidates' comments in their journals revealed a desire to participate in telecollaboration with their own classrooms. One candidate's comments are typical of those voiced by the class:

> I really enjoyed every aspect of this project. When I have my own class I will be sure to incorporate some use of telecommunication in the curriculum.

Conclusions

From the success of the TOE project itself and the comments from teacher candidate moderators, it is clear that candidates benefit from moderating a telecollaborative project. The results of the TOE project can be seen on the project web site, which includes K-12 participant introductions, pre-writing, final essays, and numerous graphics of K-12 students on location. Participation in the TOE project immersed the candidates in an authentic project and provided them with first hand experiences, which integrated technology into the classroom. This experience enabled them to develop an understanding of how technology can be integrated into the curriculum to accomplish curricular objectives. Finally, the experience left the candidates wanting a more active role in the project and fostered motivation to use technology in their own future classrooms. These teacher candidates are likely to be tomorrow's K-12 teacher participants in telecollaborative projects.

Implications for Practice

The purpose of this study was not only to determine if teacher candidates benefit from moderating a telecollaborative project but also to provide guidance for those who may be interested in trying telecollaboration. In their journals and in classroom discussion of the project, candidates offered a number of observations about ways to improve the telecollaborative experience. The following suggestions discuss the practical implications of the study.

First, teacher candidates seek a greater role as moderators. For the purposes of this project, which provides four months for the participants to complete the project, it is important that the participants be registered to participate prior to the beginning of class. For shorter projects, the instructor could allow the candidates to be involved in designing the project and announcing the project on several lists.

Second, the candidates need guidance concerning their roles as moderators. Initial discussion should occur regarding the tone of messages sent and instructors are advised to read correspondence prior to being sent to K-12 classes. In reading one student's journal which included messages sent, it was discovered that the student seemed to be reprimanding a teacher for being tardy in submitting assignments. Needless to say, the teacher dropped out of the project.

Next, moderators need a way to track progress of their assigned schools. This can be accomplished in several ways. First, to keep everyone in the communication loop, subscribe all participants and moderators to a listserv. There are several free services available on the web. One that has been used successfully at Salisbury State University is Nicenet (www.niccnet.org) Next, provide student moderators with a list of activities that K-

12 schools need to accomplish. Then create a table so that the preservice moderators check off each activity as their assigned schools complete it. This will facilitate class discussion regarding where all schools are in the project.

Finally, the instructor needs to maintain contact with the K-12 teachers to discuss their needs and the success of student moderators.

Suggestions for Further Research

Schools of teacher education are encouraged to explore the use of telecollaboration as a way to providc teacher candidates with authentic field experiences. While this study has explored the possibility of using telecollaboration, other researchers will hopefully identify additional ways to allow candidates to be even more involved in the design and implementation of telecollaborative projects. Further research could explore the impact of this tool in the higher education classroom.

References:

Allen, G., & Thompson, A. (1994). Analysis of the effect of networking on computer-assisted collaborative writing in a fifth grade classroom. Paper presented at the annual meeting of the American Educational Research Association. ERIC Document Reproduction Service No. ED 373 777.

Bagley, C., & Hunter B. (1995). Global telecommunications projects: Reading and writing with the world. ERIC Document Reproduction Service No. ED 387 081.

Bonk, C., & King, K. (1998). *Electronic collaborators.* New Jersey: Lawrence Erlbaum Associates.

Cohen, M., & Riel, M. (1989). The effect of distant audience on students' writing. American *Educational Research Journal*, 26, 143-159.

Harris, J. (1998). *Virtual Architecture: Designing and directing curriculum-based telecomputing.* ISTE. Eugene, Oregon.

Kent, T., & McNergney, R. (1999). *Will technology really change education*? California: Corwin Press.

Lampert, M., & Ball, D. (1998). *Teaching, Multimedia and Mathematics.* New York: Teachers College Press.

NCATE Standards Page. 2000. <http://www.ncate.org/standard/m stds.htm>. 27 November.

Petko, M. (1991). Using audience awareness to stimulate interest in writing effectively. ERIC Document Reproduction Service No. ED 329 961.

Getting Real in TESP: Operational Technologies at Business English Classes

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A theory must be tempered with reality.
JAWAHARLAL NEHRU

... Education is life itself.
JOHN DEWEY

Abstract:

Introduction

In the age of information, a university graduate has to be competent not only in his major field. The world business community, traditionally communicating in English as *lingua franca* and well advanced in using modern technologies to manipulate relevant information, requires both language proficiency and technology skills as mandatory for a business executive from outside the English-speaking world. This implies the broad-scale integration of modern information technologies in all courses of any university program. ESP (English for Specific Purposes) courses should, therefore, be based on the wide use of language-learning technologies as well as operational software employed in the field. Using the English-based operational software at Business English classes is the efficient way to develop the students' command of the language as well as that of technology, thus raising the quality of higher education.

The paper presents the basic ideas for integrating operational technology in the Business English course and discusses the necessary competencies of an ESP (English for Specific Purposes) practitioner.

Content-based ESP Teaching and Technology in ESP Courses

Content-based ESP Teaching and Specific Competencies of an ESP Practitioner

Apart from the language-based approach in Teaching English for Specific Purposes (TESP), the content-based approach (Dudley-Evans & StJohn 1998) has been widely spread. It appears to be more efficient than the language-based approach: instead of dismembering the language structure for no obvious reason, students are encouraged and motivated to use the language for manipulating professionally valid and valuable information. Thus, the conditions are produced for engaging students in " in experiencing, creating, and solving real problems" (Lieberman 1995), motivating the use of professionally oriented language which is vital for its internalization (Berryman & Bailey 1992; Zahorik 1995)

Obviously, content-based TESP requires that an ESP practitioner have some specific competencies. These include the knowledge of the specialty basics (Master 1997), specific language, and field routine: "...Text comprehension, a necessary precondition for the use of the text in the LSP [Language for Specific Purposes – *T.S.*] classroom,.. is facilitated by specialist knowledge and hindered by its absence" (Ferguson 1997). The field routine includes also the information technologies involved in handling information. Thus, an ESP instructor has to know, among other things, what technologies are used in the profession taught to his/her students. The use of operational technologies for professionally relevant problem solving offers the unlimited reserves for better ESP courses and, finally, quality education on the university level.

Technology in ESP Courses

P.Delcloque (1997) pointed out that foreign language teaching had always been on the forefront of using technologies. Ironically, as technologies become more sophisticated, they are less used in language teaching (op. cit.) - partly on the account of their inaccessibility, but mostly because of ESP practitioners' *technofear* (op. cit.) and their lack of specific competencies: having no idea of the specialty basics, they can - and are not scared to - use only the simplest of educational technologies (e.g., computer drills). Only a few technologically advanced instructors use multimedia in their language courses.

However, there is another class of technologies used in specialist training and thus considered educational. If instructional technologies are used for language learning facilitation, operational technologies, employed for information handling in the field, should be involved in ESP courses on the stage of communication practice. Their enormous educational potential is completely ignored by the Humanities faculty, though, if creatively used, they can significantly add up to instructional technologies' educational impact.

Operational Technologies in Business English Courses

Operational technologies can be integrated in Business English courses as the tools for manipulating professionally relevant information (obtaining, organizing, generating, and disseminating various data) that serves as the information base of further communication. "Requiring the learner to generate materials is a powerful technique" (Hammond 1989); using the learner-generated materials for further communication is another successful practice for facilitating language acquisition. This provides learners with the information to communicate and motivates the communication that helps internalize the knowledge of the language structure (*declarative knowledge*) and the skills of using it in professional settings (*procedural knowledge*).

The integration of operational technologies into Business English (BE) courses implies the use of software and hardware utilized in the business realm for solving professional problems. The software used can be classified as document-makers, information managers, information sources, presentations, and communication programs. The first include business card makers, business planners, marketing campaign builders, resume makers, etc. Information managers are the tools for manipulating various types of information; they comprise daily organizers, financial managers, project managers, etc. Finally, on top of the Internet, there are such information sources as small business packs, Incorporate™, Infobusiness Information USA & Government Giveways™, and others. Business presentations in the format of computer slide shows are made with Microsoft PowerPoint™ or Corel Presentations™; this group also embraces Web page makers. Communication software includes e-mail, listserv, electronic billboards, etc. The types of operational technologies to be used in Business English courses are presented on Fig. 1:

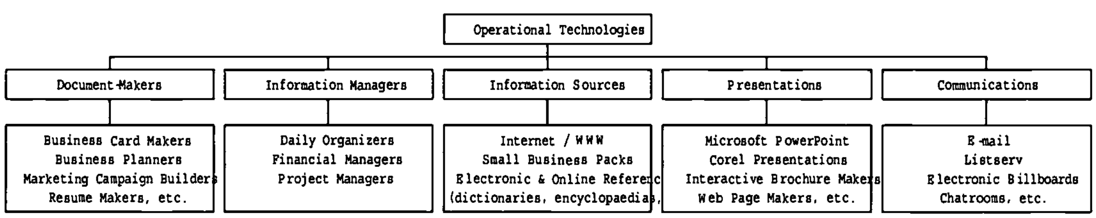

Figure 1. Operational technologies in Business English courses.

Integrated into Business English courses, operational software is used in class as well as out of class, e.g. for students' projects and for preparing materials and handouts for role play, thus making the courses, in general, more functional and the classes, in particular, more authentic. "Requiring the learner to generate materials is a powerful technique" (Hammond 1989); using the learner-generated materials for further communication is another successful practice for facilitating language acquisition. This provides learners with the information to communicate and motivates the communication that helps internalize the knowledge of the language structure (*declarative knowledge*) and the skills of using it in professional settings (*procedural knowledge*).

Office equipment can also be integrated in BE courses for modeling business communication. It includes the tools for processing and multiplying documents to be used as handouts as well as the means of communication, e.g. telephone, fax machine, and modem. In some cases, video and audio can be involved in preparing presentations as well as multimedia.

In the original ESP course developed by the author for students of Economics, Management, and Finance at Northern International University, modern technologies are used as the integral part of the program:

Educational Technologies	Software	Purpose
Instructional technologies	Computer language drills	Language structure learning facilitation
	Computer slide presentations	New language material presentation
	Audio	Discourse model presentation
	Video	Communication model presentation
	Language-learning multimedia	Situational language acquisition facilitation
Operational technologies	Computer slide presentations	Professionally relevant information presentation Students' presentations
	Document makers	Handout preparation Information dissemination Assessment
	Sources of information	Informational background for students' presentations and role play
	Communications	Information dissemination Discussions Assessment
	Information managers	Handout preparation Informational background for role play

Table 1. Educational Technologies at ESP classes.

This broad use of various technologies in the BE course not only improves the classes, bringing them closer to life, but also requires some specific skills from the ESP instructor.

Course-specified Competencies of a Business English Instructor

On top of the general competencies that include the language command, the knowledge of teaching methodology, cross-cultural techniques, the skills of classroom management (Johnstone 1997; Master 1997), and educational technologies, an ESP practitioner delivering a particular course, e.g. Business English, has to develop some specific competencies, based on the knowledge which is necessary for successfully arranging and managing classes in the professionally situated discourse. Educators (e.g. Ferguson 1997) define this knowledge as specialist knowledge, or «knowledge of the subject matter or profession of the students taught» (op. cit.).

However, this definition is not complete because it implies only the declarative part of specialist knowledge, completely ignoring its procedural part. The latter includes the routines of the profession and tools/technologies used for solving professional problems. So the course-specified competencies of an ESP practitioner comprise not only the basics of the specialty theory, but also their practical implementation through the use of operational technologies. Therefore, a Business English instructor should be competent in both business basics and technologies used in everyday business practice. Only then he/she can be reasonable and responsible in selecting the operational technologies to supplement his/her course and make it professionally relevant.

Operational Technologies in ESP Courses: Implementation Experiences

The framework used for successful implementation of operational technologies in professionally oriented language courses is presented below:

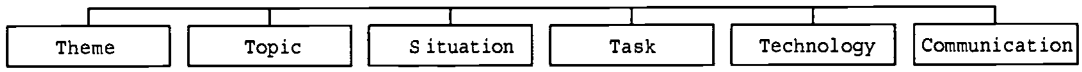

Figure 2. Operational technologies in Business English: implementation framework.

Starting with some basics ("Basic Business Concepts, " "All About Companies," etc.), the author's Business English course is structured according to five principal activities within the sphere of business:

1. Management
2. Marketing
3. Accounting
4. Finance
5. Computer and Data Processing.

Each theme comprises several topics, including various situations that are typical for professionally set communication. Considering the formats of information presented as the communication base, the instructor selects the technologies that facilitate manipulating this information. For instancc, thc "All About Companies" unit includes such topics as:

1. Company structure
2. Company profile
3. Jobs and responsibilities
4. Company hierarchy
5. Formal introductions, etc.

Considering the most typical situations and developing relevant tasks, the instructor comes to the following:

Topic	Situation	Task	Software
Company structure	Telling a new employee about the company	Compile the organization chart presenting the company structure / the board	Corel WordPerfect™ Microsoft Office™ Microsoft Organization Chart™
Company profile	Company presentation at an international business conference	Produce a computer slide presentation about the company	Corel Presentations™ Microsoft PowerPoint™
Jobs and responsibilities; company hierarchy	Recruiting new employees	Compile a *Wanted* ad	Corel WordPerfect™ Microsoft Office™ Adobe PageMaker™
	Job interview	Generate a job application form Generate a job interview questionnaire Write a resume	Corel WordPerfect™ Microsoft Office™ Adobe PageMaker™ ResuMail It!™
Formal introductions	Meeting a business partner Meeting people at an international business conference	Prepare a business card	Corel WordPerfect™ Various business card makers

Table 2. Technology-enhanced Business English course: contents and operational technologies.

This framework, based on the Six T's approach (see Master 1997), helps integrate renowned technologies and technological innovations on any stage of any ESP course.

Conclusion

Integrating operational technologies into Business English courses is best performed through using the Six T's approach postulated by Stoller and Grabe (Master 1997). It implies structuring the course content from themes and topics to communicative situations and tasks as the assignments to be done by students. These should apparently include the seventh T - technology, both instructional and operational. The use of operational technology in BE courses would make them more authentic and successful and, finally, would help improve the quality of higher education, in general, which is vital in the age of information.

Acknowledgements

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References

Berryman, S., & Bailey, T. (1992). The double helix of education and the economy. New York: Institute of Education, Teachers College, Columbia University..

Delcloque, P. (1997). LSP teacher training in the use of technology: Overcoming technofear. R.Howard & G.Brown (Eds.), *Teacher education for Language for Specific Purposes*. Clevedon; Philadelphia; Toronto; Adelaide; Johannesburg: Multilingual Matters, Ltd. 103-114.

Dudley-Evans, T., & StJohn, M.J. (1998). *Developments in ESP: A multi-disciplinary approach*. Cambridge, UK; New York; Melbourne: Cambridge University Press.

Ferguson, G. (1997). Teacher education and ESP: The role of specialized knowledge. R.Howard & G.Brown (Eds.), *Teacher education for Language for Specific Purposes*. Clevedon; Philadelphia; Toronto; Adelaide; Johannesburg: Multilingual Matters, Ltd. 80-89.

Lieberman, A. (1995). Practices that support teacher development. *Phi Delta Kappan* 76, 8: 591-596.

Master, P. (1997). ESP teacher education in the USA. R.Howard & G.Brown (Eds.), *Teacher education for Language for Specific Purposes*. Clevedon; Philadelphia; Toronto; Adelaide; Johannesburg: Multilingual Matters, Ltd. 103-114.

Zahorik, J.A. (1995). 1995. *Constructivist teaching*. Bloomington, IN: Phi Delta Kappa Educational Foundation.

Movies in English for Specific Purposes: From Entertainment to Excellence

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Abstract:

The quality education today is associated with the operational command of English as the vehicular language of the world business community. Successful teaching English for Specific Purposes (ESP) involves the use of technology-enhanced language-learning materials that present the authentic model of discourse as well as its genuine professionally determined background. Video as inexpensive and widely spread presentation technology has both advantages and drawbacks; an ESP practitioner has to employ the former so that they compensate the latter . The paper introduces an original video-based ESP material and the framework for its implementation in a university-level Business English course.

Introduction

Being instrumental within the global business community, English has become an integral part of quality education in the post-industrial society. In the format of English for Specific Purposes (ESP), it has taken a firm position in the university curricula outside the English-speaking world: «...Throughout the world there are similar trends towards increasing academic and professional stability and expanding markets, with the consequent need for specialized language skills» (Howard & Brown 1997). Consequently, «Special-purpose courses geared towards students' professional interests have become popular» (Scinicariello 1997). However, the ESP practitioners encounter the problem of teaching/learning materials scarcity or imperfection: the materials available either do not meet the needs of a specific ESP course or appear too general for it and thus can be used in fragments only on the early stages of specialized language learning. The observed trend to the greater variety of ESP courses is followed by their greater specialization. So, what we need today is the set of linguistically authentic, professionally relevant ESP course materials with the enormous matemagenic (Rothkopf 1979; Laurillard 1993) potential, to be used in class and in self-studies.

The increasing demand for constructivist ESP-learning materials, both informative and motivating, has only been partly satisfied. Obviously, the technology-based learning materials used in teaching Business English are rather scarce and limited to a few computer programs on top of numerous audio and several video courses. This reflects the troublesome tendency in teaching English as a Second Language in general, pointed out by P.Delcloque (1997): "Linguists... have made full use of audio, little use of video, and have been very slow to adapt to the computer revolution."

Thus, only a small portion of the immense potential of video has been employed in language learning. The paper presents the work that aims in increasing the use of video in TESL/TESP and is an example of incorporating video materials in Business English university-level courses.

Video in TESP

Whatever a course is, technology is engaged in language learning to serve the general purpose of raising the language learning quality. The reasonable and well-grounded use of technology on the constant basis enhances the cognitive power of the course. However, it is vital to realize that «it is not the technology itself but rather the way in which teachers use the technology that has the potential to change education» (Carr et al. 1998).

Considered basically as a presentation technology modeling the language discourse (Dudley-Evans & StJohn 1998), video presents the language use patterns as well as the genuine communication background. Its undoubtful advantages are its affordability and accessibility: there hardly is a school where a video class would be impossible. Besides, video allows multiple repetitions of the presentation in a user-friendly mode, which also adds to its educational value, as well as its self-studying capacity. However, in terms of ESP teaching, it suffers several major drawbacks, such as weak feedback, which certainly has to be compensated by the teacher in class.

According to M.Bush (1997), when trying to implement any technologically enhanced material in language teaching and learning, an ESP practitioner should consider the language model used in it, and develop the appropriate instructional design and system implementation strategies. In an ESP course based on the 'technology-as-a-supplement' model, the instructor has to consider both real and carrying content (Dudley-Evans & StJohn 1998), i.e. the language used and professionally valid context, presented in videos.

In the specially prepared language-learning video courses, the language used is carefully selected and to some extent simplified; therefore, the discourse presented there is but a blueprint of real-life communication. This makes it applicable on the primary stage of the learning process, as an introduction of the language material and a model of its use. Mastering the language command with time, students gradually come to need more authentic examples, containing more sophisticated language, and more life-like communicative situations. These can be found in movies.

Movies in TESP

As a source of the real-life discourse, movies are characterized by the authenticity of discourse and communication background. However, the general fault of all video materials, their weakened feedback, requires the additional efforts from the instructor aimed in stimulating the students' cognition and in motivating communication in class. The format of video implementation is of primary importance here.

In ESP courses, such as Business English, movies can be used in the following formats:

1) complete movie presentation (e.g., *Take A Letter, Darling* and *Wall Street)* with the proper introduction and feedback
2) movie fragment (e.g. job interview in *The Firm)*, actively elaborated at the class
3) original video program, containing several movie fragments, comments, and feedback, and
4) a part of language-learning multimedia software, supplied with interactive assignments.

The first two formats are no news for an ESP practitioner and have been widely used, though the fault of the complete movie presentation is the feedback limited to classroom discussions and essay writing. The second two are less common because they involve more creativity, time, and technological competence from a teacher. However, when developed by a practicing educator in the context of a certain ESP course, they may be more successful than the renowned professionally prepared language-learning materials.

When producing an original language-learning movie-based video program, the instructor has to keep in mind the following faults of video as a teaching aid:

1) technically complicated and time-consuming revisions of the fragment;
2) background noises, e.g. city transport in the street, etc.
3) zero interactivity of the material.

Considering these drawbacks realistically, the ESP practitioner has to find a counterbalance for each. To waste no time for rewinding in class, he/she should copy the clip on the same cassette as many times as it is implied by the lesson format. Careful selection of episodes practically eliminates the background noise interference which can also be reduced technically or, much easier, through the use of the printed script in the workbook. But the zero interactivity problem appears the most difficult because it requires specifically designed language-learning materials; otherwise it takes a lot of creativity, time, and effort from the instructor to compensate it.

Each unit of professionally developed video courses contains the special feedback section. For instance, in the world-renowned *Family Album, U.S.A.* video course, an Activities section closes each of the three acts making an episode. However, the tasks offered are hardly interactive in terms of language learning, where interactivity implies the collaboration between the communicants and the context of situation. «Students achieve facility in *using* a language when their attention is focused on conveying and receiving authentic messages (that is, messages that contain information of interest to speaker and listener in a situation of importance to both). That is *interaction*...» (Rivers 1987). When using a movie as a basic discourse pattern for an ESL/ESP class, the instructor has to arrange the interaction part.

So, a quality video-based language–learning material would *be linguistically and culturally authentic, informative, motivating*, and *interactive*. Movies present the real-life communication in genuine settings; they supply language learners with valuable and veritable information on language and culture; they are intrinsically motivating because of the intricate; and, like any video they possess the zero interactivity potential. This determines the need to involve additional technologies that can provide the needed interactivity. One of these technologies is multimedia that combines the video and audio input with interactive feedback.

Mergers and Acquisitions: Video-based Business English Materials

The original video-based materials developed by the author for her Business English course taught at the Northern International University include:

1) the *Mergers and Acquisitions* video program
2) a corresponding module of the *Wiser Educator*™ multimedia software.

The *Mergers and Acquisitions* video program is based on seven fragments of the 1987 20th Century Fox movie, *The Working Girl*. The fragments present an acquisition project from the idea to the completion and thus go with Unit 2 («Forms of Business Organization») of the content-based Business English course. Each fragment has been preceded with the video introduction, including comments on language and culture. The program was compiled and edited by the author with the use of the *Avid Cinema*™ video editing software and is used as the *presentation* of both real (language) and carrying (professionally determined communication context) content.

The *Mergers and Acquisitions* multimedia module has been produced on the author's platform of the *Wiser Educator*™ multimedia authoring software, which allows to import video and audio clips and smart-link them with the text. It also helps generate exercises in five basic formats, thus providing multiple repetitions and revisions of each clip. The module is designed as the *additional language training set.*

The *Mergers and Acquisitions* Video

The *Mergers and Acquisitions* program is supplied with the workbook that, on top of the video fragment scripts and comments, contains the extensive reading material and assignments, thus providing the necessary feedback which has always been the Achilles' heel of any language-learning video course.

The workbook is opened with the Introductory Reading that contains the basic information about mergers and acquisitions in business. It is followed by seven units, each presenting an episode in the strictly observed format, including the episode script, comments, and several stages of elaboration.

After the Preparation that implies reading and discussing the episode script and comments, each episode is supposed to be presented several times. First comes the Preview aiming in the general understanding of the situation; it is checked by questions about it. Next, the students move on to the View stage: they watch the movie fragment again and fill in the blanks in the script. After the Review, they have to do some writing assignments (prepare either reviews or essays on the given topics). Finally comes the Interaction, including role play and presentations. An important feature of this part of the unit is the outreach that implies the search for additional information to be used in role play and students' presentations.

The workbook is completed with the Summing Up unit built around two groups of issues, Language and Business: while Language Issues aim in checking the mastery of the language material, both general and specific, Business Issues comprise more presentations, information search, and projects based on the material learned.

The *Mergers and Acquisitions* Multimedia

The multimedia module is based on the same episodes and the *Wiser Educator*™ authoring system that allows compile five types of activities:

1) Matching, that implies finding the text of the phrase presented in a video fragment;
2) Sequencing, i.e. arranging the sentences in the correct order of the dialog presented in the video clip;
3) Gap Filling, that checks the knowledge of the unit vocabulary through filling the gaps in the text of the dialog;
4) True or False, testing the student's knowledge of the whole situation; and
5) Multiple Choice, used to estimate the student's knowledge of the communication background details, e.g. business etiquette, etc.

The smart-linking technique ties each of the activities with the video episode fragments. The activities allow develop both real (language) and carrying (professional) content. Since they do not coincide with those submitted in the video workbook, this module can be used independently as well as in the format of a training supplement to the video program.

Software Selection

Software selection was based on the following qualities of the former:

1) its *relevance to the task and material format*. An ESP practitioner has to develop an accurate idea of the material he/she is planning to design. A movie-based language-learning program based on the theory of constructivism implies multiple presentations of the discourse patterns on the video, accomplished through several stages of watching the video and practicing the language structures, and extensive interaction, including role playing and various projects completed by students;
2) its *user-friendliness*, which is one of the most important technology characteristics for Humanities faculty, with their comparatively low level of technological proficiency and even *technofear* (Delcloque 1977). The author had a terrifying experience with several professional multimedia authoring systems and found that the *Wiser Educator*™ is surprisingly easy to use;
3) its *time- and effort-saving capacity* directly results from user-friendliness. It is vitally important for instructors involved with, so to speak, condensed courses that comprise long and frequent classes (e.g. intensive ESP programs).

Software	Type	Tasks Accomplished
Avid Cinema™	Video editing software	• copying movie fragments to the computer hard disk as **.mov* files • editing them to one minute of length, according to the copyright regulations • putting together the video program episodes • producing titles and effects • copying the program on the videocassette
Wiser Educator™	Multimedia authoring system	• inserting **.mov* files into learning modules • inserting the script • smart-linking movie fragments with their scripts • preparing exercises • smart-linking parts of each episode

Table 1. *Mergers and Acquisitions:* software used for production.

Framework for Implementation

The *Mergers and Acquisitions* program is designed as the supplement to the corresponding unit of the Business English course. As such, it can be employed in parts as successfully as in the whole. In any case, the work starts with the Introductory Reading section to be completed before the first video presentation class. Practice shows that the most successful classes are conducted in the mixed format (general video presentation of each episode followed by its individual multimedia elaboration and completed with the interaction). Thus, the multimedia has to be included in the video presentation between the Preview and View stages. This significantly increases the number of motivated multiple revisions of each episode, which adds up to the successful accommodation of the language and background information. Thus, the acquisition of the professionally valuable language content and the cultural component of the discourse occurs within the constructivist paradigm that implies active learning, encouragement of deeper understanding through multiple responses to the unfamiliar stimuli, and learning in context (Berryman & Bailey 1992).

Movies in Business English: Entertainment in Education or Education in Entertainment?

The use of movies in ESP classes differs significantly from that of language-learning videos. Sharing such characteristics as the enforced discourse presentation due to combining video with sound and the weak feedback, movies, however, are noted for their greater motivating capacity and emotional appeal. Successful integration of movies in ESP, e.g. Business English, courses requires that the instructor assess realistically all their technological advantages and drawbacks as well as the learning potential.

Characteristics	Language-Learning Video (LLV)	Specially Selected Movie (SSM)	Implications for ESP Practitioners
Real (language) content	Extremely simplified, basically neutral, and generalized	True-to-life, emotionally expressive, and situation-specific	LLV is to be used on the lower stages of ESP courses than SSM
Carrying (cultural and professional) content	Generalized	Comprehensively presented both in discourse and communication background	Activities based on SSM cultural and professional context should be included into interaction
Motivation capacity	Extrinsic motivation: "*I have to*"	Intrinsic motivation: "*It's interesting* "	In LLV feedback activities have to be intrinsically motivating
Interactivity	Zero (feedback provided through the course workbook activities)	Zero (feedback to the instructor's discretion)	SSM-based ESP classes should include an extensive set of interactions

Table 2. Language-learning video vs. specially selected movies in TESP

The creative use of movies for knowledge construction in ESP courses is one way to realize the idea of easy, relaxed learning (Kitaygorodskaya 1986) that is known to facilitate language acquisition A recently coined term, *edutainment*, finds another meaning here: this is not just learning with fun, it is using the educational potential of entertainment.

Conclusion

The language and background potential contained in some movies can be successfully used in ESP teaching and learning. An ESP practitioner can easily develop original audio and video programs as well as the multimedia learning modules that are highly authentic and close to his/her course. The synthesis of video and multimedia classes has proved highly successful at advanced Business English classes based on the authentic linguistic and extra-linguistic information presented in some movies. The author plans to continue the project, adding more interactive video programs and multimedia modules.

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References

Berryman, S., & Bailey, T. (1992). The double helix of education and the economy. New York: Institute of Education, Teachers College, Columbia University.

Delcloque, P. (1997). LSP teacher training in the use of technology: Overcoming technofear. R.Howard & G.Brown (Eds.), Teacher education for Language for Specific Purposes. Clevedon; Philadelphia; Toronto; Adelaide; Johannseburg: Multilingual

Matters, Ltd.
Dudley-Evans, T., & StJohn, M.J. (1998). Developments in ESP: A multi-disciplinary approach. Cambridge, UK; New York; Melbourne: Cambridge University Press.
Kitaygorodskaya, G.A. (1986). Methodological foundations of intensive language teaching. Moscow: Moscow University. *(Russian)*.
Laurillard, D. 1993. Rethinking university teaching: A framework for the effective use of educational technology. London; New York: Routledge.
Rivers, W.M. (Ed.) (1987). Interactive language teaching. Cambridge: Cambridge University Press.
Rothkopf, E.Z. (1979). The concept of mathemagenic activities. Review of Educational Research 40: 325-336.
Scinicariello, S.G. (1997). Uniting teachers, learners, and machines: Language laboratories and other choices. M.D.Bush & R.M.Terry (Eds.), Technology-Enhanced Language Learning. Lincolnwood, IL: NTC. 185-213.

Technology, Language Arts, and Teacher Preparation: Stacking the Odds of Classroom Use

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Abstract: This paper presents the results of a university project funded by a Rural Integration of Technology in Education Grant from the U.S. Dept. of Education. The project, entitled "Tech Bridging for Literacy Development", involved collaborative use of communication technology across five sites involving preservice teachers, elementary pupils and university teaching methods faculty. Feedback results from participant groups indicated positive benefit from the project with regard to extended computer competencies and an increased likelihood of using technology in future classroom instruction. The preliminary findings support the perceived benefit of change efforts aimed at simultaneous involvement of multiple constituents in the infusion of technology-enhanced instruction. The report concludes with several recommendations aimed at overcoming some of the difficulties inherent in multi-site technology collaboration.

Introduction

During the past decade, universities have been repeatedly criticized for failing to equip future teachers to implement technology enhanced instruction. In particular, the 1993 report from the Office of Technology Assessment stated, "...Teacher education students are exposed to very few educators who use technology as a teaching tool in their preservice program and see very little technology use in their student teaching placements." (p. 4). Continuing study of classroom teachers in the 90s has confirmed that teachers are using computers far more frequently for administrative functions than for purposes associated with instruction (McCannon & Crews, 2000). As we turn the corner of the new century, a new sense of urgency for infusing technology into teacher education has been created, driven largely by competition and impending standards from professional accreditation organizations (Rogers, 2000).

Given the calls for change, it would appear that higher education personnel involved in teacher preparation need to simultaneously answer questions concerning two different components of preparedness: a) How can we increase the instruction-related technological capabilities of future teachers, and b) How can we change future teachers' plans for incorporating technology in their classrooms? This paper reports on the implementation and results of a project intended to address both questions.

Description of the project

During the spring of 2000, preservice teachers in reading and language arts methods courses at Winona State University participated in a semester-long project aimed at showcasing technology infusion possibilities for elementary language arts classrooms. The project, titled Tech Bridging for Literacy Development, sought to model two different approaches to classroom technology use, both of which allow teachers to sustain interactive communication around explorations of children's literature.

The first phase of the project involved preservice teachers from Winona State University and two other universities in the collaborative building of an interactive children's literature web site. Each preservice teacher enrolled in selected language arts methods courses at the universities read and reviewed a book from each of five different genres for the intermediate elementary grades (4-8). After creating the reviews in basic word processing software and utilizing spell checking tools, the preservice teachers were told to open a web-based version of File Maker Pro and search for the reviewed title. Students then made a new entry or continued an existing entry as they copied their reviews into the database.

The general structure of the reviews was prescribed to include the fulfillment of expectations, comments on author craft, and perceived connections to other books. Each review ended with a question for subsequent reviewers of the book.

The second phase of the project involved WSU preservice teachers in creating and sustaining a literacy conversation centered around a children's novel and carried on through a series of email exchanges with distant fifth grade partners. Students from WSU were partnered with students from two different elementary classrooms, one from a very diverse metropolitan area, and one from a rural town, population 2300.

Implementation: Anticipated and Realized Difficulties

The design of the project anticipated difficulties with coordination between the three university faculty as each person attempted to implement the project in different locales with varying technology access, varying computer platforms and applications. Voice and email conversations in the weeks prior to the project were scheduled to talk through foreseen difficulties. Similar early contact with elementary instructors attempted to address planning and computer access issues. At launch day, all parties appeared to have worked out logistics for initiation of the project.

Phase One, the database project, was initiated with WSU students by introducing the WSU students to a sample review along with modeled oral and written directions for accessing the database in the education computer lab. The first review of children's literature was assigned to be completed by February 15. Following instructor feedback on the initial review, students were given the rest of the semester to complete the remaining three reviews for the project, with a suggestion that they pace their reviews equally across the semester in roughly two to three week intervals. All students completed the required total of four reviews.

Unexpected difficulties arose in the intended collaboration between universities. Instructors from similar methods courses at a private institution in Minnesota and at a state institution in Georgia had agreed to have their students join the WSU students online in the collaborative development of the children's literature database. Repeated technology difficulties arose at the Georgia institution and scheduling issues made it difficult to anticipate participation from the private university in Minnesota. Although follow-up phone calls and email to Georgia were received positively, participation by the Georgia students was not apparent in the database by semester's end. In spite of this, the instructor did indicate interest in pursuing the project in the upcoming school year. Although the private university students from Minnesota did not providing identification coding, based upon a noticeably different structure in the reviews it was estimated that they made approximately 23 entries to the collaborative database. Project evaluation forms were not returned from either institution.

Phase Two, the literacy letter exchange was scheduled to coincide with an on-campus visit by one of the two fifth grade classes. The students from the metropolitan elementary made the 110-mile trip to visit the WSU campus in April 2000. In order to establish a leading relationship, the email exchange was scheduled to take place the two weeks prior to their arrival. The same email schedule was used to establish the email exchange with students from the rural elementary in hopes that they also would be able to make an on-campus visit. This proved to be an unfounded assumption as the field trip of 20 miles was subsequently denied. Nonetheless, the classroom teachers and the university instructor had agreed upon stopping points within the novels being read, and asked students to read up to a given stopping point by the date of each of the three email exchanges.

Difficulties arose almost immediately with the commencement of the first email exchange. Classes at the metropolitan school had never used email before. However, the media specialist there set up Hot Mail accounts for each student. However, after each scheduled email exchange, the WSU instructor typically received five to eight reports of problems where students had either not gotten email or had not responded back before time for the next exchange. The situation was complicated by the inability of the WSU instructor to schedule class time into the computer lab so that all emails would be sent at a given point in time. Also, the lab time at the metropolitan elementary was scheduled earlier in the day than the WSU course. Thus sometimes messages from WSU were sent on a specified day, but elementary students had already left the lab and could not return until their schedule permitted later in the following week.

Initial correspondence with the rural elementary also met with confusion. Students at the rural elementary had completed a computer unit earlier in the year and already had Hot Mail accounts established, so their teacher assumed that everything was in place. Upon the initiation of the email exchange from WSU however, it was discovered that several St. Charles students had been "kicked off" their Hot mail accounts because they had not been using them regularly. This led to delays in responses to emails as well. Eventually, the WSU college instructor tired of serving as the central clearinghouse for complaints and provided emails for all participants to the college students and classroom teachers. This appeared to help resolve issues more quickly, although a few students continued to report difficulty establishing and maintaining contact.

College students were asked to submit a printed copy of their email exchanges for instructor review. All college students completed at least three email messages by the end of the planned time. A culminating activity was planned for the face-to-face meeting with the students. College students were placed into groups of three or four, and were asked to design a game board using the theme of the shared novel. Students then developed questions at three different levels of comprehension and used the questions as question cards in the playing of the game. The games provided a comfortable structure for interaction when the students from the metropolitan elementary came to meet their key pal on campus. The group working with the rural elementary ended their exchange with a final email telling the students that their games were going to be delivered to the school for the fifth graders to use in class time.

Results of Phase I: Collaborative Database

Both projects were completed by May 1, 2000. At the conclusion of the database project, WSU students were asked to complete a one-page project evaluation form, which incorporated both Likert scale items and open ended sentence completion items.

The Likert Scale items asked students to respond to four statements: a) I think the database project is more enjoyable than index card reviews of children's literature for future teachers, b) I think the database project is more effective than index card reviews of children's literature for future teachers, c) This project extended my ability to use technology, and d) This project increased the likelihood that I would consider using technology in my classroom in the future. Data collection for the database phase of the project resulted in eight sets of usable preservice teacher feedback data from WSU students. This report will focus on the data sets from preservice teachers.

From the Likert Scale items, a majority of students reported that the database project was more enjoyable (87% agree or strongly agree) and that the database project was more effective than traditional index card reviews of children's literature (87% agree or strongly agree). A majority indicated that the project had extended their ability to use technology (75% agree), while 100% of the respondents felt the project increased the likelihood of using technology in their classroom in the future (12% strongly agree; 88% agree). The latter finding goes directly to a guiding question for the project: Can technology-based projects in preservice literacy methods change future teachers' plans for incorporating technology in their classrooms? The limited results of this project would indicate a positive answer to this question.

From the sentence completion portion of the project evaluation, it appears that students felt the project developed their capability for teaching by its focus on different genres of children's literature, and appreciated it most for providing access to their peers' reviews of books. The aspects of the project that students appreciated least were clustered around issues with technology. However student suggestions for refinement of the project were decidedly not technology improvements, but rather a variety of shifts in directions, genres, and sharing of reviews.

Results of Phase II: Email

Similar to the database project, students were asked to complete a one-page project evaluation form, which incorporated both Likert scale items and open ended sentence completion items. Data collection for the email phase of the project resulted in forty-seven sets of usable elementary student feedback data, two sets of usable elementary teacher feedback data, and sixteen sets of usable preservice teacher feedback data from WSU students. This report will focus on the data sets from preservice teachers.

Similar to the database project, Likert Scale items indicated strong support for the project in general. Students were in general agreement that the email project was more enjoyable than traditional index card reviews of children's literature (88% agreed or strongly agreed). A similar majority felt that the project extended their capability to engage in informal but meaningful book talks. The group split evenly over whether the project extended their ability to use technology (50% disagreed or strongly disagreed). It was somewhat surprising to the author that 50% of the students thought it did extend their tech capability, given that the email technology under consideration is relatively common at the university level.

As in the database evaluation, the last item went directly to the guiding question for the project: Can technology-based projects in preservice literacy methods change future teachers' plans for incorporating technology in their classrooms? Once again, the responses were strongly affirmative (100% of students agreeing or strongly agreeing).

When students were asked what they appreciated most about the project in the sentence completion portion of the project evaluation, students felt the project developed their capability for teaching: the project focus on informal interaction and understanding of elementary student views as well as realistic technology utilization. When asked about the aspect of the project they least appreciated, several students stated they had no problems with the project. However, others indicated concern that the email was too structured both in terms of a given number of exchanges and the content of the exchanges. Student suggestions for refinement of the project focussed on procedural improvements to ensure that students had more regular and frequent exchanges.

Conclusion & Recommendations

Any results or conclusions drawn from the two-phase project should be considered as tentative at this point. The difficulties with technology access, the constrained timeline for email exchange, the less than full participation of collaborating institutions, and the limitations of the data gathering system employed would each need to be addressed before drawing firm conclusions from such a study. Nonetheless there are possible insights to be gained from the project's implementation and findings.

Insights and recommendations from the implementation of the database project are threefold. First, future projects might explore providing extended time for "silent mentoring" of would-be instructor participants. The time necessary for mentoring would allow the technical issues to be addressed prior to beginning the project. Secondly, it is recommended that future project investigate the establishment of a "scouting team" of would-be college student collaborators. The scouting team would allow clarification of project requirements and create on-site champions of the project to encourage subsequent participants in the project. Finally, it is recommended that project originators gain advance agreements from would-be college instructor participants. Such agreements would involve a commitment to joint ownership of the completion of the project as well as completion and return of project evaluation forms.

Several specific recommendations pertaining to subsequent email collaboration projects are also made. First, a less restricted schedule of email exchanges should be utilized. The fixed schedule of three exchanges was utilized in the current project to insure no student was left out. However, such limitations seem to run counter to the ever-present nature of email communication. An unlimited number of exchanges across a longer duration of time should be explored to allow individual student participants to tailor the project to their own needs and all participants should have needed contact information to re-establish contact in the likely event of missed exchanges.

Lastly, the technical difficulties of distant collaboration for technology should not overshadow the benefit of such projects. In spite of the frustrations which accompanied the logistics of such networks, all participants involved expressed a desire for continuation of such projects.

References

McCannon, M. & Crews, T. (2000). Assessing the technology training needs of elementary school teachers. *Journal of Technology and Teacher Education,* 8(2), 111-121.

Office of Technology Assessment (OTA). (1993). *Teachers and technology project proposal.* Washington, DC: Congress of the United States.

Rogers, D. L. (2000, Spring/Summer). A paradigm shift: Technology integration for higher education in the new millennium. *Educational Technology Review,* 13, 19-28.

Innovative Software-based Strategies for Reading/Listening Comprehension: how Information Technology is Reforming Foreign Language Acquisition

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Abstract: This paper presents supporting background information for the interactive session where the actual hands-on use of reading/listening comprehension software has taken place. To provide the larger context for using IT (Information Technology) software, the methodological and theoretical framework of IT is discussed, from the viewpoint of SLA (Second Language Acquisition) theory and practice. By training SLA teachers to delegate the more mechanical "programmable" linguistic skills to CALL (Computer Assisted Language Learning) software, more emphasis can be placed on the practical aspects of language use and language socialization, and acquisition of cross-cultural interaction skills. Emphasized is the role of IT-based reading and listening comprehension tools that enable the learner to work independently with authentic foreign language texts from the Internet.

Introduction

In my work as a teacher of the English language in China and a teacher of the Chinese language in Canada, I have witnessed a wide spectrum of phenomena in language teaching, methodology and foreign language didactics, ranging from the rote learning of vocabulary from word lists to computer-based courseware. No doubt, computer-based instructional technology and educational media have gone a long way during the past decade, since the outlook given by Last (1992) on computers and language learning. In my Master's thesis (Zhang, 1997) I emphasized the importance of a needs analysis for IT-based language instruction, while in my present doctoral research I lay stress on the cross-cultural component of communicative competence, and on the communicative aspects of language socialization (Lazaraton, 1995). Employing IT in language teaching benefits teachers and students, because more time and effort can be devoted to issues of language use in a naturalistic environment (Tesch, 1990), in particular to the issue of cross-cultural understanding in real life settings. Thus, my message to language teachers and students alike can be summarized: making full use of interactive multimedia computer technology, both in the authoring of teaching materials, in language teaching and learning itself and - the special concern of this paper – in using analytic software tools for the acquisition of reading/listening comprehension skills, allows teachers and students to focus their attention on issues of the students' language socialization.

The Dichotomy in SLA

For a brief background overview, let us for the moment disregard instructional technology and other IT aspects and look at the area of SLA. In the theory and practice of SLA we are confronted with a deep-rooted dichotomy: on the one hand, there is an understanding of language as closed system of formal knowledge (Chomsky, 1965) that allows the learner to generate grammatically correct sentences; on the other hand, Hymes (1970) and his followers view language as social behaviour, thus including the cultural aspects of language communication. Both interpretations of language have their advocates among the practitioners of language teaching, and both views are reflected in the design of language courseware that has been published during the past decade, as will be discussed in the next chapters.

Within a theory discussion of the background in SLA, another dichotomy must be mentioned: the polarization in research methodology, resulting in the diametrically opposed quantitative and qualitative approaches. Although the boundaries are not always sharp and clearly cut, in general the linguistically oriented researchers favour quantitative research methods, and they outnumber the qualitative researchers who have an ethnographic orientation. In her discussion of applied linguistics, Davis (1995) points out that the social and cultural aspects of language acquisition have been considered less important than the mental processes involved in language acquisition. SLA studies usually do not have a sociological orientation, and many sociolinguists use methods from psychology, and have a positivist perspective, collecting data through experimental techniques or surveys, and analyzing the data through statistical methods. In the SLA discussion among these different schools, the opinion of Lazaraton (1995) stands out: she advocates the principle of Language Socialization, which is defined as language use in non-instructional, real-life settings – the opposite of language acquisition in a controlled, pre-programmed environment that is based on the quantitative testing of linguistic skills. This reflects the concern of the functionalists' view of language "what is language for?" instead of the formalists' concern "how is language learned?"

Firth & Wagner (1997) point out that in traditionally oriented language SLA research the social factors of emic relevance are neglected, and that most socially and contextually oriented studies relating to language research tend to take the formal learning environment, typically the second and foreign language classroom, as the point of departure. They further lament that although second and foreign language interactions occurring in non-instructional settings, such as in the workplace, are everyday occurrences, but they have not yet attracted the attention of SLA researchers. Such views are motivating language teachers and educational experts to re-think and renovate existing SLA syllabi that are built on traditional designs and traditional methods; courseware that is technology-based may sometimes be merely a presentation of old contents in a new-looking hi-tech wrapping.

From Courseware to IT Language Learning Tools

The concept of "Information Technology" (IT) as it is used in this paper within the SLA context, particularly for the acquisition of reading and listening comprehension in the foreign language, does not necessarily include all computer-based courseware. In order to call itself IT-based, a learning program has to take advantage of certain capabilities that are inherent in computer technology, especially computer software, such as electronic search functions and interactive multimedia features that allow learners to dynamically interact with the foreign language text they are trying to understand. For example, a CD-ROM-based program that presents text in static format, using the same linear programming as in a book, would not be included in this concept of "IT", because it would miss the dynamic factor.

In order to illustrate the general focus of discussions in CALL (Computer Assisted Language Learning) literature, we take a look at a few samples of such discussions. A relatively early (1992) overview of the area of CALL covers the time since the first experiments with simple tutorials in the mid-1970s, commenting in great detail on the simple linear interaction in tutorial mode between the learner and the computer. "This simple tutorial mode of interaction formed the basis of the first generation of CALL software, although the ingenuity of the software writers caused it to extend far beyond the question-and-answer mode ... ...the issue rapidly broadened into a recognition of the importance of the user interface as a whole in promoting good CALL practice and encouraging the learner to treat the computer as a reliable and non-threatening tutor" (Last 1992). Describing the desirable and undesirable features of a CALL software package, a higher degree of flexibility in the course design is then suggested. "... there should be a feeling of flexibility in the package as a whole; in other words, many packages have an extremely limited form of interaction. A word is flashed on the screen and you have to offer up the Spanish or French or German for that word. Nothing else is on parade - no contextualization, no tests of the gender, no listing of synonyms, no help panels, and in such circumstances the poverty of the learning environment soon causes the learner to tire of what ought to be recognized as a highly intensive interactive mode" (Last 1992). A further concept which considered to be a successful computer application is the field of clozentropy (gap testing), with the goal of improving the learner's inferencing ability, or guessing strategy. The author concludes the article by stating that CALL has still not achieved the critical mass of a mature and universally supported discipline, and there are still many in the profession "who are frankly suspicious that the computer is being applied to teaching the wrong things in the wrong way" (Last 1992, pp. 227-245).

An article by Zekulin (1993) about instructional computer technology was published in a collection of papers from the International Colloquium on the Teaching and Learning of Modern Languages held at the University of Ottawa in 1993. The author draws from his experience with the computer language lab at the University of Calgary. Since 1991 when the lab was established, students of first and second year Russian and Japanese use the computer lab as a part of the regular course requirement; starting in 1992, computer exercises for first and second year Chinese were introduced. Students also use the lab on a drop-in basis for self-study. The article warns against the numerous pitfalls the course designer of a language course might encounter. CALL is described as a highly labour-intensive approach to learning a language, the importance of efficient courseware is stressed, and the difficulties are mentioned for using a cognitive approach to L2 learning on the computer. "A number of people originally welcomed CALL because they saw it as a means of relegating repetitive and therefore boring tasks to the computer. This ignores the fact that if the task is boring for the instructor, it is likely to be boring for the student and is therefore unlikely to be pedagogically effective. Computer exercises are excellent for pattern accustomization, but rather more tricky for assisting with intellectual understanding. This problem can be exacerbated by the fact that students often ignore instructions and explanatory screens that precede the exercise in their eagerness to 'get on with the exercise itself', and, furthermore, in doing computer exercises, some students are primarily interested in right and wrong answers, less in why a particular answer is right or wrong." (Zekulin 1993). Guidelines for courseware design are: the screen should not just be treated as an electronic book; attempts to emulate computer games in CALL courseware are "doomed to failure (we cannot match the arcade), while in fact disguising the seriousness of what we are doing", and "careful design regarding the length of one exercise; dividing long exercises into several shorter ones has proven effective" (Zekulin 1993, pp. 230-238).

In their recent quantitative study, Herron et al. (2000) measure whether and to what extent a video language course can teach overall cultural knowledge, and their results support that video is an effective technological tool for presenting culture in the FL classroom. However, after mention of several references corroborating this view, we find a warning about possible interferences between the visual component of the video and the learner's comprehension. "However, this positive view of using video to teach culture is not unanimously shared. It could be that the first time students watch a video, the processing of syntactic information could place such a high cognitive demand on the students that they are unable to process any other kind of information (e.g. cultural information). This processign problem is one of the major tenets of the capacity theory of text comprehension (Just & Carpenter, 1992). According to this theory, it may be overly optimistic to think that first semester French students will be able simultaneously to process both the linguistic and the cultural information from an authentic video" (Herron et al. 2000, p. 397).

All these discussions are about designing learning programs, and writing and handling content. It is the goal of my presentation to add to the discussion with the concept of an analytic instrument in form of an IT-based "Comprehension and Learning Tool", which I perceive to be the application of the future in IT-oriented SLA operations. Undoubtedly courseware may have its purpose at an introductory level, but at the same time a universally applicable reading comprehension tool should be given to the language learners as early as possible, enabling them to learn reading foreign language texts of their choice in an independent manner, from the largest pool of electronic text available: the Internet. "Software selection is one of the first tasks in establishing a CALL program. A considerable literature exists which offers advice to teachers on how to choose software that will be suitable for their students, syllabus and curriculum. On the other hand, the actual dynamics of software acquisition, while mentioned occasionally in the literature, has not, to our knowledge, been studied in detail" (Robb & Susser 2000, p. 41). Regarding IT in SLA, we have to think beyond electronic courseware, by using analytic, text-exploratory comprehension learning tools, for an independent, student-centered CALL approach, as an important supplement to the existing courseware.

IT in SLA: Comprehension Learning Tools

We now investigate the ultimate concept of "IT in SLA" which I demonstrated in my interactive session and which is in the focus of this paper: combining the principle of language use in naturalistic, real-world settings with the analytic power of computer software. In addition to the courseware with its predetermined content, the language student should be given a "content-free" language comprehension and language leaning tool that is universally applicable to any foreign language text in electronic format. The main intention here is to lead the students to an authentic real-world context. I demonstrated this principle in my interactive session through the KEY software (detailed instructions for computer-assisted text analysis see on the "Multimedia" page of www.cjkware.com), as an example of an IT tool for learning to read and comprehend foreign language text. Such software tools enable even beginners to independently develop a reading and listening comprehension of foreign language texts. The interactive session demonstrated how an analytic software tool can benefit teachers and students through

- Opening the door to information that is written in a foreign language
- Acting as the key to reading foreign language content on the Internet
- Allowing language learners to independently acquire reading and listening comprehension skills in a foreign language, at an early level
- Doing away with rote learning of vocabulary: whether using the software tool to read Chinese (as demonstrated in the interactive session) or English (within ESL) or any other language, students can devote more time and effort to reading about their subjects of interest in the second language
- In the case of Chinese, automatically bridging the gap that exists in the written Chinese language between traditional characters (used in Hong Kong, Taiwan and the overseas Chinese communities) and simplified characters (used in China and Singapore)
- Enabling non-English readers to read English newspapers, magazines and other publications.

Conclusions

Based on the principle of language socialization, IT in foreign language learning that combines content-oriented courseware with multimedia comprehension tools is ideal for language learners to achieve reading/listening comprehension skills. Having powerful analytic software tools at hand helps students apply confidently the knowledge and skills they acquired in content-based language courses, when they encounter real-world authentic text environments, which would otherwise intimidate them. For the reader who ventures out into the ocean of the foreign-language Internet, such tools are a reliable floating aid.

References

Chomsky, N. (1965). Aspects of the theory of syntax. Cambrigde, Mass.: MIT Press.

Davis, K. A. (1995). Qualitative theory and methods in Applied Linguistics research. *TESOL Quarterly,* vol. 29, 427-453.

Firth, A. & Wagner, J. (1997). On Discourse, Communication, and (Some) Fundamental Concepts in SLA Research. *The Modern Language Journal* v81 n3 p285-300, Fall 1997.

Herron, C., Dubreil, S., Cole, S.P., & Corrie, C. (2000). Using Instructional Video to Teach Culture to Beginning Foreign Language Students. *CALICO Journal* v17 n3 p395-429.

Hymes, D. (1970). On communicative competence. In J.J. Gumperz and D. H. Hymes (eds), *Directions in Sociolinguistics.* New York: Holt, Rinehart & Winston.

Last, Rex (1992). Computers and Language Learning: Past, Present - and Future. In *Computers and Written Texts,* edited by Christopher S. Butler. Oxford, UK & Cambridge, Mass.: Blackball.

Lazaraton, A. (1995). Qualitative Research in Applied Linguistics: A Progress Report. *TESOL Quarterly,* vol. 29, 455-472.

Robb, T.N. & Susser, B. (2000). The Life and Death of Software: Examining the Selection Process. *CALICO Journal* v18 n1 p41-52.

Tesch, R. (1990). Qualitative Research: Analysis Types and Software Tools. Basingstoke, U.K.: The Falmer Press.

Zekulin, Nicholas G. (1993). Some Observations on the Introduction of Digitized Audio and Videodiscs into Russian CALL. In: *L2 and Beyond, Teaching and Learning Modern Languages,* edited by V. Adamantova. Ottawa: Ottawa University Press.

Zhang, S. (1997). A needs analysis for adult learners of the Chinese language. *Master's thesis.* Victoria: University of Victoria.

RESEARCH

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The importance of technology in the teaching and learning process has gained considerable support from educa tional institutions at all levels. As technology is increasingly incorporated into teaching and learning, researchers are answering the call for a better understanding of technology's role in education. This year's SITE conference papers reflect many issues that contribute to this understanding. The authors of these contributions highlighted students', teachers', and administrators' perceptions of technology and technology use, differences in competence and use of Instructional Technology (IT), evaluation of technology use in practice, and methodological issues in the use of IT.

Perceptions of technology and technology use

Many articles fell into the category of perceptions of technology and technology use. Askar & Umay related self-efficacy, attitudes, and perceptions to computer use by preservice elementary mathematics teachers in Turkey in their research. Askar & Usluel interviewed teachers and administrators in Turkey regarding an IT innovation and content analyses revealed two different diffusion processes: as an instructional tool, and as a management tool. Berson & Armstrong study technology beliefs and practices among graduating teacher education majors focusing on the International Society for Teacher Education's (ISTE) National Educational Technology Standards (NETS). Chambers, Smith, Hardy & Sienty used the Myers-Briggs Type Indicator (MBTI) to identify personality types of teachers, which were then related to teachers' willingness to use technology. deMontigny, Cloutier, Ouellet, Courville & Rondeau studied teachers' information and communication technology (ICT) self-efficacy preliminary to introducing ICT components into a Nursing Master's Program in Quebec. Heafner & McCoy reported on a survey of computer use and attitudes towards computers of seniors at a computer intensive liberal arts college that supplies each student with a personal laptop. Janz reported a survey study to determine how the use of a notebook computer will impact a student's computer experience, confidence, and attitudes when compared to those of a traditional university student. Kemker, Harmes, Kalaydijan & Barron focused on a survey of over two thousand teachers targeting their attitudes toward and use of computers in instruction, with specific emphasis on classroom uses consistent with the proposed National Educational Standards (NETS) for teachers and students. Litton reports a study addressing how the use of technology impacts teacher education programs by exploring what teacher education students learn besides content knowledge when using technology in the classroom. Owens & Magoun conducted a study of junior high girls to encourage enthusiasm for computer science and applications through an intensive summer program. Prater & MacNeil compare perceptions of instructional use of technology by teachers and principals. Results found that principals perceived students were using technology for higher level skills such as desktop publishing whereas teachers perceived student use for more drill and practice activities. Wang studied the redefined role of the teacher as technology is incorporated into teaching and learning. The focus of Wang's research centered on preservice teachers' perceptions when teaching with or without computers.

Differences in competence and use of Instructional Technology

Several articles came under the category of differences in competence and use of IT. Ang, Edwards, Kim, Little, Matuszak, Simmons, Stinson & Pierson reviewed constructivist-oriented practices supporting technology, cost-effectiveness of technology use, the effectiveness of virtual field trips, instructional courseware, online discussion tools, and computerized tests. Borthwick, Handler & McGrath, in seeking to determine the features of outstanding doctoral programs through survey and interview techniques, point out that the field lacks clear consistent definitions of terms such as IT, Instructional Design and Educational Technology. Heath, Burns, Dimock & Ravitz focused on answering three questions: (1) What do constructivist learning environments (CLEs) supported by technology look like in practice? (2) How can teachers be assisted in developing CLEs supported by technology? (3) How does technology facilitate the development of a CLE? Hughes seeks to characterize some uses of web page data and the most common experiences of researchers who are new to the experience of working with large amounts of information in a theoretical paper. Leh & Ogata's work focused on how teachers use technology to better address the needs of diverse populations. Liu & Cheeks found that the nature of assessing technology-assisted use of information was to assess a learning process as well as specific skills. Pastore addressed how the effect of multimedia software training can be used to move from a teacher centered classroom to a more student centered environment. Reehm, Long & Dickey used performance criteria established by the Kentucky Department of Education technology standards to compare confidence among undergraduate and graduate education majors to non-education majors. Schmertzing & Schmertzing studied graduate education students' adaptation from traditional instruction to a technologically mediated classroom. Sherry & Billig presented findings from a five year Technology Innovation Challenge Grant purposing to infuse standards based instruction in multimedia, digital art, music composition and online discourse into the curricula of Vermont's schools.

Evaluation of technology use in practice

In the category of evaluation of technology use in practice, Sangrà & Bellot examined the use of information and communication technologies (ICT) in non-university settings in Spain using a survey, interviews, round tables and discussions. Bornas & Llabrés found that dynamic helping software combined with teacher assistance was more effective than software providing static help. Civiletti, Santos & Santoro used a longitudinal case-study method with genetic text analysis to focus on teacher effects during situations involving cooperative learning and autonomy. Dean provided a quasi-experimental program evaluation of a teacher preparation program designed to help teachers integrate technology into their teaching in the state of Washington. Elliott examined student teachers' ICT experiences in Australia with an eye to improving teacher preparation programs. Flowers, Jordan, Algozzine, Spooner & Fisher reported on a quasi-experimental study of student evaluations of the effectiveness of distance education courses and instructors. Guimaraes described a program in which teachers are introduced to and learn to evaluate educational software programs before leading students in educational activities. Juliana describe qualitative research focusing on 3rd and 4th grade students' understanding of science concepts before and after a technology rich learning experience in order to answer the question: How does technology support higher order thinking goals about science concepts? Kamb & Niederhauser examined self-efficacy and peer status as factors that influence interactions between students working in learning groups on a computer-centered activity. Kilbane examined the effects of CaseNET, a professional development course using case methods and web-assisted technology, on pre-service teachers' classroom problem solving skills. Leh & Keeler present case studies and action research to illustrate technology use in today's English as a Second Language (ESL) classrooms. Loveless, Taylor and Millwood addressed the progression in practice of visual literacy and information and communication technology (ICT) through a series of projects in a five year period. Lucking, Rovai & Ireland studied the impact of classroom community in a higher education classroom. This complex study looked at multiple factors including distance versus traditional instruction, type of school, level of schooling and gender. Preservice teachers were studied to help determine if technology activities encouraged higher cognitive levels using an adaptation of Bloom's taxonomy and ACOT scales in Murphy and McFarland's research. Nail, Hare, Davidson, Ferguson & Leman used a qualitative study to determine if an educational technologist was helpful in facilitating technology integration in the K-12 classroom. Rhodes reports that students from impoverished areas have too little access to IT; teachers have insufficient time to learn to use programs; and staff development on effective use of technology is not emphasized. Stuckey, Hedberg and Lockyer examined the role of an on-line professional development strategy and teacher implementation of a software application for the performing arts program in K-12 schools. Weber & Sabine present experiences from the HALUBO Project dealing with the relation between intercultural competence and the Internet. Willis, Tucker, Rowland, Wong & LeCrone studied the effectiveness of K-12 schools and universities in preparing a literate workforce.

Methodological issues in the use of Instructional Technology

The final category was methodological issues in the study of IT. Christensen & Knezek described the Technology in Education Competency Survey (TECS) related to NCATE standards. Baloian, Ochoa & Fuller presented a model for designing courses based on the authors' experiences designing and redesigning a software engineering course. Hughes & Walker provided a meta-analysis of text and documents in the public domain to characterize and evaluate the methodology adopted during IT course evaluation in the United Kingdom and the USA. Major suggests distance education courses should contain multiple communication methods including threaded online discussions, video conferencing as well as printed materials for optimal effectiveness. Shotsberger extended research from an earlier SITE paper to encompass synchronous dialogue generated from a Web based inservice program using a qualitative analysis software package. Thomas, Wilkinson, Marr, Thomas & Buboltz studied measures to decrease the attrition rate in engineering programs through the instructional technique precision teaching in a web based approach.

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Concerns Of Administrators And Teachers In The Diffusion Of IT In Schools: A Case Study From Turkey

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Abstract: In this study 27 teachers and 6 administrators from three primary schools in Ankara were interviewed about the characteristics of IT: relative advantage, compatibility, complexity, triability and observability. In addition, the stages of concerns (awareness, informational, personal, management, consequence, collaboration and refocusing) of the teachers were assessed. Overall %30 of the teachers showed no interest in using computers. %40 of the teachers are between at awareness and personal stages. 30% the teachers are at the management stage.

Introduction

Use of information technology in schools for the purpose of teaching and learning is a kind of diffusion process in which IT is an innovation which is defined by Rogers (1995, p.11) as "any idea, practice or object that is perceived as new by an individual or other unit of adoption ". In fact , IT as a relatively new building block in the educational system, causes innovations which ranges from way of communications, and interactions to teaching methods, and materials.

Information technology were first introduced to schools in Turkey in 1984. Since then, computer literacy courses have been offered as elective courses in the primary and secondary schools. On the other hand Ministry of National Education has allocated considerable about of budget for the diffusion of computers in the teaching and learning process. For the diffusion of IT into schools, so many efforts have been undertaken like inservice training of teachers and administrators, courseware and educational material development and training of computer coordinators. The type of innovation-decisions in the educational system in Turkey are authority innovation –decisions which is explained by Rogers as the choices to adopt or reject an innovation that are made by a relatively few individuals in a system who possess power, status or technical expertise. The body of authority is the key policy makers in the Ministry of National Education for all levels of schools. However the implementation of any innovation, including IT is under the responsibility of the schools. Therefore the adoption rate varies due to the administrators and teachers. To install a computer lab or to get a trained teacher (computer coordinator) do'nt imply that adoption is successful even it is an authority innovation-decision.

The evaluation of one of the World Bank supported experimental study showed that: those schools with laboratories that were not yet in full operation often lacked computer formator teachers or computer teachers. On the other hand not all subject teachers are interested in training. One school reported that only 15 % of the teachers attented in-school training(A kar, Rehbein, Noel, 1996).

The theoretical framework of this research is based on these four elements defined by Rogers (1995, p.10-35) .As stated by Hall & Hord (1987), the diffusion of an innovation process strongly depends on the experiences, concerns, skills and knowledge of the individuals and groups involved in the innovation In addition according to Hall, George and Rutherhord, (1998), concerns will vary depending on the amount of one's knowledge about and experience with the innovation. Therefore concerns of the teachers and administrators play an important role in the diffusion of IT in the schools (Dooley, Metcalf, Martinez, 1999).

Study

In this study 37 teachers and 6 administrators (three of them are principals, the others are deputies) from three schools A, B and C were interviewed. School A, a private school, has been using computers for about seven years. School B, a public school, is a curriculum laboratory school which has received computers three years ago. School C , another public school, has started to use computers in this semester. The data were analyzed qualitatively. Content analyses was used and coding categories were created . It seems that there are two different diffusion processes : IT as an instructional tool and IT as a management tool.

Findings and Conclusions

Relative Advantage: One of the characteristics of an innovation as stated by Rogers (1995) is the relative advantage which is the degree to which an innovation is perceived as advantageous. Over all, this study has presented the advantage of using computers as a management tool. The perceived advantage is higher in Sool A which is using computers for at least seven years. However, many questions were raised when the computers are taken as instructional tools. The reasons for the concerns are related to crowded classrooms, curricula and the age of teachers. One classroom teacher stated that "computers are for younger teachers." Compatibility: Compatibility is the degree to which an innovation is perceived as being consistent with the existing applications in the schools. The results showed that in School A , teachers rated the degree of compatibility of computers as near to high where in the other schools they are rated as near to low. Complexity: In this study complexity is taken as the degree to which computer is perceived as difficult to understand and use. The results showed that teachers could be categorized in two groups. One group perceived computers as a very complex device, the others perceived as an easy tool to handle. These groups differ according to their ages. As age increases, the number of teachers regarding computers as complex devices getting higher. Triability: Triability is the degree to which computer as a tool experimented with on a limited basis in schools. As a management tool, it is perceived as triable. In fact as an instructional tool the rate of triability is very low.Observability: Observability is the degree to which the results of using computers in the schools are visible to others. As a managment too; preparing lesson plans, giving the test results or developing presentation materials are visible at some degree. However, teachers haven't seen enough examples for using computers as instructional tools.

Most of the teachers in the study showed their willingness to use computers for various reasons. One dominating reason is that, to know how to use computers is a necessary skill for information age. Another reason for using computers is its storage capability in which lesson and unit plans could be used several times with little changes, without making extra effort. Surprisingly, only one teacher out of 33 mentioned its impact on students' learning by stating its capabilities

The stages of concerns by Hall was stated as; awareness, informational, personal, management, consequence, collaboration, refocusing. Overall 30% of teachers in the study has no concern about computers as a management tool. We can not regard them even in the awareness stages. Most of these teachers are in school C in which a computer laboratory has been recently installed Overall %40 of the teachers are between awareness and management stages. They have general awareness of the use of computer in their daily routines, they are uncertain of their inadequecy to meet all their needs. 30% the teachers (Most of them are at school A) are at the management stage. Their attention is focused on the processes and tasks of using computers and the best use of information and recources. Only one teacher is at the consequence stage. She mentioned the impact of computers on students and focused on the relevance of computers for students.

References

A kar P., Rehbein L. & Noel K.(1996) Mid-term review and Evaluation -Consultants' Report on Computer Experimental Schools Project- Prepared for Ministry of Education and World Bank. Ankara Turkey.

Dooley, L.M., Metcalf, T., Martinez ,A. (1999), "A Study of the Adoption of Computer Technology by Teachers, " *Educational Technology and Society* 2 (4)

Hall, E.G., George, A.A. and Rutherford,W.A. (1998). Measuring Stages Of Concern about the Innovation: *A Manual for Use of the SoC Questionnaire*, Austin, TX: The Research and Development Center for Teacher Education, The University of Texas.

Rogers, E. M. (1995). *Diffusion of Innovations*, 4th edn. New York, NY: The Free Press.

Preservice Elementary Mathematics Teachers' Computer Self-Efficacy, Attitudes towards Computers, and their Perceptions of Computer-Enriched Learning Environments

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Abstract: In this study 155 preservice elementary mathematics teachers responses were taken on Computer Self-Efficacy (CSE), Attitudes toward Computers (ATC), Perception of Computer-Enriched Teaching Environment (PCETE). The study showed that preservice elementary mathematics teachers have positive attitudes toward using computers, and learning and teaching with computers. They believe that CAI is better and more comfortable way of learning than are conventional methods. On the other hand their self efficacy in using computers is low.

Introduction

Increasingly, the schools are focusing their attention on the use of computer as a management and teaching-learning tool. The computer not only demandes changes in the school environment, but also requires new roles for the teachers.In fact , majority of the teachers have concerns in adopting computer as a tool to use in their daily applications. Lack of or inadequate training is one of the reason why teachers are not using computers for their courses. Moreover, studies stating that, students, in general , are far more knowledgeable than their teachers. It is obvious that unless teachers feel comfortable with the new technologies they will be unwilling or unable to use them meaningfully.On the other hand, research studies showed that most of the time inservice training programs are not effective and efficient for many reasons. Therefore preservice teacher training is getting more important.

The efforts for using computers in Turkey are growing exponentially. This leads to changes in preservice teacher training programs. One of the differences is the computer courses added in the preservice mathematics teachers training programs. Preservice mathematics teachers enrolled in the School of Education at the Hacettepe University in Ankara are required to take three courses related to computers: Computer Literacy, Instructional Technology and Material Development and Computer-Based Mathematics Instruction. The reason for these courses is to prepare the teacher candidates to be confident and competent in using computers in the schools.

In addition to the organizational implementations, individual differences in using computers is another critical issue to be taken into consideration. One of the concept that can explain individual differences in computer acceptance and utilization is computer self-efficacy which is defined as a judgement of one's capability to use a computer (Yi, M.Y.,& Venkatesh, V. 1996). Expectations of personal mastery affect both initiation and persistence of coping behavior (Bandura, 1977).One of the sources for efficacy expectation is performance accomplishment. The effects of failure on personal efficacy partly depend on timing and the total pattern of experiences in which failures occur. Another source of information is seeing others perform threatining activities. If others can do it, they should be able to achieve at least some improvement in performance. (Bandura, 1977). A study done in Turkey showed that a course on computer literacy for pre-service teachers increased their self-efficacy in application tools.(Cakiroglu & others, 1999) Another issue might be related to the acceptance of computer usage in educational setting is its perceived characteristics in terms of usefulness and difficulty as a management and teaching-learning tool.

The purpose of the study is to address the following questions:

1. What is the computer self-efficacy (CSE) of preservice elementary mathematics teachers?
2. What is the attitude of students towards computers (ATC) in terms of usefulness and difficulty?
3. What are students' perceptions of the difference between computer-enriched teaching environment (PCET) and regular classroom environment?
4. What is the relationships CSE with experience, accesibility and fequency of using computers ?

Study

The subjects in this study are 155 pre-service elementary mathematics teachers. The students were assessed on three scales: Computer Self-Efficacy (CSE), Attitudes toward Computers (ATC), Perception of Computer-Enriched Teaching Environment (PCETE). In addition a questionnaire was administered to the students in order to get an information about: the frequency of using computers, accesibility and experience. The reliability estimates of CSE is 0.71, ATC is 0.85 and PCETE is 0.65 .

Findings and Conclusions

The first analysis was conducted to identify the preservice elementary teachers' responses, as a group, to the items on the computer self-efficacy scale.Results indicated that students' computer self-efficacy is relatively low. For example, the mean of the item " I believe in my abilities to use computers is 2.73 out of 5. One of the reasons for low self efficacy is limited experience on computers.

The responses of preservice teachers to computer-enriched teaching environment scale concerned with the differences between the regular classroom and CAI environment is in favor of CAI. Overall, preservice teachers believed that interest , attention and success would be increased and the level of understanding the material presented on computers could be higher. In addition , they stated that fear and anxiety would be decreased. On the other hand they saw no difference between these two environments with respect to interaction between studentand teacher and class participation. The responses to one of the item related to self-confidence is high, indicated that experience with computers improve beliefs about their self.

Preservice elementary mathematics teachers felt positive attitudes toward computers since they believe that computers play an important role in their lives. They thought computers are useful and essential tools. However, since their experience is limited, the responses to the items in the affective domain showed uncertainity about the degree of attitudes.

The correlation coefficients between the computer self-efficacy scores and experience, frequencu of using computers and access to computers are, 0.42, 0.37 and 0.18 which are significant at 0.05. The positive and significant correlation coefficients indicated that self efficacy on computers is increased with experience and usage.

The study showed that preservice elementary mathematics teachers have positive attitudes toward using computers, and learning and teaching with computers. They believe that CAI is better and more comfortable way of learning than are conventional methods. On the other hand their self efficacy in using computers is low which means that recently added computer courses are not enough to improve their confidence. Nonetheless, computers are now available in most schools. If the role of teacher preparation programs is to produce teachers able and confident to use computers, there is a need to re-analysis the courses and activities.

References

Bandura A. (1977) Self-efficacy: Toward a unifying theory of behavioral change. Psychological Review, Vol. 84, No.2, p: 191-215.

Cakiroglu, E., Askun, C.S. & Karaarslan, H. (1999) Effects of a computer literacy course on pre-service secondary teachers' attitudes and self-efficacy,In D.A. Thomas (Ed.) Proceedings of International Conference on Mathematics/Science Education and Technology , pp. 57-62. San Antonio, Texas: AACE.

Yi, M.Y. & Venkatesh, V. (1996) Role of computer self-efficacy in predicting user acceptence and use of information technology. http://hsb.baylor.edu/ramsower/ais.ac.96/papers/mun.htm

THE OBSERVATORY OF THE ICT IN HIGH SCHOOL CENTRES

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What is it?

The observatory of ICT in non-university schools is a project implemented by Jaume Bofill Foundation and the Edu Lab of the Universitat Oberta de Catalunya, whose purpose is to analyse the use of information and communication technologies (ICT) in the non university education.

Main goals

Measuring the evolution of real use of ICT in non-university schools

Comparing the use of ICT in different communities and countries

Detecting useful ideas for the centres to act with a future view

Creating topics for discussion around the pedagogical use of ICT

Who is participating?

Around 33 centres in Catalonia with different characteristics according to their ownership, population and technologies resources are taking part of a proof to examine (from survey, interviews, round tables and discussions) the situation of the use of ICT.

An assessment council integrated by experts who undertake the use of ICT in non-university school from different fields (trainer of trainers, teachers association, educational administration, etc) are establishing the principles of the project from the analysis of the sample centres work.

A technical team undertakes the communication with the sample centres, from the data collecting and analysis, the research diffusion, and the main conclusions reached every time.

Main aspects subject to study by the observatory

There are many aspects to consider with regard to the ICT use in the non university school. The study of the following list of questions adduce a pedagogical enrichment in the use of ICT in the non university centres. We will formulate hypothesis for each aspect and the study will be orientated attending two criteria:

Possibility of having conclusions more or less immediate and useful to make better the use of ICT.
Interest demonstrated from the centres and educational institutions involved in the project.

Work Methodology

The use of ICT by teaching staff: Knowing how teachers use the ICT can help us to answer questions like: Is it a priority? Is another resource for the teacher? Is a qualitative improvement? What is the contribution of ICT to the educational process?

Strategies the use of the ICT are responding to. It is worth to detect the motivation that teaching staff has to implement ICT in the centre. Is it a new pedagogical resource? Is it just a motivation tool?...

The presence in the centres of interschool projects as a result of the use of ICT. Detecting new experiences can help the Observatory to evaluate changes in the methodology, in the standard of learning and the motivation of the pupils as well as detecting which changes the curricular design is making (basically focussed on the interdisciplinary) comparing co-operative projects with other individual projects focussed in the school without the participation of the ICT.

Changes in the pedagogical exposition of the centre according to the use of ICT. Knowing if the use of ICT raise the co-operative work or reinforce the individual one either the pupils or the teachers, if teachers are forced to expose the subject in a different way. How do work teachers with pupils? And with the rest of the teaching staff?

The interdisciplinary: Although the curricular design is made to be interdisciplinary most of the times the credits proposed become insulated from the rest of the curriculum. Can the use of ICT promote a learning planning more interdisciplinary?

Strategies of the teaching staff to re-establish curricular projects according to the use of ICT. Knowing if planning are re-established according to the use of ICT. It is very important to detect the consideration of the teaching staff face to ICT. Is the new technologies another resource or an essential tool of work that helps to articulate a credit.

Departments (credits, subjects...) with more affinity to the use of ICT. Are there any areas that have tendency towards the use of ICT?

The integration of ICT in the curricular project. Has any influence the use of ICT to the curricular project of the centre?

The capacity of innovation of the teaching staff in the centres which use ICT. Do teaching staff work as usual when using ICT or this use allows teachers to make innovations affording a qualitative improvement? How do teaching staff value the changes made when using ICT?

Teaching staff

- **The use done by teaching staff of ICT** We do believe knowing what are the uses made by teaching staff of the new technologies. The point is knowing if teachers have a priority in the use of ICT. Do teaching staff consider ICT as a pedagogical resource or it is only another tool else to develop their job?

- **The re-defining of the curricular project according to the use of ICT.** We value the necessity of knowing if the curricular project has been modified because of the use ICT. Do the modifications in the curriculum make better its understanding, and its adaptability to the different levels of pupils making better and wider the subject to course?

- **The innovation in the centres through teachers that use ICT:** The point is knowing if the use of the ICT produce innovation in the pedagogical field, new ways of work organisation, increasing of the interdisciplinary work and increasing of co-operation among different centres.

- **Changes in the role of teaching staff.** Traditionally, the teacher assumed the role of knowledge transmitting. How do modify ICT this change of mentality? We have to value if the following aspects affects in the work of the teaching staff: research through Internet, teachers on-line and changes of the pedagogical exposition when using computers.

Attitude of the teaching staff face ICT: The complicity of teaching staff is essential to implement ICT in the centres. This is the raison why it is necessary to know the attitude of teachers. Knowing the grade of implication will help us to know the consensus in the cluster about the use of ICT. Moreover, detecting how teachers see the use of ICT become essential to suppose how difficult, or easy, will be the penetration of ICT in these centres. Mistrust for not knowing how to use them? Uncertainty for the changes implied for using usually ICT? Or, contrariwise, we are talking about been enthusiastic for been able to innovate?

Pupils

How to manage the information received by pupils through Internet. Are there any filters established by teachers? Does the quantity, and sometimes the lack of quality, of the information going round by Internet unable a correct evaluation of its possibility of use? How do pupils use this information?

The use of ICT as a possible generator of inequality. Can a new borderline born between pupils with more initiative and some others passives face the use of the computers. Is it possible to have pupils passing the subjects successfully in the traditional educational but not motivated at using the ICT in the new model of learning? On the other hand, economic inequality among pupils can be widely increased because of the use of ICT in educational centres? Or, contrariwise, the use of ICT become an element which democratize the access and improvement of learning?

The abilities related with the reading and writing of pupils. Which use do pupils of ICT and how are they affected? Are these abilities condition for been useful at using ICT? Do the use of ICT make worse these traditional abilities?

The motivation of the pupil Is a real motivation the use of ICT that brings improvement in the capacity of learning?

The variation of the relation of ICT with pupils. How do the learning of ICT (either the formal one in the school or the intuitive at home) is integrated by pupils? How do they front the learning of a new environment or a new program?

Educational centres and its organisation

The consensus in the cluster about the use of ICT. The use of the ICT as a pedagogical tool of the centre is an aspect to discuss in the cluster, it would exist different inclinations among teaching staff (People against and for). Observing the vision that each cluster has about the use of ICT can help us to detect inclinations and difficulties of each centre.

The appearance of new private educational services through Internet (teachers on-line, new educational software) The thing is to check if the proliferation of these services make evident the limitations of the own centres to reply for the pedagogical necessities of their pupils modifying, in a certain way, the role of the teacher in the classroom.

The performance organisational in the centre. Technology serve to the professionals that use it. From this point of view we think is worth to know if the infrastructure of communication has been modified among the members of the educational community of the centre for the application of the new technologies. It would be important to know also if the bureaucratic process has been modified and the administrative management (making them shorter and quicker) before and after using ICT. Is the communication process with parents and pupils better than before?

The reports of the observatory

Every three months the observatory will make a thematic report reflecting all the study conclusions and the exchange of information with the centres.

The objective of the report is to gather in a systematic way the reality and the work made by the centres with the new technologies in order to obtain a dynamic image about the activities, the expositions and the problems the centres find when implementing new technologies.

The reports are directly linked with those aspects that we pretend to study in the observatory. Three reports will be published in 2000:

First report - April 2000: the reality of the centres will be analysed according to their software and number of PCs, the activities usually made which are based on pedagogic expositions.

Second report - July 2000: the teaching staff role will be analysed in the setting up of ICT, changes in the teaching staff role and their attitude towards the ICT.

Third report - November 2000: First of all, we will study the relationship between pupils and new technologies, the way to manage the information obtained by the pupils from Internet, to know if ICT generates differences, pupils reading and writing improvement with the use of ICT, and their motivation.

The observatory web

The observatory web page is, mainly, an informative reference based on what is done and offered:

Framework for non-university professionals who use ICT, exchange of experiences
Framework for the exchange of experiences in innovation projects
Innovation initiatives as a way to implement achievements in the dialogue between ICT and the educational community members
Knowledge viewed as a way to improve in the ICT use in educational centres
Discussions for enriching all the opinions about this subject

http://www.edulab.net
http://www.uoc.es
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Examining Technology Education and Practices of Preservice Teachers: Lessons Learned from a Large, Urban College of Education

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Abstract: This paper describes the results of a study of the technology beliefs and practices among graduating teacher education majors. The purpose of the study was an exploratory effort to examine the University's compliance with The International Society for Teacher Education's (ISTE) National Educational Technology Standards (NETS): Standards for Students and state graduation skill requirements in the area of Technology education. Additionally, application of technology skills during the students' internships was evaluated. Participants (N=175) were proportionately representative of the enrollment by major and demographics of the college. Recommendations for technology integration and curriculum modifications are proposed.

Purpose

In order to assess the degree to which the University was in compliance with The International Society for Teacher Education's (ISTE) National Educational Technology Standards (NETS): Standards for Students (International Society for Technology in Education, 2000) and the state graduation skill requirements (Accomplished Practices) in the area of Technology Education (Florida Education Standards Commission, 1996) an exploratory study was conducted.

Resources allocated to increasing classroom access to technology have resulted in 96% of all public schools and 75% of all classrooms having computers (NRP Online, 2000); and 90% of schools have Internet connections (Becker, 1999). When schools are given access to technology, the emphasis shifts from the number of computers to how technology is used in the schools (CEO Forum, 2000). However, the U.S Department of Education reports that only 20% of the 2.5 million teachers currently working in our public schools feel comfortable using these technologies in their classrooms (U.S. Department of Education, 1999). A 2000 study by the Center for Educational Statistics reported that: only 24% of the teachers with access to computers make assignments involving the production of multimedia reports; only 30% assigned research using the Internet; and only 19% percent required graphical presentations (Rowland, 2000). The need for teachers adequately prepared to use technology in the classroom is evident and the focus for this study.

Results and recommendations are intended to provide the basis for development and implementation of policy and the identification of future efforts in the area of Technology Education. Education majors are currently required to complete one basic course in computer applications prior to acceptance, however, the generalizability of the skills students gained in this course to the classroom setting was unknown.

Areas of interest assessed in the survey include: technology skills and knowledge students had obtained as well as the sources of these skills and knowledge, student confidence in applying technology skills in the classroom for both teaching and lesson preparation, and the amount of exposure to technology uses in the classroom gained by students during their semester long internships.

Methods

Participants

At the completion of their final semester-Spring 2000, graduating Education majors were administered the survey 'on-line' during their final internship seminars. One hundred and seventy five students participated in the survey. Seventy-six percent of the respondents were female, and 24% were male. Eight-two percent identified themselves as Caucasian, 7 percent African-American, 8 percent Hispanic, 2.5 percent Native American, and .5 percent as Asian.

Sixty-three percent of the group were under 25 years of age, 23 percent between the ages of 26 and 35, 10 percent between 36 and 45 years, and 4 percent were over age 46. Respondents were representatively distributed across majors within the College of Education: 38 % Elementary Childhood Education, 14% Early Childhood Education, 11% Social Science Education, 9% Special Education, 7% English Education, 6% Physical Education, 6% Mathematics Education, 4% Science Education, and 2% or less from Foreign Language Education , Teachers for All Students and Business Education.

Instrumentation

The International Society for Teacher Education's (ISTE) National Educational Technology Standards (NETS):Standards for Students, served as the foundation for development of the survey. College of Education Faculty members provided expert review in the construction, modification, and development of the survey items and format.

In addition to demographic data, students were requested to complete three sections of the survey and make recommendations for current and future technology training for teachers. Section I –Computer Instruction and Frequency of Use was composed of two parts. The first part asked students to indicate the primary way in which they had learned various computer skills and applications by selecting one of the following categories: Not learned, On-the-job, Self-taught, In a workshop, or In a required course. In the second part, students were asked to indicate the frequency with which they used the skill or application by indicating use as daily, weekly, monthly or never.

Section II-Confidence using Technology for Instruction and Experience with Technology applications during Internship was also composed of two parts. The first part asked the respondents to describe their level of confidence in using technology for instruction in the areas of a) lesson planning, b) lesson development, and c) lesson delivery. Responses were indicated on a three-point scale: none, somewhat or very confident. In the second part students were requested to indicate the amount of experience they had applying technology during their internship. Students responded on a five-point scale: 1) I have not observed or performed this skill, 2) I have observed but not performed this skill, 3) I have performed this skill under direct supervision, 4) I have performed this skill independently once or twice, and 5) I perform this skill routinely in my work.

Section III-Confidence in Teaching Technology Content assessed students' confidence in transferring technology content through teaching. Students were asked to rate their level of confidence in teaching various content areas to students on a four-point scale: 1) Not confident, 2) Somewhat, 3) Usually, or 4) Very Confident.

Students were asked to provide information regarding the technology availability and accessibility at their internship sites and information regarding the number and type of technology courses taken.

Results

Table 1 displays the responses to the survey items in Section I.-Computer Instruction and Frequency of Use. Technology Information was categorized by Technology Use: Telecommunications, Program Applications, Advanced Applications and Equipment Based Uses. In part A of the following section, students were requested to indicate the primary way in which they learned the listed computer skills/applications. In part B, to indicate the frequency with which they use the skill or application. Tabled values represent the percent of respondents selecting each response choice. Category averages are shaded. With the exception of Advanced Applications (Hyperstudio, C++), students report being self-taught as the most frequent learning method. Knowledge gained in required courses was the next most identified source of technology training. On-the-job training and workshops were not significant sources of acquiring technology skills.

Seventy percent of respondents indicated daily computer use for Telecommunications purposes (E-mail, Web-browsing). A similar number of students are using word processing programs on a daily basis, however, other program applications are used with much less frequency, with at least 40 % of all respondents indicating they never use other computer-based program applications. Over 85% of the respondents indicated that they never used Advanced Applications or Equipment Based Uses of Technology tools such as scanners and digital cameras.

Table 2 provides student responses indicating their level of confidence in using technology during instruction and the experience students had applying technology during their internships. Technology tasks are grouped into lesson planning, lesson development and lesson delivery applications. In part A, students were asked to rate their confidence in using the listed technology during lesson planning, development and delivery. In Section B, students indicated the amount of experience in applying technology they had received during their internships. Tabled values represent the percent of respondents selecting each response choice. Category averages are shaded. Students felt most confident using technology for lesson planning and delivery, with over 80% of students indicating they were very confident or at least somewhat confident in their ability to access technology for these tasks. Students were less confident in their ability to use technology for lesson development—over 25% of the students indicated no confidence in this area.

Responses to Internship opportunities to apply technology in the areas of lesson planning, lesson development and lesson delivery indicated that students frequently did not encounter the opportunity to apply technology in the internship setting. Over 50% of the respondents indicated they had not witnessed technology use nor did they have the opportunity to use technology during their internships in the areas of lesson delivery and development. Students did indicate more exposure to technology use in lesson planning and that they had self-initiated the incorporation of technology into lesson planning during their internships. Lesson Planning responses indicated that students were also working more independently in this area than in the areas of development or delivery.

In response to a related question regarding internship site technology availability, students reported that the technology they wanted to use for instruction was available at their internship sites always (40%), sometimes available (48%) or not available (12%). Students reported that 83% of the schools where they completed their internships were equipped with adequate technology and that 17% of the schools were below average or not equipped.

Table 1. Computer Instruction and Frequency of Use

	Part A: Where did you learn to use this technology?					Part B : How frequently do you typically use this technology?			
	Not Learned	*On-the-Job*	*Self-Taught*	*Workshop*	*Required Course*	*Daily*	*Weekly*	*Monthly*	*Never*
Telecommunication Uses	**0.6**	**4.3**	**78.2**	**1.7**	**15.2**	**69.7**	**27.0**	**4.6**	**3.7**
World Wide Web/Internet Browsing	0.6	2.9	79.4	1.1	16.0	62.9	28.6	6.3	2.3
Telecommunications (Email, Internet, etc.)	0.6	5.8	76.9	2.3	14.5	76.4	15.5	2.9	5.2
Program Applications	**23.3**	**4.8**	**42.8**	**3.6**	**25.5**	**16.7**	**15.9**	**24.1**	**43.4**
Word Processing Programs (e.g. Word, Word Perfect)	0.0	5.1	72.2	4.0	18.8	71.0	23.3	3.4	2.3
Desktop Publishing Programs (e.g. Pagemaker, Printshop)	27.7	6.9	51.4	2.3	11.6	8.1	20.9	28.5	42.4
Spreadsheet Programs (e.g. Excel)	13.3	5.8	37.0	5.2	38.7	9.2	14.9	33.3	42.5
Presentation Tools Programs (e.g., PowerPoint)	12.7	3.5	26.0	4.6	53.2	2.3	11.6	37.2	48.8
Graphics Programs (e.g. PhotoShop, FreeHand)	39.2	2.9	48.0	2.3	7.6	2.9	12.8	27.3	57.0
Database Programs (e.g. Access, FileMaker Pro)	46.8	4.7	22.2	3.5	22.8	6.5	11.8	14.7	67.1
Advanced Applications	**62.5**	**2.9**	**10.4**	**2.9**	**21.3**	**1.8**	**2.9**	**9.6**	**85.7**
Multimedia Development Programs (e.g., Hyper Studio, Macromedia Director)	51.1	2.9	13.8	3.4	28.7	1.2	4.7	14.5	79.7
Computer Programming (e.g. C++, Visual Basic)	74.1	2.9	6.9	2.3	13.8	2.4	1.2	4.8	91.7
Equipment Based Uses	**81.5**	**3.1**	**10.3**	**0.9**	**4.2**	**2.5**	**4.7**	**3.0**	**89.8**
Hand Held Personal Computing device (e.g. Palm Pilot)	73.9	2.3	19.3	1.1	3.4	5.3	8.2	5.3	81.2

Video Conferencing	83.9	3.4	6.9	0.6	5.2	1.2	2.9	1.2	94.7
Technology tools such as scanners and digital cameras	86.7	3.5	4.6	1.2	4.0	1.2	3.0	2.4	93.5

Table 2. Confidence in Using Technology for Instruction and Experience with Technology Applications During Internship

	A What is your level of self-confidence in using technology during instruction?			B How much experience you have had applying technology during your internship.				
USING TECHNOLOGY IN INSTRUCTION:	None	Somewhat	Very Confident	①= I have not observed or performed this skill. ②= I have observed BUT NOT performed this skill. ③=I have performed this skill under direct supervision. ④= I have performed this skill independently once or twice. ⑤=I perform this skill routinely in my work. Percent of Responses				
	Percent of Responses			①	②	③	④	⑤
Planning for Lessons	**11.6**	**38.4**	**50.0**	**24.7**	**10.0**	**9.0**	**23.5**	**32.8**
Select appropriate technology to support lessons	7.8	46.4	45.8	14.5	7.3	10.9	32.7	34.5
Identify technology resources appropriate for the Florida Sunshine State Standards	11.0	53.7	35.4	23.2	11.6	16.5	25.6	23.2
Choose effective instructional software	16.1	49.1	34.8	33.1	17.2	11.0	24.5	14.1
Access the electronic information that I want/need	11.9	20.6	67.5	21.0	8.0	3.1	20.4	47.5
Incorporate telecommunications (e-mail, Internet)	11.6	22.0	66.5	31.7	5.6	3.1	14.3	45.3
Lesson Development	**27.6**	**32.6**	**39.8**	**54.2**	**9.6**	**6.3**	**17.8**	**12.1**
Develop computer based presentations using the Internet	27.5	35.0	37.5	56.4	11.7	5.5	16.6	9.8
Develop computer-based presentations using presentation tools (e.g., Power Point)	26.8	31.7	41.5	46.0	13.5	8.6	25.2	6.7
Incorporating word processors into lessons	15.3	27.0	57.7	42.5	5.6	4.4	16.9	30.6
Incorporating spreadsheets and data bases into lessons	35.4	32.9	31.7	63.5	5.7	6.9	15.1	8.8
Use linear (e.g. Power Point) and nonlinear (Web) multimedia presentations	32.9	36.6	30.4	62.7	11.4	6.3	15.2	4.4
Lesson Delivery	**18.5**	**28.2**	**53.3**	**52.0**	**10.2**	**5.4**	**15.6**	**16.7**
Use computers in different settings (e.g., classroom, laboratory, etc.)	13.0	31.1	55.9	30.8	11.9	9.4	22.6	25.2
Using e-mail and the Internet to support small group or individual's work	19.8	26.5	53.7	59.6	10.6	3.7	12.4	13.7
Using e-mail and Internet to support student centered projects	22.7	27.0	50.3	65.4	8.2	3.1	11.9	11.3

Table 3 summarizes student confidence in transferring technology through teaching. Survey items were categorized as either Theoretical Bases for Technology Use or Applications of Technology. Students were asked to rate their personal confidence in teaching their students the computer knowledge and skills listed. In general, students felt more confident teaching students to use different Technology Applications than with the Theoretical Bases for

Technology Use. As noted in Sections I and II, students were most confident in the Telecommunications areas of email and web-surfing.

Table 3. Summary of Student Confidence in Teaching Technology Content

	How confident are you in teaching your students the following technology information and skills areas?			
TECHNOLOGY CONTENT AREAS:	None	Somewhat	Usually	Very Confident
Theoretical Bases for Technology Use				
Basic computer theory such as bytes and bits	38.0	30.7	13.9	17.5
Technology vocabulary (e.g., cursor, memory, Internet, WWW)	8.4	25.7	23.4	42.5
Use guidelines for Internet safety	15.9	23.8	24.4	36.0
Copyright laws as they relate to the Internet	25.3	27.7	18.1	28.9
Use technology legally and ethically	13.3	21.1	24.1	41.6
Applications of Technology				
Use word processors in their work	6.0	12.0	26.9	55.1
Use telecommunications (e.g., e-mail, Internet)	7.8	13.3	22.9	56.0
Use spreadsheets and databases	24.0	31.1	22.8	22.2
Create a bar graph that is linked to a spread sheet	31.7	24.0	18.6	25.7
Incorporate graphics into their computer-based written documents	16.0	25.3	21.6	37.0
Select appropriate technology for a given task (e.g., problem solving, writing)	11.3	22.6	30.4	35.7
Use search strategies with the Internet and CD-ROMS, etc.	10.8	18.7	22.3	48.2
Use electronic encyclopedias and catalogs	12.7	14.5	24.7	48.2
Access information using networks and modems	19.8	17.3	21.0	42.0

Student suggestions for enhancing technology training in the College of Education were requested. Students were asked to respond to the following question: "What suggestions do you have for enhancing future technology training and instruction in the College of Education? What would have been useful to you?" Responses were categorized as either Comments on Current Courses or Further Technology Training. The number of student responses precedes each subcategory.

Comments on Current Courses
9- Courses not useful as technology not currently used in school classrooms
6- Classes too large
6- Technology information is not relevant to program, information is not applicable
5- Inadequate support, TA's not helpful, more one-on-one assistance needed

Suggestions for Future Technology Training
14- More real life applications-develop actual lessons-hands on experience
13- More technology courses are needed
10- Incorporate technology more into current courses
5- Specific training in PowerPoint & Web Page Development
4- More open access labs with more educational software available to review
4- Training on Macintosh/ Apple-IBM not used in schools.

Summary and Recommendations

Although the incorporation of technology into education has grown at a massive rate, the lack of teacher preparedness has necessitated development of standards and graduation requirements to facilitate the seamless integration of technology into instruction. Enhancing the efficacy of technology for transformation of schools is a strong basis for reform; however, the focus of educational development and design needs to be informed by a conceptual framework which explicitly addresses the challenges and potential of technology innovation in education. We are at a crossroads with tremendous potential, and the following recommendations are suggested to direct the use of technology implementation.

- Faculty technology leaders within COE departments are encouraged to develop content specific examples of technology integrated into lesson plans. For example, Social Studies Faculty may use the CITE Forum web site to gain ideas for integration: http:\\www.citeforum.org
- Reexamine and restructure undergraduate technology course.
- Consider more content focused courses by major area of study. For example, technology in Science Education.
- Work with area school districts to ensure students are exposed to technology applications in the classroom by selecting good model teachers and technologically equipped schools.
- Offer individual (one-on-one) training for faculty on the seamless integration of technology into courses.
- Consider reward systems for faculty who integrate technology into courses in the areas of classroom assignments and tenure-promotion.
- Develop college-wide grant writing initiatives for technology development.
- Provide students and faculty better access to and training on technology equipment such as scanners, digital cameras and teleconferencing.
- Create a supportive environment within the College of Education that provides risk-free opportunities for the practice of using various forms of technology.

References

Becker, Henry J. (1999). *Internet use by teachers: conditions of professional use and teacher-directed student use* [Online]. Available: http://www.crito.uci..edu/TLC/finding/Internet-Use/strartpage.htm

CEO Forum. (2000). The Power of Digital Learning Integrating Digital Content. Author: Washington D.C. [Online]. Available: hppt://www.ceoforum.org/home.cfm.

International Society for Technology in Education. (2000). *National Educational Technology Standards for Teacher*. Eugene, OR. [Online] Available: http://cnets.itse.org

National Center for Education Statistics. (2000, April). *Teacher Use of Computers and the Internet in Public Schools, Stats in Brief.* Washington DC: U.S. Department of Education , Office of Educational Research and Improvement.

U.S. Department of Education. (1999). *Preparing Tomorrow's Teachers to Use Technology* [Online]. Available: http://www.ed.gov.teachtech

Multimedia Tools and Case-Method Pedagogy for Teaching and Learning

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Teacher educators face the challenge of preparing teachers to recognize and respond to educational problems as they arise in highly variable, often unpredictable contexts. Two recent innovations in teacher education offer promising possibilities for doing so: case-method pedagogy and multimedia tools for teaching and learning. The purpose of this research was to explore how these innovations interacted in CaseNET to help preservice teachers learn to address problems as they emerge in K-12 classrooms.

CaseNET is a set of Web-assisted professional development courses for educators that combines the use of case methods and Web-based technologies. CaseNET provides preservice and inservice teachers at approximately 20 universities in four countries and 15 school districts in the United States and three other countries opportunities to improve their professional problem-solving skills. Participants in CaseNET use a variety of technologies including videoconferencing, electronic journals, and online discussion groups to learn to analyze multimedia cases. Throughout a fourteen-week academic semester, participants learn to analyze cases using a specific five-step problem-solving strategy (McNergney, Herbert, & Ford, 1994; Herbert & McNergney, 1995, McNergney & Herbert, 1995) and practice this strategy when analzying a set of multimedia teaching case studies.

Teaching case studies might be described as stories, vignettes, or "slices of real life." These cases present predicaments from practice that demand some kind of action (Gideonse,1999). They illustrate reality in its intricate complexity and often include important contextual evidence. Although based on reality, cases condense facts or elaborate on real events to create succinct analytic puzzles. Cases illustrate life in the classroom as it is, not necessarily as it should be. Learning with cases provide preservice and inservice teachers with opportunities to practice problem identification (Merseth, 1996). The skills developed through case methods are useful in a variety of settings. Experience with various types of cases also helps professionals develop a repertoire of defensible solutions for commonly occurring problems (Kleinfeld, 1992; Merseth & Lacey, 1993).

This study investigated the efficacy of a particular problem-solving method on participants' experiences with a multimedia case. The sample consisted of 33 preservice teachers participating in CaseNET at two institutions of higher education (Group One), 26 preservice teachers from these institutions of higher education not participating in CaseNET (Group Two), and 34 other students enrolled in arts and sciences from these institutions of higher education who were neither CaseNET participants nor preservice teachers (Group Three). Problem-solving proficiency, as demonstrated by participants' three-page written case analyses, was determined by a panel of professional educators, or judges, who were prepared to use an instrument measuring participants' abilities to: (1) identify educational issues, (ISSUES); (2) consider events in the case from different points of view, (PERSPECTIVES); (3) identify professional knowledge (personal, empirical, theoretical) relevant to issues in the case and raise questions about other potentially useful knowledge, (KNOWLEDGE); (4) propose actions for addressing a variety of issues, (ACTIONS); and (5) speculate about the consequences of such actions, (CONSEQUENCES).

Participants in the study assembled in groups of about 15 in computer labs where they were asked to read and analyze a case presented in hypertext and multimedia format called "Here to Serve." The case tells the story of a middle school technology coordinator who is challenged to address the needs of mainstreamed students with special needs, attend to the professional development of teachers under her authority, and deal with the many other tasks her position demands. Information useful for analyzing the case was embedded in descriptions of the characters and events occurring in the case and in ancillary materials contained in a resource area linked to the case. After reading the case, participants submitted a three-page analysis that was then rated by a panel of judges.

In examining the generalizability of the judges' ratings, analyses were considered the objects of measurement. Judges were considered random facets and subscale scores were considered fixed facets. The design of the study was participants' written analyses (p) crossed with judges, (j) who were nested within subscales (i), p x (j : i). Using GENOVA, the generalizabilty coefficient was sufficient to propose adequate dependability (g=.77).

Scores indicating participants' problem-solving performance were calculated and a comparison of these sub-scale scores and a total scores was performed. Participants' subscale scores were calculated by summing the points participants received from both judges on each of the subscales on the judges' rating instrument (issues, perspectives, knowledge, actions, and consequences). The subscales reflected each participant's performance on the individual steps of the five-step method.

Judges' ratings were summed to yield the total score. A direct discriminate function analysis was performed using the five variables as predictors of membership in the groups. Variables were ISSUES, PERSPECTIVES, KNOWLEDGE, ACTION, and CONSEQUENCES. One discriminant function was significant. With a combined $x^2_{(10)} = .81$, $p<.01$. After removal of the first function, there was no strong association between group and predictors. The loading matrix of correlations between predictors and discriminant functions suggests that the best predictors for distinguishing between CaseNET participants and those in the other two groups was the rating participants' analyses received on the subscale KNOWLEDGE, ISSUES, and CONSEQUENCES. Group One had higher scores on this variable (M=17.79) than Group Two (M=14.73) and Group Three (M=14.26). Variables loading less than .50 were not interpreted.

The total scores reflected participants' performance on all the subscale items combined. Group scores obtained for participants' total scores were significantly different among groups ($F_{(2, 90)} = 57.91$, $p<.01$). A Tukey post hoc test revealed that there were differences between Group One (M=71.06, s=4.37), and Group Two (M=63.54, s=3.01) and Group Three (M=62.24, s=3.07), but not between Groups Two and Three.

Results suggest that preservice teachers in CaseNET were able to learn the problem-solving strategy and apply it when analyzing a multimedia case study. Participants in this group identified problems, applied professional knowledge, and anticipated consequences more proficiently than did the participants in the other groups.

At least since John Dewey (1910) promoted the joining of education and real life, teacher educators have tried to help preservice teachers develop reflexive teaching strategies that are adaptable to many learners. Teacher educators have provided opportunities for preservice teachers to learn from one another in college and university classrooms and from more experienced colleagues in K-12 schools. Now, multimedia technology offers teacher educators new ways to provide realistic educational experiences for teachers.

References

Dewey, J. (1910). *How We Think.* Lexington, Mass: Heath.

Gideonse. H. (1999). What is a case? What distinguishes case learning? In M. Sudzina (Ed.). *Case study applications for teacher education: Cases of teaching and learning in the content areas.* Boston: Allyn & Bacon.

Herbert, J. M., & McNergney R. F. (1995). *Guide to foundations in action videocases: Teaching and learning in multicultural settings for Foundations of Education.* Boston: Allyn & Bacon.

Kleinfeld, J. (1992). Learning to think like a teacher. In J. H. Shulman (Ed.), *Case Methods in Teacher Education.* New York: Teachers College Press.

McNergney, R. F., Herbert, J.M. & Ford, R. E. (1994). Co-operation and competition in case-based teacher education. *Journal of Teacher Education, (45),*5, 339-345.

McNergney, R. F., & Herbert, J.M. (1995). *Foundations of education: The challenge of professional practice.* (1st ed.). Boston: Allyn and Bacon.

Merseth, K. K. (1996). Case and case methods in teacher education. In J. Sikula, T. Buttery, & E. Guyton (Eds.), *Handbook of Research on Teacher Education: A project of the Association for Teacher Educators.* New York: Macmillan Library Reference.

Merseth, K. K., & Lacey, C. A. (1993). Weaving stronger fabric: The pedagogical promise of hypermedia and case methods in teacher education. *Teaching & Teacher Education, 9(3),* 283-299.

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Helping Third Grade Low Achievers Through Dynamical Modelling Software: An Experimental Study

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Abstract: The aim of our study was to evaluate the instructional effectiveness of a curriculum based software for low achieving children students (LA). In order to test the importance of the type of help, two versions of the same software were developed (static vs dynamic help). Furthermore, the dynamical version was used in two ways (computer alone vs computer and psychologist's support). Sixty students participated in the research. The results of our study clearly suggest that computer technology can help teachers to attend the LA students, at least when the instructional software has been developed regarding the school curriculum and the teaching style of the regular teacher. However, LA students working with the computer alone used less advanced strategies than those used by the LA students who got psychologist's support. Therefore, our results recommend to put computers into the regular classroom so that teachers can "be there" if the student needs help.

Introduction

Although low achieving students (LA) usually do not cause serious problems in the school, they need an individualized instruction to learn what high achievers learn in the classroom through regular teaching (Bornas, Servera, & Llabrés 1997). Teachers have too many students in the classroom, so they could not attend their LA students individually. Computers can deliver such instruction if an appropraite software is used (Bender & Bender 1996). This software has to be based on the specific school curriculum. In addition, the software teaching style has to be in accordance with the regular teacher's style. Despite we know that, generally speaking, instructional software with those characteristics can be useful, several specific questions remain unclear. One of these questions is related to the type of help the software must provide when the student does not understand a concept or when he or she is not using the correct strategy to solve a specific task. Static help is provided when the computer just reminds the student "to be careful", "to pay attention", "to try again", and so on. However, computers can provide dynamic help too. Dynamic help is provided by showing the student the process of solving a specific task (Shute & Miksad 1997). For example, to teach how to solve the addition of 1/4 and 1/2, the computer could show several tanks with water and how water flows from small tanks to a big tank with 1/4 and 1/2 marks. Dynamic help is provided also when the computer teaches a specific strategy. Using criteria to group words (e.g. "red" and "blue" are names of colors) may be a good strategy to remember a list of words. Moreover, dynamic help can be provided by the computer as the only instruction tool or by the computer and the teacher together. Traditional curriculum materials (textbooks) only provide static help. Dynamic help is usually provided by teachers when they draw on the blackboard, play with blocks or other things, build some apparatus in the classroom, etc. (Bornas, Servera & Llabrés 1996).

The aim of our study was to evaluate the instructional effectiveness of a curriculum based software for LA students. In order to test the importance of the type of help, two versions of the same software were developed. One of them provided static help, and the other one provided dynamic help. Furthermore, this dynamical version was used in two ways: with the computer alone and with the computer and a psychologist who gave help to the students if they needed it.

Method

Subjects

Sixty low achieving (LA) students from four third-grade classrooms of a private school in Palma (Spain) participated in the research. They were selected because of their low achievement in the school as well as in the Math and reading specific tests that were administered before they start using the software. The students' teachers also gave their opinion about the achievement level of every student. LA students were randomly assigned to one of four conditions: Attentional Instruction (AI), Computer Driven Instruction (CDI), Computer Assisted Instruction (CAI) or control. Each group was made up of fifteen students.

Educators

There were two psychology students in each group who had been trained to be educators, both in the knowledge of the software and the purely educational aspects. One of them only had the function of observer but could substitute the other when necessary (which did not happen). These students participated both in the pre-intervention assessment and in the post-intervention assessment.

Variables and measures

Academic achievement in math and reading was measured using curriculum based tests before and after the instructional period. In addition, a measure concerning the process of doing the instructional tasks was used for the three experimental groups (see below). Standard attention and impulsivity tests were administered as additional selection criteria.

Procedure

Regular teachers contributed to select the academic contents (reading and math) the software should include as well as the strategies they were teaching in the classroom to solve specific tasks (e.g. dividing). Even some figures that appeared in the students textbooks were reproduced in the software to make it more familiar to the students. In other words, what the software was going to teach and how was going to do it was determined by the school teachers and the school curriculum and materials. The software was developed using the Toolbook® authoring package and it took three months. When the software was almost completed, it was installed on the school computers, and the ten-weeks instruction period started. Some more exercises were added later, during this period, because some students did the programmed tasks very quickly. The AI group worked with the software that provided only static help, and the educator could only refer to this software for help. The CDI group used the same software but it provided dynamic help and the educator did not help students. In the CAI group, dynamic help was also available and the educator helped students if they needed it. Students in the control condition did not work with the software and they followed the regular instruction in the classroom, while the other three groups went out of the classroom to go to the technology classroom to use the software when they had reading or math tasks with their regular teachers. It is worth to note that the software *replaced*, and it was not added to, the regular instruction during the ten weeks research period.

Sixteen computers were located in the school's technology classroom, and the instructional software was installed on all of them. LA students went to this classroom two times a week during ten weeks. Every instructional session lasted 45 minutes, so the total time they could use the software was 15 hours. During each session students had a sheet of paper where they could write or draw whatever they want. These sheets of paper were collected at the end of each session to have some knowledge about the strategies students were using to solve the tasks, but no comment about them was made to the students. At the end of the instruction period, LA students were administered Math and reading performance tests. These tests were designed in accordance with what the regular teachers said they have taught in the classroom during that period.

Results

In general, as to the achievement in the math and reading tests used, there were no statistically significant differences between the four experimental groups. In other words, the children in the control group, who continued to attend regular classes, had the same achievement at the end of the intervention as those who had worked with the computer. As far as the reading comprehension is concerned, by making an analysis of the main effects we obtained a "group" factor score of $F=0.90$. Neither was the interaction between the two design factors significant ($F=0.38$), which is why we analyzed the "test" factor ($F=51.87$; $p<.001$) uni-factorially, but none of the groups showed any significant difference between the two assessment points. With respect to the math scores, the same pattern of lack of differences between groups is maintained. The study of the main effects of the different factors indicates there is no significant "group x test" effect ($F=1.92$) although significant "test" factor differences can be seen ($F=67.37$; $p<.001$). The analysis of this factor shows how despite the fact that the four groups improve significantly from the statistical point of view, the three intervention groups are the ones that show the greatest difference after treatment (see table 1).

	PRE		POST			
	M	SD	M	SD	F	
AI	9.38	3.92	14.15	0.89	20.83	**
CDI	8.40	3.48	13.33	1.63	39.03	**
CAI	10.15	3.95	13.38	1.38	10.83	**
CTRL	9.84	2.96	11.76	2.94	5.71	*

* $p<.05$; ** $p<.01$

Table 1: Calculation Score Before and After Intervention

The analysis of the strategies employed by the children in solving the intervention tasks has been carried out with the information obtained from the sheets of paper handed out to the children involved in the three experimental groups during the intervention sessions. We do not have the strategies of the control group because if we had handed out a sheet of paper while they were in class with their regular teacher we would have distorted the study. The sheets collected during the math lessons did not show any particularly interesting strategy given the fact that the children only made use of them to do the necessary calculations in order to solve the math problems set by the computer. In the case of reading, the sheets showed more varied, interesting strategies. The strategies used were independently assessed by two experts, who only had a list of all the strategies used without knowing at any moment in time the subjects who had carried them out or which group they belonged to. Each expert categorized each strategy as rudimentary, normal or advanced and gave it a score of between 1 and 10. For instance, copying the full list of new words to be remembered was considered a less advanced strategy than grouping words according to certain criteria (e.g. arm, leg, and foot, or red, green, yellow, and white). Afterwards, the value of each strategy was defined as the mean of the two scores appointed by each observer whenever they were placed in the same category and there was a difference of no more than two points between the two scores (otherwise the strategy was not taken into account in the analysis).

According to the ANOVA carried out (see table 2), the CAI group used significantly more strategies than the AI group, and the strategies they used were more advanced than those used by the other two groups.

	AI		CDI		CAI				
	M	SD	M	SD	M	SD	F		Contr.[a]
Number[b]	2.26	1.03	3.42	1.45	4.30	2.17	5.79	**	1-3
Value[c]	7.80	4.68	13.14	7.77	21.42	12.49	8.55	**	1-3 / 2-3
No. X Val.	16.03	13.09	33.85	21.14	60.73	40.58	9.75	**	1-3 / 2-3

** $p<.01$; [a] Contrasts SNK with a significance level of .05 (1=AI, 2=CDI, 3=CAI); [b] Number of strategies used; [c] Value assigned to the strategies

Table 2: Strategies used in reading activities

Discussion

The results of our study clearly suggest that computer technology can help teachers to attend the low achieving students they have in the classroom, at least when the instructional software has been developed regarding the school curriculum and the teaching style of the regular teacher. It is worth noting that the children in the control group continued learning in class the same as what the other groups learned with the computers. Therefore, the computers have been just as efficient as the teachers as far as academic achievement is concerned.

The results obtained as to the strategies are the most important point. Unfortunately, we did not find a good way of assessing the strategies used in math and this would need more research in the future. In addition, it should be said that the procedure we used to know the students' strategies has a clear limitation: A blank sheet does not mean that the student has not used any strategy. However, we chose the blank sheet procedure because it is less reactive than directly asking students what strategies they had been using. Further research is needed to develop better strategies' assessment procedures. Despite this limitation, which recommends caution when reading the following discussion, we think that the results on the strategies in reading deserve close consideration.

Statistically speaking, only the CAI group used strategies which were more advanced than the other groups working with computers. Below, we will comment on this result, but it would now be worth noting the differences between the three groups. The AI group worked with software offering static help and the value of the strategies employed was 7.80. When the software offered dynamic help (CDI) the corresponding group used rather more advanced strategies (13.14). And when, in addition to the software's dynamic help, the educator provided further assitance (CAI) we find much more advanced strategies (21.42). The progression, at first glance, is curious: the value of the CDI group strategies practically doubles the value of those used by group AI, and the value of those used by group CAI practically triples this value. The fact that this was not reflected in the academic achievement could be simply a question of time. It could be supposed that on a more long term basis, the children who acquire advanced strategies will have higher achievement.

Let us now focus on the CAI group which statistically used more advanced strategies than the others. This group, like the CDI group, worked with the computers that offered dynamic helps. The difference between the CDI and CAI groups was not in the software employed but rather in the additional help provided by the educator. Whereas in the CDI group it was minimal or non-existent (the whole responsibility was the software's), in the CAI group the educator actively helped the children who asked for it. Hence, the human factor seems to have been decisive.

If we analyse this factor a bit more we see that the scaffolding provided is meta-cognitive, whereas the scaffolding provided by the software is cognitive. The software with dynamic helps provides cognitive strategies but does not deal with (at least not intentionally or explicitly) the meta-cognitive aspects. For instance, knowing when it is convenient to use a particular strategy, which makes it possible to generalise its use in different tasks or activities is not provided by the designed software. On the other hand the educator, despite having instructions not to teach cognitive strategies directly, could suggest or remind the child of a previously learned strategy. Thus, he was putting himself in a meta-cognitive scaffolding level and this could then explain how this CAI group used statistically more advanced strategies than the others.

To close, specific meta-cognitive aspects could probably be introduced without too much difficulty, and this is a challenge for research into educational software in the near future, but meta-cognition also involves flexibility and speed in adapting to children's needs. Therefore, computers by themselves can be useful instructors to consolidate the sudents' knowledge, but they have limitations to teach advanced strategies to solve specific tasks. If this is the teacher's goal then the teacher must be there.

References

Bender, R. L., & Bender, W. N. (1996). *Computer-assisted instruction for students at risk for ADHD, mild disabilities, or academic problems*. Needham Heights, MA: Allyn & Bacon.

Bornas, X., Servera, M., & Llabrés, J. (1997). Preventing impulsivity in the classroom: how computers can help teachers. *Computers in the Schools, 13*(1/2), 27-40.

Bornas, X., Servera, M., & Llabrés, J. (1996). *VISPRO.Grafies: programa interactiu per a l'aprenentatge de les grafies*. Palma: Universitat de les Illes Balears.

Shute, R., & Miksad, J. (1997). Computer assisted instruction and cognitive development in preschoolers. *Child Study Journal, 27*(3), 237-253.

Our Own Tower of Babel: Describing Instructional Technology or Educational Technology Doctoral Programs

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Abstract: Many of us who teach those who will become tomorrow's professors have not found a way to clearly share what we do and find out what others are doing in their doctoral programs. Information the authors gathered about a variety of educational/instructional technology programs demonstrated the complexity and richness of doctoral programs in this area. This appears to be the right time for discussion of how we are alike and different and for the possible development of additional doctoral programs in the area. A better understanding of our missions, visions and language within this community will assist us in our conversations. Further, clarity in our program foci is reflected in program goals, university/grant-funded research opportunities for graduate students, employment options for graduates, and the hiring of appropriate faculty. This round table will discuss a project that aims to help build a common vocabulary and common understandings to encourage the conversation.

Predictive Relationships Among Certain Personality Factors and Novice Teachers' Use of the Newer Technologies

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Abstract: As a result of innovative technologies designed to enhance learning, today's teachers must learn to incorporate the newer technologies into instructional strategies. The present study examined the impact of certain personality types of Emergency Permit secondary teachers' inclination to use technology. A selected sample of 200 Emergency Permit teachers was surveyed using the Myers-Briggs Type Indicator and a questionnaire designed to determine the subjects' willingness to use technology. The Kruskal-Wallis one-way analysis of variance test was applied to each of the 20 items contained in the survey. Findings indicate that Intuitive-Thinking types of personalities were more likely to utilize technology in teaching while the Sensory/Feeling types were the least likely.

Introduction

The quality of public school education has been of grave concern since the Nation at Risk report in 1983 (National commission of Excellence in Education, 1983; Schlechty and Vance, 1981, 1983; Doyle and Hartle, 1985; Seely, 1990). Commission reports--The Twentieth Century Fund Task force on Federal Education Policy (Making the Grade), the Task Force for Economic Growth (Action for Excellence), and the National Science Board Commission (Educating Americans for the 21st Century) supported the growing alarm and called for changes in public education and reform in the preparation of teachers. Major concern in the U.S. today focuses on public education and teachers' ability to educate students for the 21st Century. One major challenge is the use or disuse of newer technologies available. The importance of a technology-based, integrated learning environment for students cannot be over emphasized since technological transformation is occurring daily (Reed and Sautter, 1987; Crow and Buckley, 1988). As early as 1989, Dezell stated," We must work together to ensure that technology becomes a constructive force in children's lives (p.3)." Technology is an instructional tool that can lure students to engage actively in the learning process. Public schools must incorporate and transfer the use of technology into teaching methodology to successfully educate students for tomorrow's generation.

In addition to the use or disuse of technology in teaching, there has been an interest highlighting the types of personalities that tend to use or not use technology. Erdle, Murray, and Rushton (1985) found that specific personality traits of teachers are reflected in classroom instruction, especially through the teacher's use of various instructional strategies and material. They also found that a positive relationship existed between individual personality constructs and learning styles. Meisgeier and Richardson (a996) concluded that all personality types and learning styles of children in the classroom would receive direct benefits from teacher education and preparation programs that used the Myers-Briggs Type Indicator (MBTI) in preparing future educators. One of their more supportive findings stated that teachers and pre-service teachers knowing the implications of their MBTI, as well as their students' MBTI, may have a more global understanding of a useful framework for modeling instructional technology. In addition, they will be more likely to include it as a tool to focus on integrating the curriculum both vertically and horizontally. Research results support the use of the Myers-Briggs Type Indicator (MBPI) as a valid means of identifying the different types of cognitive styles and how individuals process information and make decisions. Once identified, the MBPI also describes how individual types make needed adaptations through self-reflection and personal growth (Lyons, 1984; Thompson and Borrello, 1986; McNickle and Veltman, 1986; Clark and Peterson, 1986).

Griddler and Stratton (1990) found that the MBPI results could be used to help teachers develop different teaching methods and more readily accept materials and technology. Studies indicate that extroverted, stable, and tough-minded personalities were more receptive to the use of the computer (Grant and Cambre, 1990; Katz, 1992). Knupfer (1989), in a study with elementary education majors concluded that a "sensing" individual desired direct access to technology but that a "intuitive" type was cautious and needed some prior training before initiating multimedia procedures. "Intuitive/thinking" types of intermediate/secondary teachers or those educators who are creative, analytical, logical, and imaginative are more receptive to the use of technology than the "sensory" types who are practical, realistic, and sociable (Sudol, 1991; Katz, 1992; Smith, Munday and Windham, 1993). "Sensory/feeling" types of teachers are interested in examining meanings and relationships and are least likely to be comfortable with technology that other personality types (Grindler & Stratton, 1990; Smith, Munday and Windham, 1993).

The 1995 NCATE standards have raised expectations for colleges of education for candidate and faculty use of technology in instruction and assessment. Wise, Leibbrand, and Williams (1997) state, "The challenge is how to change the situation so that teacher candidates are provided with a solid foundation in technology skills which they can use in the classroom. The accreditation standards will continue to have higher expectations for educators to utilize technology for teaching and assessment.

Instrumentation

The Myers-Briggs Type Indicator (MBTI), used to identify personality types, and a questionnaire designed to describe teachers' willingness to use technology were administered to collect data for the present investigation. C. G. Jung created and tested the MBTI model in his clinical practices, and Isabel Myers furthered the model through the development of the Indicator to make it possible to test and use Jung's theory with nonclinical populations. The instrument, developed through clinical experiences and supported by research, was created in the 1940's and revalidated in 1977 (Myers and McCaulley, 1985). In order to make practical applications of the instrument possible for research, the MBTI was published by the Educational Testing Service (ETS).

The MBTI is a widely used personality inventory with positive evidence of its construct validity (Thompson and Borelo, 1994). Mendelsohn (1965, p. 321) reported that "an unusually large body of reliability and validity data" has been completed on the MBTI. Test-retest correlation of approximately 0.70 were obtained for three of the indices and 0.48 for the fourth. Further, Mendelshon reported the internal consistency reliabilities (split-half) for the indices ranged from 0.70 to 0.80 (1965).

The MBTI, form G, is a self-administering questionnaire that has a 96 item in forced-choice self-scoring format. Scores generate eight basic personality preferences that assist individuals in understanding themselves and their behavior. Of these eight, this study used the following four: Sensory/Feeling (SF), Sensory/Thinking (ST), Intuitive/Feeling (IF), and Intuitive/Thinking (NT).

Background literature and similar studies guided the selection of questionnaire items for the technology questionnaire (Dezell, 1989; Callister & Burbules, 1990; Cicchelli & Baecher, 1989). A panel of six professional educators with expertise in the field of educational technology and who met criteria established by the researchers established content validity for the survey. The questionnaire contained 20 statements, with eleven of the 20 statements considered to elicit positive responses concerning the respondent's perception of his or her willingness to use technology. Nine items were considered to elicit negative responses on similar issues. A Likert-type scale was used to indicate the relative importance of each item. Number "6" on the scale indicated the lowest degree of acceptance, strongly disagree; and number "1" revealed the highest degree of acceptance, strongly agree.

Methodology

During the spring semester, 2000, a selected sample of 200 Emergency Permit teachers enrolled in university courses, SHED 515 and Reading 515 and who are currently teaching on an emergency permit contract in grades 7 -12, were invited to participate in the study. These teachers were employed in school districts on emergency permit teaching certificates in the Northeast Texas area. Data for this study was acquired from scores on a technology questionnaire and the Myers-Briggs Type Indicator (Form G). Demographic data was obtained from personal reports included in the questionnaire. Instruments were administered in a regularly scheduled class period by the researchers. Of the 200 teachers contacted, 149 returned both instruments with their responses.

Treatment

To assess the impact of teacher's personality types their willingness to use technology, the Kruskal-Wallis one-way analysis of variance test was applied each of the 20 items contained in the technology survey. For ten out of the twenty items, a significance difference between ranks were obtained ($p<.05$). For each of the ten significant items, a Mann-Whitney U test was applied to assess the impact of specific personality types – Intuitive/Thinking (NT), Intuitive/Feeling (NF), Sensory/Thinking (ST), and Sensory/Feeling (SF). Tables 1. and 2. provide a listing of the significant ($p<.05$) personality type pair-wise comparisons within each item.

Conclusions

Alternative certification program participants classified as Intuitive (N) were more receptive to the use of technology than Sensory (S) types. Pair-wise comparisons of personality types within ten of the technology survey items found significant differences between Intuitive associated and Sensory associated types. This conclusion is congruent with cumulated research on type-indicators and their relationship to teaching and learning styles (Grindler & Stratton, 1990). Smith, Munday & Windom (1993) found that Intuitive/Thinking (N) types of secondary teachers, those educators who are creative, analytical, logical, and imaginative, are more receptive to the use of technology than the Sensory (S) types who are practical, realistic, and sociable. They also discovered that Sensory/Feeling types of educators who are interested in investigating meanings and relationships are also least likely to be comfortable with technology than other personality types.

Within Intuitive types, a significant difference was found between Thinking (T) and Feeling (F) types on two technology survey items. Within Sensory (S) types, no differences were noted between Thinking (T) and Feeling (F) types.

	Comparisons				
	NT/NF	NF/SF	NF/ST	NT/SF	NT/ST
I enjoy using computers.		*		*	
I feel comfortable using a word processing program.		*		*	*
I can think of several ways to use computer software for instructional purposes.		*	*	*	*
I look forward to the time that telecommunication systems are in every classroom.		*	*		*
If my school district would pay the tuition, I would take an educational technology course.		*		*	*

(1) An asterisk (*) represents a pair of groups significantly different ($p<.05$). For each pair-wise comparison, the first personality type listed represents higher agreement with each statement.

Table 1: Mann-Whitney *U* Test Significant Personality Type Pair-Wise Comparisons, Positively Stated Items

	Comparisons				
	NF/NT	SF/NF	ST/NF	SF/NT	ST/NT
Using media & technology is more trouble than it is worth.				*	*
I feel very negative about computers in general.	*	*		*	*
I am not comfortable using technology in the presence of others.	*	*		*	*
I feel that instructional software is nothing more than an attempt to replace the teacher.		*	*	*	
I think that the use of instructional technology is best limited to certain subjects.			*		*

(2) An asterisk (*) represents a pair of groups significantly different ($p<.05$). For each pair-wise comparison, the first personality type listed represents higher agreement with each statement.

Table 2: Mann-Whitney *U* Test Significant Personality Type Pair-Wise Comparisons, Negatively Stated Items

Implications for Practice

Because of the emerging demand for teachers to use technology, the research data may add to the body of knowledge on professional development and be used by educators to modify and adapt programs and curriculum through the identification and individualization of the different personality types. This study suggests that those who are charged with educating preservice and novice teachers need to be aware of specific types of personalities that tend to use or not use technology as an instructional tool and their tendency to incorporate and transfer this information into a practical teaching methodology. Therefore, educators must support the call for change and reform in the preparation of teachers in order to successfully reduce anxieties often experienced by some novice teachers when challenged with the task of supporting alternate ways to align materials and their teaching styles with new technology-related projects and curriculum packages.

Teachers who are aware of their own and others' type profiles can develop different attitudes and teaching methods that will empower them to accept materials and technologies as well as help to facilitate the learning process of diverse student populations. In return, they will be able to provide a more solid foundation in educational technology which will improve the potential for each individual to develop those global technology skills needed to survive in a high-technological society. For effective training educators need to design programs for pre and in-service teachers that include descriptions of how different personalities can best use technology in the classroom with diverse students. Those individuals more inclined to use technology may be identified to work in interdisciplinary teams with others who are less successful using the newer technologies in the instructional process. Building on the ability of those personality types more inclined to use technology, provide models that could enhance the use of technology of others in schools.

References:

Callister Jr., T.A., & Burbules, N.C. (1990). Computer literacy programs in teacher education; What teachers really need to learn. *Computers in Education, 14(1),* 3-7.

Cicchelli, T. & Baecher, R. (1989). Micro-computers in the classroom: Focusing on teacher concerns. *Educational research quarterly, 13(1),* 37-46.

Dezell, J. (1989). The role of multimedia technology in education. *Technology horizons in Education, 17(ibm Special Issue),* 2-3.

Dial, M., and C. J. Stevens (1993). Introduction: The context of alternative teacher certification. *Education and Urban Society*, 26(1), 4-17.

Feistritzer, C. E., and D. T. Chester (1998). *Alternative teacher certification: A state by state analysis, 1998-99.* Washington, D.C.: National Center for Educational Information.

Grindler, M.C., & Straton, B.D. (1990). Type indicator and its relationship to teaching and learning styles. *Action in Teacher Education,* 7, 31-34.

Katz, Y.J. (1992). Toward a personality profile of successful computer-using teacher. *Educational Technology,*32, 39-40.

Meisgeier, C.H., & Richardson, R.C. (1996). Personality types of interns in alternative teacher certification programs. *The Educational Forum, 60,* 350-359.

Mendelsohn, G. A. (1965). Myers-Briggs Type Indicator. *Buros sixth mental measurements yearbook.* Highland Park, N.J.: Gryphon.

Myers, I. B., & McCaulley, M. H. (1985). *A guide to the development and use of the Myers-Briggs Type Indicator manual.* Princeton, N.J.: Educational Testing Service.

Seigel, S. (1956). Nonparametric Statistics for the Behavioral Sciences. New York, NY: McGraw-Hill.

Sudol, R.A. (1991). Personality influence on student use of word processing. *A paper presented at the Annual Meeting of the Conference on College Composition and Communication*. Boston, MA.

Thompson, B. & Borelo, G. (1994). Construct validity of the Myers-Briggs Type Indicator. *Educational and Psychological Measurement 46(3),* 745-52.

Wise, A. E., J. A. Leibbrand, & B. C. Williams (1997). NCATE's response to critical issues in teacher preparation today. *Action in Teacher Education*, XIX(2), 1-6.

The Technology in Education Competency Survey (TECS): A Self-Appraisal Instrument for NCATE Standards

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Abstract: The Technology in Education Competency Survey (TECS v1.1) is a self-assessment rating form covering teacher competencies in major areas addressed by the National Council for the Accreditation of Teacher Education (NCATE) standards for the USA. It is intended for preservice educators interested in measuring the level of technology competency in their students. Preservice programs may wish to use this instrument as a posttest to determine if students, upon exiting, feel competent to use information technology in their future classrooms. TECS v1.1 may also be useful as tool to assess pre-post changes in classes that intend to teach integration techniques.

Introduction

TECS v1.1 is a self-report measure for use in assessing teacher education graduates' technology competency in six major areas: Professional Productivity, Project-based Learning, Problem Solving, Assisting Students with Special Needs, Teaching about Technology, and Ability to Use a Range of IT Learning Environments. The instrument was constructed using the ISTE guidelines contained in "Preparedness of Graduates" (ISTE, 1999) as a blueprint. Nine items were written to represent the areas listed in Table 1. Five-choice Likert rating categories (1= strongly disagree to 5 = strongly agree) were selected as the means of gathering responses. Normal completion time is less than 5 minutes.

TECS Content and Construct Validity

A factor analysis (ULS, Oblimin rotation) was carried out on data gathered from 188 preservice teachers and 44 university faculty in Texas during 1999-2000 in order to explore the underlying construct(s) of the scale. A scree plot of the eigen values produced by factor analysis indicated that either 1 or 2 factors existed in the data. Successive interval scaling (T-scale, Dunn-Rankin, 1983) performed on the same data indicated that the 9 items form a reasonable unidimensional scale. These analysis outcomes were judged to be sufficient evidence that the TECS has high content and construct validity.

Internal Consistency Reliability

This direct appraisal, 9-item form has yielded an internal consistency reliability estimate of .92 across 188 preservice educators and 40 university faculty (Christensen & Knezek, 2000). The instrument appears to consistently yield reliability estimates in the range that instrumentation authorities such as DeVellis (1991) would label "very good."

Contemplated Refinements

Psychometricians have suggested that removal of compound item components in items 1, 5, and 6 may further improve the scale. Future research is planned to determine if selecting just one descriptor of skill level for a given NCATE competency, rather than listing the several examples included in the specification, is sufficient. For example, deletion of the phrase "and implementing" from item #5, "I feel competent constructing and implementing..." may improve its measurement characteristics. TECS v1.1 is currently available in the book, *Instruments for Assessing Educator Progress in Technology Integration* (Knezek, Christensen, Miyashita, & Ropp, 2000). It can also be found online at http://www.iittl.org.

Table 1. Items on the Technology in Education Competency Survey (TECS) v1.1

1. I feel competent using a word processor and graphics to develop lesson plans.
2. I feel competent using e-mail to communicate with colleagues.
3. I feel competent using the World Wide Web to find educational resources.
4. I feel competent using an electronic grade book.
5. I feel competent constructing and implementing project-based learning lessons in which students use a range of information technologies.
6. I feel competent to help students learn to solve problems, accomplish complex tasks, and use higher-order thinking skills in an information technology environment.
7. I feel competent in recognizing when a student with special needs may benefit significantly by the use of adaptive technology.
8. I feel competent about teaching K-12 students age-appropriate information-technology skills and knowledge.
9. I feel competent working with students in various IT environments (such as standalone and networked computers, on-computer classrooms, labs, etc.).

References

Christensen, R., & Knezek, G. (2000). *Internal consistency reliability for the Technology in Education Competency Survey*. Presentation to the Preparing Tomorrow's Teachers Evaluator's Workshop, American Educational Research Association Annual Meeting, New Orleans, LA, April 25, 2000.

DeVellis, R. F. (1991). Scale Development. Newbury Park, NJ: Sage Publications.

Dunn-Rankin, P. (1983). Scaling Methods. Newark, NJ: Erlbaum.

International Society for Technology in Education (ISTE). (1999). Will new teachers be prepared to teach in a digital age? A national survey on information technology in teacher education. Santa Monica, CA: Milken Family Foundation, Milken Exchange on Education Technology.

Knezek, G., Christensen, R., Miyashita, K., & Ropp, M (2000). *Instruments for Assessing Educator Progress in Technology Integration.* Denton, TX: Institute for the Integration of Technology into Teaching and Learning. [Available online: http://www.iittl.org]

The Role of Teacher's Mediation in the Development of Hypertext Projects

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Abstract: This research aims to investigate the role of teacher's mediation in the development of cooperative learning and autonomy. It was based on the constructivist and social interactionist learning teaching conception. In order to do that, we accomplished a longitudinal case study with genetic analysis of the occurrence of situations involving co-operation and autonomy among 8-10 year old children in the course of a work project using Microworld software. A field journal was organized by the teacher and four categories were used in its analysis: "Cooperative learning", "Autonomy", "Non-existent cooperative learning" and "Heteronomy". The increase of the two first categories and the extinction of the last ones were verified during the intervention, demonstrating the importance of teacher's intervention in the development of those characteristics.

Introduction

The current study, based on a constructivist and social/interact ional concept of the teaching-learning process, aimed to investigate how teacher's mediation in the construction of hypertext projects benefit the cooperative learning and autonomy development. In order to do so, a longitudinal case study was accomplished. It lasted five months, during which a genetic analysis about the rising of situations involving cooperation and autonomy among children engaged in the construction of a work project with *Micromundos* software (Logo language) took place.

We can consider the pedagogic approach adopted by the teacher as a guide to his/her work, either towards reproduction or construction of knowledge. Coll (1994), based on Deutsch's studies (1973), states that some investigations succeeded in demonstrating how cooperative learning experiences provide the establishment of more positive relationships among students than competitive ones. The students' connections became more friendly, attentive, respectful and helping.

Seidl de Moura and Oliva (1996) point out some of the cooperative working traits: it is a long term activity with a longitudinal evaluation of the student who should be able to overcome a plausible stipulated stage; it is a group with a common goal and co-helping elements; it is an active, dynamic search for knowledge through individual reading and sharing; the teacher should suggest about the task division; there should be a division of the material to be studied making everyone responsible for the knowledge to be collectively acquired; it should promote critical evaluation by presenting a topic, a subject to the students.

Socializing has been Vygotsky's study subject (1984). He affirms that social interaction has an essential role in cognitive development and identifies two child development levels that can be extended to any other learner. The real development level, determined by one's capacity to accomplish the proposed task by him/herself and the potential development level which is determined through proposed activities achieved with help or cooperation of a more skilled person.

The gap between the real development level and the potential development level is known as the 'Proximal Development Zone' and that is where the learning process should be taking place. *"Already consolidated processed do not require outside interference to get started; on the other hand, processes yet to be structured do not benefit from this sort of interference"* (Oliveira, 1997, p.61).

According to Vygotsky (1984, p.60), *"(...) other people's interference really affects the results of an individual action"*, therefore social interaction is considered very important in the building of human psychological functions, promoting one's development.

"Other people" could be their own classmates, more capable or not, or even the teacher. Seidl de Moura and Oliva (1997) say that his/her classmates help the student's development during a cooperative activity, which does not depend on spontaneous formation but on *"a person who coordinates these interactions by distributing the prompting tasks. The teacher establishes certain objectives that should be accomplished by the group"* (p.3). However the partners for promoting the Proximal Development Zones are not always the more experienced ones: classmates with similar development level can be actors throughout this process for the significant amount of time they spend together.

As you can see, the child is considered an actor in the scenery and not a mere receiver of social interference. For that reason, he/she can assume multiple roles, having the opportunity to live meaningful experiences and interact with others, promoting the development of superior mental functions.

Newman, Griffin and Cole (1989) bring about the concept of construction zone, which amplifies the conception of proximal development zone. The construction zones are development-promoting spaces, where signification is traded, shared and interchanged. In these sites, the growth of the partners engaged in the trading and acquirement of a wide range of signification is very likely to occur.

Tudge (1996) calls our attention to certain studies, which could suggest that *children learn meanings, behaviors and adult technology during a process of collaboration* (p.152). As a result, the development of appropriated cultural forms happens because of the cooperation with grown ups or an advanced classmate. Beyond its social aspect, partner collaboration is an effective way of stimulating cognitive growth, and, to researchers based on Piaget, the social cognitive conflict would be its promoting agent. Nevertheless, the ones based on Vygotsky, have concluded, *"for interaction to be effective, children should work as a group towards a common goal"* (p.164).

Forman (1981, in Tudge, 1996) describes a research involving fourth grade children in which it was verified that during a certain age the individual does not think about coordinating his/her activities with the other classmates. Still, many of these children gradually grew more able of working in groups and even subordinating their own individual roles to a partner's, willing to accomplish a common objective.

Many studies have proved that children learn more historical concepts when working in groups than in individual activities, confirming that active participation towards a collective aim is a necessary element for collaboration and critical evaluation (Tudge, 1996).

Piaget (1977) deals with autonomy and heteronomy as he presents a study about the game rules in the book "The moral judgment of the child". According to it, two group of phenomena are connected to these rules: a) rule practice, or how they are applied and b) the consciousness of these laws, and either autonomy or heteronomy, which are inherent to the rules.

Through his studies of moral realism, Piaget (1977) concluded *"it seems like there are two distinct morals for the child"* (p. 170), as a result of experienced processes: adult moral enforcement and cooperation. The first one promotes heteronomy and moral realism while the second generates autonomy.

The last one begins to develop when the child discovers that veracity is essential to friendly relations and mutual respect. *"There is moral autonomy when the consciousness longs for an ideal independent from any external pressure. Without relationship there is no moral necessity"* (Piaget, 1977, p.172). In every connection to another person with unilateral respect, heteronomy can be found. Autonomy rises with reciprocity, mutual respect and necessity to treat others, as they would like to be treated.

To this author, cooperation and autonomy are always together what can be easily noticed by the statement that there are two types of respect, and consequently two morals: one is heteronymous and the other, autonomous or cooperative: *"Heteronomy provides objective responsibility as well as autonomy, natural to mutual respect, leads to subjective responsibility"* (1977, p.290).

Kamii (1988) defines autonomy, as being governed by one's self in opposition to heteronomy, that implies to be guided by another person.

According to her, children are gradually able to become more autonomous and thus more independent, being less guided by others. However, it happens only if adults adopt an attitude that promotes the development of autonomy. Any how, as she reviewed Piaget's theory, Kamii (1988) stated that adults reinforce children's natural heteronomy by using rewards and punishments.

The punishment has three different consequences: repetition of the act but this time the child worries about not being caught, obedience, which assures safety and respect, or reaction, which can lead to criminal behavior. Therefore, punishment strengths children's heteronomy, stopping the development of autonomy

According to Kamii (1988), Piaget has developed a new theory on how children learn moral values. While traditional conception believes that children assimilate such values from their environment, Piaget defends that, in order to acquire these principles, children must first construct them inwardly, by interacting with their environment. The outside does not absorb the values.

Autonomy is also developed intellectually and not only on the moral field, by using the same principle: knowledge construction should come from the inside instead of an outside insertion. Children acquire knowledge by creating and coordinating connections. This is what we call constructivism.

We believe that reporting this sort of educational proposal, which uses work projects and computers to promote an appropriated environment for developing a more cooperative and autonomous subjectivity, is a pertinent contribution to teachers because: *"a well-succeeded school performance would be the one that agreed to the student's potentials and demands, promoting their growth and creative production, motivating the assimilation of new knowledge and learning attitudes, comprehending life in its modern complexity"* (Novaes, 1999, p.105).

Method

Twenty-three students, ranging from 8 to 10 years old (third grade of elementary school), took part in the project. A longitudinal case study with a genetic analysis of the rising of situations involving cooperative learning and autonomy was adopted as the research model. It happened throughout a pedagogic intervention consisting of an interdisciplinary project with hypertext production. The theme, object of the interdisciplinary work, was included in the Social Studies program: "Rio de Janeiro at different times (Colony, Empire and Republic)". Other subjects were involved in the study, such as Geography, Science, Math and Portuguese Language, allowing the knowledge to be expanded and inter-related.

Fourteen topics on the yet to be researched subject matter were selected by the students (occupation of space, fauna, flora, water supply, illumination system, clothing, communication means, economic activities, sewerage, transportation means, alimentation, and significant historical and scientific facts.

During the entire project, there were various communication sources available to the students (videos, magazines, newspaper, CD-ROM, books, songs, suggestions of field trips), stimulating the group and bringing up interest and curiosity towards the subject. Besides there was a field trip to downtown Rio de Janeiro, in order to verify some researched aspects. The book adopted by the school was also very useful through written exercises, which helped to organize and register the data.

The activities were divided in seventeen steps, distributed along the weeks from August to December. First of all, an initial study was done with the whole group, then a series of researches about the selected topics of each historical period, a data assemblage, discussion, organization of the texts, seminaries, and finally, a test and computer implementation (through *Micromundos* software, based on Logo language).

During the initial study, some activities were used in order to prepare and stimulate the group, bringing up interest and curiosity towards the subject. Regarding the research, data assemblage, discussion and text organization, the students worked in randomly chosen pairs, trading places with each other every time the focused historical period changed. After organizing the reports on each period, the pairs presented seminaries sharing the gathered information with the rest of the group, which was then able to evaluate their work, make suggestions and select the words to go in the glossary. The computer implementation occurred, throughout the three periods, right after the seminar analysis. During the first week of December, by the end of the experience, the class determined what links should be used to connect the "knots" (information islands) developed by *Micromundos*. This moment of wrapping up the hypermedia was considered the climax of the entire process.

In its final form, the hypermedia presents a summarizing scene in the opening page with the elements referring to the three historical periods. Each aspect, including the ones not represented with drawings, has an icon, which enables the user to move on to the next page, holds an index of the included matters and presents the chosen subject in the historical periods.

On the next page there are three icons with the aspect name and the numbers 1, 2 and 3 that illustrate the following time periods: Colony, Empire and Republic. There is also another icon called "Voice" through which the user can hear the students' explanations on how to proceed when getting information about the selected matter. As one of the three icons is chosen, it moves on to the next page and a new topic is explained in the same way. The page contains information about the selected aspect and more icons leading to other pages with drawings, games and other topics.

In order to collect data, the teacher elaborated a field journal. The analysis was done through four different categories: 'Cooperative learning', 'Non-existent cooperative learning', 'Autonomy' and 'Heteronomy'. 'Cooperative learning' situations involved: interaction; shared action; sharing of information; respect to individual differences; negotiation practice; collective responsibility. Situations with opposite qualities were identified as 'Non-existent cooperative learning'. A situation of 'Autonomy' presented the following items: information search through different sources; ability to question, evaluate, gather and organize the most relevant information and capacity to take decisions alone. On the other hand, a situation of 'Heteronomy' was recognized by passive demand of information; acceptance of a transmitted knowledge or situation without questioning; incapability to take decisions.

Results and Discussion

The category frequency was grouped in three time periods. Teacher's mediation throughout the project allowed the rising of certain categories: 'Cooperative learning' (5 times during the first period, 20 during the second and 21 in the third) and 'Autonomy' (27 times during the first period, 39 during the second and 41 in the third); as well as the extinction of others such as 'Non-existent cooperative learning' (5 times in the first, 4 in the second and none in the third) and 'Heteronomy' (10 times in the first, 3 in the second and none in the third).

Categories Periods	Cooperative learning	Non-existent cooperative learning	Autonomy	Heteronomy
Period I	05	05	27	10
Period II	20	04	39	03
Period III	21	00	41	00

Table 1: Evolution of the frequency of the categories throughout each period

Data analysis verified that the students had learned to work in groups, becoming more autonomous and cooperative during the project implementation.

Cooperative work resulted from the teacher's planning and could be easily identified through some parts of the field journal, as can be seen in the following examples.

Group elements engaged in mutual support aiming to overcome difficulties:

> *Some pairs (three), which had finished their part before the others, offered help by giving tips of how to complete the implementation and explaining the right procedure to accomplish it.* (Santos 1999, p. 119)

Active search for knowledge, through individual reading and group sharing:

> *A couple of students (working in 'Transportation means used during Imperial Times') brought two books on different topics about Rio de Janeiro. After using the books and marking some pages considered relevant to the seminar, they offered the same material to other classmates.* (Santos, 1999, p.163)

Task division suggested by the teacher:

> *Each group organized the task division. Each student, from the three teams, was responsible for bringing a poster or drawing of a certain time period.* (Santos, 1999, p.111)

Division of the topics to be studied, making each member responsible for a piece of the whole:

> *The class was divided into five groups that had to look up more information about the Republican period using books and magazines. One of the students suggested that each group had a different theme in order to avoid gathering similar data.*
> (Santos, 1999, p.186).

Presenting a topic to the group, allowing critical evaluation:

> *The teacher explained about the procedures during the seminar (intervention if necessary to ask*

anything or suggest any change in the explanations and choosing of the words that should go to the glossary) and let the children decide which group should be the first one. (...) Every child stood up in front of the class; some held posters, others just stood aside and a student explained the topic. (Santos, 1999, p.112)

There was still another relevant topic, promoter of cooperative learning and that considers the act of 'explaining a certain subject that has been elaborated to somebody else', as one of the most efficient ways to attain cognitive restructuring. In the first group (republicans), two classmates talked about the system of government and architecture, while the others explained the drawings, representing what had been said before.

According to the analyzed authors, interactions of this nature allow the students, both the explainers and the listeners, to learn in a much more successful way.

Collective responsibility was also identified during the project:

During the video, one of the student's grandfather made an interruption and asked his grandson to leave the room for a moment. A few minutes later, the child returned with a smile and told the teacher that he would only leave after the video exhibition. The day after, the teacher found out that the student had explained to his relative that the video was very important for what he was doing, his group work and that it would be unfair with his partner not to stay. The little boy then asked his grandfather to wait by the school gate for he would meet him right after the end of the class.

(Santos, 1999, p.134)

During the discussions about the project, "concept controversies" (Coll, 1994) were verified, or in other words, *"a disagreement of ideas, information, opinions, believes, conclusions or theories among the members of a group, and a desire to reach common ground"* (p.89). These situations may also be described as social-cognitive conflict, in which the group members have different opinions but need to reach a common conclusion, generating intellectual progress:

During the presentation of the group about 'Water supply', there was a real mess and misunderstanding because they also talked about 'sewerage'. When the student started this part of the explanation, a girl said, 'that again? Thierry's group have already talked about it?' Another child replied: 'Let them finish and then we talk'. After the group was done... 'There is water in the sewerage, that's why we decided to talk about it.' But another element of the group said: 'No, that wasn't the reason. The thing was that Ariene gave us this material and we figured we could add it to our topic...' There was still another one that tried to explain...'It's ok, there is water in the sewerage, but it's dirty, it's not the same water they used to drink, take a bath, make food, and that was what your seminar should be about'. After a lot of discussion, the class decided to take this part out of their seminar and keep only the one about the water supply. (Santos, 1999, pp.145-146)

The occurrence of cooperative learning and autonomy was possible, mainly as a result of the attitude adopted by the teacher, based on the constructivist theory.

In a changing world, where things are gradually becoming more uncertain and unpredictable, it is necessary to prepare individuals to be agent of this transformation. Beyond adapting subjects, these individuals must be able to think by themselves and question any sort of proposal, either from work or society in general.

In order to accomplish that, the school ought to focus on the development of cooperation, autonomy and critical thought, which are fundamental features to a citizen to be a critical and questioning agent.

Unfortunately there are few elementary school projects like the one analyzed through this research. Generally, the schools emphasize activities involving competition or non-cooperative exercises.

Conclusion

We concluded that two aspects were essential for the work to succeed: teacher's mediation and its hypertext feature.

The teacher's mediation promoted a complete interaction among the students. They really learned to work as a group, respecting the classmate opinion and sharing their information and discovers.

In this context, the teacher did not adopt an attitude of merely transmitting information, going from simple to more complex concepts and stimulating the students to absorb the knowledge just to express it during a test. She acted as a mediator between the student and the information to be learned.

Therefore, the teacher promoted the student's contact with different subjects and sources, stimulating a critical analysis: *"learner and information emerged with new meanings after each contact, reflecting new knots, links of the extraordinary web of human knowledge"* (Civiletti & Araujo, 1997, p.244).

A hypertext project was possible by the use of *Micromundos*, authorship software that allows the construction of multimedia pages (text, pictures, photos, music, moving images, etc.), which may be interlinked in a non-linear way: *"hypermedia production from authorship software may be considered a very useful pedagogic strategy because it is able to integrate different subjects, promoting a web-like knowledge construction"* (Civiletti & Araujo, 1997, p.245).

However, choosing 'constructivist' software did not guarantee a pedagogic use based on the same principle. It was viable because of the project context. Being constructivist is not an abstract conception. It is a responsibility of the educator. The teacher provided a propitious environment to the students, through which they could be active during the exercises, in a cooperative, autonomous and critical way.

The lack of linearity was presupposed in the project organization. Knowledge construction was not meant to be focused on "the master" but fragmented in multiple intersections among the students, in a collective search of information about some common interest. It happened when the different subject matters included in the project started to establish internal links, relating the groups and demanding discussions and analysis in order to effectively achieve these connections.

Actually, two hypertexts were developed. The first one involved the children themselves, who cheerfully collected data to produce knowledge and feed the knots and links yet to be negotiated. It represented unique moments, filled with friendship and learning. The second, a virtual reflection of the other, is also its recorded memory. Besides a rich source for future users, it proves that transformation is a perennial possibility.

Literature References

Civiletti, M.V.P. & Araujo, A.M.R. (1997). As novas possibilidades didáticas com a chegada da Internet. *Revista Ciências Humanas, 20*, 238–261.

Coll, C. (1994). *Aprendizagem escolar e construção do conhecimento*. Porto Alegre, RS: Artes Médicas.

Deutsch, M. (1973). *The resolution of conflict. Constructive and destructive process*. New Haven and London: Yale University Press.

Kamii, C. (1988). *A criança e o número*. Campinas: Papirus.

Newman, D., Griffin, P. & Cole, M. (1989). *The construction zone: working for cognitive change in school.* Cambridge (etc.): Cambridge University Press.

Novaes, M.H. (1999). *Compromisso ou alienação frente ao próximo século.* Rio de Janeiro: NAU.

Piaget, J. (1977) *O julgamento moral da criança.* São Paulo: Mestre Jou.

Santos, A.M.R. (1999). *O papel da mediação para o desenvolvimento da aprendizagem cooperativa e da autonomia na construção de projetos hipertextuais.* Unpublished master's thesis, Psychology Post graduation Program, Universidade Gama Filho. Rio de Janeiro, RJ.

Seidl de Moura, M.L. & Oliva, A.D. (1997). Condições facilitadoras da aprendizagem cooperativa num ambiente de comunicação eletrônica em rede: o papel do professor. *Temas em Psicologia, 1*, 119-136.

Tudge, J. (1996). Vygotsky, a zona de desenvolvimento proximal e a colaboração entre pares: implicações para a prática em sala de aula. In Moll, L.C. (Org.), *Vygotsky e a educação: implicações pedagógicas da psicologia sócio-histórica.* (pp.151-168). Porto Alegre, RS: Artes Médicas.

Vygotsky, L.S. (1984). *A formação social da mente*. São Paulo: Martins Fontes.

Infusing Technology in K-12 Classrooms: A Study of One Method Used to Evaluate the Impact of a Teacher-Focused Technology Integration Program

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Abstract: This paper describes one method used to evaluate a program designed to prepare teachers to integrate technology into the classroom so that children will become capable and confident users of technology. The method observed involved in-depth training conducted outside of teachers' school districts via the Teacher Leadership Program sponsored by the Bill and Melinda Gates Foundation in Washington state. A quasi-experimental evaluation method was used. Results showed significant improvements in teachers' computer attitudes, self-efficacy, and experience measured on a pre to post test basis. Responses on post-test only factors indicated that: (a) school districts did not contribute significantly to participant's technology infusion efforts; (b) teachers described themselves as collaborative, mentoring, confident integrators of technology, and (c) teachers perceived that student learning was being positively impacted.

Introduction

This paper examines the author's recent evaluation of a statewide technology infusion effort in Washington state. What evaluation method was used? Why? How was the evaluation implemented? What were the results of the evaluation? The focus of this paper is on HOW and WHY the specific evaluation method was used and administered. Results from the study are included in this paper in order to illustrate the kinds of findings which can be achieved by the evaluation method used. The research described in this paper took place in the context of the authors' Doctoral dissertation study. This paper provides an extremely abbreviated description of the study.

In the state of Washington, school administrators and teachers are being pressured to improve student performance on standardized exams and they are being asked to integrate technology into their curriculum. Factors supporting the development of exemplary computer-using teachers should be studied to determine their relative cost effectiveness and to demonstrate to administrators that teaching practices will change given time and an appropriate technology environment for teachers (Becker, 1994, p. 319). Research was conducted on 210 teacher participants of the 1999-2000 school year Teacher Leadership Project (TLP), sponsored by the Bill and Melinda Gates Foundation (the "Foundation") in Washington state. The training method observed involved seventy hours of in-depth training conducted outside of teachers' school districts. Participants received technology training, a laptop, and funding for technology for their classroom.

Conceptually, the research project consisted of six distinct steps: (1) Conduct research to build a scholarly foundation, (2) Identify research questions, (3) Determine methodology and develop or locate a research instrument, (4) Execute the study, (5) Analyze data, and (6) Present findings in context with the research questions. A discussion of the evaluation of the Teacher Leadership Project (TLP) follows. The TLP study is described in the context of these six research steps.

Case Study - Teacher Leadership Project

Conduct Research to Build a Scholarly Foundation

It is critical to take time to perform background research before executing a study. This step is the equivalent to scraping and priming a house before it is painted. The more thorough job that is done in preparation of the house (or in building the foundation for your evaluation effort) the better and more long-standing will be the results when the actual task – painting the house (or administering your study) – is performed. Take time to gather background materials and to discover how previous researchers have tackled evaluation projects similar to the one you face.

For the TLP study, a review of the literature regarding integration of technology into the classroom revealed that teachers will be much more likely to infuse technology into their curriculum if the following items are true: (a) training is available on the use of computers; (b) training is available on integration of computers into the curriculum; (c) the teacher has a sense of self-confidence; (d) the teacher believes that computers are, or can be, relevant to their role as a teacher; (e) the teacher is innovative; (f) the district has conveyed an expectation to the teacher supporting the importance of computers in the classroom; (g) technical support is available to the teacher; and (h) the teacher has peers to collaborate with regarding instructional uses of information technologies (Becker, 1994; Chiero, 1997; Evans-Andris, 1995; Koontz, 1992; Marcinkiewicz, 1994-1995).

The study of the TLP incorporated research from 51 recent studies, the majority of which involve research conducted within the past three years. These studies focused on identifying: (a) differences between exemplary computer-using teachers and "typical" computer-using teachers (e.g. Becker, 1994; Evans-Andris, 1995); (b) differences in technology infusion skills between pre-service and practicing teachers (e.g., Marcinkiewicz, 1994-1995; Rosenthal, 1999; Trilling & Hood, 1999); (c) specific hypothetical "causal factors" such as gender, age, classroom environment, and percentage of budget spent on technology where the researcher seeks to determine the significance of such factors in teachers' technology infusion practices (e.g. Busch, 1995; Loyd & Gressard, 1984a); (d) the current level of teacher technology infusion skills and "best practice" factors which lead to technology infusion excellence (e.g. Peck, 1998; Smith, 1995); (e) the relationship between positive classroom experiences and self-efficacy (e.g. Ertmer, et. al, 1994; National Science Foundation, 1984-1989); and (f) the relationships among computer self-efficacy, attitudes toward computers and the desirability of learning computer skills (e.g. Bandura, 1997; Zhang & Espinoza, 1998).

Identify Research Questions

As the saying goes, "If you don't know where you are going, how will you know when you've arrived?" Properly designed research questions provide a study with direction. In a sense, when designing the study you "reverse engineer" the study to identify what you want to know at the conclusion of the study. Design research questions with the conclusion of the study in mind. The research questions also allow the researcher to narrow the focus of the study so that a methodology and a research instrument can be identified.

In the case of the TLP, the following research questions were identified at the beginning of the study and were answered by the study:

1. Is there a significant change in the level of computer attitudes, self-efficacy, experience, and frequency of use of computers among the participants following the 10 month treatment?
2. What level of support have participants received, from their school districts, for technology infusion?
3. What are participants' perceptions of the impact technology has had on their role as teacher?
4. What are participants' perceptions of the impact of technology infusion on their students' learning experiences?
5. What impact do demographic variables (number of years of experience teaching, age, gender, and grade level taught) have on CASE scores, teacher perceptions of district role, teacher perceptions of their own role, and teacher perceptions of the impact the training has had on student learning?

Develop or Locate Research Instrument

Instrument Design: A Computer Attitudes, Self-Efficacy, and Experience (CASE) assessment instrument was designed by the researcher for this study. The CASE was modeled after three instruments – the Bath County Computer Attitudes Scale (BCCAS) by Bear, Richards, and Lancaster (1987), the Computer Self-Efficacy Scale (CSE), developed by Murphy, Coover, and Owen (1988), and a measurement of Computer Experience as described by Moroz and Nash (1997a).

The instrument consisted of four parts. Part One contained attitude items modeled after the BCCAS. Part Two included items of computer self-efficacy modeled after the CSE. Part Three asked computer experience questions in a format similar to that described by Moroz and Nash. Part Four asked demographic questions. The CASE pre-program questionnaire included 21 questions pertaining to attitudes about computers, 18 questions regarding computer self-efficacy (perceived computer skills), and 13 questions that measured computer experience. A six-point scale was used to measure attitudes and self-efficacy. Teachers were asked to rate the extent to which they agreed or disagreed with each statement, on a scale where 1 = strongly disagree and 6 = strongly agree. Computer experience was measured on a five-point scale, where 1 = never use and 5 = use daily. In addition to these questions, four demographic questions were asked regarding (a) the number of years of teaching experience, (b) participant age group, (c) participant gender, and (d) grade level taught.

Computer Attitudes: The BCCAS was selected as the model for the attitudinal component of the CASE because it has been used with several large groups of elementary grade level students as well as with adult populations, and it has been found to effectively measure overall attitude towards computers (Francis & Evans, 1995; Katz, Evans & Francis, 1995; Moroz & Nash, 1997b). Developed by Bear, Richards, and Lancaster (1987), the original BCCAS questionnaire included thirty-eight Likert items designed to assess attitudes toward computer use. Some items were worded positively (e.g., "I enjoy learning about how computers are used in our daily lives"); others were worded negatively (e.g., "Reading and talking about how computers might be used in the future is boring").

Self-Efficacy: A variety of studies have examined the relationship between computer self-efficacy and other attributes. Miura (1986) suggested that self-efficacy may play an important role in a person's acquisition of computing skills. Self-efficacy is defined as an estimation of one's ability to successfully perform target behaviors to product outcomes (Bandura, 1986). Self-efficacy theory proposes that individuals who judge themselves as capable (efficacious) to perform certain tasks or activities will tend to attempt and successfully execute them (Murphy, Coover, & Owen, 1988).

Busch (1995) defined self efficacy as "the belief in one's ability to execute successfully a certain course of behaviors" (p. 174). Miura (1986) found that self-efficacy impacted a person's understanding of the importance of computers in the future and she found that self-efficacy could be used to help predict an individual's intention to learn about computers. Woodrow (1991) asserted that students' attitudes toward computers played a key role in their success with computer classes and with self-paced computer materials.

Bandura (1997) encouraged the development of an instrument designed to measure teacher self-efficacy for a specific domain, such as computer self-efficacy. "Teacher's sense of instructional efficacy is not necessarily uniform across different subjects. Thus, teachers who judge themselves highly efficacious in mathematical or science instruction may be much less assured of their efficacy in language instruction and vice versa. Therefore, teacher efficacy scales should be linked to the various knowledge domains" (p. 243).

The Computer Self-Efficacy Scale (CSE) was chosen as the model for the self-efficacy component in the CASE instrument. The CSE scale was developed by Murphy, Coover and Owen (1988) to measure perceptions of respondent's capabilities regarding specific computer-related skills and knowledge. The scale employs a 5-point Likert-style response format, with each question preceded by "I feel confident." A high score indicates that the person has a high level of confidence in his/her ability to use computers. The CSE has been found to have a high level of validity when administered to groups of adults and students.

Computer Experience: Research has shown that the amount of experience a person has with computers will significantly impact that person's assessment of their computer self-efficacy (Ertmer, Evenbeck, Cennamo, & Lehman, 1994; Loyd & Gressard, 1984a; Loyd & Gressard, 1984b). It has also been shown that computer experience and computer anxiety are interrelated (Loyd & Gressard, 1984b) and studies have found a link between computer experience and attitudes about computers (Bear, Richards, & Lancaster, 1987; Delcourt & Kinzie, 1993; Loyd & Loyd, 1985; Moroz & Nash, 1997a; Zhang & Espinoza, 1998).

Exemplary computer-using teachers have been found to spend more than twice as many hours personally working on computers at school than do "typical" computer-using teachers. Only a small difference has been found in computer use at home between typical and exemplary computer-using teachers (Becker, 1994, p. 307). Computer experience questions in the CASE, were developed to collect data pertaining to the respondents' computer-related activities – distinguishing between computing activities performed at work and those performed at home. Questions ask the respondent to select appropriate indicators of computer usage that describe the intensity and consistency of activity rather than asking for indicators that would measure the length of time they spend on that activity. This method of measuring computer experience based on frequency of activity rather than temporality (time on task) has been employed in a variety of studies (Chiero, 1997; Hudiburg, 1990; Mitra, 1998; Nash & Moroz, 1997; Zhang & Espinoza, 1998).

Demographics: Demographic questions on the CASE, include: (a) number of years the respondent has taught, (b) respondent age range, (c) respondent gender, and (d) grade level of students the respondent teaches. Research indicates that exemplary computer-using teachers have more years of teaching experience and more years of exposure to computers than the typical computer using teacher – exemplary computer-using teachers had taught their subject for three years longer than other computer users, and they had used computers for about one year longer (4.0 years versus 3.2 years) (Becker, 1994, p. 309).

Post-Program Questions: The post-test instrument was enhanced by the addition of questions arising from the literature and geared to provide insights in the areas of: (a) school district role in participant's technology infusion efforts, (b) teachers' perception of their teaching role upon exit of the TLP, and (c) teachers' perception of the impact their technology infusion efforts are having on student learning.

Execute the Study

Pre-test data collection took place at the start of the first week of training for each participant (July and August, 1999). Two-hundred and twenty-five surveys were collected during administration of the pre-test. At each (of seven) initial training sessions, attendees were given a copy of the CASE (Computer Attitudes, Self-Efficacy, and Experience) instrument and were asked to randomly select a small manila envelope from a collection of similar envelopes. Each envelope contained two adhesive mailing labels, each label displaying a printed control number unique from other participants' number. This control number, adhered to pre and post assessments, guaranteed respondent anonymity while providing a mechanism to correlate pre and post program data for each participant.

Post-test data collection took place at eight locations across Washington State on April 29, 2000, the last day of the final TLP-sponsored training session attended by the 1999-2000 school year's participants. In early April, participants were instructed by the Foundation to reserve their place with the appropriate regional coordinator for the location at which they planned to attend. The Foundation provided the researcher with a list of participants by location. Sealed envelopes containing the matching control number were sorted by region and forwarded, along with surveys, survey instructions, and post-paid return envelopes to the regional coordinators. Regional coordinators administered the surveys the morning of the last day of the last TLP training session for this group. Completed surveys were returned to the researcher.

Gather and Analyze Data

Initially, all of the data were analyzed using descriptive statistics. Frequency scores, mean scores, and standard deviation scores were computed for all Likert scale responses for all response items – both pre and post treatment. A total CASE score for each individual was calculated to measure TLP impact pre and post test. In order to answer research question number one, which asks whether there were significant differences in teacher responses pre to post treatment, t-tests for correlated samples were calculated for each of the 62 CASE factors. Research questions number two, three, and four were answered based exclusively on the results of descriptive statistics calculated on post-treatment data (questions 61-74, which were used to answer research questions number two, three, and four, appeared only on the post-instrument). Two statistical routines were utilized to answer research question number five, which asks whether there was a significant relationship between CASE factors and demographic factors. A Pearson correlation score was calculated to determine if a significant relationship existed between the first demographic factor (number of years teaching) and CASE scores pre, post, and case-change (post minus pre score). Oneway Analysis of Variation (ANOVA) statistics were calculated to determine if a significant relationship existed between the three other demographic factors (age range, gender, and teaching grade level) and CASE scores pre, post, and case-change.

Present Findings in Context with the Research Questions

Results of this study led to seven conclusions:

1. Teacher's computer attitudes are significantly higher following the TLP.
2. Teacher's computer self-efficacy is significantly higher following the TLP.
3. Teacher's computer experience is significantly higher following the TLP.
4. Teachers perceive that school districts provide little support for TLP participants' technology infusion efforts.
5. TLP participants' perceive their role as a teacher to be dramatically different from the classical role of the teacher as the "sage on the stage."
6. Teachers perceive that students benefit from technology infusion efforts.

7. Participants' age, gender, number of years teaching experience, and grade level taught do not significantly relate to CASE scores.

Summary

Research can be exciting, rewarding, and enlightening. Take the time to do the "scraping and priming." Reverse engineer your study and determine ahead of time what you want to know when the study is completed. Avoid creating your own instrument – get permission to utilize existing instruments if possible. Make sure you are gathering data that will allow you to answer the research questions. Carefully analyze the data and report your findings in the context of the original research questions.

The Teacher Leadership Project (TLP), has concluded its third year and has reached more than 400 teachers. Interestingly, the focus of the TLP training model is not on computer use (the "which button do I push" kind of class), but rather the focus is on helping teachers learn how to adopt a mentoring, collaborative teaching style. Training emphasizes use of discovery learning lessons with the appropriate use of technology as a tool to improve student achievement. Sixty of seventy hours of training focus on: discovery learning, technology infusion, and teacher collaboration. About 10 hours of traditional computer application training is provided, nevertheless, the minimum computer experience score doubled on a pre to post test basis indicating a substantial increase in the frequency of use of computers by even the least experienced respondent.

A new environment is emerging in the classrooms of TLP participants. Students often become teachers, and teachers learners. Students are engaged, curious and interested in active inquiry. They have begun collaborating with each other and serving as peer mentors. Teachers have adopted a mentoring, collaborating style of interacting. And through regular meetings and workshops, teachers had the opportunity to share and learn from their peers' new strategies.

Research conducted by the National Center for Educational Statistics (NCES) found that only 20% of the 2.5 million teachers who currently work in public schools feel comfortable using information technologies in their classrooms (Rosenthal, 1999). In contrast with the NCES finding, the majority of participants in the 1999-2000 Teacher Leadership Project indicated overwhelmingly that they are comfortable using information technologies in the classroom. Participants reported that they enjoy using computers (99% positive response), they feel school is a better place with computers (100% positive response), they indicate a positive self-efficacy score on a variety of computing tasks, and they uniformly believe (99% agreement) that student learning is being positively impacted due to participants' technology infusion efforts.

The author hopes this abbreviated description of the Teacher Leadership Project evaluation will provide one more example of an evaluation effort that future studies will build upon.

References

Bandura, A. (1986). Social foundations of thought and action - A social cognitive theory. Englewood Cliffs, NJ: Prentice-Hall.

Bear, G. G., Richards, H. C., & Lancaster, P. (1987). Attitudes towards computers: Validation of a computer attitudes scale. Journal of Computing Research, 32(2), 207-219.

Becker, H. J. (1994). How exemplary computer-using teachers differ from other teachers: Implications for realizing the potential of computers in schools. Journal of Research on Computing in Education, 26(3), 291-321.

Chiero, R. T. (1997). Teacher's perspectives on factors that affect computer use. Journal of Research on Computing in Education, 30(2), 133-145.

Delcourt, M. A., & Kinzie, M. B. (1993). Computer technologies in teacher education: The measurement of attitudes and self-efficacy. Journal of Research and Development in Education, 27, 35-41.

Ertmer, P. A., Evenbeck, E., Cennamo, K. S., & Lehman, J. D. (1994). Enhancing self-efficacy for computer technologies through the use of positive classroom experiences. Educational Technology Research and Development, 42(3), 45-62.

Evans-Andris, M. (1995). An examination of computing styles among teachers in elementary schools. Educational Technology Research and Development, 43(1), 15-31.

Francis, L. J., & Evans, T. E. (1995). The reliability and validity of the Bath County Computer Attitudes Scale. Journal of Educational Computing Research, 12(2), 135-145.

Hudiburg, R. A. (1990). Comparing computer-related stress to computerphobia. Dallas, TX: U.S. Dept. of Education, ERIC Document Reproduction Service.

Katz, Y. J., Evans, T., & Francis, L. J. (1995). The reliability and validity of the Hebrew version of the bath county computer attitude scale. Journal of Educational Computing Research, 13(3), 237-244.

Koontz, F. R. (1992). An assessment of teacher trainees' attitudes toward selected instructional media. (p. Proceedings of selected research and development presentations at the convention of the Association for Educational Communications and Technology and sponsored by theResearch and Theory division).

Loyd, B. H., & Gressard, C. P. (1984a). The effects of age, sex, and computer experience on computer attitudes. Association for Educational Data Systems Journal, 18, 67-77.

Loyd, B. H., & Gressard, C. P. (1984b). Reliability and factorial validity of computer attitude scales. Educational and Psychological Measurement, 44(2), 501-505.

Loyd, B. H., & Loyd, D. E. (1985). The reliability and validity of an instrument for the assessment of computer attitudes. Educational and Psychological Measurement, 45, 903-908.

Marcinkiewicz, H. R. (1994-1995). Differences in computer use of practicing versus preservice teachers. Journal of Research on Computing in Education, 27(2), 184-197.

Mitra, A. (1998). Categories of computer use and their relationships with attitudes toward computers. Journal of Research on Computing in Education, 30(3), 281-295.

Moroz, P. A., & Nash, J. B. (1997). Assessing and improving the factorial structures of the computer self-efficacy scale. Chicago, IL: U.S. Dept. of Education, ERIC Document Reproduction Service.

Moroz, P. A., & Nash, J. B. (1997). Bath County computer attitude scale: A reliability and validity scale. Chicago, IL: U.S. Dept. of Education, ERIC Document Reproduction Service.

Murphy, C. A., Coover, D., & Owen, S. V. (1988). Assessment of computer self-efficacy: Instrument development and validation. Paper presented at the Annual Meeting of the National Council on Measurement in Education (New Orleans, LA, April 6-8, 1988):

Nash, J. B., & Moroz, P. A. (1997). An examination of the factor structures of the computer attitude scale. Journal of Educational Computing Research, 17(4), 341-356.

Rosenthal, I. G. (1999). New teachers and technology: Are they prepared? Technology and Learning, 19(8), 22-27.

Zhang, Y., & Espinoza, S. (1998). Relationships among computer self-efficacy, attitudes toward computers, and desirability of learning computing skills. Journal of Research on Computing in Education, 30(4), 420-431.

Teachers' Perceptions of Self-Efficacy and Beliefs Regarding Information and Communications Technology (ICT)

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Abstract: The aim of this three-year project is to develop information and communications technology (ICT) competencies in both nursing students and teaching staff by means of, implementing technologies into a graduate nursing program offered throughout the province of Quebec, (Canada). Through reviews of the literature and experience from other colleagues, we have learned that actors' motivation is essential for the success of such a project. Our first step was the identification of teachers' perceptions of efficacy and beliefs. These two concepts were then examined in an exploratory research with a mixed research design. In all, twenty-four nursing professors participated, and findings indicate that they perceive themselves as being more efficient in basic level ICT, and less so in advanced ICT. Nevertheless, the research sample in general expressed their belief in the importance of integrating ICT in graduate students' curriculum.

Introduction

During the past four years, nursing professors have been involved in initiating a master's degree in nursing, which has become effective since September 2000 in five universities throughout the province of Quebec, (Canada). These five universities work together as networked learning environments (Chute, Sayers, Gardner, 1997) to ensure that graduate studies are accessible to nurses in all Quebec regions. We anticipated that this geographic layout would represent a big challenge in terms of allowing a specific teacher's expertise to be available to students from all institutions; however, we feared that both actors, students and teachers, would eventually feel isolated.

Integrating information and communication technology (ICT) in the program offers interesting possibilities in terms of enhancing access to knowledge and promoting networking activities. We wanted to create a learning community on the web, that is, a community of practice, which could stimulate energy exchange between the program's partners. We feel that the use of video-conferencing, e-mailing, and the creation of a technological learning environment, etc, seem to provide interesting answers to the needs of both teachers and students. Referring to experiences in the United States, we observe that since 1995, one third of all superior education institutions offer distance-learning opportunities (Cravener, 1999). Amongst them, nursing teaching experiences can be found (Milstead & Nelson, 1998; Cravener, 1999). In Europe, the Open University in England is a leader in distance education. Closer to home, in Quebec, a growing number of experiences have been attempted by colleagues, but never to the extent of offering a full graduate program. Cloutier, (1999) deMontigny & al, (1997, 1999) agree that appropriating information technology is a major challenge for all actors involved. For most of these projects, the conclusions appear quite similar; for one thing, the leaders are thrilled with the existing possibilities however, at some point, they doubt that their colleague teachers and students involved have the intention or the capabilities of really integrating the technologies into their everyday work. Many of these projects have their grounds in the leader's will but do not proceed from the actors' wishes.

In order to implement technologies into our master degree program, we developed a three-year project called MÎSTIC, (Maîtrise en Sciences infirmières intégrant les Technologies de l'Information et de la Communication). The purpose of MISTIC is to develop competencies in both students and teaching staff, thus facilitating integration of information and communications technology. Knowing, (from our colleague's experience and upon reviewing the literature) that the actor's "intention" is a fundamental aspect in the success of such a project, we first attempted to consult around us. We were in fact, unable to make a description of teachers' knowledge or abilities pertaining to information technologies, although we were aware that there were variations and disparities. It was obvious that our first step had to be the proper identification of teachers' perceptions of efficacy, learning needs, beliefs and motivation (Cloutier & al, 2000). This paper presents nursing teachers' self-efficacy perceptions and beliefs relating to information and communications technology.

The study

This study's objectives are to identify nursing teachers' self-efficacy perceptions and beliefs. This exploratory research has a mixed research design, and the instruments combine both quantitative and qualitative items. A self-efficacy perception questionnaire was devised for this research, based on Bandura's definition of personal self-efficacy, in which he states that beliefs are built by an individual regarding his abilities to mobilize his motivation, his cognitive resources and the behaviours necessary to meet the demands of a given situation (Bandura, 1991; Ozer & Bandura, 1990; Bandura, 1996). The twenty items questionnaire was constructed by a team of three professors and was submitted to two expert judges for content validity. Qualitative data concerning beliefs relating to obstacles and facilitating factors in the use of information and communication technology were gathered. Beliefs were defined as: "the conviction that a subjective reality is the truth" (Wright, Watson & Bell, 1996, p.41). According to these authors, constraining beliefs decrease solution options to problems, whereas facilitating beliefs increase solution options. ICT was defined as usually accepted technologies of communication and information, such as cyberspace, e-mail, discussion groups, chat, video-conferencing, etc. For this study, we distinguished between basic techniques and advanced techniques; the former referring to daily teaching and research activities (for example, e-mailing) and the latter referring to more specialized activities requiring mastery of basic techniques (for example, creating a web page).

Participation was anonymous and on a voluntary basis. Twenty-four nursing professors participated by filling in an online questionnaire, which was available on a web site for a ten-day period. This questionnaire, which the creation in itself was a technological innovation, is presently being used in an independent study carried on by Pothier (2000). It allows data to be compiled into descriptive statistics, which are automatically transferred into a data base.

Participation rate was 73%, which is considered acceptable. According to Polit and Hungler (1999), a response rate greater than 60% is sufficient for most purposes. Among the participants, 50% (12) were in the 40-49 year age group, as illustrated in tab.1. Of the twenty-four participants, 83% (20) were women and 17% (4) were men.

	Nursing teachers N (%) T=24
20-29 years old	0 (0)
30-39 years old	5 (21)
40-49 years old	12 (50)
50 and over	7 (29)

Table 1. Distribution of nursing teachers by age group.

Data Analysis

Data were recorded using Microsoft Excel and Oracle and content analysis was performed with the qualitative data.

Findings

Nursing teachers' self-efficacy perceptions of ICT

Analysis of self-efficacy perceptions revealed that nursing teachers perceive themselves as mastering all basic information and communication techniques, except for participating in group discussions, and using and upgrading anti-virus software. Nursing teachers perceive themselves as being limited in terms of their efficacy in using their university's library web site (tab. 2).

Item	Basic ICT	I could not do it (%)	I could reasonably do it (%)	I could certainly do it (%)
1	Operating a computer	5	0	95
2	Creating a backup copy	5	0	95
3	Using an anti-virus software	14	29	57
4	Using a text editor	0	5	95
5	Using a presentation software	9	0	91
7	Using e-mail	0	5	95
8	Using a browser	5	0	95
9	Using a web search tool	5	14	82
13	Participating in a discussion group	24	24	52
20	Using the library web site	14	14	73

Table 2. Nursing teachers' self-efficacy perceptions of basic ICT.

In terms of advanced information and communication techniques, nursing teachers perceive themselves as being efficient in the use of multimedia material. Few however were able to create web pages or transfer data on the web with FTP (tab.3).

Item	Basic ICT	I could not do it (%)	I could reasonably do it (%)	I could certainly do it (%)
6	Data base	23	32	45
10	Creating web pages	50	35	15
11	Using ER (Electronic Reserves)	20	25	55
12	Using FTP protocol	29	50	21
14	Using a scanner	12	18	71
15	Treating images	22	33	44
16	Using a multimedia room	19	10	71
17	Video-conferencing	33	10	57
18	Computerizing references	26	26	47
19	Chatting	20	25	55

Table 3. Nursing teachers self-efficacy perceptions of advanced ICT.

Nursing teachers' beliefs in ICT

Facilitating beliefs

As for beliefs, we found that the majority of nursing teachers (85%) believe that ICT should be used in nursing graduate studies (tab. 4). They are also convinced that ICT could improve their way of teaching and the students' learning. We observed that the motivation to use ICT was high in this group (84%). The nursing teachers felt they were supported in their experiences with ICT with sufficient equipment (84%) and available expertise (74%).

Constraining beliefs

Nursing teachers hold some beliefs that can be seen as obstacles when using ICT in teaching-learning experiences. For example, 60% of the participants mentioned that the lack of time was an important restraint, and 50% felt the cost of the equipment was a limitation factor. Several of the teachers consulted believe that the development of such activities needs further recognition from their peers.

Interestingly, although nursing teachers perceive themselves as being competent with ICT, a large proportion doubt (75%) that their students have the abilities to work with ICT.

Beliefs	Importance
Facilitating beliefs	
I think it is important to integrate ICT in my teaching	85%
I am interested in using ICT in my teaching	84%
The equipment necessary to use ICT in my teaching is available in my institution	84%
I think that ICT will allow me to improve my teaching	80%
I think that ICT will improve students' learning	80%
The expertise offered in my institution facilitates using ICT in my teaching	74%
I possess the abilities required to integrate ICT in my teaching	65%
Constraining beliefs	
Students do not possess the abilities to use ICT	75%
There is little time available; this restrains my using ICT in my teaching	60%
The cost of equipment required to use ICT retrains my using ICT	50%

Table 4. Nursing teachers' beliefs in integrating ICT in education

Limits

One of this study's limitations took its root in the complexity of technical concepts that are sometimes difficult to translate into a simple question. This could have biased the answers, since technical terms may have been misunderstood. Considering the fact that some teachers did not answer the questionnaire, we assume that some teachers did not have access to a computer or, were unable to access the web site even though a technical support was available for them in all institutions.

Conclusion

When new elements are introduced into teaching-learning situations, it can be expected that teachers will perceive these as important stressors, especially when these changes are imposed from the outside and when the time required to learn how to use technologies is time taken away from course content development (Akerlind & Trevitt, 1999). In this context, the study sample's positive attitude about ICT integration in teaching stands out. This may be attributed to the fact that most nursing teachers in these institutions are mature professionals who have experienced a variety of instructional methods in their career, and are thus more able to adapt to novelty. According to Bandura & Wood (1989), an individual's history of success and failure and his past experiences are his most significant sources of information to evaluate his abilities and limits.

In the end, our findings are not unusual. For instance, Roblyer's (1993) reports that usually, teachers quickly recognise the importance of using technology in teaching situations. Self-efficacy theory stipulates that an individual's self-efficacy perceptions will influence the quantity of effort he is likely to put into an activity and the length of time he will maintain his effort in spite of obstacles and failures met (Stretcher, de Vellis, Becker & Rosenstock, 1986). Considering this study's results, we are lead to believe that the participants will be persistent in integrating ICT in their teaching experiences.

Even though most teachers realize the importance of integrating ICT in their curriculum, different obstacles encountered often hinder their efforts, such as: difficulties working with a new software or the fear of negatively affecting their teaching performance (Ertmer, 1999). These apprehensions can be found in the qualitative data, despite the overall positive comments. It is clear that both pedagogical and technical supports are important aspects of integrating technology in the curricula. This leads us to recommend: an investigation of nursing professors' learning needs regarding ICT, training sessions to meet those needs, and finally, a re-evaluation of self-efficacy perceptions following the training sessions.

References

Bandura, A., & Wood, R. (1989). Effect of Perceived Controllability and Performance Standards on Self-Regulation of Complex Decision Making. Journal of Personality and Social Psychology, 56(5), 805-814.

Bandura, A. (1991). *Self-Efficacy Mechanism in Physiological Activation and Health-Promoting Behavior.* New York: Raven Press,Ltd.

Bandura, A. (1996). Ontological and Epistemological Terrains Revisited. *Journal of Behavior Therapy and Experimental Psychiatry,* 27(4), 323-345.

Chute, Alan G. , Sayers, Pamela K., Gardner, Richard P. (1997). *Networked learning environments*, Lucent Technologies, http://www.lucent.com/cedl/networked-learning.html

Cloutier (1999-2000) La pratique infirmière en milieu isolé. Projet intégrant les TIC à un programme de formation de premier cycle. Université du Québec à Trois-Rivières (www.uqtr.uquebec.ca/bcn).

Cloutier, L., deMontigny, F., Courville, F. Ouellet, N., Rondeau, G. (2000). *Projet d'intégration des technologies de l'information et de la communication pour le programme de Maîtrise en Sciences Infirmières du réseau de l'Universités du Québec.* M.î.S.T.I.C. Research report. http : //www.uqtr.uquebec.ca/mistic/

Cravener, P.A. (1999) Faculty experiences with providing online courses: thoms among the roses. *Computers in Nursing.* 17(1), 42-47.

deMontigny, F., Blais, S., Cousineau, H. (1997*) L'Infirmière et la santé.* http://www.uqah.uquebec.ca/chroniques/index.html

deMontigny, F., Blais, S., Mayrand-Leclerc, M. (1999). *Programme court de deuxième cycle de formation à la pratique privée infirmière.* http://www.uqah.uquebec.ca/m_sante/privee/index.html

Ertmer, P.A. (1999). Addressing first and second order barriers to change: strategies for technology integration. *ETR& D*, 47 (4), 47-61.

Milstead, J.A. & Nelson, R.(1998) Preparation for an online asynchronous university doctoral course: lessons learned. *Computers in Nursing*, 16(5),247-258

Roblyer, M.D. (1993). Why use technology in teaching ? Making a case beyond research results. *Florida Technology in Education Quarterly*. 5(4), 7-13.

Ozer, E. M., & Bandura, A. (1990). Mechanisms Goveming Empowerment Effects: A Self-Efficacy Analysis. *Journal of Personality and Social Psychology,* 58(3), 472-486.

Polit, D.F., & Hungler, B.P. (1999). Nursing Research: Principles and Methods (6th ed.).Philadelphia : Lippincott.

Strecher, V. J., McEvoy-DeVillis, B., Becker, M. H., & Rosenstock, I. M. (1986). The Role of Self-Efficacy in Achieving Health Behavior Change. Health Education Quarterly, 13(1), 73-91.

Wright, L. M., Watson, W. L., & Bell, J. M. (1996). *Beliefs: The heart of healing in families and illness.* New York: Basic Books.

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Academic Product Assessment: A tool for graduate action research assessment

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This research project examines a systematic assessment process as part of the Educational System Design (ESD) model, derived from work at Vanderbilt University by the Cognition Research Team and by Charles Reigeluth at Indiana University at Bloomington. The ESD model outlines four principles of effective learning environments: Problem-Based Learning, Scaffolding, Deepening Learning, and Collaboration. The research will explore the use of a formative assessment tool within this educational model. As part of Gannon University's M.Ed. Cohort program, academic portfolios are required as a final synthesizing activity. A part of this portfolio is the Applied Master's Project (AMP), an ongoing action research project. Students in the cohort program are to design, construct, and implement a research project over the course of the 18 months of cohort coursework. The AMP project is to be incorporated as a component of each of the six core courses, advancing the project from design and construction, through implementation and culmination. Research indicates that feedback, provided at key stages in the portfolio development process, results in improved final products. Providing effective feedback during this course should contribute to product improvement. Questions are raised however, about the type of feedback provided and the mechanism for providing this feedback.

The use of portfolios has emerged in recent years as a mechanism for students to demonstrate their subject knowledge and skill proficiency. In the area of fine arts and English, portfolios have a documented history and specific purpose. In these curricula, students assemble a collection of their best work to present for final evaluation. Each element of the portfolio has undergone a process of design, construction, and revision.

Inherent in portfolios is the understanding that these collections represent the student's best work. It is understood that each product has undergone the design, construction, and revision process. Portfolios are a work in progress and feedback is an important part of the portfolio's development. How the feedback is gathered and used plays a significant factor in the quality of the final product(s). When the final portfolio is presented, reviewers expect to see the highest quality work possible from the student.

At the time of the final portfolio submission, reviewers use some criteria to evaluate the portfolio products. The assessment instruments are typically rubrics, which the student may have been using to guide and direct the portfolio's design and construction. There may be a separate rubric for each item in the student's academic portfolio, making evaluation a maze of rubrics. More often, one standard assessment instrument is applied to each portfolio product or applied to the portfolio as a whole, focusing on global learning goals.

The review process is the focus of this research initiative. In this project, a standard assessment tool (Academic Product Assessment Form – APAF) was used to provide direction and guidance in the design and construction of portfolio products, through its use in providing feedback to students. This assessment tool was derived from the work of Reigeluth and Reis. Feedback was provided through assessment by peers and contemporaries.

There appear to be a number of unique features in this research project, which address some of the criticisms of portfolio use and academic product assessment. It was the goal of the research initiative to address the following objectives: determine the utility of the Academic Product Assessment Form (APAF) in evaluating components of a Master's degree Applied Master's Project and Portfolio; examine the use of this assessment tool as an integral part of a comprehensive assessment program; establish reliability and validity of the Academic Product Assessment Form (APAF).

The Academic Product Assessment Form (APAF) is a modified version of the Student Product Assessment Form (SPAF) designed and constructed by Drs. Joseph Renzulli and Sally Reis at the University of Connecticut. The original assessment form was designed to be used as a formative assessment tool used by younger students in enrichment programs. The form used in this study incorporated the same nine categories used in the original format. These included eight (8) individual dimensions: Statement of Purpose; Problem Focusing; Level of Resources; Diversity of Resources; Appropriateness of Resources; Logic, Sequence and Transition; Action Orientation; Audience. A ninth category incorporated seven (7) descriptors used for the

Overall Assessment of the product. These included: Originality of the idea; Achieved objectives stated in plan; Reflects familiarity with subject matter; Reflects a level of quality beyond what is normally expected; Reflects care, attention to detail, and overall pride on the part of the student; Reflects commitment of time, effort and energy; Reflects an original contribution. The category descriptors were revised only to eliminate the use of terms referent to younger students, school, or age. The item descriptions were modified to reflect the project at hand and the adult students engaged in the project. Four additional items were included in the assessment form. These came from the Gannon Cohort Applied Master's Program Manual, detailing the current evaluation criteria for the program.

As part of Gannon University's M.Ed. Cohort Program, academic portfolios are required as a final synthesizing activity. A part of this portfolio is the Applied Master's Project (AMP), an ongoing action research project. Students in the cohort program are to design, construct, and implement a research project over the course of the 18-month program of study. The AMP project is to be incorporated as a component of each of the six core courses, advancing the project from design and construction, through implementation and culmination.

Students enrolled in Technology as a Change Agent (GC 654) were to advance their AMP project as part of the course. Students electronically posted an abstract of their project. Learning teams were formed and these teams evaluated each other's projects and assisted in resource building throughout the course. Each cohort member presented their project at the last class meeting for the course. This session was set up using a conference format, where students presented either during a poster session or oral presentation. At this class meeting, colleagues provided input to presenters of each poster and presentation. The daylong conference was intended to provide each cohort student an opportunity to develop and present what may become a part of a final portfolio presentation for the M.Ed. program. Graduate students enrolled in the Cohort Master's Program offered through Gannon University's School of Education were recruited to participate in the study as part of a course within the core program of study. Data from the APAF is currently be collected and reviewed.

Students were asked to complete the Academic Product Assessment Form for each of the poster and oral presentations, scheduled to take place during the last day of class. Confidentiality of student information was assured through a process of random coding. The instructor and research assistant's assessment forms were not included in the research data. A copy of each completed assessment form was returned to the each student in the course for his/her project. Students used this input as they continued to develop their projects and prepare for their final portfolio presentation. A second collection point is being planned at the final portfolio presentation of each student, where evaluators will be solicited to complete the APAF on a voluntary basis. The forms will not be used for grading, but may be copied and given to the research participants. All evaluator names will be eliminated from the APAF in all cases.

At the current time, this research project has implemented the phase one collection process. This has generated over 500 assessments on 48 projects and presentations. These have been completed by cohort peers. Some general observations have been included in this stage of research progress. The use of one standard assessment device for the variety of portfolio projects and presentations has benefits and limitations. Although a customized form for each individual project would be preferred, this would require that the device be conceived at each project's initial creation and then would have to be modified throughout the project life. An alternative form might be constructed around each of the eight core courses in the program of study, with the hope that students would integrate something from each of these courses. This creates another series of issues due to the diversity of projects in which students are engaged. Students have found the form easy to use with minimal orientation to the item descriptions. The ranking scale (1 to 5) has not discriminated adequately the projects on any particular scale. In effect, cohort peers are being rather generous in rating each others' projects.

As students in the cohort program undergo their final portfolio presentations, faculty reviewers will be asked to complete the APAF for specific portfolio products. These reviews will be examined for internal consistency and inter-rater reliability, and then compared with peer assessment reliability data and previous studies using this instrument. Additionally, assessments conducted by M. Ed. Students and cohort faculty reviewers will be compared on specific products and students to examine variations between peer and contemporary assessments. This study is expected to continue through the academic year 2001-2002, initially focusing on the establishment of the instrument's reliability and face validity. As cohort student complete their portfolio presentations, additional reviews will be conducted as sufficient data becomes available.

Student teachers' information technology experiences in schools

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Step into many elementary classrooms and it's like stepping into a time warp. Classrooms look, feel and operate much the same as they did in the 1970s. While many teachers use computers to support children's learning in meaningful ways, most in-class use of computers is minimal and has changed little from the drill and practice and story writing models of the 1980s (Marcinkiewicz, 1994-95, Elliott, 1998). With information and communication technologies (ICTs) now so widely available in schools and the community, the possibilities for classroom adoption are ripe. Yet, few elementary school students' experiences of ICT, and especially in the early years of schooling, encapsulate the potential of the technology to enliven, enrich and individualise learning.

The reasons for teachers' limited adoption of ICTs, even in schools that are well resourced, have perplexed researchers and policy makers. Further, limited classroom use of computers has implications for pre-service teacher educators who rely on partnerships with schools to provide student teachers with experiences of contemporary pedagogies, curriculum content and classroom management. As teacher educators, we expect that during school professional experiences (practicum and internships) students will be involved in a range of first hand, authentic teaching experiences that complement university-based teaching, including ICT experiences.

At the same time, policies and practices in teacher education affect students' engagement with information and communications technologies and are important in shaping pre-service teachers' attitudes to adoption and integration. In Australia, the document *Computer Proficiency for Teachers* (1997) represented an attempt to ensure greater awareness of contemporary computer needs in schools, to specify the ICT competencies required by beginning teachers, and to remind teacher educators of their responsibilities to prepare students for teaching in an information and knowledge oriented society (DET, 1997). Clearly, teacher educators must continually strengthen applications of information and communications technologies across their programs if student teachers are to gain relevant pedagogical understandings, attitudes and skills. Explicating ways of using the technologies in an integrated manner must be a cornerstone of teacher education curricula. Concomitantly, student teachers must have opportunities to work with children in classrooms as they use information and communications technologies, including the internet.

In NSW, almost all schools have good access to technology, infrastructure, and teacher support, but many have done little to adapt instructional processes to capitalise on ICT access, strengths and flexibility. While schools are known as inherently conservative entities (Rizvi, 1993), reluctance to embrace ICT to focus on improving educational outcomes is of concern to education policy makers, and to teacher educators.

There is considerable evidence showing that student teachers have only limited opportunities to experience computer use in classrooms (Bosch & Cardinale, 1993; Downes, 1993; Elliott, 1996; 1998; Hunt, 1995; Yang & Holthaus, 1997).. From a teacher education perspective, cooperating teachers' limited modelling of computer use in teaching and their seemingly negative or ambivalent attitudes to ICT, are not conducive to developing student teachers' ICT competencies.

Translating information and communication technology from the policy documents and marketing brochures into classroom practice has been an elusive goal over past decade. Clearly though, developing future teachers' expertise in harnessing ICT to provide meaningful learning opportunities in classrooms is important for current teacher education programs.

The aim of this paper is to report student teachers' ICT experiences in some 60 early childhood classrooms (Kindergarten to Year 2) during recent pre-service professional teaching periods in greater Western Sydney. Drawing on both quantitative and qualitative data I document student teachers' perceptions of children's in-class information technology activities and identify some characteristics students associated with computer-using teachers. The purpose of highlighting student teachers ICT experiences and their perceptions of computer-using teachers is to articulate some of the qualities that might be capitalised on or complemented in building programs to support teachers' ICT competence. In particular, a clearer understanding of characteristics of computer-using-teachers might ensure that teacher education programs can better prepare students to deal with realities of classroom situations where computers are not widely used because teachers are not particularly committed to improving practice through adoption of relevant ICT support. Student teachers may also be better prepared for the more hostile situation where specific strategies are needed to counter teacher pressures, often subtle, to adjust to the way things are and maintain the status quo (Britzman, 1991). Finally, greater knowledge of the classroom situation may help us better prepare student teachers who find themselves having to persuade well meaning, but technologically novice classroom teachers to "allow" them to observe and use computers in class.

Finally, reference is made to the computer enactment model for teacher education proposed previously (Elliott, 1999b) and its role in helping teacher educators develop partnerships with schools to support student teachers' ICT experiences during professional experience programs.

Method

After completing a 4 week block teaching practice on K-2 classrooms in elementary schools in the western suburbs of Sydney, NSW, 60 student teachers completed a short questionnaire probing the nature of the computer experiences encountered in schools and participated in focus group discussions about characteristics of teachers who embraced ICT in their classrooms.

Results and Discussion

Consistent with previous studies (Elliott, 1996, 1998, 1999b), results from the present research showed that most students had limited opportunities to observe computer use in day-to-day classroom practice. All students reported that teachers had access to computers in their classroom or adjacent space, in a dedicated computer room, or in the library. A few had access to computers on multiple sites. Over the four week period, nearly half the student teachers (43%) estimated that each child in their class used computers for less than 15 minutes per week. Two students reported children did not engage in any computer-based learning activities while at school. A further 25% estimated that each child had 20-30 minutes of computer use per week and 16% estimated that children spent about 35-45 minutes engaged in computer activities. Only 5 students reported that children in their classrooms had over one hour of computer use per week.

Again, as noted in earlier studies of student teachers' experiences in schools (Elliott, 1996, 1998, 1999b), the main types of activities observed in the classroom were word processing for story writing, some directed maths activities (number recognition, counting, shapes), reading electronic books and some word recognition and spelling. Only five students saw children using the internet; in each case activities related mainly to the Olympic games; emailing athletes, tracing the journey of the torch, and other Olympic-related activities. Internet use occurred only in classrooms where children averaged over 35 minutes of computer use per week.

There were a number of cases where children went to a dedicated "computer room" for "computer lessons" with a "specialist teacher" on a weekly basis. In several cases "computer lessons" were held in the library. In five cases, the only computer-based activities for children were those provided by the student teacher as part of the practical requirements of the professional experience. Two students claimed that children in their classes had no computer use of any sort during the 4 weeks and that they were "not allowed" or "not able" to complete the university required computer tasks with children.

In classes where student teachers reported that children averaged 20 minutes of more computer use per week, and computer activities were initiated by the regular classroom teacher rather than a "specialist computer teacher", terms such as "motivated", "creative" and "involved" were often used to describe the cooperating teachers. The main distinction though, between descriptors of teachers in these more "computer-active classrooms", as opposed to classrooms where computer use was less evident, was teachers' apparent strong "communication" with parents, their "excitement" about teaching, their positive attitudes, motivation, and enthusiasm, and their "confidence", and expertise in teaching. In some cases, the teacher described as "fantastic" or "excellent".

Focus group discussions with student teachers based in classrooms where children averaged in excess of 35 minutes computer use per week suggested that cooperating teachers articulated a strong commitment to ICT use in learning, were good classroom managers, and tended, generally, to be involved in a wider than normal range of school activities. One teacher, for example, was the school's "computer coordinator", another the head of the junior school, and another the "choir leader". Indeed, good classroom management strategies have long been regarded as a cornerstone to effective teaching (Stannard, 1995) and in most cases students commented that their cooperating teacher was a "great organiser" and always "very busy".

That only 10 students claimed that each child in their class had in excess of 35 minutes of computer use per week, and 5 reported experiences in excess of one hour per week, hardly points to a major classroom adoption of ICT. Nor is there any indication that children are having *too much* computer use. Further, data do not show that computer-based activities were particularly innovative. Indeed, even in the high-use classes, most children engaged in the standard word processing, and basic skill-type activities associated with reading and math. There were no apparent differences between the types of activities in high-use and low-use classes, except for internet use.

As discussed elsewhere (Elliott, 1996; 1998; 1999b), that student teachers had few opportunities to observe teachers and children using ICT in every-day classroom situations is not surprising given the limited integration of computers in the enactment of curriculum. And, as also mentioned previously, the situation is affected not so much lack of appropriate technology, but rather lack of teacher commitment to changing pedagogy to facilitate enactment and integration of technologies (Elliott, 1999a).

In the light of the present findings, it seems teachers are not confronting the main tasks that must be addressed before change of any type, and in this case, adoption of ICTs can be effected. A major tenet of organisational theory is that effective organisational structures and directions can be shaped around tasks (Bolman & Dealo, 1997; Scott, 1998) and, in turn, that tasks are pivotal for shaping teachers' work (Rogoff, 1990). In the case of ICT, three main tasks confront schools-fostering new understandings of ways teaching and learning processes can be supported through use of ICT; promoting and supporting use of ICT in classrooms; and building partnerships between school and community through the use of ICT.

As shown previously (Elliott, 1999a) individual teachers must be prepared to reconstruct their conceptions of pedagogy to embody less teacher-centred notions about learning and embrace more fundamentally democratic understandings, beliefs and values about classroom practice. Further, major changes to classroom structures and pedagogies needed to adopt ICT will not occur until teachers both understand and commit to change. Change occurs only when participants construct new understandings of the tasks and processes, not simply when technical innovations are introduced.

From a teacher education perspective, it is important that cooperating teachers are able to support student teachers' development of ICT competencies. Part of teachers' professional role is inducting new teachers to the culture and practice of teaching in all its complexities. Thus, efforts to enhance beginning teachers' ICT skills must involve partnerships between teacher educators and classroom teachers. Using computers to enhance classrooms learning should be as important as guiding learning and practice in more traditional aspects of pedagogy and curriculum.

Explicating ways of using and managing information technology to complement and support children's learning must be an integral part of teacher education curricula. Importantly, student teachers must have authentic opportunities to work with children as they use information technologies, including the Internet, to complement and support their learning. Adoption of an ICT enactment model (Elliott, 1999b) can assist in developing partnerships between teacher educators and schools. Significantly, such a model proposes joint ownership and collaboration between teacher educators, student teachers and teachers. In such partnerships teachers must work as co-creators of new pedagogies that embody ICT, because for changes to be lasting they must be accompanied by new values and understandings.

REFERENCES

Bolman, L.G. & Deal, T.T. (1997). *Reframing organisations: Artistry, choice and leadership* (2nd ed.) San Francisco: Jossey-Bass.

Bosch, K.A. & Cardinale, L. (1993). Pre-service teachers' perceptions of computer use during a field experience. *Journal of Computing in Teacher Education*, 10(1), 23-27.
Britzman, D. P. (1991). *Practice makes perfect. A critical study of learning to teach*. Albany: State of New York Press.
Downs, T. (1993). Student-teachers' experience in using computers during teaching practice. *Journal of Computer Assisted Learning*, 9, 17-33.
Elliott, A. (1996). Are schools making a difference? Changes in students' computer experiences and attitudes 1987-1994. In *Proceedings of the Thirteenth International Conference on Technology and Education,* Vol. 2, pp. 679-691. New Orleans, March 17-20th.
Elliott, A. (1998). Changing conceptions of information technology in education. In J. Foster, D. Gill & E. Walters. *A worldwide network of learning: Opportunities, challenges and contrasts*. International Conference on Technology and Education, Grand Prairie TX: ICTE, 465-468.
Elliott, A. (1999a). Effects of sociocultural contexts and discourses on science and technology teaching in early childhood education. (pp. 330-345). In J. Hayden, (Ed). *Landscapes in early childhood education.* New York: Peter Lang.
Elliott, A. (1999b). Shaping information technology practice in pre-service teacher education (pp.532-534) In D. Walker, T, Van der Kuyl, & G. Turnbull, (Ed.) *Preparations for the new millennium. Directions, developments and delivery,* Grand Prairie TX: International Council on Technology and Education.
Hunt, N. (1995). Bringing technology into the pre-service teaching field experience, *Computers in the Schools,* 11(3), 37-48.
Marcinkiewicz, H.R. (1994-95). Differences in computer use of practicing versus pre-service teachers. *Journal of Research on Computing in Education*, 27(2), pp. 184-197.
Ministerial Advisory Council on the Quality of Teaching (1997). *Computer proficiency for teachers* . Sydney: DET Coordination.
Rizvi, F. (1993). Race, gender and the cultural assumptions of schooling. In C. Marshall (Ed.), *The new politics of race and gender. The 1992 Yearbook of the Politics of Education Association* (pp. 203-217). Washington, DC: Falmer Press.
Rogoff, B. (1990). *Apprenticeships in thinking: Cognitive development in social context*. NY: Oxford University Press.
Scott, R. (1998). *Organizations: Rational, natural and open systems* (4th ed.). Englewood Cliffs: NJ. Prentice-Hall.
Stannard, J. (1995). Managing the primary curriculum after Dearing: A rationale. *Education,* 23(1), 3-13.
Wang, Y. & Holthaus, P. (1997). *Student teachers computer use during practicum*. Proceedings of the 1997 National Convention of the Association for Educational Communications and Technology, Alberquerque, NM ED 409 879.

Comparison of Student Rating of Instruction in Distance Education and Traditional Courses

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Abstract: This study examined differences in student perceptions of course and instructor effectiveness in distance education and traditional courses. The type of distance education examined was a two-way interactive TV. Three different modes of course delivery were studied: (1) distance education off-campus, (2) distance education on-campus, and (3) traditional on-campus. Eight instructors taught a course using each method of delivery. On-campus students in traditional courses perceived the course and the instructor as being more effective than their off-campus peers in distance education courses. The magnitude of difference between the means was large.

Introduction

The term "distance learning" describes any instructional arrangement where the teacher and learner are geographically separated (Moore & Thompson 1997). Distance learning, sometimes described as distance education (DE), home study, correspondence study, independent study, or external studies, has been an alternative method for delivering university-level courses for almost 300 years. Correspondence education was invented in the late 19th century to enable learners to receive instruction when they could not attend traditional classes (Moore & Thompson 1997). Today, the more popular term for this type of learning at a distance is distance education.

Moore and Thompson (1997) describe effective distance education as requiring communication between the instructor and learners through media and new approach to instruction. Currently, distance education incorporates many alternative education opportunities, a significant number that involve emerging technologies such as two-way interactive TV, video, and web-based or web-enhanced instruction.

Keegan (1988) suggests that there are six defining characteristics of distance learning. First, there is separation of the teacher and the student (i.e., separation vs. face-to-face in the same classroom). Next, there is a component not typically found in most on-campus courses, the influence of an educational organization (e.g., department or college) in the planning, preparation or delivery of material (vs. a stand alone instructor responsible for content generation and delivery of course information). Third, there is the use of technical media. Historically, this technical media has been print, but as technology advances, electronic media (computers, TV studio delivery, computer software presentation packages) will be added to a list of technical options. The fourth defining characteristic is the provision for two-way communication. This could be via a telephone conference with a single student, or a group of students at a central location at a prescribed time. Another defining characteristic is the possibility of an occasional seminar. This would be the opportunity for students working independently, to assemble as a group in the presence of the instructor.

The last defining characteristic as illustrated by Keegan is participation of the most industrialized form of education. Simply said, the industrialized form of education means a division of labor. Basically, there would be a team of individuals involved in the preparation and delivery of course content. Members of the team could be a content expert (e.g., a faculty member in elementary education, for a course offered from that program), graphic illustrators, who for all practical purposes, have no knowledge of the content, but, take the content and bring it to life with related illustrations, and a "TV personality," an individual trained to work in the presence of the camera and a TV or radio announcer's voice to deliver the content.

Although distance education has been viewed to be effective by some, in the eyes of others it has been seen as something less than education typically received on a university or college campus. In studies of various types of distance education, comfort and convenience were repeatedly cited as positive elements of the distance experience (Moore & Thompson 1997). Essentially, students in these studies like the convenience of distance education, but if given the choice to be in the same room with the instructor, most students will choose the personal contact.

Research on the effectiveness of distance learning is sparse. For example, a comprehensive historical review of technology research in special education does not mention distance learning (Woodward & Reith 1997). Moore and Thompson (1997) reviewed research on learning outcomes and attitudes for students in higher education. The studies included in their review reflected no differences in cognitive factors (amount of learning, academic performance, achievement, and exam and assignment grades) between the distance classes and traditional classes.

Other factors (e.g., student satisfaction with the course, comfort, convenience, communication with instructor, interaction and collaboration between students, independence, and perceptions of effectiveness) had more mixed results in the Moore and Thompson review. In the majority of the studies where interaction was studied, the distance condition seemed to negatively affect opportunities for interaction between students and with the instructor. In contrast, distance condition was found to positively affect collaboration and interdependence among students, in addition to support for independent learning activities.

Comfort and convenience were repeatedly cited as positive elements of the distance condition. However, a promising characteristic of one of the studies described distance education as "an acquired taste." Students reported that the more experience that they had with distance education technology and conditions, the more comfortable they became with the course and mode of interaction (Jones 1992). Perhaps the lessening of "distance tension" would allow students to enjoy the benefits of distance education (e.g., comfort, convenience) to a greater extent. Spooner, Spooner, Algozzine, and Jordan (1998) assert that learning, attending classes, and obtaining information should be enhanced via distance learning.

Initial support for the "no difference phenomenon" in higher education was provided by Spooner, Jordan, Algozzine, and Spooner (1999) who compared student ratings in two special education courses in a masters-level curriculum sequence for students in the area of severe disabilities when each was offered on campus and off campus. Additionally, student ratings were compared when distance classes via two-way interactive TV were taught at local and remote facilities. Student evaluations suggested no differences for overall course means. Organizational ratings were similar for a methods course taught on campus and at a distance, but were different for a curriculum course. When outcome measures for on-campus students vs. off-campus students were examined no differences were found in the overall ratings. Ratings for course, instructor, and communication were similar across settings and courses. Ratings for organization were similar for a curriculum course taught on campus, but were different for a methods course.

The purpose of this study was to empirically compare students' perceptions of (a) course effectiveness, (b) instructor effectiveness, and (c) overall effectiveness of the instruction in distance education (DE) courses, both off- and on-campus locations, and traditional on-campus courses. The courses included in this study are part of a graduate program in special education in learning disabilities.

Method

A quasi-experimental study was conducted to examine differences between DE courses, both off- and on-campus, and traditional on-campus courses. The independent variable was mode of course delivery – DE off-campus, DE on-campus, and traditional on-campus. To control for the effects of instructor and course topic, the same instructor and same class were taught under all 3 conditions; that is, each instructor taught the same course under the DE off-campus, DE on-campus, and traditional on-campus conditions. Students self selected into the type of class they would attend. A questionnaire was administered to students at the end of the course to evaluate their perception concerning course effectiveness, instructor effectiveness, and overall effectiveness of instruction. The instructor was not present when the questionnaires were administered and all responses were anonymous.

Participants

All participants were graduate students enrolled at a large university in the southeast United States. Most students were white (89%) females (91%) and worked full-time (83%). All courses were required for graduation by all participants.

Treatment

This study examined three modes of course delivery – DE off-campus, DE on-campus, and traditional on-campus. All the DE courses were delivered using a two-way interactive TV that allowed for real-time interaction between the instructor and students. The only difference between the DE off-campus and DE on-campus was the location of the instructor. Typically the instructor taught the class from the on-campus location. Students in the DE off-campus viewed the lesson from the two-way interactive TV screen. Students enrolled in DE off-campus classes met in a community college classroom fully equipped with video and audio communication equipment. The traditional on-campus classes were taught with the instructor and students in the same classroom.

Instrumentation

The questionnaire consisted of 23 items that examined course effectiveness (e.g., This course had clearly stated objectives), instructor effectiveness (e.g., Instructor was able to simplify difficult materials), and overall satisfaction with the course. Each item was answered on a 5-point scale ranging from *strongly disagree* (1) to *strongly agree* (5). The questionnaire consisted of three domains, (1) course effectiveness (items 1-11), (2) instructor effectiveness (items 12-18), and (3) overall course effectiveness (items 19-23). The domain scores were calculated by averaging all the items within the domain with scores ranging from 1 to 5. Coefficient alpha internal consistency reliability estimates were 0.98 for all 23 items, 0.95 for the scale that evaluated the course effectiveness (items 1 to 11), 0.95 for the scale that evaluated the instructor's effectiveness (items 12 to 18), and 0.94 for the overall course evaluation (items 19-23).

Results

Eight instructors teaching eight different courses that were required in a graduate degree program were examined in this study. A total of 261 DE off-campus, 106 DE on-campus, and 176 traditional on-campus students completed and returned the questionnaires. Student results were aggregated to the class level and used in the analyses; that is, the mean class scores were used in the analyses.

A series of repeated measures ANOVAs was conducted with one within factor (i.e., mode of course delivery) to determine differences between the three modes of instruction. The means, standard deviations, F-values, and effect sizes (*partial* η^2) for each domain (course effectiveness, instructor effectiveness, and overall course effectiveness) are reported in Table 1. The means for the DE off-campus were lower than those of the on-campus courses in all the domains. The DE on-campus courses had lower means than the traditional on-campus courses. In addition, there was greater variability in scores for the DE off-campus courses.

There was a statistically significant difference between the mode of course delivery for all three domains. The mode of course delivery accounted for a large part of the explained variance (η^2), ranging from .33 to .41. Follow-up analysis (dependent t-tests) indicated that there were statistically significant differences between the DE off-campus courses and the traditional on-campus courses; large effect sizes (Hedges, 1981) were found for (a) course effectiveness (g=1.16), (b) instructor rating (g=1.14), and (c) overall course effectiveness (g=1.10). There were no statistically significant differences between the DE off-campus courses and the DE on-campus. In addition, there were no differences detected between the DE on-campus and traditional on-campus domain scores.

	Distance Education				Traditional			
	Off-Campus		On-Campus		On-Campus			
Domain	M	SD	M	SD	M	SD	F	Paritial η^2
Course Effectiveness Rating	4.13	.50	4.36	.33	4.56	.15	5.61*	.33
Instructor Rating	4.13	.59	4.47	.30	4.63	.20	4.77*	.40
Overall Course Rating	3.85	.69	4.28	.39	4.43	.29	4.79*	.41

* p<.05

Table 1: Descriptive Statistics, Repeated Measures ANOVAs, and Effect Sizes for the Three Domains

To better understand the differences between the mode of delivery, each item was examined. Examining the course effectiveness items (Tab. 2), there were statistically significant differences for items 3, 4, 5, 8, and 9. Follow-up analyses indicated that the mean differences were between the DE off-campus and the traditional on-campus courses. The magnitude of differences between the means was large, ranging from .97 to 1.34. There were no differences between the DE off-campus and DE on-campus or the DE on-campus and the traditional on-campus course means.

	Distance Education				Traditional			
	Off-Campus		On-Campus		On-Campus			
Item	M	SD	M	SD	M	SD	F	Paritial η^2
1. This course had clearly stated objectives.	4.34	.52	4.54	.24	4.68	.11	2.02	.22
2. The stated goals of this course were consistently pursued.	4.25	.45	4.41	.31	4.60	.15	2.92	.30
3. I always felt challenged and motivated to learn.	3.90	.60	4.32	.39	4.49	.16	4.37*	.38
4. The class meetings helped me see other points of view.	4.15	.40	4.37	.37	4.56	.27	4.12*	.37
5. This course built understanding of concepts and principles.	4.17	.51	4.45	.32	4.62	.17	4.20*	.38
6. The practical application of subject matter was apparent.	4.13	.62	4.43	.43	4.60	.22	2.46	.26
7. The climate of this class was conductive to learning.	4.12	.59	4.15	.39	4.55	.22	2.71	.28
8. When I had a question/comment I knew it would be respected.	4.20	.59	4.62	.24	4.69	.13	4.48*	.39
9. This course contributes significantly to my professional growth.	4.00	.58	4.27	.44	4.53	.15	3.93*	.36
10. Assignments were of definite instructional value.	4.08	.52	4.26	.44	4.54	.16	3.03	.30
11. Assigned readings significantly contributed to this course.	4.03	.45	4.20	.47	4.34	.25	1.32	.16

p<.05

Table 2: Descriptive Statistics, Repeated Measures ANOVAs, and Effect Sizes for the Course Effectiveness Items

Examining the instructor effectiveness items (Tab. 3), there were statistically significant differences for all items except item 13. Follow-up analyses indicated that the differences were between the DE off-campus and the traditional on-campus courses. The magnitudes of differences for all items were large, ranging from .83 to 1.42.

	Distance Education				Traditional			
	Off-Campus		On-Campus		On-Campus			
Item	M	SD	M	SD	M	SD	F	Paritial η^2
12. Instructor displayed clear understanding of course topics.	4.45	.49	4.75	.26	4.76	.19	3.73*	.35
13. Instructor was able to simplify difficulty materials.	4.06	.72	4.44	.42	4.59	.29	3.00	.30
14. Instructor seemed well-prepared for class.	4.33	.58	4.63	.36	4.69	.19	4.57*	.39
15. Instructor stimulated interest in the course.	4.09	.66	4.46	.38	4.59	.30	5.16*	.42
16. Instructor helped me apply theory to solve problems.	3.95	.56	4.36	.39	4.52	.24	4.77*	.41
17. Instructor evaluated often and provided help when needed.	4.02	.60	4.31	.37	4.65	.18	5.29*	.43
18. Instructor adjusted to fit individual abilities and interests.	4.04	.62	4.36	.32	4.58	.26	4.28*	.38

Table 3: Descriptive Statistics, Repeated Measures ANOVAs, and Effect Sizes for the Instructor Effectiveness Items

Examining the overall course effectiveness items (i.e., items 19 to 23), there were statistically significant differences for all items. Again, follow-up analyses indicated that the differences were between the DE off-campus and the traditional on-campus courses. The differences were large, ranging from .83 to 1.20.

	Distance Education				Traditional			
	Off-Campus		On-Campus		On-Campus			
Item	M	SD	M	SD	M	SD	F	Paritial η^2
19. Instructor had an effective presentation style.	4.06	.66	4.50	.35	4.54	.33	5.07*	.42
20. Instructional methods used in this course were effective.	3.97	.65	4.34	.39	4.52	.28	3.96*	.36
21. Evaluation methods were fair and effective.	4.09	.56	4.50	.26	4.56	.25	4.22*	.38
22. This course is among the best I have ever taken.	3.40	.81	3.79	.64	4.18	.43	4.61*	.40
23. This instructor is among the best teachers I have known.	3.70	.80	4.25	.47	4.36	.30	5.14*	.42

Table 4: Descriptive Statistics, Repeated Measures ANOVAs, and Effect Sizes for the Overall Course Effectiveness Items

Summary

The results suggest that on-campus students perceive their courses and instructors as being more effective than the off-campus DE students. Students in the off-campus sections consistently rated the course and instructor lower than both on-campus groups. The students in the DE off-campus courses reported (a) not being as challenged and motivated to learn, (b) lower opinions about the extent to which the class meetings helped them see other points of view, (c) lower opinions about the course building understanding of concepts and principles, (d) less feeling of respect, and (e) lower opinions of the contribution of the course to their professional growth. In addition, the DE off-campus students rated the instructor lower in (a) displaying clear understanding of topics, (b) being prepared for class, (c) stimulating interest in the course, (d) applying theory to solve problems, (e) evaluating often and providing help when needed, and (f) adjusting to fit individuals abilities and interests.

Universities that base instructors' performance on student evaluations should be aware that teaching DE courses might present disadvantages to overcome. What can be done to address the potential hazards? Spooner, Algozzine, Flowers, Gretes, and Jordan. (1998) suggest seven strategies that can be used to facilitate faculty/student interaction at a distance, so that the students at the remote sites believe that they are connected to their peers and the instructor in the studio classroom on campus. These techniques include: (a) establishing weekly agenda that goes beyond the syllabus, (b) facilitating a weekly student share to encourage class participation, (c) establishing off-line small group discussion with reporting, (d) tapping sites and individuals at remote sites for questions, (e) encouraging across site questioning by students, (f) traveling to remote sites for broadcast (each site one per semester), and (g) playing off of your local audience.

Other variables which will likely impact on the instructor's ability to reach students at remote sites, in addition to altering presentation style might be the overall size of the class. The instructor will likely have to work harder at making ALL students feel included as part of the group when the collective numbers approach 50, as opposed to as smaller number of students. A second important variable, and one that could potentially affect the evaluation outcomes is the number of times that the instructor delivers a course at a distance. The more practice the instructor has and the more times that s/he is "on the air" will also likely impact that individual's ability to be effective at reaching those students at remote sites. The type of presentation equipment (e.g., white board "on the fly" writing, or prepared overhead material, or material developed with electronic presentation software with appropriate images to illustrate content) that the instructor uses to deliver the content is another variable that could likely affect the outcome of student evaluation of instruction as well. Regardless of the approach taken to address potential problems and difficulties when teaching at a distance, there is a clear need for additional research evaluating implementations of improvement strategies and their effects in distance education courses.

References

Hedges, L.V. (1981). Distributional theory for Glass's estimator of effect size and related estimators. *Journal of Educational Statistics, 6,* 107-128.

Keegan, D. (1988). Problems in defining the field of distance education. *American Journal of Distance Education, 2,* 4-11.

Jones, T. (1992). *IITS students' evaluation questionnaire for fall semester of 1991: A summary and report.* (ERIC Document Reproduction Service No. ED 311 890)

Moore, M. G., & Thompson, M. M. (1997). *The effects of distance learning* (rev. ed.). (ACSDE Research Monograph No. 15). University Park, PA: The Pennsylvania State University, American Center for the Study of Distance Education.

Spooner, F., Algozzine, B., Flowers, C., Gretes, J. A., & Jordan, L. (1998, March). *Facilitating communication in distance education classes.* Electronic poster presented at the fifteenth annual meeting of the international Conference on Technology and Education, Santa Fe.

Spooner, F., Jordan, L., Algozzine, B., & Spooner, M. (1999). Student ratings of instruction in distance learning and on-campus classes. *Journal of Educational Research, 92,* 132-140.

Spooner, F., Spooner, M., Algozzine, B., & Jordan, L. (1998). Distance learning: Promises, practices, and potential pitfalls. *Teacher Education and Special Education, 21,* 121-131.

Woodward, J., & Reith, H. (1997). A historical review of technology research in special education. *Review of Educational Research, 67,* 503-536.

A Model for Courseware Development (MCD)

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Abstract: Today's educational requirements have forced the traditional institutions to introduce technology in the education and modify the teaching-learning process in order to maintain curricula updated and cope with the constant changes. Although this is a costly and time consuming task there is still not a proper methodology which would help authors to carry out this task. The model proposed in this paper (MCD) is a systematized way for designing/redesigning computer technology-based courses (coursewares), based on their learning goals. This model is a formalization of a set of successful strategies applied by the authors, in the design/redesign courses in the computer science area.

Introduction

Most of the existing courseware development tools have a very poor support for the course design and redesign, especially for curriculum design if any. This may be a serious drawback of them, because the evolution of technology and knowledge is demanding courseware authors to continuously update and/or redesign their courses. This task is difficult, slowly and costly, so we think it is important to define one which can be easily embedded in a courseware development tool or used for complementing the work did by these tools, in order to support a clear and systematic methodology for designing courseware. We introduce here such a methodology, based on the hierarchical definition of the course's pedagogical goals. This methodology called "MCD".

The proposed model (MCD) arises as a formalization of the authors' experience in the process of design and redesign of a courseware in order to improve the achievement of its learning goals. The course is called "Software Engineering Workshop" and it is part of the curriculum of the Computer Engineer of the Catholic University of Chile. Many design principles of the software engineering were used for defining MCD, adapting them to the courseware design (Jackson, 1999). We also used some ideas taken from the Artificial Intelligence area, especially those used for designing curriculum in Intelligent Tutoring Systems (ITS). In the next section we present the proposed model, and finally, the conclusions of this work.

A Model for Courseware Development (MCD)

The proposed model offers a guide, step by step, to design a course and then to build a courseware based on this design. The model is based on the prototype development model used for software engineering (see figure 1), which is very easy to adapt it to the design/redesign of a course.

The model has tree stages: The first stage called the "course design" consists in the hierarchical definition of the specific goals and restrictions of a course. The second stage consists of the development of the curriculum which will be used to implement the courseware. We understand the curriculum as the selection and logical sequencing of the learning material in order to achieve the learning goals. Finally, this implementation is tested to find errors or weaknesses. In order to do the reengineering of the course, it is important to implement feedback mechanisms about teaching/learning process, in order to identify each wrong or weak strategy to replace it, and each successful strategy to repeat it and maybe to extend it.

In the design phase we have defined three steps. The first step is called "goals design" in which a hierarchical goals tree is defined. The root of this tree is represented by the overall goal of the course. The nodes of the second level of the tree will define the chapters goals, and the nodes on the third level will be the sections goals. Several cycles can be employed to get a final goals design and it can involve people such as lecturers, assistants, students, and experts in the course domain. The reason for organising the goals in a hierarchical way (tree) and with this organizing the whole courseware in this way is because it is the most natural way for human beings to organize things in their mind (Novak, 1998). Beside the nodes that represent the goals this tree has another type of nodes called "means". Goals are intermediate objectives that contribute to achieve the main goal, means are the activities that should be executed, to reach the designed goals. These are the leaves of the tree.

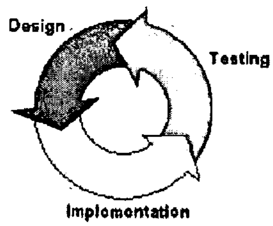

Figure 1. Proposed Development Model

The second step of the design phase is called "means design". In this step, the activities/contents (means) to reach each goal are selected and designed. The combination of one activity and the computer-based learning material, which will support this activity (content), is called a mean. For example, a mean to satisfy a certain goal could be "the expositive presentation of the topic 1". The activity associated to the mean is the "expositive presentation", and the content associated is the "topic 1". In this stage, the duration of the mean (activity) should also be designed. These means can be student's means or teaching means, and both have different graphical representation on the tree. A student's mean is an activity for which the student is the main responsible to carry out.

On the other hand, the teaching means are the activities whose main responsible is an instructor (lecturer or assistant). An activity node is graphically represented as a rectangle while a goal node with a circle. The third step is called "means sequence design" and its goal is to organize the means as a sequence of activities which will implement the teaching-learning process to reach the goals. Once step 2 is concluded, it may be necessary to establish the implementation constraints among means of different branches, in order to achieve the goals. Normally there will be many possible means sequence, while keeping the constraints specified in by the tree. For that reason, the goal of this phase is to design the most appropriate sequence of activities. To carry out this task, it is necessary to sequence the teaching and student's means in two separate sequences. After that, both sequences should be joined to get the final course means sequence. Once this sequence is defined, it is possible to establish the course schedule. The sequence of the teaching means allows lecturer and assistant to fin out wether the time to be spent in each one is the appropriated, as well as whether the mean sequence is correct. In the "implementation" phase, all activities and course contents are created and linked together to get a courseware. This courseware will help the lecturer to carry out the teaching-learning process, and to get the course's goals. To build a courseware we use a framework of educational software components that permits to implementers to create a course assembling and adapting this predefined components. Thus, this is a way to reuse existent learning material.

Conclusions

With the proposed model we want to define a methodology that will systematize the design process of a course which will take place in the context of a normal high education institution in a simple way. As it was mentioned in the introduction, the proposed model is a formalization of a design and redesign process used by the authors on a software engineering course. This process has been carried out five times for three years. The student's performance in the course has improved notably with every redesign, indicating that this strategy may be correct. Recently the same methodology has been used to redesign the "Groupware Workshop" course also with good results. Part of the course design can be validated before its implementation, which it can reduce the product's development time and cost (Jacobson, 1999). Besides the courseware, a very important product that can be obtained applying the model is the course's activity plan (or course's schedule). This activity plan is generated automatically based on the course's final design. The construction of the courseware itself is carried out assembling the software components. Therefore, this model also promotes the reuse of the content and knowledge structures (like chapters, sections, etc.) of a courseware content in other courseware, thus reducing the efforts in the generation of future courses and improving the quality of the final product (Boehm, 1999).

Acknowledge

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References

Boehm, B. (1999). *Managing Software Productivity and Reuse*. IEEE Computer, Vol. 32, N° 9, pp. 111-113.
Jackson, M. (1999). *Specializing in Software Engineering*. IEEE Software. Vol. 16, N° 6.
Jacobson, I., Booch,G., Rumbaugh, J. (1999). *The Unified Software Development Process*. Addison Wesley.
Novak, J. (1998). *Learning, Creating, and Using Knowledge: Concept Maps As Facilitative Tools in Schools and Corporations*. Lawrence Erlbaum Assoc.

ABSTRACT OF DISSERTATION
The University of Alabama Graduate School

Degree: Doctor of Philosophy Major Subject: Instructional Leadership

Name of Candidate: Jenka Keizer

Title of Dissertation: A Study of Social and Academic Uses of the Internet by High School Students

This research studies how ninth-grade students in a fully computerized, K-12, affluent school use computers for educational purposes and in their personal lives. The target population for the study was the student body from the American School Foundation of Mexico City (ASF), a K to 12 American-type school with an American curriculum for over 100 years, and 2,400 students. The survey also included parents and teachers.

The qualitative and quantitative surveys revealed that students use the Internet from one to three hours daily, and the predominant use is as a personal communications tool. Students are knowledgeable about precautionary measures that are required in conversations with strangers in the Internet social space.

Parents believe computers and the Internet help their children with school assignments, and that the lack of Internet connection at home would put their teenagers at a disadvantage with their peers. The students' use of computers and the Internet at the ASF is meeting their parents' expectations. Most teachers give daily assignments to be done on the computer and require Internet searches for their assignments. The majority of the students say they use the Internet for research.

Gender and nationality are not differentiating factors with respect to the use of computers and the Internet by high school students at the ASF for school-related work.

However, there are some variations in other applications. For example, male students use the Internet more than females for games and for accessing sexually explicit images.

The study sheds some light about the potential benefits of the introduction of computers and the Internet into U.S. classrooms. However, it also reveals that full integration of the technology into the curriculum is an elusive goal. Fundamental transformation in education, as in any major social change, certainly requires clear vision, hard work, and time.

Abstract Approved:	Chairperson of Dissertation Committee	____________________ George E. Marsh II, Ed.D.
	Associate Dean	____________________ L. Nan Restine, Ph.D.
Date ______________	Dean of the Graduate School	____________________ Ronald Rogers, Ph.D.

Analysis, Design, Implementation and Evaluation of Instructional Software by Computer Science Students and Public School Teachers

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Abstract: This paper describes how computer science students of Texas A&M-CC (TAMUCC) and public school teachers benefited from an Eisenhower Funded Project "Training k-3 teachers on how to best use educational technology in the classroom" and were able to evaluate and construct educational software. During the first phase, teachers were exposed to educational technology. The next step was to evaluate educational software to teach science and rank the top software. They used a tool constructed by a computer science graduate student. In a third phase, they designed storyboards for computer science students from a Visual Programming Language Course to implement the software.

I) Introducing Educational Technology

During the first phase of our project, teachers became familiar with Educational Technology. After brief history of Computer Science & Computer Uses in Education, teachers became acquainted with the Web by searching for articles in educational technology (mainly from Northwestern and MIT) and wrote an essay analyzing Roger Schank and Seymour Papert's educational point of view. Many of the participants learned to search the web and use a word processor for the first time. MS-Powerpoint (in order to prepare their class presentations), MS-Excel (to grade their students) and Hyperstudio (to gain ideas concerning what an Educational Software may do) were also presented. Finally, teachers created their own web-pages.

II) Evaluating Educational Software

The primary reason that Educational Software is not widely used is not due to the difficulty of constructing good tools, but disseminating and incorporating them into the curriculum. It is frequently said that a limited software tool well applied to the curriculum is of much more value than a very good tool that is applied inappropriately [LAJO93]. Furthermore, there is reluctance on the part of instructors to incorporate these tools into their classrooms [STAS97].

Some authors [BORO97] believe that as the World Wide Web becomes the universal medium for disseminating information, all educational software will be platform independent, thus solving the dissemination problem. Although Educational Software is being made web compatible and this will increase its use, there are other barriers that keep instructors from using it.

This reluctance is in great part due to: faculty not knowing that the tools exist, difficulties in obtaining the tool, not knowing which tools to use, not knowing how to incorporate the tool into the curriculum, and fearing that the tool will increase their course load. What is needed is a mechanism for searching what Educational Software for a specific domain as well as a uniform location for students and teachers to discuss classroom experiences with the tool.

To solve this problem, we created an Interactive Repository for Educational Software (IRES) prototype that may be accessed from our project's home page (http://www2.tamucc.edu/ecdc/eisenhower.html). The functions of this software are to: 1) search for and add an educational software, 2) Evaluate, read evaluations, edit and/or delete evaluation(s), 3) Search for an educational web site, and add information about an educational web site.

Besides lacking security features (users could update or delete others' evaluation), we also received feedback concerning the unfriendly user interface. The feedback included too many fields to fill in (separate the mandatory and the optional fields), some fields had to be more intuitive, an easy help system informing the objectives of the software and a tool to summarize the evaluation (example: if 20 evaluators rated the tool, obtain the avg. rating). We also found a necessity for a form to specify teachers' request for new software (Describe educational software that the user would like developed).

The software not only catalogs all the educational software available, but also allows the participants to view each other's evaluations. For each, software there are several evaluations (one for each participant).

III) Constructing Educational Software

After the teachers became familiar with Educational Technology and Evaluated the Software, they tested the softwares with experimental classes of K-3 grade children. Following this phase, each teacher chose the software they wanted to purchase and also used storyboards to specify what softwares they would like developed. This served as input to a Visual Programming Class held at TAMUCC. The students of the Programming class interacted with the teachers, providing them hands on experience with a real world scenario. At the end, a web page was produced where the prototypes can be downloadable http://www.sci.tamucc.edu/~mariog/vpproj/vp.html. Some of these prototypes are already being used in public schools.

References

1) [KEAR87] Kearsley, Greg. "Artificial Intelligence and Instruction". Addison-Wesley Publishing Company. 1987.

2) [LAJO93] Lajoie, Susanne P.; Derry, Sharon J. "Computers as Cognitive Tools", Lawrence Erlbaum Associates, Publishers. Hillsdale, New Jersey, 1993. p.17.

3) [PAPE80] Papert, Seymour. "Mindstorms", Basic Books Inc., New York, NY., 1980.

4) http://www.ils.nwu.edu , Northwestern University's Institute of Learning Science.

5) http://www2.tamucc.edu/ecdc/eisenhower.html, Eisenhower Grant's Home Page.

6) http://papert.www.media.mit.edu/people/papert/, Seymour Papert and MIT.

Technology and the Academic and Social Culture of a University Campus

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Abstract: As colleges and universities consider various options for wide scale "computerization," one southern liberal arts university has instituted a technology program that insures that all students have equal access to laptop computers. At this university each student is issued his or her own IBM ThinkPad, and activities involving this computer are infused throughout the academic and social life of the campus. Students use the computer extensively in class activities and projects and also in social communication and entertainment. This study sought to examine the computer attitudes of students who had experienced a technology-rich environment for four years.

Introduction

Much has been written about the infusion of technology into academic life. While colleges are moving at different paces in its integration, we all recognize that technology is an integral part of education in the 21st century (Brown, 1999). Research studies describe an exhaustive computing environment as a positive influence on academics (Corwin & Marcinkiewicz, 1998; Geissler & Horridge, 1998; Walters & Necessary 1996).

Papert (1987) implies that integrating technology involves a systematic change. Systematic change refers to systematic evolution of a university's political and social climate. "Potential computer networking may hold for creating, nourishing, and sustaining the genuine learning communities so desperately needed if we are to confront the social, cultural, economic, and ecological challenges of the coming years" (Sayers, 1995, p. 773). It is these communities that foster academic and social growth of university students immersed in a culturally rich learning environment.

Intensive implementation of computers transforms an academic institution's climate, culture and atmosphere. With increased experience with technology, students' academic and social lives are significantly impacted and student attitudes toward computers become more positive (Mitra & Steffensmeier, 2000). Through forced familiarity, students develop an appreciation for computers and readily accept the evolution of the university into a completely wired educational and cultural environment.

Methodology

Yahoo has identified the university where this study took place as one of the "most wired" campuses in the country. Upon initial registration, each first-year student at this university was given his or her own personal IBM ThinkPad computer and printer. At the beginning of the junior year, students traded in the initial computer for a new ThinkPad. A computer support system included professional and peer assistance. Each dormitory room was equipped with network connections and everyone on the campus had the same standard computer and standard software load. Professors regularly integrated the computer into instruction, and students also used it for personal and social tasks. At the end of the fourth year of this program, the senior class had lived and worked in this environment of ubiquitous computing for their entire college career. Approximately 800 students were surveyed near the end of their senior year to obtain their self- reports of computer use and computer attitudes. This study reports the analysis of the attitude items and narrative comments from the student surveys.

A survey was constructed to obtain use and attitude data. The survey was posted online (with a CGI script to encode responses in a text file) and an email message was sent to all 800 seniors encouraging them to follow the included link and complete the survey. After one week, a reminder email was sent. Then after another week, a paper version of the survey was sent to all students who had not responded. After two more weeks, a random sample of the remaining nonresponders were interviewed by phone and asked the survey questions. To check for representativeness, Computer Expertise scores were compared for the three groups (web (n=274), paper (n=35), phone interview (n=10)) and there were no significant differences ($F(2, 316)= 0.391$, $p=0.67$).

Results

Campus Culture

Students reported, "Constant exposure to technology is great." On the attitude items, 73% of students reported that they "loved" computers, while 23% "liked" them, 4% "disliked" them, and 1% "hated" them. See Table 1.

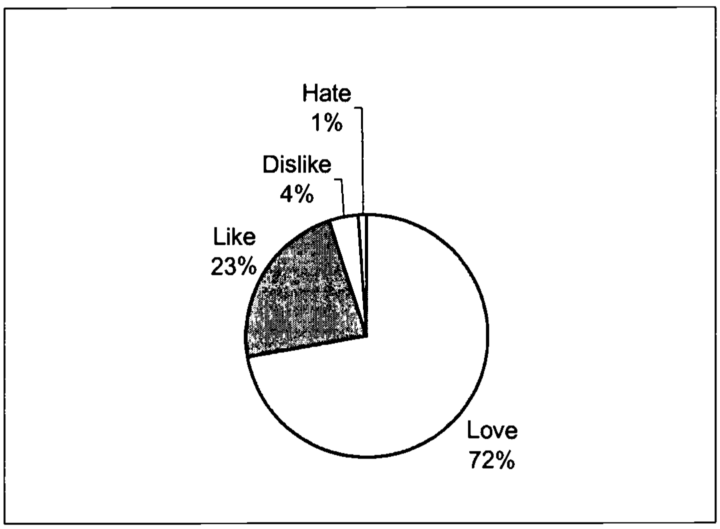

Table 1. Students' Attitudes toward Computers.

Many students developed an affinity toward technology, because it was such an integral part of their campus life. The integration of computers forced significant changes in the campus climate. Computer use, email, and web surfing are major components of everyday campus activities. Given the fact that all students unquestionably had the computer availability, there was forced familiarity with many different computer applications, which resulted in increased computer expertise. Self-ratings of computer expertise revealed that 80% of the students rated their abilities average or above. See Table 2. In a cyclical manner, students used the computer more, became more computer savvy, and found increasingly more needs for using the computer. 83% of the seniors felt that the ThinkPad had significantly impacted the campus culture. Students feel that "Technology pervades every aspect of college life in one way or another."

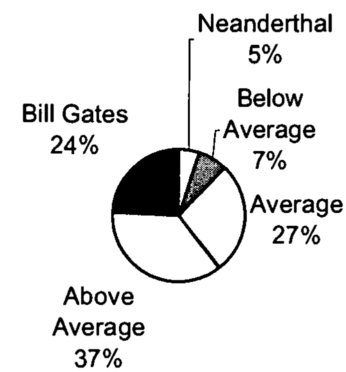

Table 2. Students' Self-reported Computer Expertise

Increased communication was another result of computer accessibility. Students used online technology tools to interact frequently with friends, family, and faculty. A student commented that "Email and IM are more accepted forms of communication here than on other campuses." Because of the widespread availability, email has become the preferred method of communication. This is true in both academic and social settings. It is common to hear students remark "email me" instead of "call me." In addition to regular email, students participate in list serves and news groups that keep them informed of academic and social information. Many students commented that email had enabled them to do more projects collaboratively. They also stated that they were more informed of university activities and functions. Many campus student groups, including social and service organizations, use email for routine communication. Other "real-time" communication, which is common includes chat rooms and Instant Messenger. A final means of computer communication is Internet phone, where a computer is used to make free long distant voice calls. 48% of the students surveyed felt that the ThinkPad had helped in their overall social life.

Many students emphasized the exclusivity of campus life as a result of the ThinkPad Initiative. Exposure to technology provides Wake students with invaluable skills and an intimate social experience. One student stated, "I believe that the ThinkPads have made Wake Forest a unique community/campus. It allows the students on this campus to experience something that students on other campuses do not have." In a question relating to job marketability, many students reported that in job interviews their computer expertise had given them an edge. It appears that future employers recognize Wake Forest University as a leading source of technical-savvy employees.

Academic Life

75% of the respondents felt that the ThinkPad had helped in their overall educational life. The accessibility to computers has decreased preconceived inequities among sexes and socioeconomic groups that infiltrate other universities. Because the ThinkPad is included in tuition fees, it is "covered" by financial aid packages. A further source of standardization is the fact that each student has the same computer and the same software. At many universities, even if a computer is required or recommended, there is wide variety in the hardware and consequently in the software. With the standard hardware and software, much time and effort is saved on the part of faculty and students in sharing resources and collaborating on assignments. A student commented, "Everyone is on equal footing. Everyone has the same access to resources, presentation, etc." As a result, students develop a familiarity with computer applications. Students use computers extensively; consequently, using computers becomes second nature. See Table 3. Students' views are summarized by one student's statement about ThinkPads, "It has redefined how we learn by adding an enormous new resource in information receiving." With the increased accessibility of computers, students are forced to become technologically literate. A representative student comment suggests, "The ThinkPad has overall improved the education on this campus."

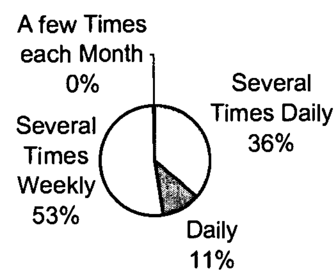

Table 3. Students' Self-Reported ThinkPad Use

Consistency of technical resources offers a commonality among students, which provokes conversation that in turn promotes collaborative learning. One students feels that "Whether it is just a topic of conversation, an article in the newspaper, or knowing that everyone had a computer when doing a project, the ThinkPad has been a major focus of energy in many areas." Many students stressed that with the ease of access to email, they were more able to collaborate on projects, discuss assignments with their classmates, and clarify professors' expectations through constant contact. A student remarked "Everyone I know uses the ThinkPad every day, to communicate, to do research, or just to goof around. We all discuss things we can do with our computers. Sometimes, we complain about what they can't do. But everyone knows that if they talk about the computer, every other student will understand what they mean."

Overall, 82% of the students felt that ThinkPads saved them time, but they recognized distractions and problems from having the computers. One student commented that "The convenience factor is a huge time-saver, however, I also wasted a lot of time goofing off. But overall, I feel like the time I have saved with the ThinkPad outweighs the time wasted." Arguments for time saved include convenience, accessibility, improved communication, and standardization. On the time-wasted side, students identified higher academic expectations, time-consuming tasks such as scanning, and distractions like games, chat rooms, and web surfing, which resulted in procrastination of academic work.

A student pointed out that "It (the ThinkPad) has saved me a significant amount of time due to the accessibility and the availability of the Internet." Many students recognized the limitations of computer labs and the advantage that they had in ease of access. A student remarked "Everyone has equal access to the internet, email, and word processors without having to wait in long lines in computer labs." It is common for students to research topics for major academic papers on the Internet. Even those who use the Library used the online card catalog and other online indices to locate materials. One student commented that "Being able to access the library catalog from my room was awesomely helpful. I could get abstracts even articles in the comfort of my pajamas." Efforts have been made to educate students on critical analysis of online sources, so that they select Internet references that are of the same quality as printed works.

A student stated, "I spent a lot of extra time surfing the web and emailing, just because I could." Because of the accessibility to the Internet, students were enticed by the entertainment features of the Web. Many students spend an inordinate amount of time with email and several students have become addicted to music and gaming on the Internet. Students commented that it was very convenient to use their computers in the comfort of their own rooms. One student reported that "If students still had to walk to a lab to check e-mail, surf the web, etc. They (myself included) wouldn't be so willing to spend time on the web, etc. However, since we have easy access to the Internet, chat programs, and e-mail, it is much easier to fall into surfing around the web or chatting with friends and family on a chat program." The ease of access and availability of the Internet provides an easy distraction and causes students to procrastinate in completion of academic assignments. A student acknowledged that "Web-surfing has enslaved me."

One student remarked, "Although I love the computer, and while in some ways, it has saved me time, overall it has cost me time. For example, doing presentations on PowerPoint, scanning pictures, etc, takes more time than the old-style presentations." Students commented that the standardization of computer access had increased the professors demands for assignments; consequently, increasing the preparation time for assignments. Some students felt that they had learned many computer skills through trial and error, with no guidance or instruction. Just because students had a computer, professors assumed that they knew how to operate it. Students reported that "There are many times when professors think you know how to do stuff and you do not. We had basic computer training and that is all." This issue was addressed in more detail with a section for other comments. The students' consensus was that a course should be designed to familiarize students with their ThinkPad, to train them in the standard software load, and to develop computer expertise. It was recommend that this course be required early in each student's freshman year. There is not a direct link between computer access and computer understanding. Because of having a personal computer, many students did however recognize that through forced familiarity that they had developed a computer expertise that most college graduates do not have.

Implications

Students emphasized changes in the academic and social atmosphere at Wake Forest as a result of the computer initiative. Results of this study verify that these changes were positive toward technology. An overwhelming 95 percent of the students reported that they either "loved" or "liked" computers. It is important to note that this is a liberal arts university, which typically does not attract the "techie" type. Similarly, 88 percent of students rated themselves as average or better in computer expertise. The students incorporated the technology into all aspects of their lives, including academics as well as communication and entertainment. It became an integral part of their day-to-day activities.

Students recognized the benefits of equal access to technology, improved technical skills due to forced familiarity, and the cultural evolution of the new technological community. This new environment fostered academic success by establishing a comforting and supportive network between faculty and students. Rather than becoming a tool of isolation, as feared by many detractors, the ThinkPads have opened new channels for communication. Students are able to be in constant direct contact, both synchronous and asynchronous, with faculty. This contact and resulting improved conversation offer a more personal educational system. Students expressed appreciation of the ability of the ThinkPad to allow involvement and individual feedback from professors on a regular basis.

This new learning environment also promotes communication among students, as they share ideas and provide support. Because of standardization, students are able to rely on their peers' expertise to solve problems. Through collaboration, shared experiences, and problem solving, students develop closer relationships. Students' computer expertise and cooperative skills make Wake Forest University students highly marketable.

Overall the integration of the ThinkPads was very positive in many aspects. It saved students time and enabled them to create a higher quality of academic work. Students did recognize that with all the electronic diversions available like entertainment, games, music, and web browsing, students must develop self-discipline to stay focused on educational objectives. Balancing these issues is a problem that all youth face as our society evolves, as this campus has, into a techno-focused environment. Wake Forest students are better equipped to manage computer distractions, because they have experienced its easy accessibility and have developed a comfort level and balanced attitude.

As implemented at this university, wide scale "computerization" changes the social and educational climate and has a positive impact on campus life. This cultural evolution in not just limited to academic universities. Technology infiltrates all aspects of our lives. One student commented that "The world is becoming more and more wired. Computers and the Internet are a huge part of life now, and they will continue to allow a greater level of efficiency in life, and will play a pretty major role in most people's lives, regardless of if they have computers or not. I don't think that we could avoid this change if we wanted."

References

Brown, D. G. (1999). *Electronically enhanced education: A case study of Wake Forest University.* Winston-Salem, NC: Wake Forest University Press.

Corwin, T. & Marcinkiewicz, H. (1998). *Prediction of and differences in computer use when universally available.* (ERIC No. ED 423 832).

Geissler, J. E. & Horridge, P. (1998). University students' computer knowledge and commitment to learning. *Journal of Research on Computing in Education*, 25 (3), 347-365).

Mitra, A. & Steffensmeier, T. (2000). Changes in student attitudes and student computers use in a computer-enriched environment. *Journal of Research on Computing in Education, 32* (3), 416-433.

Papert, S. (1987). Computer criticism vs. technocentric thinking. *Educational Researcher, 16*(1), 22-30.

Sayers, D. (1995). Educational equity issues in an information age. *Teachers College Record*, 96(4), 766-774.

Walters, J. & Necessary, J. (1996). An attitudinal comparison toward computers between underclassmen and graduating seniors. *Education*, 116, 623-630.

Applying Technology to Restructuring and Learning: An Analysis of a Professional Development Intervention

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Abstract: The *Applying Technology to Restructuring and Learning* (ATRL) study was carried out over a two year period to document and assist 150 teachers in six schools during the process of creating constructivist learning environments (CLEs) supported by technology. The research component of this project involved an *intervention study* with a two-tiered research design. *Tier One* was a collective case study of the approximately 150 classrooms, located across six school sites, whose teachers participated in 72 hours of ATRL professional development. *Tier Two* consisted of six detailed case studies of individual teachers whose experiences represented the process and the practices they employed in creating a constructivist learning environment within their classrooms. This paper will summarize the findings from the *Teaching, Learning, and Computing* (Becker & Anderson, 1998) teacher survey regarding the impact of the professional development intervention that was provided for the teachers in the project.

The Intervention

Design and delivery of 36 hours of professional development each year (72 hours total) was carried out over the two years of the *Applying Technology to Restructuring and Learning* project. Sessions were designed to be highly interactive and to model the application of constructivist learning theory. Major emphasis was devoted to teachers' own prior knowledge about how students learn. Instructional strategies included inquiry, project-based teaching, authentic learning and problem-based learning. Sessions used various types of software that supported student-centered learning and focused on teachers' ideas for other ways of using these software applications. The design and development of the professional development sessions for the ATRL project evolved over a period of several months and strove to accommodate the unique characteristics of the teachers as well as their individual schools, a variety of computer skill levels, different learning styles, curriculum interests, and varying available hardware and software.

The Teaching, Learning, and Computing Teachers Survey was given to all of the participating teachers at the end of year two. It provided a comparison of the ATRL teachers to a national probability sample. As the participating teachers received professional development designed to assist them in creating constructivist learning environments, one might hypothesize that rankings on constructivist practice and use of technology would be higher than for the national sample.

Effectiveness of professional development

Several measures were used to assess the impact of the professional development however, the effectiveness of professional development was most evident in results of the *Teaching, Learning, and Computing Teachers' Survey*. Analysis of this comparison of these 102 teachers to the national sample regarding the effect of professional development is reported in Table 1 below.

TLC Item	TLC 98 national sample N=4,083	ATRL 2000 teachers N=102
Staff development/workshops have influenced their teaching practice	54.1%	76.8%
A change in their understanding of learning has influenced their teaching practice	54%	72.8%
Computer/technology opportunity and experience has influenced their teaching practice	50.7%	78.7%
The person who gives them the best ideas about teaching knows a lot about computers	21%	50%
Teachers now participate more frequently in professional development activities	42%	59.8 %
Teachers discuss staff development sessions afterward with other teachers	42.3%	52.4%

Table 1: Effects of Professional Development

Conclusions

As the above data show, professional development that modeled technology-integrated, constructivist practices appeared to have assisted teachers as they shifted from traditional to more constructivist approaches. Results are consistent with the findings of other researchers (*Education Week*, 1999) who report that up to sixty percent of teachers who had eleven hours or more of basic technology skills training and curriculum-integration training say they feel "much better" prepared to use technology. This is but a brief snapshot of what took place in this two year study. Results from the this two year study also showed that professional development needs to be combined with other internal and external support structures to bring about effective integration of technology use and constructivism in classrooms. A complete report of this study can be obtained from any of the authors.

References

Education Market Research, (1999, September 23) Technology counts '99: Building the digital curriculum. *Education Week* [on-line] Available: http://www.edweek.org/sreports/tc99/

Becker, H. J. & Anderson, R. E. (1998). Teaching, Learning, and Computing: 1998. A national survey of schools and teachers describing their best practices, teaching philosophies, and uses of technology.

Just Another Evaluation Paper: Working Towards a Shared Methodology for Evaluation of Information Technology Courses in Teacher Education

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Abstract In response to a perceived increase in the amount of course evaluations being presented at conferences and appearing in the journals, this short paper seeks to characterise the methodology adopted during the evaluation of information technology courses forming part of teacher pre-service education. An attempt is made to discover the strengths and weaknesses of the most common procedures by the review of course evaluations readily available in the public domain. Elements of course evaluation are described in a short taxonomy under the main headings of curriculum effectiveness, learning effectiveness and cost effectiveness.

Too Many Course Evaluations

"It's all very well coming to these conferences but all you get is session after session of people presenting the results of student evaluations of their ICT courses. Is that all course leaders can do – ask the students? I think we should have one enormous 'poster' session where we can lock all the students' evaluations in one room and provide a key if anybody is remotely interested."

This is not perhaps a verbatim recollection of a colleague's sense of frustration at finding conference proceedings dominated by course evaluations, but it does serve to illustrate the potential threat to a balanced approach to course evaluation. Is there an over-reliance on gathering participants' perceptions in this context and if so, does it matter? Is the customer always right? This paper sets out to illustrate and characterise the most common sources of data for course evaluation in ICT, the methods of analysis applied to the data and the kinds of conclusions drawn from the work.

Gathering the Data

A straightforward method was used for gathering literature. Both the Eric and British Education Index databases were searched for references using criteria related to course evaluation, education technology and teacher pre-service education. Abstracts were searched for any indication that the title of the paper bore some relevance to the content and the most promising complete papers were then gathered. Analysis was made using the conceptualising, formulating and verifying elements of a methodology for using the Internet as a source for qualitative research (see Hughes, 2000)

The most striking characteristic of the evaluation of ICT (technology) courses in teacher education, is a reliance on students' self reported attitudes. Attitudinal surveys, with and without contextual information appear to have been and to remain the first and only recourse for course evaluation.

An Emphasis on Student Evaluation

Most published reports are concerned with a post-course evaluation (Boylan et al, 1994; Bauer, 1998) and student satisfaction (Bechtelheimer and Tamashiro, 1987). Some analyses provide information which looks to co-relate factors taken from pre and post-course questionnaires (McDermott, 1985; Savenye, 1993) and these examples look to find shifts in student self-esteem, confidence, professional self-perception and attitudes to using technology in the classroom (Cannon, 1996; Bauer, 1998; Brush, 1998)

Student evaluations are used to help reconstruct courses (van Rennes and Collis, 1998) or to assist in the development of guidelines for the development of distance learning courses (Cochenour and Reynolds, 1998). It is not always clear from the literature accessed during the present study what is the purpose of the evaluation. Neither is it clear what use was to be made of any conclusions that were drawn. Whatever use is made of the evaluation the use of students' perceptions provides a very reassuring picture. Evaluations are almost invariably positive and in some cases glowing.

The reliance upon students' self reported perceptions and reactions may extend to the comparatively unstructured context of the trainees' or learners' diaries and journals (Badley, 1986). Diary data may potentially be perception-rich and less open to the charge that questionnaires are likely to pre-position possible responses and so 'miss out' on some interesting and valuable information. However, there are concerns about the use of journals. Information from diaries is usually in a format that is difficult to analyse. On balance, although such instruments as diaries and journals are useful examples of contextual information, by themselves they are unlikely to capture elements of course evaluation that we need to address.

Some further clue as to what those elements should be are provided by Fucaloro and Russikof (1998) in their study to develop an assessment model for an on-line course. The model was applied to examine the effects of on-line instruction on teaching and learning by examining factors of faculty-student contact, speed and type of tutor feedback, student time on task and the range of learning styles offered. A second set of factors was centred around observable characteristics of the participants: the shift of technological skills, the chosen preferences of participants, and the extent to which students were actively involved in their learning. Finally, the evaluation looked at the demands on the faculty: staff workload, the technical support required for participants, and the demands of a reflective teaching approach.

The present study has examined an apparent over reliance on students' own perceptions of the value and impact of ICT courses leading to professional qualifications. The following taxonomy seeks to indicate what the present author considers to be the purposes and aims of course evaluation. At this stage no further discussion of appropriate methodologies is offered. However, subsequent papers will consider how these elements of course evaluation are best achieved.

Elements of Evaluation

- Achievement of Expected Outcomes – Curriculum Effectiveness
  - Shift of technological skill
  - Ability to apply principles of course into practice
  - Changes in students' confidence to be appropriately critical of their own and others' practice.
- Effect upon Students Experience – Learning Effectiveness
  - Availability of a range of learning styles
  - Opportunities for and outcomes of tutor/student contact and feedback
  - Student outcomes as a positive function of time on task
- Effect upon the work of the Faculty – Cost Effectiveness
  - The workload of the Faculty: in-service training and an erosion of other scholastic activity
  - Course demands on IT provision
  - Impact upon the delivery of other courses offered by the Faculty

References

Badley, G(1986)Using a Diary to Evaluate a Course of Programme. *Journal of Further and Higher Education.*v10 n3 p51-56.
Bauer, J. W (1998) Anchored Instruction in Pre-Service Educational Technology Classes: A Research Project. *
Bechtelheimer, L and Tamashiro, R (1987). Expanding Teachers' Thinking in Computer Curriculum Courses. *
Boylan, C.,et al (1994) Audiographic Teleteaching in Pre-Service Teacher Education. *Education in Rural Australia.*v4 n2 p23-27.
Brush, T. A., (1998). Teaching Pre-Service Teachers to use Technology in the Classroom. *The Journal of Technology and Teacher Education.* v6 n4 p243-258.
Cannon, J. R., (1996). The Infusion of Telecommunications and Word Processing Educational Technologies in the Primary Pre-Service Teacher's Science Teaching Methods Course: An Action Research Project.
Cochenour, J. J., and Reynolds, C., (1998) Integrating Computer Technology in Distance Learning as Part of Teacher Preparation and Inservice: Guidelines for Success. *
Fucaloro, L., and Russikof, K. (1998) Assessing a Virtual Course: Development of a Model. *
Hughes, M. (2000). *Creating a Methodology for using the Internet as a source of data for Qualitative Research in the Social Sciences.* Research Conference, ITTE, University of Cambridge.
McDermott, B.(1985) Developing Computer Literacy:What Are We Actually Teaching Pre-Service Teachers? *
Savenye, W. C., (1993). Measuring Teacher Attitudes toward Interactive Computer Technologies. *
Interpersonal Computing and Technology. v4 n1 p8-19.
Van Rennes, L.and Collis, B., (1998) User Interface Design for WWW-Based Courses: Building upon Student Evaluations.*
*EDRS Availability.

Creating a Methodology for Using the Internet as a Source of Data for Qualitative Research in the Social Sciences

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Abstract *At a time of much increased use of the Internet as a source of data for research, there is concern about how best to do this. This short theoretical paper seeks to characterise some uses of web page data.. Can the Internet deliver what we are looking for and how will we know when we have found it? A methodology is suggested, drawing heavily upon 'Grounded Theory', and some principles of good practice are recommended.*

The Nature of Qualitative Research and Documentary Analysis

Researchers in the social sciences are more and more attempting to make use of the vast amount of information available on the Internet. This short paper is an early attempt to re-configure the way we think of conventional concepts of validity, authorship and the representation of reality. The Internet offers a resource with its own ethical and moral properties formed by a multitude of authors publishing in unstructured and unregulated ways. This attempt to explore how we 'move around' in the ethical space created by the Internet will necessarily be constrained by the fact that we are trying to invent a new language to uncover 'standards', i.e. agreements on how to manage information and interaction on the web.

The qualitative researcher is often concerned with finding patterns of meaning, perception and reaction evidenced in the language used by actors within either a 'live' social setting or the more deliberative context of the written word. Documentary analysis is generally non-intrusive, particularly in contrast to ethnographic approaches and may be considered strength of documentary analysis: the researcher is demonstrably not having any effect upon the social setting she is observing. Yet it may also be considered a weakness, in that the researcher is distanced from the reality of the setting, only gaining access through the report of others. Any methodology in this area must take into account the possibility of authorship being open to similar criticisms as with any unquestioning reliance upon oral history (Seldon and Peppworth, 1983)

By analysis of the content and nature of the language used, an attempt is made to reveal the significance and meaning of what is observed. Notions of validity and bias in the data are important in documentary analysis, particularly where the content is considered as an attempt at persuasion (Sparks, 1992). So if it is the case that researchers will be increasingly accessing the many millions of pages stored on web sites and applying documentary analysis to that data, what should that form of analysis look like? How will it differ from the methodology most usually applied to text, images and the analysis of their meaning?

Why Create a Methodology?

What if we were to simply not bother with the Internet? By adopting research methods that preclude the collection of data of this sort, the researcher is doing more than simply excluding vital evidence from their study. They are also assuming a particular view of social activity and of provenance, one moreover that argues that as researchers we cannot grasp the nettle of sorting data in compelling and powerful ways. We would thus be assuming a way of thinking that reduces our human interaction with the information highways to the role of 'unwitting dupes' of ideas and attitudes beyond our comprehension and influence, and this will not do.

The creation of a supportable methodology in the context of the Internet is dependent in some way upon an acceptance of the limitations of our ability to generalise findings and create proven principles. Qualitative studies based upon access to large amounts of data are particularly vulnerable, when it comes to managing the data. Nevertheless, it is appropriate to set down a way of working that can support researchers in their planning. The procedures and principles of a methodology for qualitative research using the Internet are summarised in Figure 1. They are based upon the application of Grounded Theory in a context where selection and exclusion of material are primary procedures

Figure 1. Summary of the Procedures of a Grounded Methodology when using the Internet for Research

Process	Activity	Comments
Conceptualising	Search the Web to find exemplary material from a wide range of web sites and sources.	Check cross-references and access to a wide range of socio-linguistic and socio-representational material gender, age, economic status and culture.
	Collect data into an accessible file format and use open coding to create main headings.	Use both a 'manual' scan and an IT application. It is necessary to capture complete texts, figures and images
Textualising	Collect main data set using an intelligent agent and main headings.	The method used by the agent is part of the advised methodology. This should include a detailed analysis of strengths and weaknesses.
	Use 'manual' scans to exclude unpromising text and images.	Keep exemplars of material not included to indicate the 'position' of the researcher.
	Convert material into a form that can be easily 'read'.	Use of *hard returns* or similar to create units of text. Using common file formats to enable access.
Coding	Detailed coding using IT application.	Choose an appropriate application depending upon the developing structure of the codes.
	Establish a coder reliability study with a longitudinal aspect	Axial coding; possible relationships between categories are tested against data obtained in ongoing theoretical sampling.
Formulating	The main issues are explored and an interim analysis made. A core category is defined.	These will be conceptual links, models and provisional findings. At this point the core category is related to the coding paradigm and all other subsidiary categories.
	Develop observable characteristics of the analysis.	How would others replicate the searches, coding and analysis?
Complementing	Bookmark manager to maintain an active link with the data set.	Record the timing of data reviews.
	Check interim analysis by comparison of data with the observable characteristics.	Include updated data.
Verifying	Grounding the Theory	The emergent theory is grounded by returning to the data and validating the theory against actual segments of text or images
	Review categories	Do the coding, the search criteria and the reliability study address the purposes of the project?

In conclusion, an argument has been put forward that a development of grounded theory in the context of searching the Internet, provides a potent and robust method for constructing theory. It enables researchers to generate ideas that are true to the data and, because of its emphasis on inductive logic, closes the theory-data gap. Working with the Internet is time-consuming, complex and potentially frustrating. However, the advantages to the researcher of accessing such huge amounts of 'free' data, can do much to make more inviting the prospect of overcoming these impediments.

References

Glaser, B.G. (1978) *Advances in the Methodology of Grounded Theory: Theoretical Sensitivity.* California, Sociology Press

Guba, E.G. (1990) *The Paradigm Dialog.* London, Sage

Levy, P. (1981) *On the Relation between method and substance on psychology.* Bulletin of the British Psychological Society, 1981, 34, p265-270

Seldon, A. and Peppworth, J. (1983) *By Word of Mouth*

Sparks, R. (1992) *Television and the Drama of Crime: Moral Tales and the Place of Crime in Public Life.* Buckingham, Open University Press.

Strauss, A. (1987) *Qualitative Analysis for Social Scientists.* Cambridge: Cambridge University Press

Computer Confidence and Attitudes of College Students Attending a Notebook or Traditional University

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Abstract: This study attempts to determine how the use of a notebook computer impacts a student's computer confidence and attitude when compared to those of a traditional university student. This descriptive study used a survey research instrument to gather quantitative data concerning computer confidence and attitudes. Forty-six students at a notebook university and 64 students at a traditional university were surveyed during the summer semester of 1999. Data were collected on computer attitudes to determine students' perceptions of computer usefulness, and comfort or anxiety. The study found that notebook university students had significantly higher levels of computer usage, confidence, and positive attitudes than did students at a traditional university.

Introduction

Colleges and universities are studying ways to integrate technology and instruction. Administrators at two North Dakota higher education institutions feel that the prevailing technology model for higher education is no longer working. Brown (1997), Executive Director of the Associated Colleges of Central Kansas, and former Vice President of Mayville State University and Valley City State University, believes knowledge of current technology is a basic tool for learning and success in the workforce; therefore, every student needs access to the hardware and software. Notebook universities share this same goal.

In order to be competitive, students should have equal access to computers both at home and school. Many students already have home computers, but some others do not. Providing each student with a notebook computer is the most equitable solution for problems of access. Giving computers to every student levels the field for all students at the university. In addition, since universities are finding it difficult to provide access to the computer labs faculty members want to use, notebook computers alleviate scheduling problems for courses involving required computer use.

Notebook universities are looking at not only new methods of teaching but also new methods of enhancing student learning (Chaffee, 1995). Information resources are becoming fundamental in daily classroom activities. The notebook computer can be used in the classroom as a conduit to information. Students are able to examine the information they have collected and to synthesize the data; they can then evaluate both the value of the information they have gathered and the technique used to gather it. Students who collect their own data partake in active learning. Active learning increases knowledge retention and synthesis. When a student has a notebook computer available twenty-four hours a day, active learning is facilitated.

Four recent studies measure attitudes toward computer notebook use. Brown (in press) found that 20 to 25 percent of university classes across the nation use e-mail, and 10 to 15 percent use presentation software. At two notebook universities in North Dakota, 54 percent of the faculty used technology in their courses. In 1993, 48 percent of the faculty of these two universities rated themselves high in utilization of information technology. By 1996 two-thirds of the faculty reported high utilization for instructional purposes.

In 1997, Holleque, Professor of Education and Psychology at Valley City State University, determined that a notebook computer environment had a positive effect on students' perceptions of computers. By the end of one semester, 92 percent of the students surveyed reported a mostly positive attitude toward having a notebook computer. In addition, 91 percent of the students were at least somewhat confident about using their computers. Finally, 97 percent of the students reported using their computers on a daily basis.

A survey at the University of Minnesota-Crookston (UM-C) found students used the notebooks for much more than writing papers and taking notes. In 1996, 90 percent of the students at UM-C said they used the notebook computer for e-mail; 80 percent used notebook computers to do research on the Internet; 75 percent of the students used the notebook computer to communicate with their professors and to work with other students on projects; and almost 50 percent used the notebooks for graphics and presentations. In the same survey, 75 percent of the students said the notebooks increased "the amount and quality of learning" at UM-C. Ninety percent of the students stated that the notebook computer helped them build the technology skills they needed in their careers (Osborne, 1997).

In a fourth study, conducted by Rockman et al. (1997), an independent research organization, for the "Anytime Anywhere Learning by Microsoft Corporation" and the "Notebooks for Schools by Toshiba America Information Systems," found teachers', parents', and students' positive attitudes for the notebook computers used in the schools had a direct effect on students' motivation and engagement, time on task, and sharing of work. The study showed that 70 percent of the teachers involved in the notebook computer project had a high degree of enthusiasm for the notebook computers in the classroom. Ninety percent of the teachers used the notebook computers for word processing, 74 percent for presentations, 61 percent for Internet, 46 percent for spreadsheets, 35 percent for skill remediation, and 29 percent for databases and record keeping.

The purpose of this study is to attempt to determine how the use of a notebook computer will impact a student's computer confidence and attitudes when compared to those of a traditional university student. It is a descriptive study using a survey research instrument to gather quantitative data on experience and confidence. The survey will cover areas of computer expertise including word processing, Internet and communication applications, spreadsheet, and data management software. In addition, data were collected concerning computer attitudes to determine students' perceptions of computer usefulness, and comfort or anxiety levels.

For the purpose of this study, the following terms have been defined: Notebook Computer: A portable computer that has a flat screen usually weighing less than six pounds which is small enough to fit into a briefcase. In terms of computing power, notebook computers are equivalent to desktop computers. Notebook computers come with batteries enabling them to run without the need of an external electrical power source. Notebook University: A campus where all students and faculty are issued a notebook computer (as defined before). Students and faculty have 24-hour access to a computer. Classrooms feature student tables with electrical and network connections. Computer labs at these institutions have become obsolete because any classroom on campus is, in essence, a computer lab. Traditional University: A campus that does not issue notebook computers to students and where class-related computer activities take place in a computer lab.

This study was undertaken to determine how computer confidence, and attitudes are affected when comparing notebook campuses and traditional universities. The data in this study will be of interest to individuals who are exploring the idea of implementing a notebook campus. The results are intended to add to the total knowledge about notebook campus implementation and its effect on students.

The Study

The objectives of the study were to answer the following questions: (1) Do notebook university students have higher computer confidence and attitudes when compared to students from a traditional university? (2) Do students who own a home computer at a traditional university have computer confidence and attitudes equivalent to students from a notebook university? A survey was used to measure student's experience, confidence, and attitudes to answer the above research questions.

The participants were students from two state universities sharing similar foundations as normal schools that developed into more comprehensive universities. One is located in the upper Midwest and follows the notebook model; the other is located in the lower Midwest and follows a traditional model.

A survey was used to measure students' computer confidence, and attitudes. The survey was based on existing surveys. The survey contains the following categories: Background Information, Computer Experience, Computer Confidence, and Computer Attitudes.

The students were given the survey in various courses during the summer semester. The questionnaire was constructed so that the students would need no longer than 10 minutes to complete it. The students were informed about the goals of the study. The participants were assured that their responses were voluntary and would be anonymous. The students were also informed that their names would not be associated with any individual scores nor would their names be identified with any results of the study.

All of the replies for computer confidence and attitude questions used a 4-point Likert scale (strongly disagree = 1; strongly agree = 4). T-tests were performed to compare means in computer experience, confidence, and attitudes between students at notebook and traditional universities. The t-tests were then repeated to compare experience, confidence, and attitudes between students attending a traditional university who owned a home computer and notebook university students. A final set of t-tests was carried out to compare experience, confidence, and attitudes between students enrolled in computer classes at a traditional university and the entire notebook university sample student population.

Findings

A total of 108 students completed the survey. Among this total, 46 students attended a notebook university, and 62 students attended a traditional university. The sample populations were represented by students from two fields, business and education. At the notebook university, 76% of the students declared an education-related major, while 24% of the student population declared a business-related major. Within the traditional university, 84% of the students surveyed listed education as a major, while 16% of the students declared business. Of the sample population at the notebook campus, 78% were female, and 22% were male. Sixty-three percent of the sample population of the traditional university were female, and 37% were male. The grade levels of participants at the notebook university included 43% seniors, 40% juniors, 13% sophomores, and 4% freshmen. In the traditional university, the sample population reported 40% seniors, 39% juniors, and 21% sophomores. Employment of the students at the notebook university was 78%. This rate was comparable to the 73% of the students holding employment in the traditional university.

The purpose of the present study was to determine how the use of a notebook computer would impact a student's computer experience, confidence, and attitudes when compared to a traditional university student. The analysis is organized according to the individual research objectives.

Does the average notebook university student have higher computer experience, confidence, and attitudes when compared to a student from a traditional university? T-tests were used to compare means in computer experience, confidence, and attitudes between students at a notebook university and those at a traditional university. A t-test compared computer confidence between students at a notebook and a traditional university. This analysis showed that in three areas of confidence--word processing software, Internet and communications software, and spreadsheet software--notebook computer students had significantly higher scores. There was no significant difference between notebook and university students with respect to database management software.

Areas of Confidence	Notebook University (N=46)		Traditional University (N=62)			
	Mean	Sd	Mean	Sd	t	p
Word Processing Software	38.24	2.82	34.21	5.12	4.820	.000*
Internet Communication Software	32.67	2.70	26.60	4.77	7.759	.000*
Spreadsheet Software	24.39	4.44	17.32	6.93	6.052	.000*
Database Management Software	18.13	7.79	15.87	7.74	1.496	.138

*$p < .01$.

Table 1. Computer Confidence (Traditional University-Notebook University)

A second t-test was used to compare a notebook and traditional university student's computer attitudes. Computer attitudes were divided into the categories of usefulness and comfort/anxiety. The analysis showed that a notebook university student had significantly higher scores in computer usefulness and comfort (Table 2).

Computer Attitudes	Notebook University (N=46)		Traditional University (N=62)			
	Mean	Sd	Mean	Sd	T	p
Usefulness	42.11	2.96	38.42	5.07	4.409	.000*
Comfort/Anxiety	28.91	3.43	23.77	4.84	6.147	.000*

*p < .01.

Table 2. Computer Attitudes (Traditional University-Notebook University)

Do students who own home computers at the traditional university have equivalent computer experience, confidence, and attitudes when compared to students from a notebook university? As in the previous section, t-tests were used to compare means. Thirty-nine students in the sample population of the traditional university, or 63%, owned a home computer. The analysis of computer confidence between notebook university students and computer owners at a traditional university showed three areas of significance. Notebook university students have higher confidence in word processing software, Internet and communication applications, and spreadsheet software. There was not a significant difference with respect to database management software (Table 3).

Areas of Confidence	Notebook University (N=46)		Traditional University – Computer Owners (N=39)			
	Mean	Sd	Mean	Sd	t	p
Word Processing Software	38.24	2.82	35.87	4.61	2.903	.005*
Internet Communication Software	32.67	2.70	27.33	4.75	6.489	.000*
Spreadsheet Software	24.39	4.44	19.59	5.78	4.326	.000*
Database Management Software	18.13	7.79	17.46	7.74	.402	.688

*p < .01.

Table 3. Computer Confidence (Computer Ownership)

A second t-test in the second research objective compared computer attitudes between notebook university students and computer owners at a traditional university. The notebook university student had significantly higher attitudes toward computers, including both the areas of computer usefulness and comfort (Table 4).

Computer Attitudes	Notebook University (N=46)		Traditional University – Computer Owners (N=39)			
	Mean	Sd	Mean	Sd	t	p
Usefulness	42.11	2.96	39.97	3.70	2.95	.004*
Comfort/Anxiety	28.91	3.43	25.15	4.20	4.544	.000*

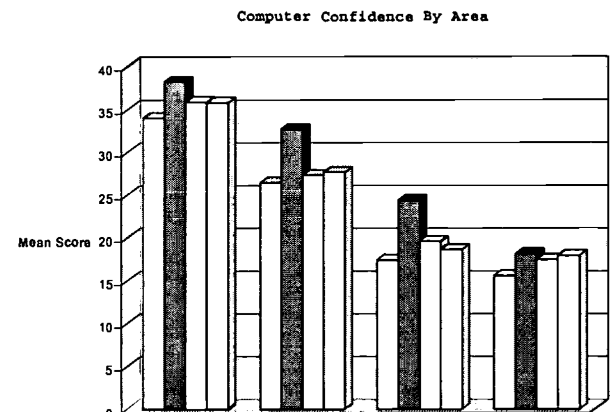
*p < .01.

Table 4. Computer Attitudes (Computer Ownership)

Conclusions

The study found that notebook university students had significantly higher computer usage in all areas than students at a traditional university or than students who owned computers at a traditional university. Computer use was also significantly higher for notebook university students in the areas of word processing and spreadsheet software when compared to students who were currently taking computer classes at a traditional university.

Whether comparing notebook university students to the traditional university population as a whole, to traditional students who are currently taking a computer class, or to traditional students who own their own computers, notebook university students display higher confidence in word processing software, Internet and communication applications, and spreadsheet software. Figure 1 provides a graphic representation of computer confidence with regard to notebook and traditional universities.

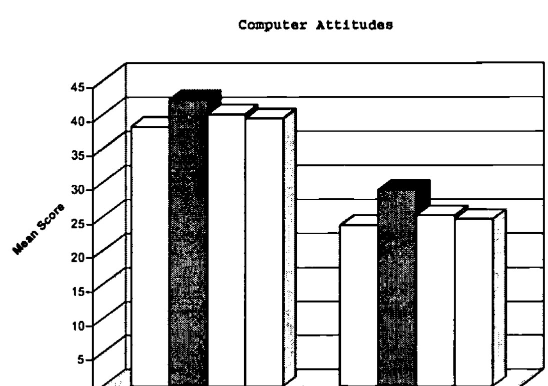


	WP Total	I/C Total	SS Total	DB Total
Traditional University (N=62)	34	26.45652174	17.39130435	15.58695652
Notebook University (N=46)	38.23913043	32.67391304	24.39130435	18.13043478
Computer Ownership (N=39)	35.87179487	27.33333333	19.58974359	17.46153846
Computer Class (N=28)	35.78571429	27.67857143	18.64285714	17.92857143

Confidence Area

Figure 1. Confidence by Area.

When comparing computer attitudes, this study showed that students who attended a notebook university have significantly higher scores in the areas of computer usefulness and comfort in using computer technologies than traditional university students, computer owners at a traditional university, or students who were currently attending a computer class at a traditional university (Figure 2).



	Usefulness	Comfort/Anxiety
Traditional University (N=62)	38.2173913	23.73913043
Notebook University (N=46)	42.10869565	28.91304348
Computer Ownership (N=39)	39.97435897	25.15384615
Computer Class (N=28)	39.39285714	24.60714286

Categories

Figure 2. Computer Attitudes.

Recommendations

Several recommendations are made for future research.

1. The effects of experience and its relationship to confidence and attitudes should be studied in the context of the notebook university and the traditional university.
2. The scope of a future study should be enlarged to examine if notebook university students use the computer to be more productive in their educational pursuits.
3. In future research efforts, the survey instrument for computer experience should collect data beyond the use of computers for word processing, Internet and communication applications, spreadsheet software, and database management software.
4. In future research efforts, the survey instrument for computer confidence should include an additional category for presentation software.
5. In future research efforts, a larger sample size including multiple institutions should be used to allow for generalizations.
6. Future research should examine the modeling of computer use by faculty at notebook and traditional universities to determine its relationship to computer use, confidence, and attitudes of the respective student populations.
7. Future research should explore why computer use is significantly higher for notebook students than for traditional university students.
8. A study should focus on the different training methods used by universities that may contribute to computer experience, confidence, and attitudes.
9. Computer performance between notebook and traditional university students should be studied.
10. Additional research should be done to explore and identify other factors that contribute to the implementation of the notebook computer model.

References

Brown, R. (1997). Technology initiative: Improving learning with technology. AASCU (American Association of State Colleges and Universities) [On-line]. Available: http://www.vcsu.nodak.edu/offices/itc/notebooks/Articles/aauaawrd.html

Brown, R. (in press). Technology & innovation with notebook computers. Campus Wide Information Systems Journal.

Chaffee, E. E. (1995). Improving learning with technology. Remarks to the State Board of Higher Education on November 16 [On-line]. Available: http://www.vcsu.nodak.edu/offices/itc/notebooks/Articles/cwis397.html

Holleque, K. (1997). Student survey: Notebook computer environment [On-line]. Available: http://www.vcsu.nodak.edu/offices/itc/notebooks/Results/studentsurvey.htm

Osborne, D. (1997). Notebook university. IBM Higher Education [On-line]. Available: http://www.hied.ibm.com/solutions/think/crookstn.html

Rockman et al. (1997, June). Report of a pilot year: A project of anytime anywhere learning by Microsoft Corporation notebooks for schools by Toshiba America Information Systems. San Francisco: Author.

Science Concepts, Technology, and Higher Order Thinking Skills- What's the Connection?

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Abstract: Using the scientific process involves ample opportunity for complex higher-level thinking. Integrating technology into the unit can support and enhance these same critical thinking skills. This qualitative study was designed to examine students' understanding of a science problem involving human habitation of wetlands, woodlands, and grasslands. Four fourth grade students and their teacher were observed during a six-week period in which they spent two hours a day in a technology immersed classroom. Researchers observed how students used technology to proceed through defining, investigating, and drawing conclusions about the problem. Student interviews revealed how useful they felt technology had been for completing each stage of the process. Teacher interviews revealed how she believed technology was supporting and enhancing students' complex thinking. For the purposes of this study, the scientific process has been limited to the following four main stages: identify the problem; collect information; analyze information; and draw/present conclusions.

Peer-Status and Self-Efficacy: Effects on Technology-Based Small Group Interactions

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Abstract: Computers use in many U.S. schools is shifting from individual to group-based learning environments. This development is forcing a reevaluation of traditional uses of computers as tools for tutoring individual students. Teachers are beginning to recognize the potential for computers to serve as a medium for group-learning situations. This study examined some of the factors that influence interactions as students work in learning groups on a computer-centered activity. Twelve groups of three high school students each worked together around one computer to solve a mystery presented in a problem-based learning program. Prior to the activity, participants' self-efficacy was assessed and their peer-status was determined relative to the other members in their group. The preliminary results of this study indicate that high self-efficacy and high peer-status positively influenced individual participation. These results suggest that these teachers should attend to these individual student characteristics when forming student groups for technology-based learning situations.

Introduction

As the use of computers in our society increases, so does the need for research on effective ways to incorporate uses of computers into classroom learning. Teachers have typically used computers to present individual learning activities in lab settings. However, as more computers are integrated into classrooms, this dynamic is changing. Teachers are starting to view computers not just as tools for tutoring individual students, but as a potential medium for cooperative learning activities. When using computers in small-group learning situations, teachers must not assume that cooperative learning will automatically occur. The environment must be structured to promote cooperation and interpersonal interaction among group members and stimulate cognitive growth (Johnson, Johnson & Stanne, 1985). Examining the factors that influence the effectiveness of the interactions that occur in a cooperative-learning group will help teachers understand how to create a more effective cooperative learning environment. Some of these factors include a) how the group functions, b) the task structure, and c) individual characteristics of students (Hooper, 1992; Webb & Palincsar 1996). This study examines how two individual student characteristics (self-efficacy and peer status) influence group functioning in a computer-centered task that is structured to promote cooperative interaction.

Several features are important in developing tasks that support cooperative interaction. One important factor that affects cooperation in small groups is whether members share a common goal (Webb & Palincsar, 1996). It may prove more effective for group members to function independently or competitively when the goals of individuals within the group differ. The goals that are established for the group, and thus whether the group functions cooperatively, are largely determined by the task structure.

Ill-structured tasks tend to elicit cooperative interaction (Cohen, 1994). Ill-structured tasks are less clearly defined than well-structured tasks. Where well-structured tasks tend to have one "right" answer, ill-structured tasks require group members to reiteratively process the task or problem definition, to generate several problem-solving approaches, and to analyze all the viable solutions (Gallagher, Stepien & Rosenthal, 1992). These processes force group members to interact at a highly mutual level, that is, cooperatively.

One model of cooperative group learning that provides an ill-structured task with common group goals is problem-based learning (PBL). PBL is a student-centered pedagogical strategy in which students try to solve ill-structured problems set in authentic contexts by reflecting on their experiences and sharing experiences with others (Hmelo & Ferrari, 1997). A key component of PBL activities is the opportunity for participants to engage in cooperative small group problem solving.

The characteristics of individuals within a small learning group may have a powerful influence on the nature of the group interactions. Social status is one characteristic that teachers consider when grouping students. Social status may be influenced by several factors including ethnicity, socio-economics, and gender (Cohen, 1982). Less obvious status characteristics that should also be considered include academic status and self-efficacy (Cohen, 1997; Busch, 1996). However, it is not clear *how* these characteristics influence group interactions. More effective grouping strategies could be used if teachers had a better understanding of the effects of status and self-efficacy on technology-based small group interactions. This study was an examination of the influence of self-efficacy and peer status on small group interactions during a computer-centered PBL activity.

Methodology

Setting and Participants

Participants were students in a private high school in a medium-sized western city. Thirty-six students with 3.0 or higher grade point average were randomly selected from one section of a ninth grade Spanish class and one section of an eleventh grade Spanish class. Eighteen of the participants were male; the other 18 were female. All participants were in the middle- to upper-middle class socioeconomic status. The 36 participants were randomly assigned to one of 12 same-gender or mixed-gender working groups of three students each. Three groups were all females, three groups were all males, three groups were two females and one male, and three groups were one female and two males to counterbalance gender across the groups.

Materials

Computer Software

The PBL activity involved developing a solution to The Mystery of Machu Picchu, a problem-based hypertext program developed by the lead author. Each group of students worked at a laptop computer with an external mouse. The objective of the program was to have the students choose a theory to explain the demise of the culture that built Machu Picchu. Students were required to use supporting evidence (gathered from informational resources in the program) to support their choice. Thus, students were assigned a common goal and the program provided an ill-structured problem—several viable theories that could be supported through information in the program were provided for the students.

The main screen of the program introduced the mystery of Machu Picchu to the students and indicated that there were several possible theories as to why Machu Picchu was built and what happened to it. Students were asked to determine which of the possible theories was most likely after exploring several different paths along the Inca Trail on their way to Machu Picchu. Different paths provided information that supported different theories. Hyperlinks to the Theories screen and to the Inca Trail screen were on the main screen. The Theories screen listed five possible theories. From there, students could link back to the main screen or to the Inca Trail screen.

The Inca Trail screen contained a graphic image map linking to five different sections: (a) Location of Machu Picchu, (b) Inca Customs, (c) Inca Construction Techniques, (d) Inca Artifacts, and (e) Tour of Machu Picchu. All sections contained from two to eight related subsections. Each of these subsections contained graphic maps and textual descriptions. Students could link back to review the information on the main screen or the Theories screen from any section or subsection screen.

Case sheet

Two column case sheets and pencils were provided for note taking. The first column of the case sheet was divided into five sections (one for each theory) with space to write supportive evidence found in the program and to note the section and subsection of the Inca trail where the evidence was found. The second column provided space to make notes about how the evidence in the first column supported a selected theory.

Self-efficacy test

A self-efficacy measure was adapted from the English version of the General Perceived Self-Efficacy Scale (Schwarzer & Jerusalem, 1995) and the Computer Self-Efficacy Scale (Eachus & Cassidy, 1998). This assessment was used to determine general self-efficacy toward learning and self-efficacy toward using computers. A series of 23 statements regarding how students handled difficult situations, their feelings about learning and school, and their feelings about computers were presented. Participants rated each statement on a scale from one to four (1 = not at all true, 2 = hardly true, 3 = mostly true, and 4 = exactly true). Higher scores correspond to higher self-efficacy. The highest possible score was 88.

Peer-status ranking

Peer-status ranking was assessed using a sociometric instrument developed by Cohen, Lotan and Catanzarite (1990). A series of 20 descriptive questions regarding the academic and social status of each groups' members were presented. Next to each question were all the names of the individuals in the respondent's group. The participants were then asked to circle the name of the group member who most accurately fit each descriptive question. Respondents had the option of selecting him or herself as well as the other two members of the group.

Video equipment

A video camera was mounted on a tripod approximately 10 feet from the group to record interactions during the activity.

Procedures

The research was conducted in two sessions. During the first session students took the self-efficacy test and rated themselves and the other students in their group in terms of academic and social status. This session took approximately 20-40 minutes.

The second session was conducted with one three-person group at a time. Each group worked on The Mystery of Machu Picchu PBL computer program in an empty classroom. Before starting, the researcher gave the students instructions that they were to work together to solve the problem presented in the program, and to take notes on their case sheets as they progressed through the program. The problem and instructions as to how the users of the program were to go about solving the problem were presented in the program. Each group of students worked through the program with little intervention from the researcher. While students worked they took notes on their case sheets when they found supporting evidence. The groups were free to talk among themselves. Each group was given approximately 35 minutes to work through the program. These sessions were videotaped to record the group interactions during the process of completing the task. The researcher also recorded general and task-specific observations made during the activity. Participation, attentiveness to the task, the types of questions and responses, the amount of both task and non-task verbalizing, and mouse control were recorded and later categorized.

Analysis

To investigate the effect of an individual group member's self-efficacy and peer-status on group interactions, the participants' pre-activity questionnaire results were compared to the videotaped interactions during the activity. Each participant's score on the self-efficacy scale was totaled and individuals were given a self-efficacy rank within the group relative to other group members' scores.

The second part of the pre-activity questionnaire asked the participants to circle the name of the group member (including him or herself) who most accurately fit each of 20 descriptive statements regarding academic and social status. The number of times each name appeared on any of the three lists was totaled for each group. The individual whose name appeared most frequently received the highest peer-status ranking; second and third place rankings were assigned accordingly.

Videotapes of group interactions were analyzed to categorize each group member's actions and interactions during the activity. Transcriptions from the videotapes of each of the group's interactions were qualitatively coded into the following categories: 1) questions, 2) responses, 3) initiation of concepts, 4) elaboration, 5) building on elaboration, 6) directing, and 7) disagreements. All on-topic questions were coded as questions. All responses to on-topic questions were coded as responses. When an individual came up with a new idea without prompting from other members of the group, that statement was coded as initiation of a new concept. Statements that elaborated on (a) something that was read or (b) their own idea were coded as elaboration. Statements that elaborated on another group member's idea or statement were coded as building on elaboration. Giving instruction or directing other members in how to act or think was coded as directing. When a group member disagreed with another group member's idea, the statement was coded as disagreement.

Preliminary results from these data suggest that both self-efficacy and peer-status positively influence an individual group member's participation in group interactions. 50% of the time, the individual asking the questions in the group had the highest self-efficacy score and peer-status ranking of the group. Concepts were initiated 57% of the time by the individual with the highest self-efficacy score and 50% of the time by the individual with the highest peer-status ranking. Building on elaboration, the most frequently coded type of statement, came from the individual with the highest peer-status ranking 58% of the time and from the individual with the highest self-efficacy score 50% of the time. These findings suggest that students who are confident in their abilities and hold higher social status within a group show more willingness to present new ideas and build on and develop their peers' ideas in PBL computer-based learning group-environments.

These data also suggest that self-efficacy may have more influence on an individual's confidence to disagree with another group member than peer-status. Fully 75% of the disagreements with another group member's ideas came from the individual with the highest self-efficacy score. However, the student who disagreed never had the highest peer-status ranking. Perhaps those individuals with a high peer-status ranking were afraid to openly disagree with the other members of their group for fear of disrupting the group dynamic and potentially loosing their peer-status. Students with high self-efficacy scores who disagreed consistently had lower peer-status ranking. These students may have had the self-confidence to express their disagreements without the fear of losing peer-status.

Finally, in each of the three groups with the greatest within-group difference between self-efficacy scores the individuals with low self-efficacy scores had the least total participation of all students in the study. This suggests that when there is a large disparity in self-efficacy, individuals with low self-efficacy may be intimidated when paired with individuals with much higher self-efficacy and hesitate to fully participate in group discussions.

Conclusions

The preliminary findings from this study suggest individual characteristics such as self-efficacy and peer-status may play an important role in how PBL-based cooperative learning groups interact. Self-efficacy and peer-status were found to influence student involvement relative to initiating new ideas and elaborating on others' ideas, while challenging ideas through disagreement appears to be positively related to self-efficacy and negatively related to peer-status. The findings also suggest that the characteristics of each of the individuals in a group may influence each other's participation. Pairing very low self-efficacy students with very high self-efficacy students may have a negative influence on low self-efficacy students' participation.

As teachers begin to move beyond traditional drill-and-practice implementations of computers, these results can provide helpful information for teachers who want to use computers as a context for problem-based cooperative learning activities. Self-efficacy and peer-status appear to be important factors in shaping the interactions that take place in group learning contexts. It appears that including a student with high self-efficacy and peer-status would increase the likelihood that new ideas would be presented and elaborated. Further, including a student with high self-efficacy who does not hold the highest peer-status may increase the chances of disagreement—fostering a more critical and lively discussion. However, the range of self-efficacy and peer-status within a group should be limited so that all group members feel comfortable participating and interacting to complete the task.

In this study, we have begun to examine some of the factors that effect student interactions when using computers in PBL-based cooperative learning groups. Other topics that deserve attention include the influence of gender, socio-economic status, ethnicity, computer skills and prior knowledge. Issues of group dynamics are central to teachers' adoption of new ways of integrating technology into their instruction through cooperative project-based classroom instruction.

References

Busch, T. (1996). Gender, group composition, cooperation, and self-efficacy in computer studies. *Educational Computing Research*, 15(2) 125-135.

Cohen, E. G. (1982). Expectation states and interracial interaction in school settings. *Annual Review in Sociology*, 8, 209-235.

Cohen. E. G. (1994). Restructuring the classroom: Conditions for productive small groups. *Review of Educational Research.* 64(1) 1-35.

Cohen, E. G. (1997). Understanding status problems: Sources and consequences. In E. G. Cohen & R. Lotan (Eds.). *Working for Equity in Heterogeneous Classrooms: Sociological Theory in Practice*. New York: Teachers College Press.

Cohen, E. G., Lotan, R. & Catanzarite, L. (1990). Treating status problems in the cooperative classroom. In S. Sharan (Ed.). *Cooperative Learning, Theory and Research*. New York: Praeger Publishers.

Eachus, P. & Cassidy, S. (1998). *Developing the computer self-efficacy (CSE) scale: Investigating the relationship between CSE, gender and experience with computers* [On-line]. Available: http://www.salford.ac.uk/healthSci/selfeff/selfeff.htm

Gallagher, S. A., Stepien, W. J., & Rosenthal, H. (1992). The effects of problem-based learning on problem solving. *Gifted Child Quarterly*. 36(4), 195-200.

Hmelo, C. E., & Ferrari, M. (1997). The problem-based learning tutorial: Cultivating higher order thinking skills. *Journal for the Education of the Gifted*. 20(4), 401-422.

Hooper, S. (1992). Cooperative learning and computer-based instruction. *Educational Technology Research and Development*. 40(3), 21-28.

Johnson, D. W., Johnson, R. T., & Stanne, M. B. (1989). Impact of group processing on achievement in cooperative groups. *The Journal of Social Psychology*, 130(4), 507-516.

Schwarzer, R., & Jerusalem, M. (1995). Generalized self-efficacy scale. In J. Weinman, S. Wright, & M. Johnston (Eds.), *Measures in health psychology: A user's portfolio*. Causal and control beliefs (pp. 35-37). Windsor, UK: NFER-NELSON.

Webb, N.M., & Palincsar, A. S. (1996). Group processes in the classroom. In D.C. Berliner & R.C. Calfee (Eds.). *Handbook of Educational Psychology*. New York: Simon & Schuster/McMillian.

Working Toward National Technology Standards: Teacher Use of Computers in the Classroom

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Abstract: Technology, when properly implemented, can bring a new dimension to education. In addition to automating some applications, it can be used "to help us do things in education that were heretofore impossible" (Thornburg, 1999, p.1). This paper focuses on the results of a survey of almost two thousand teachers. The survey focuses on the teachers' attitudes toward and use of computers in instruction, with specific emphasis on classroom uses. The study investigated the extent to which classroom teachers are prepared for meeting national standards through their use of technology for educational applications and instruction.

Introduction

In recent years, states and districts have increased expenditures to equip schools with computers and related technology (Quality Education Data, 1998). As a result of the significant investments being made in hardware, software, and infrastructure, there is a call for evidence regarding the effectiveness and appropriate use of technology in K-12 schools (Panel on Educational Technology, 1997). Many researchers have "realized that technology cannot be treated as a single independent variable, and that student achievement is gauged not only by how well students perform on standardized tests but also by students' ability to use higher-order thinking skills" (North Central Regional Educational Laboratory, 1999, p1). It also became apparent that with the acceleration in the pace of technological innovation, skills, such as problem solving with appropriate tools for learning, synthesizing information, and communicating are essential for today's students (Panel on Educational Technology, 1997).

Although technology cannot solve all of the issues facing education, there is substantial evidence that, when used effectively, it can promote an improvement in student achievement, including higher-order thinking skills (CEO Forum, 2000; Means, Blando, Olson, Middleton, Morocco, Remz & Zorfass, 1993). In an attempt to provide guidelines and expectations of technology use in education, several states have instituted standards related to competencies in the use of technology. One of the first national movements toward establishing standards for technology was initiated by the International Society for Technology in Education (ISTE). Through their leadership, a consortium of organizations representing major professional education groups, government entities, foundations, and corporations was formed to create a national set of standards to govern the use of computers in schools.

The first set of standards, the National Educational Technology Standards (NETS) for Students was published in 1998. It categorizes technology competencies into six areas: (a) basic operations and concepts, (b) social, ethical, and human issues, (c) technology productivity tools, (d) technology communication tools, (e) technology research tools, and (f) technology problem-solving and decision-making tools. Profiles are provided that detail technology achievement indicators at various stages in PreK-12 education. It is recommended that the skills be integrated into a student's personal learning and social framework by being introduced in the classroom, reinforced, and finally mastered. The standards are intended to be an integral tool for technology learning within the context of academic subject areas (ISTE, 2000).

Method

In order to investigate the degree to which teachers are using computers in the classroom, a survey was designed and administered to teachers in a large urban school (N=1665). The survey targeted the areas of teacher attitudes toward computer use, integration of computers into instruction, types of software used, and teacher confidence and comfort with computer use. Demographic information, including grade level and subject areas taught was also gathered. In the context of the NETS, the sections of primary interest for this study were those focusing on the integration of computers into instruction and teacher attitudes toward computer use.

The integration section of the survey was divided into three parts consisting of both the methods used and the extent to which teachers were integrating computers and technology in the classroom. Items included instructional strategies employed by the teacher in the classroom (e.g., individual and small group instruction), software used by both teachers and students to complete school related activities (e.g., word processors, spreadsheets, graphics programs), and teachers' personal use of computers (e.g., for fun/entertainment; as a communication or research tool).

Responses to items related to the integration of technology and types of software used were provided on a 5-point frequency scale (ranging from *Not at All* to *Every Day*). In the survey section targeting general attitudes toward the use of computers in the classroom, items covered student access to computers, essential skills for students, the incorporation of computers in the classroom, and the impact of technology on teachers. This portion of the survey contained 20 items reported on a 5-point Likert scale (ranging from *Strongly Disagree* to *Strongly Agree*).

Data were analyzed for differences between school level (i.e., elementary, middle, and high school) and subject area taught (i.e., English, math, science and social studies). The Chi Square test of independence was used to compare the amount of time spent on integrating technology into the classroom by teachers across both school level and subject area. The teaching modes included in the survey were representative of standards for students in the NETS. A series of ANOVAs were conducted to examine differences in affinity and aversion to technology across school level and subject area. Affinity to technology, in this case, implies a positive attitude towards technology. Aversion, on the other hand, indicates a negative feeling towards technology. The use of software to complete school related activities was examined for both teachers and their students.

Results

School Level Differences

School Level Teaching Mode	Elementary	Middle	High
Small Group Instruction	32.05	20.92	18.50
Individual Instruction	60.72	30.36	32.08
Cooperative Groups	40.58	20.62	21.85
Independent Learning	76.61	35.11	40.76
Tutor	57.11	19.95	21.28
Promote Student Centered Learning	65.57	29.82	27.47
Research Tool	32.05	34.35	40.43
Problem Solving Tool	29.95	23.26	20.29
Productivity Tool	36.78	39.54	37.77
Classroom Presentation Tool	26.53	27.69	26.14
Communication Tool	59.35	54.34	48.23

Table 1: Percent of Use by Teaching Mode and School Level

Percents of computer integration at each school level are presented in Table 1. Statistically significant differences were evidenced among the levels for computer use for small group instruction, individual student instruction, cooperative groups, independent learning, tutoring, to promote student centered learning, problem-solving, and as a communication tool.

While statistically significant differences were found in eight of the integration items, the remaining three items (computers used as a productivity tool, as a classroom presentation tool and as research tool) evidenced no statistically significant difference across school level.

Subject Area Differences

The Chi-Square test of independence was also used to compare English, math, science, and social studies teachers' integration of computers in the classroom (Table 2). In these analyses, only middle and high school teachers were used because only these levels are subject specific.

Subject **Teaching Mode**	**English**	**Math**	**Science**	**Social Studies**
Small Group Instruction	10.16	13.16	14.94	11.49
Individual Instruction	23.44	21.93	29.89	12.79
Cooperative Groups	10.40	14.16	20.69	18.82
Independent Learning	29.92	26.32	41.38	28.24
Tutor	13.39	16.67	27.38	12.94
Promote Student Centered Learning	19.69	22.52	28.74	21.69
Research Tool	30.16	23.89	51.14	44.19
Problem Solving Tool	10.40	16.96	28.41	22.62
Productivity Tool	31.50	33.33	48.28	40.00
Classroom Presentation Tool	21.26	16.96	42.53	29.76
Communication Tool	49.21	49.12	59.09	53.57

Table 2: Percent of Use by Teaching Mode and Teacher Subject Area

Statistically significant differences were found across the subject areas when teachers used computers with students to tutor, as a research tool for students, as a problem-solving and decision-making tool, and as a classroom presentation tool. No statistically significant differences were evidenced between the groups when computers were used for small group instruction, individual instruction, in cooperative groups, independent learning, to promote student center learning, as a productivity tool, or as a communication tool.

Software Use

The means and standard deviations for teachers' software use by level are presented in Tables 3 and 4. The types of software used were divided into two groups, application software and instructional software. An examination of these means revealed that word processors and web browsers were used the most (nearly every day) in all school levels. In contrast, web publishing and programming tools were rarely used by any schools.

Level	**Elementary**		**Middle**		**High**	
Software	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Word Processors	4.20	.99	4.18	1.04	4.22	1.01
Spreadsheets	2.13	1.12	2.34	1.34	2.19	1.27
Databases	2.28	1.38	2.41	1.43	2.13	1.33
Desktop Publishing	2.48	1.22	2.23	1.14	2.15	1.27
Presentation Software	1.59	.87	1.75	1.09	1.71	1.03
Web Publishing	1.34	.80	1.25	.70	1.40	.86
Programming/Authoring Tools	1.27	.74	1.29	.74	1.35	.87
Web Browsers	3.41	1.43	3.47	1.48	3.46	1.53

Table 3: Application Software Used to Complete School Related Activities by Level

Level	Elementary		Middle		High	
Software	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Drill and Practice	1.57	1.10	1.50	.99	1.48	.93
Games	1.80	1.21	1.77	1.14	1.76	1.13
Simulations	1.34	.79	1.52	.98	1.46	.85
Tutorials	1.65	.98	1.63	1.00	1.61	.95
Integrated Learning Systems	1.30	.78	1.34	.86	1.21	.65

Table 4: Instructional Software Used to Complete School Related Activities by Level

In addition, the instructional software used the most was games and tutorials. It is important to note that instructional software was used significantly less than application software. Similar results were found when teacher use of application and instructional software was compared across subject area. These data are represented in Tables 5 and 6.

Subject	English		Math		Science		Social Studies	
Software	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Word Processors	4.31	1.01	4.04	1.13	4.37	.91	4.09	1.13
Spreadsheets	2.08	1.28	2.41	1.52	2.58	1.24	2.05	1.23
Databases	1.90	1.24	2.27	1.47	2.33	1.30	1.83	1.18
Desktop Publishing	2.40	1.34	2.02	1.09	2.39	1.23	1.91	1.18
Presentation Software	1.56	.85	1.73	1.16	2.09	1.12	1.81	1.16
Graphics	1.73	1.05	1.92	1.13	1.94	1.04	1.55	.79
Web Publishing	1.33	.76	1.30	.78	1.34	.73	1.32	.89
Programming/ Authoring Tools	1.23	.66	1.41	.94	1.33	.85	1.26	.75
Web Browsers	3.17	1.47	3.32	1.58	3.87	1.35	3.67	1.50

Note: approximate sample size = 410

Table 5: Application Software Used to Complete School Related Activities by Subject

Subject	English		Math		Science		Social Studies	
Software	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Drill and Practice	1.33	.70	1.54	1.07	1.55	.99	1.27	.63
Games	1.64	1.09	1.84	1.21	1.66	1.18	1.67	.98
Simulations	1.26	.58	1.49	1.00	1.92	1.09	1.33	.60
Tutorials	1.40	.74	1.59	1.06	1.85	1.05	1.47	.80
Integrated Learning Systems	1.15	.52	1.39	.91	1.21	.66	1.26	.74

Note: approximate sample size = 410

Table 6: Instructional Software Used to Complete School Related Activities by Subject

To examine students' software use to complete school related activities, a composite was created based on the classifications described above. When examined by level, teachers reported that the students in elementary school used instructional software more than application software. This trend was not true for middle and high school students, who had a tendency to use application software more than instructional software. In contrast, when software use was compared across English, math, science and social studies classes, application software was used more frequently than instructional software.

Teacher Attitude Toward Computers

When differences in Technological Aversion were examined, the results of an ANOVA suggested a statistically significant difference ($F(2,1694)=5.57, p=.0039$) across school level (see Table 7). Follow-up tests revealed a statistically significant difference in Technological Aversion between the elementary and high school teachers (with means of 3.99 and 3.88, respectively). Although statistically significant because of the large sample, a difference of this magnitude (Cohen's $f = .08$) is considered trivial. No statistically significant difference was evidenced when school level differences in Technological Affinity were investigated ($F(2,1694)=2.83, p=.0593$. Likewise, no statistically significant differences were found in Technological Aversion ($F(3,410)=2.02, p=.1106$) or Technological Affinity ($F(3,410)=1.75, p=.1560$) across subject areas (see Table 8).

		Elementary	Middle	High	
Affinity	Mean	4.0767	4.0160	4.1101	F=2.83
	Standard Deviation	.5513	.6043	.6131	p=.0593
Aversion	Mean	2.0107	2.123	2.0342	F=5.57
	Standard Deviation	.5511	.6004	.6016	p=.0039

Table 7: Teacher Attitudes by Level

		English	Math	Science	Social Studies	
Affinity	Mean	4.0914	3.9419	3.9870	4.1004	F=1.75
	Standard Deviation	.5574	.5813	.6572	.6650	p=.1560
Aversion	Mean	2.1518	2.0638	2.0282	2.2316	F=2.02
	Standard Deviation	.6139	.5994	.5560	.6885	p=.1106

Table 8: Teacher Attitudes by Subject

Conclusion

When comparing elementary, middle and high school teachers, it was found that elementary school teachers were integrating computers into the classroom more frequently than middle and high school teachers, despite the fact that attitudes were comparable. Elementary school teachers reported using computers primarily for independent learning, student centered learning, individual instruction, and as a communication tool. When the integration of computers in the classroom was compared by subject area, among middle and high school English, math, science and social studies teachers, it appeared that science teachers were using technology more frequently. Most significantly, the science teachers used technology for independent learning, as a communication tool, as a research tool for students, as a productivity tool and as a classroom presentation tool more often than for other reasons. Also, English, math, science and social studies teachers used technology as a communication tool more often than for any other reason.

Application software is that which is used to complete an activity such as writing a paper or preparing a presentation. Instructional software, on the other hand, is software that is designed as a teaching tool. A game that teaches math skills and the simulation of a frog dissection are examples of instructional software. When the software listed on the survey was divided into these two categories, it was found that instructional software was used more often at the elementary level and application software slightly more often at the middle and high school levels. The specific application software used most frequently by elementary, middle and high school teachers was word processing software and web browsers. Teachers reported using these applications almost every day. On the other hand, the remainder of the application software and the instructional software were used much less. Results were very similar when software use was compared by subject area. Web publishing and programming/authoring tools were the applications used least frequently (virtually not at all).

With regard to the NETS guidelines, it appears that the following components are being addressed in the schools that were surveyed: technology productivity tools, technology communication tools, technology research tools, and technology problem-solving and decision-making. Although not directly measured, it can be inferred from the reported use of these more complex applications that basic operations and concepts are also being covered. There is, however, still room for improvement. In the productivity area, only 40% of the schools are using computers as a productivity tool (across all levels). The largest use in this area (per subject field in middle and high schools) is found in science.

Using computers as communication tools ranks highest in the areas examined (across all grade levels), with over 50% usage at the elementary level. When examined by subject area, communication also exhibited large numbers, with over 50% in both science and social studies.

As a research tool, high schools were shown to be using computers more often than middle or elementary schools, although the difference was not statistically significant. However, even at the high school level, the total usage was less than 40%. When examined by subject area, science again ranked highest (50%), followed by social studies.

Problem-solving and decision-making scored lowest overall (with regard to the integration of computers across grade levels and subject areas). This can be a complex implementation of technology, and often requires sophisticated software or teaching strategies.

In summary, this research indicates that technology is being integrated in schools at various levels. As David Thornburg stated, "How you use technology in education is more important than if you use it at all" (1999, p. 1). With standards, such as the NETS, as guidelines, our students and our schools can gain increasing benefits from the technology investments in education.

References

CEO Forum. (2000). *The Power of Digital Learning: Integrating Digital Content.* Author: Washington D.C. [Online]. Available: http://www.ceoforum.org/home.cfm.

International Society for Technology in Education. (2000). *National Educational Technology Standards for Teachers*. Eugene, OR. [Online]. Available: http://cnets.iste.org.

Means, B., Blando, J., Olson, K., Middleton, T., Morocco, C., Remz, A., & Zorfass, J. (1993). *Using technology to support education reform.* Washington, DC: U.S. Department of Education. [Online]. Available: http://www.ed.gov/pubs/EdReformStudies/TechReforms/.

North Central Regional Educational Laboratory. (1999). *Critical Issue: Using Technology to Improve Student Achievement* [Online]. Available: http://www.ncrel.org/sdrs/areas/issues/methods/technlgy/te800.htm.

Panel on Educational Technology, President's Committee of Advisors on Science and Technology. (1997, March). *Report to the President on the use of technology to strengthen K-12 education in the United States* [Online]. Available: http://www.whitehouse.gov/WH/EOP/OSTP/NSTC/PCAST/k-12ed.html.

Quality Education Data. (1998). *U.S. school districts to spend $5.4 billion on technology in 1998-99.* Denver, CO: Quality Education Data. [Online]. Available: http://www.qeddata.com/TPFPress%20Release.htm.

Thornburg, D. (1999). *Technology in K-12 Education: Envisioning a New Future* [Online]. Available: http://www.air-dc.org/forum/Thornburg.pdf.

Multimedia Tools and Case-Method Pedagogy for Teaching and Learning

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Teacher educators face the challenge of preparing teachers to recognize and respond to educational problems as they arise in highly variable, often unpredictable contexts. Two recent innovations in teacher education offer promising possibilities for doing so: case-method pedagogy and multimedia tools for teaching and learning. The purpose of this research was to explore how these innovations interacted in CaseNET to help preservice teachers learn to address problems as they emerge in K-12 classrooms.

CaseNET is a set of Web-assisted professional development courses for educators that combines the use of case methods and Web-based technologies. CaseNET provides preservice and inservice teachers at approximately 20 universities in four countries and 15 school districts in the United States and three other countries opportunities to improve their professional problem-solving skills. Participants in CaseNET use a variety of technologies including videoconferencing, electronic journals, and online discussion groups to learn to analyze multimedia cases. Throughout a fourteen-week academic semester, participants learn to analyze cases using a specific five-step problem-solving strategy (McNergney, Herbert, & Ford, 1994; Herbert & McNergney, 1995, McNergney & Herbert, 1995) and practice this strategy when analzying a set of multimedia teaching case studies.

Teaching case studies might be described as stories, vignettes, or "slices of real life." These cases present predicaments from practice that demand some kind of action (Gideonse,1999). They illustrate reality in its intricate complexity and often include important contextual evidence. Although based on reality, cases condense facts or elaborate on real events to create succinct analytic puzzles. Cases illustrate life in the classroom as it is, not necessarily as it should be. Learning with cases provide preservice and inservice teachers with opportunities to practice problem identification (Merseth, 1996). The skills developed through case methods are useful in a variety of settings. Experience with various types of cases also helps professionals develop a repertoire of defensible solutions for commonly occurring problems (Kleinfeld, 1992; Merseth & Lacey, 1993).

This study investigated the efficacy of a particular problem-solving method on participants' experiences with a multimedia case. The sample consisted of 33 preservice teachers participating in CaseNET at two institutions of higher education (Group One), 26 preservice teachers from these institutions of higher education not participating in CaseNET (Group Two), and 34 other students enrolled in arts and sciences from these institutions of higher education who were neither CaseNET participants nor preservice teachers (Group Three). Problem-solving proficiency, as demonstrated by participants' three-page written case analyses, was determined by a panel of professional educators, or judges, who were prepared to use an instrument measuring participants' abilities to: (1) identify educational issues, (ISSUES); (2) consider events in the case from different points of view, (PERSPECTIVES); (3) identify professional knowledge (personal, empirical, theoretical) relevant to issues in the case and raise questions about other potentially useful knowledge, (KNOWLEDGE); (4) propose actions for addressing a variety of issues, (ACTIONS); and (5) speculate about the consequences of such actions, (CONSEQUENCES).

Participants in the study assembled in groups of about 15 in computer labs where they were asked to read and analyze a case presented in hypertext and multimedia format called "Here to Serve." The case tells the story of a middle school technology coordinator who is challenged to address the needs of mainstreamed students with special needs, attend to the professional development of teachers under her authority, and deal with the many other tasks her position demands. Information useful for analyzing the case was embedded in descriptions of the characters and events occurring in the case and in ancillary materials contained in a resource area linked to the case. After reading the case, participants submitted a three-page analysis that was then rated by a panel of judges.

In examining the generalizability of the judges' ratings, analyses were considered the objects of measurement. Judges were considered random facets and subscale scores were considered fixed facets. The design of the study was participants' written analyses (p) crossed with judges, (j) who were nested within subscales (i), p x (j : i). Using GENOVA, the generalizabilty coefficient was sufficient to propose adequate dependability (g=.77).

Scores indicating participants' problem-solving performance were calculated and a comparison of these sub-scale scores and a total scores was performed. Participants' subscale scores were calculated by summing the points participants received from both judges on each of the subscales on the judges' rating instrument (issues, perspectives, knowledge, actions, and consequences). The subscales reflected each participant's performance on the individual steps of the five-step method.

Judges' ratings were summed to yield the total score. A direct discriminate function analysis was performed using the five variables as predictors of membership in the groups. Variables were ISSUES, PERSPECTIVES, KNOWLEDGE, ACTION, and CONSEQUENCES. One discriminant function was significant. With a combined $x^2_{(10)} = .81$, $p<.01$. After removal of the first function, there was no strong association between group and predictors. The loading matrix of correlations between predictors and discriminant functions suggests that the best predictors for distinguishing between CaseNET participants and those in the other two groups was the rating participants' analyses received on the subscale KNOWLEDGE, ISSUES, and CONSEQUENCES. Group One had higher scores on this variable (M=17.79) than Group Two (M=14.73) and Group Three (M=14.26). Variables loading less than .50 were not interpreted.

The total scores reflected participants' performance on all the subscale items combined. Group scores obtained for participants' total scores were significantly different among groups ($F_{(2, 90)} = 57.91$, $p<.01$). A Tukey post hoc test revealed that there were differences between Group One (M=71.06, s=4.37), and Group Two (M=63.54, s=3.01) and Group Three (M=62.24, s=3.07), but not between Groups Two and Three.

Results suggest that preservice teachers in CaseNET were able to learn the problem-solving strategy and apply it when analyzing a multimedia case study. Participants in this group identified problems, applied professional knowledge, and anticipated consequences more proficiently than did the participants in the other groups.

At least since John Dewey (1910) promoted the joining of education and real life, teacher educators have tried to help preservice teachers develop reflexive teaching strategies that are adaptable to many learners. Teacher educators have provided opportunities for preservice teachers to learn from one another in college and university classrooms and from more experienced colleagues in K-12 schools. Now, multimedia technology offers teacher educators new ways to provide realistic educational experiences for teachers.

References

Dewey, J. (1910). *How We Think*. Lexington, Mass: Heath.

Gideonse. H. (1999). What is a case? What distinguishes case learning? In M. Sudzina (Ed.). *Case study applications for teacher education: Cases of teaching and learning in the content areas.* Boston: Allyn & Bacon.

Herbert, J. M., & McNergney R. F. (1995). *Guide to foundations in action videocases: Teaching and learning in multicultural settings for Foundations of Education.* Boston: Allyn & Bacon.

Kleinfeld, J. (1992). Learning to think like a teacher. In J. H. Shulman (Ed.), *Case Methods in Teacher Education.* New York: Teachers College Press.

McNergney, R. F., Herbert, J.M. & Ford, R. E. (1994). Co-operation and competition in case-based teacher education. *Journal of Teacher Education, (45),*5, 339-345.

McNergney, R. F., & Herbert, J.M. (1995). *Foundations of education: The challenge of professional practice.* (1st ed.). Boston: Allyn and Bacon.

Merseth, K. K. (1996). Case and case methods in teacher education. In J. Sikula, T. Buttery, & E. Guyton (Eds.), *Handbook of Research on Teacher Education: A project of the Association for Teacher Educators.* New York: Macmillan Library Reference.

Merseth, K. K., & Lacey, C. A. (1993). Weaving stronger fabric: The pedagogical promise of hypermedia and case methods in teacher education. *Teaching & Teacher Education, 9(3),* 283-299.

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Computer Use in ESL: Case Studies and Action Research

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Abstract: With the onset of the twenty first century, utilizing computer technology in school curriculum has become not only a reality but a necessity in preparing students for effective transition into today's society. In addition, with the multicultural composition of today's student population, computer technology can become a facilitative force in teaching students who originate from culturally diverse homes. The purpose of this article is to provide a brief history of how computer technology has been used in ESL classrooms. Then, a few case studies and some action research are presented as a glimpse into current ESL classroom environments where technology is being used to varying degrees.

Introduction

As predicted in John Naisbitt's (1982) pivotal work, "Megatrends," 'high tech-high touch,' (p. 35) has become a reality in today's society. At least the increased use of technology in schools and in homes has become a reality. With the changing demographics occurring in the United States, and the consequential shift in the student populations' needs, both have presented newfound challenges to today's teachers.

The presence of language minority students in public schools has been significant. As stated by Diaz-Rico and Weed (1995), "minorities now constitute the majority of public school students in fifteen of the country's largest school systems" (p. 221). More specifically, Diaz-Rico and Weed stated that "California is the nation's most racially diverse state with a greater percent of Asian and Latino residents than any other state" (p. 220). Due to this cultural diversity, the California Commission on Teacher Credentialing (1997) has tailored its standards to meet the needs of this student population by requiring teachers to be culturally sensitive, particularly in the area of language instruction.

In addition, all teachers are trained to incorporate technology in their curriculum. In states that have culturally diverse populations, teachers can meet several instructional goals simultaneously by using computer technology to facilitate English language instruction. The first goal is to individualize teaching to meet each student's unique needs. The second goal is to incorporate computer technology into the curriculum. The third goal is to improve English language instruction through more frequent use of the reading and writing skills. All of these goals can be accomplished by using software that requires reading and writing in English. Instruction can be provided at each student's ability level once each student's initial instructional level is determined with a diagnostic test, which is administered by the computer. Once appropriate placement is determined, then each student may begin practicing his or her reading and writing skills, usually within the context of pictures, stories, puzzles, etc.

So, how do teachers of English as a Second Language (ESL) take advantage of technology in their classrooms? What problems have they encountered? What do they think of using computer technology in instruction?

To answer the above questions, the authors conducted case studies and action research in 2000. The paper focused on the teachers' use of computers in the classroom. Terminology related to ESL included ELL (English Language Learners), bilingual education, and minority language education. The authors did not intend to differentiate these terms; therefore, they used the general term "ESL" for discussion throughout the paper.

The paper is comprised of three main components. It starts with a discussion of instructional methodology; then, using computers in the ESL classrooms; followed by case studies and action research. Lastly, the authors provide recommendations on employing computers in the ESL classroom, in addition to, useful Internet resources.

Instructional Methodology

In the last few decades, Teaching English as a Second Language (TESL) methodologies have been changing from the Grammar Translation Method, to the Direct Method, to the Audiolingual Method, and finally to the use of the Communicative Approach. Different technology has been utilized at different time periods. Lately, computers have become a common instructional as well as learning tool in schools. In this section, the authors will first introduce the development of TESL methodologies and then will present examples of computer use in ESL instruction and its advantages.

Development of TESL Methodologies

Prior to the mid-twentieth century, TESL methodologies, such as the Grammar Translation Method, were influenced by structuralists and characterized by the narrow linguistic view. The objectives of the Grammar Translation Method were to teach the rules of grammar and to translate sentences into a target language (Howatt, 1984). With this method, students could translate, read, and write well but had problems with oral communication.

Arising as a reaction to the Grammar Translation Method, the Direct Method viewed speech as more important than written language (Butare-Kiyovu, 1991). Learners did not have to memorize the rules but had "direct practice in speaking and reading through imitation and repetition" (Butare-Kiyovu, 1991, p. 147). However, the examples in the exercises were examples used by an "ideal speaker-listener." With this method, learners encountered problems communicating in real life situations.

In the 1940s and 1950s, the Audiolingual Method, supported by behaviorist psychologists, was commonly used (Savignon, 1983). In this method, language learning was habit formation. With audiotapes, students practiced patterns and drills repeatedly, by which they expected to master the language skills. They memorized and considered language use as automatic, not creative.

From the 1960s and 1970s, people became more concerned with communication (Hymes, 1971; Halliday, 1973; Lessard-Clouston, 1992; River, 1987; Kramsch, 1993; DeVillar & Faltis, 1994). Moskowitz (1978), Asher (1977), Curran (1976), and Gattegno (1972) stopped repetition and memorization as sole techniques of language learning and injected meaning into the classroom (Yalden, 1983). They stressed that language should be for communication. Consequently, interaction began to play an important role in second language learning (River, 1987; Kramsch, 1987).

Classic Examples of Using Computers in ESL Classrooms

During the 1980s, computers entered classrooms in increasing numbers, and much educational software, including software for ESL education, was developed. Computer-Assisted Language Learning (CALL) became a topic that interested many ESL educators. CALL professionals viewed computers to be a useful tool in ESL. By using computers, they argued, teachers could provide information through different venues, and through multiple exposures enhance language acquisition for ESL learners.

The English Department at the University of Texas at Austin used real-time computer conferencing in English, ESL, French, German, and Portuguese classes. Bump (1990) conducted research on English literature students and found that reticent students, i.e., women, minority students, and shy learners, tended to participate in the discussion more readily and more often than in the regular classroom. The conferencing classroom became non-threatening. In addition, the students' written messages expressing their thoughts and feelings became the focus of the learning experience. The instructor became more of a facilitator, rather than a person who offered correct answers.

Wong (1993) conducted research to explore the effectiveness of dialogue journal writing between ESL students and their instructors via E-mail at the University of Oregon. The results indicated that the students in the E-mail group wrote more per writing session than the students in the pen-and-pencil group. The instructor also wrote more per writing session in response to the students in the E-mail group than she did to the students in the other group. The instructor also produced more language functions. E-mail was found to increase the amount of interaction between the students and the instructor. In addition, the students in the E-mail group and the instructor showed positive attitudes towards E-mail.

These studies indicated that the technology eased anxiety of minority students, encouraged students to produce more language functions, fostered interaction between instructor and students, and lifted the social status of minority students. In short, computers were found to be advantageous for second language instruction.

Using Computers in the ESL Classrooms

To investigate the degree in which computer technology is utilized in the ESL classroom, the authors asked the following questions: Do ESL teachers take advantage of the technology, if so, how? What do they think of using computers in ESL instruction?

Case Studies

The participants involved in the case studies were three ESL instructors in public schools as well as in community colleges. One of them (teacher A) is teaching in an elementary school, one (teacher B) in a high school, and one (teacher C) in a community college. Prior to teaching in the community college, teacher C taught ESL in a high school for 10 years. Two of the participants have been teaching in ESL classrooms for more than 10 years, and one of them has been teaching for less than 5 years.

Each of the participants first completed a survey and then was interviewed. They shared from their experiences how ESL teachers used computers in classrooms and what problems they had encountered.

All of the participants mentioned that, (due to ESL students' limited language proficiency,) they had to use a variety of teaching methods to enhance students' comprehension. For example, they spoke slowly, frequently repeated what they said, and used objects or body language to help students understand. These additional considerations were particularly useful when incorporating computer use into the various lessons.

In regard to computer use, the elementary teacher reported that ESL teachers conducted language arts classes in learning centers where computers were located. They used educational software such as Reader Rabbit to enhance students' learning. The high school teachers had students conduct research using the Internet. They mentioned that they did not have computers in their classrooms, but instead had access to a computer lab. This limited access discouraged ESL teachers from incorporating computer technology into their classrooms. Similar to the high school teachers, the community college instructor interviewed stated that computers were also not commonly used in her instruction due to limited access to a computer lab. Nevertheless, whenever her classes had access to a computer lab, the students used the A+ Learning Skills Program and the Weaver Reading Program and found the programs to be beneficial.

What problems have they encountered when using computers? Listed below were problems they addressed:

(1) Lack of practice time:
(2) Unmotivated administrator and faculty:
(3) Lengthy protocol for student access to the Internet:
(4) Limited access to computers and the Internet:
(5) Lack of adult supervision:
(6) Out-of-date and/or poorly maintained computer hardware and software:
(7) Inadequate funding:

Despite the problems that the teachers addressed, all of them had positive attitudes toward using technology in ESL instruction. They mentioned that the most significant advantage of using computer software was the self-pacing feature. Students can work at their own speed and at their individual levels. The teachers believed that computers could enhance learning and should be employed in ESL classrooms. In addition, teachers stated if the various problems cited were addressed expeditiously, more technology would likely be used in ESL classrooms.

Action Research

The participants involved in the action research were students in a graduate level Computer-Assisted Language Learning (CALL) course at a university. A total of 14 students were in the class. Data of five of them was included in the research because the five participants have been teaching ESL classes in either public schools or community college in the United States (USA). Two of the participants have been teaching ESL for more than 10 years and three of them less than five years.

Data analysis was based on data collected from students' information sheets, class observations, class discussions, and students' performance in class. At the beginning of the quarter, the students filled in the information sheets, and the instructor used the information to identify students' computer knowledge prior to the course.

The data indicated that ESL teachers were not familiar with computer applications. According to the class discussions, most of ESL teachers simply used word processing in their instruction, and some of them used Internet search. The class observations and students' performance also indicated that the participants were not familiar with using computers in instruction.

The participants addressed similar problems as the ESL teachers of the case studies, for example, limited access to computers, a large number of malfunctioning computers, heavy workload, lack of practice time, and inadequate funding. Although they seldom used computers, they had strong desire for learning computer applications and using them in their classrooms. The participants revealed their positive attitudes toward using technology and willingness to implement technology in their classrooms.

Recommendations

The participants of the case studies shared various problems they encountered while using computers. Surprisingly, the researchers found that one problem was not previously mentioned by the participants in the case studies but in the action research: ESL teachers' unfamiliarity in computer use. The lack of familiarity might have caused ESL teachers not to use computers in classrooms.

To help teachers familiarize themselves with the use of computers, it is recommended that schools or school districts encourage ESL teachers to participate in technology training. As an added incentive, stipends or pay raises may be provided based on degree of teacher participation. Information about technology training can be found at California Technology Assisted Program (CTAP) website (http://rims.k12.ca.us/ctap) and university websites. The CTAP website also contains much information about technology resources and curriculum standards.

If teachers find the protocol of distributing and accounting of Internet use permission slips too time consuming, perhaps a trusted student assistant, teacher's aide, or parent volunteer would be willing to track the outgoing and incoming permission slips. Many school districts prefer to openly communicate with parents regarding various curricular issues such as the appropriate use of computer technology in the classrooms. Conversely, parents want to be assured by school districts that premium measures are being put into place to prevent student access to inappropriate websites. This understanding and agreement can be mitigated with permission slips once schools have access to the Internet. Although time consuming, the minutiae involved surrounding the distribution and collection of Internet use permission slips appears well worth the effort.

Students' access to computers seemed to be a problem for many teachers. In a classroom, teachers often only had one to four computers. It is suggested that teachers creatively utilize the limited number of computers. For example, if a teacher only has one computer in a classroom, he/she may use it to prepare teaching materials, track student academic progress and attendance, or communicate with parents. If he/she has two to four computers, she may group students and have students conduct collaborative work on a research project based on information downloaded from the Internet. If he/she has more than four computers, he/she might be able to construct class activities using computers for a spelling competition, or to create a choral reading, or to write a class newsletter.

If teachers and students do not have access to computers in their own classrooms, and instead have access to computer labs, then, computer time may need to be scheduled before school, after school, and during lunch. This could be accomplished in addition to a regularly scheduled time slot on a weekly basis. Having a computer club meet during lunch would provide additional computer time for students as well.

The elementary teacher in the case studies addressed the problem of supervision. If adult supervision is needed at computers in a classroom, it is recommended that a teacher recruit parents or college volunteers, who would be willing to provide assistance to students. By doing this, parents and community members may be included in the children's learning.

As to websites running slowly due to the large number of students simultaneously accessing the same website, one may use software like Web Buddy (http://www.dataviz.com/products/webbuddy/) to solve the problem. The software allows users to download websites and use them off-line. Currently, Web Buddy has been discontinued because the latest web browsers such as Internet Explorer have replicated its benefits. Whichever software a teacher uses, it may be beneficial for instructors who employ the Internet in instruction. In addition, while teachers download websites, they may select websites appropriate to students.

In regard to computer maintenance, it may be worthwhile to hire a technology specialist to remain on site. This individual would maintain and upgrade all computer equipment. In addition, he/she could provide computer training to the faculty. If the computer specialist does not have educational expertise, it is recommended that the computer specialist collaborate with the teachers who have computer knowledge and together provide training to other teachers. Of course, hiring such a specialist requires appropriate funding.

To increase the quantity of computer equipment, and, therefore, student access, the school district should allot money, specifically earmarked for computer technology, to each school on an annual basis. It is recommended that administrators, teachers, and computer specialists collaboratively construct a strategic plan. They can apply for state or federal grants that cater to culturally diverse school districts that exhibit a need for financial assistance in providing appropriate programs for their student population. They can also establish partnerships with corporate entities and institutions or conduct fundraisers with businesses like supermarket chains. The funding and strategic plan may eventually provide computers to classrooms, so ESL students can utilize technology to improve their literacy skills on a daily basis.

The case studies and the action research in this study provide an interesting look at the challenges that come with incorporating computer technology into today's schools. It is recommended that additional research involving a larger number of ESL teachers be conducted to examine issues related to computers and ESL education. In addition, broadening the scope and investigating the use of technology, not only computers, in ESL education is recommended.

Internet Resources

The Internet contains a great deal of resources. Listed below are websites beneficial to ESL instructors and students. The website http://www.aitech.ac.jp/~iteslj/quizzes/grammar.html contains many self-study quizzes for ESL teachers and students to use. English club at http://www.englishclub.net/reading/index.html is a good website to learn English through, for example, English readings. Students may select short stories based on their reading levels—elementary, intermediate, and advanced. Teachers may find lesson plans and handouts for classes. Teacher's Page of Lesson Plans at http://libits.library.ualberta.ca/library_html/libraries/coutts/lessons.html also provides ESL teachers with various lesson plans. One can also find many resources at the National Capital Language Resource Center http://www.cal.org/nclrc/index.htm, including articles related to performance testing and technology in language classroom.

Another worthwhile website to investigate is http://www.bedfordstmartins.com/exercisecentral/ Each student can take a diagnostic quiz, and then choose various activities for practice. Each student is required to indicate the instructor's email address, whereby the instructor can access each student's performance on his or her self-selected practice activities.

ESL Partyland http://www.eslpartyland.com provides a wealth of information for ESL instructors and students. Students may take interactive quizzes and participate in various discussion forums and chatrooms. Teachers may view many ESL lesson plans and conduct electronic communication with ESL professionals. The website http://esl.about.com is beneficial for ESL students because it offers interactive quizzes that link to lessons that explain language structures. ESL Café at http://www.eslcafe.com and http://www.ctanewsletter.com provide teachers with ESL classroom activities and discussion forums. English Baby http://www.englishbaby.com targets teenagers and contains many English slang and idioms.

Listening Lab http://www.esl-lab.com contains listening quizzes that can be beneficial for ESL learners. ESL Through Music http://www.geocities.com/ESLmusic allows teachers to exchange ideas with other teachers who use musical lesson plans. Some websites help students learn English via games, for example, http://www.nanana.com/wordgames.htm and http://members.aol.com/Jakajk/ESLLessons.html. The ESL Study Hall http://gwis2.circ.gwu.edu/~gwvcusas contains many animated pictures that motivate ESL students. A teacher can find reviews of ESL software and books at http://www-writing.berkeley.edu/chorus/call. The site may save ESL teachers much time in search for useful software and books.

Conclusion

With the onset of the 21st century and its incorporation of computer technology, schools are required to provide relevant learning experiences for our increasing diverse student population. The case studies and action research of this paper revealed that ESL instructors, unfortunately, seldom used computers in instruction. They encountered many problems including lack of practice time, unmotivated administrators and faculty, time consuming protocol, limited access to computers and the Internet, lack of adult supervision, out-of-date or poorly maintained computer hardware and software, and inadequate funding.

Despite the problems, ESL teachers had positive attitudes toward using computers in classrooms. They believed that computers were beneficial and could enhance students' learning. To assist ESL instructors in employing computers, the authors provided recommendations and resources. It is hoped that ESL teachers may continue using technology and resources available to them to help ESL students. With technology and dedicated ESL educators, we believe that ESL students will have equal opportunities in learning that will enable them to make significant contributions to our society.

References

Asher, J. J. (1977). Learning another language through actions: The complete teacher's guidebook. Los Gatos, CA: Sky Oaks Productions.

Bump, J. (1990). Radical changes in class discussion using networked computer. Computers and the Humanities, 24, 49-65.

Butare-Kiyovu, J. (1991). Language learning for off-campus students. In T. Evans & P. Juler (Eds.), Research in Distance Education 2 (pp. 144-156). Deakin: Institute of Distance Education.

California State Department of Education. (1997). California standards for the teaching profession. Sacramento: Author.

Curran, C. A. (1976). Counseling-Learning in Second-Languages. Apple River, IL: Apple River Press.

DeVillar, R. A., & Faltis, C. (1994). Reconciling cultural diversity and quality schooling: Paradigmatic elements of a socioacademic framework. In R. A. DeVillar, C. J. Faltis, & J. P. Cummins (Eds.), Cultural diversity in schools (pp. 1-22). New York: New York Press.

Diaz-Rico, L. & Weed, K. (1995). The crosscultural, language, and academic development handbook. Boston: Allyn and Bacon.

Gattegno, C. (1972). Teaching foreign languages in school the silent way. New York: Educational Editions.

Halliday, M. (1973). Explorations in the functions of language. London: Edward Arnold Press.

Hymes, D. (1971). Competence and performance in linguistic theory. In R. Huxley & E. Ingram (Eds.) Language acquisition: Models and methods. London: Academic Press.

Kramsch, C. (1987). Interactive discourse in small and large groups. In W. M. Rivers (Ed.), Interactive language teaching (pp. 17-30). London: Cambridge University Press.

Kramsch, C. (1993). Context and culture in language teaching. Oxford: Oxford University Press.

Lessard-Clouston, M. (1992). Assessing culture learning: Issues and suggestions. The Canadian Modern Language Review, 48(2), 326-341.

Moskowitz, G. (1978). Dare to share: Humanistic techniques in the second-language class. SPEAQ Journal, 4, 25-33.

Naisbitt, J. (1982). Megatrends Ten New Directions Transforming Our Lives. New York: Warner Books, Inc.

River, W. M. (Ed). (1987). Interactive language teaching. London: Cambridge University Press.

Savignon, S. J. (1983). Communicative competence: Theory and classroom practice. Menlo Park, CA: Addison-Wesley.

Wong, Y. M. (1993). E-Mail dialogue journaling in an ESL reading and writing classroom. Dissertation Abstracts International, 54(09), 3316A. (University Microfilms No. AAI94-05237)

Yalden, J. (1983). The communicative syllabus: Evolution, design & implementation. New York: Pergamon Press.

The Changing Role of the Teacher: Case Study

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Abstract: Modern technology is changing the role of the instructor from an information-giver to a facilitator. As facilitator, the teacher guides the learners through the learning process and encourages the students to be active in their learning. The experience of independent learning may encourage the students to continue the learning process on their own in other fields and in the future. This presentation reports how the author encouraged students to be resource providers and trained them to be self-learners and self-trainers in an educational multimedia course. Class observations and students' feedback revealed that the teaching methods and new role of the instructor had a positive impact on students' learning.

Introduction

Instructors are facing tremendous challenges nowadays. They have been the main information givers and center of the classroom for the past decades. However, their role is shifting due to modern technology. Consequently, they can no longer be the information giver; their students may obtain information from a variety of resources via various channels. According to the report released by the National Council of Accreditation of Teacher Education (NCATE) in September of 1997, teachers should develop a new understanding, new attitude, new approach, and new role (NCATE, 1997). Tom Carroll, director of Preparing Tomorrow's Teachers to Use Technology (PT3) grants of the US Department of Education, vividly described the changing role of teachers at the annual convention of Society for Information Technology and Teacher Education (SITE) 2000.

Carroll (2000) advocated that a teacher should take the role of a learner. A teacher is an expert learner while a student is a novice learner. Novice learners may become expert learners as time progresses. As an expert learner, the teacher should facilitate learning for novice learners and let them become instructional resource providers. Creating a learning community that consists of expert learners, novice learners, parents, and members who may foster the learning process is a teacher's responsibility. He (She) should facilitate interaction and learning within the learning community and to further expand the community by involving members of other communities.

Hence learning no longer refers to learning from a teacher. A student may learn from other students or any member of the community. A student who does not know one area may be expert in another area. Thus a student may be a receiver at one time while he (she) may be a provider another time. A student may also self-learn from available resources, for example, the Internet. Learning becomes multifaceted and dynamic, and resources become essential in the learning process.

In addition to Carroll, Oliver (2000), an invited speaker at World Conference of Educational Multimedia, Hypermedia, and Telecommunications (EDMEDIA), also supported the idea of using students as instructional resource providers. In his speech, he further explained how he treated his students as resource providers and how his students contributed to the teaching materials. Similar ideas were echoed at two presentations at the convention, Leh (2000) and Santema & Genang (2000). The author of the paper was one of the presenters and was pleasantly surprised to see the idea simultaneously spring up on three different continents, North America (USA, Leh), Europe (Netherlands, Santema & Genang), and Australia (Oliver). This notion might be an indicator of a current global educational trend.

In this paper, the author will describe how she played the role of a facilitator and encouraged her students as educational resource providers in an Instructional Technology course. She will also report her students' opinions towards their learning in the course.

The Case Study

The case study was conducted in a graduate course called "Advanced Computer Applications in Education". The goal of the course was to familiarize students with a variety of authoring multimedia software programs. Since this was the only course directly dealing with such applications in the academic program, the author structured the course as a multimedia survey course in which students studied a variety of applications rather than focused on a specific computer program.

She assessed students' skills at the beginning of the course. On a survey, students identified their skills of using the following seven computer-based application software: Webpage development tool, HyperStudio, PowerPoint, PhotoShop, Premier, Authorware, and Director. The students circled one of the following—"don't know", "good", "very good", and "excellent"—which best described their skill levels.

The author reported the survey results in class. She intended to help the students use the information to complete their course assignments: developing a HyperStudio project, creating a webpage, integrating PowerPoint in instruction, and offering a technology training session. Course assignments emphasized integrating technology into content areas, independent learning, and learning from each other. Described below is how the students learned from each other in the "Technology Training" assignment.

For the assignment, the students selected their team members (no more than three members in a team). Each team chose and learned one of the software applications mentioned above. Overview of software and step-by-step instruction of using some of the software were illustrated in a course textbook. After selecting the software program, the students constructed a training plan for a 60 to 90 minute training session. In the training session, they were supposed to teach their classmates the use of the application software they selected. The training plan had to contain (1) assessment, (2) time length, (3) content outline, (4) evaluation, and (5) training materials like handouts or evaluation sheet if applicable. They met with the author to discuss their training. During the meeting, they had to be prepared to answer questions like what their trainees' prerequisite skills were, what they would cover in the training, which criteria they used to decide on the content in the training, and how they would evaluate the success of their training session. The students were aware that they could ask for help from the instructor (the author) at any point of time.

Finally they delivered the training to the entire class. The author observed the class and recorded classroom interaction. She also took notes how the trainers could make the training better. After the training, the author first asked the trainers to self-evaluate their training. She then asked the trainees to critique the training session by providing good points and suggestions for improvement. She asked the trainees to provide oral input in class so that the trainers could receive instant feedback and response. She conducted the discussion and concluded with her own critiques. The trainers also received written feedback afterwards from the trainees and the instructor.

Findings

During the quarter, the author observed the class and interviewed students about their learning experiences in the course. At the end of the quarter, the author interviewed the students and also had them fill in a survey expressing their opinions about the course. The responses were analyzed and categorized. The results revealed that the teaching methods used in the course were deemed to be successful.

The teaching methods highly motivated the students. The students were enthusiastic about choosing a training topic and being actively involved in the learning process. Some of them chose software they were familiar with but more than half of them selected software that they knew little about. When asked why they selected the software foreign to them, the students answered that this would be a good opportunity for them to learn new skills. One said, "I wanted to learn this software for a while. Selecting this topic may push me to learn it." They learned beyond the textbook. Two of them rented a videotape on Macromedia Director. Three of them bought a book and together studied Adobe PhotoShop. The students mentioned that they enjoyed learning with their partners. They also expressed their frustration when they explored software; for example, the steep learning curve of studying Director frustrated them. Despite the frustration, they cherished the learning experience and thought that they learned a lot from their peers and other resources.

The teaching methods generated students' meaningful, active, and constructive learning. For the training plan, the students constructed their own instrument to assess the trainee's skills, decided on training content, and determined how to evaluate their training. They mentioned that instructional design models, for example Dick and Carey's model, made much more sense when they went through the process. They expressed that they spent much time on the course, much more than what they spent on a regular course. However, they liked the experiences. They felt that they were the masters of their learning and were able to claim ownership of their work. They mentioned that this learning experience would influence how they learn and how they teach in the future. They would search for resources that could foster their learning and try to play the role of a facilitator rather than an information giver in their own classrooms when appropriate.

The teaching methods encouraged the students to think critically. The author required the students to critique their classmates' training sessions. She noticed that the students could easily say, "you did a great job!" Nevertheless, they had difficulty in addressing points of improving a training session. By requiring the students to specify good points and provide recommendations for improvement, they practiced to think critically. At the end of the quarter, the author noticed the improvement that the students made on critique.

The teaching methods increased the students' self-confidence. Before taking the course, the students often complained that they did not know how to use certain software, for example, webpage development tool, because the instructors did not teach them. The students seemed to count on the instructors and did not feel comfortable of learning by themselves. At the end of the course, the students expressed that the course increased their confidence in learning technology on their own. They mentioned that, if they could learn software with their partners and successfully provide training to their classmates in this course, they should be able to do the same elsewhere. They became comfortable of being self-learners.

Conclusion

Technology advancement is shifting our education paradigm. The role of the instructor is changing from an information-giver to a facilitator. Students no longer passively receive information but may be instructional resources in class. Given opportunities, they may be self-learners and self-trainers.

In a multimedia course, the instructor employed teaching methods allowing her to be a facilitator and her students to be self-learners. It was found that the course motivated students, fostered students' active, meaningful, and constructive learning, encouraged students' critical thinking skills, and increased students' confidence. Class observations and students' feedback revealed that the teaching methods and new role of an instructor had positive impact on students' learning.

As a university professor in Instructional Technology, the author might have experienced the education paradigm shift and its impact on the role of an instructor earlier or faster than instructors of other subject areas might. However, the changing role is a trend. Every instructor should be open to the idea and explore the possibility and experiment with the opportunity.

As NCATE stated in 1997, teachers need to develop a new understanding, new attitude, new approach, and new role. Every instructor should be open to the changes and further create a learning community in which instructors, students, and community members may contribute, benefit, and generate meaningful learning experiences. One can only look forward to participating in the dynamic learning and expect its positive impact on our society.

References

Carroll, T. 2000. "If We Didn't Have the Schools We Have Today – Would We Create the Schools We Have Today?" Presented at the annual convention of Society for Information Technology and Teacher Education, San Diego, CA, February.

Leh, A. S. C. 2000. "Training Students to Be Self-Learners in Educational Hypermedia and Technology Courses". Presented at the annual convention of World Conference of Educational Multimedia, Hypermedia, and Telecommunications, Montreal, Canada, June.

National Council for Accreditation of Teacher Education. 1997. "Technology and the New Professional Teacher: 21st Century Classroom". Washington, D. C.: National Council for Accreditation of Teacher Education.

Oliver, R. 2000. "Web Tools: Flexible and Reusable Resources for Web-Based Learning". Presented at the annual convention of World Conference of Educational Multimedia, Hypermedia, and Telecommunications, Montreal, Canada, June.

Santema, S., & Genang, R. 2000. "Rethink Education: How We Make Our Learners Instructors". Presented at the annual convention of World Conference of Educational Multimedia, Hypermedia, and Telecommunications, Montreal, Canada, June.

Does Technology Really Make a Difference? – Perspectives from Teacher Education Students

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Abstract: This study analyzes how computers can be used more effectively in teaching in learning. The purpose of this study is to find out how the use of technology makes a difference in learning in a class designed for teacher education students. Data was gathered through a survey that asked students to reflect on their learning experiences immediately after a lesson that utilized computers. The study shows that technology makes a difference in teaching and learning. The students reported that technology made the lesson more meaningful, allowed them to be more creative, and they often learned a lot more than what was intended by the teacher. The use of computer technology in the class also gave the students an excellent way to experience true cooperative learning. The results can influence the design of future lessons that integrate technology in Teacher Education.

Introduction

Computers are increasingly being used in educational settings. Teachers are constantly striving to become more technologically literate. In my own work as a Teacher Educator, I have made a conscious effort to design lessons using technology that allow students to experience a new way of learning and teaching (see Litton, 1999a; Litton, 1999b). New teachers often use methods they have experienced. Consistent with their experiences in their own schooling, many new teachers still see their primary purpose of teaching as transmitting information. McDiarmid, Ball, and Anderson (1989) state that "students typically begin their teacher education programs with the view that teaching is telling and learning is accruing information." (p. 223). Thus, it is important to design lessons that allow students to experience a different way of learning. Using technology in teacher education classes provides a promising way to help students see that there are other models of learning and teaching (National Council for Accreditation of Teacher Education, 1997).

This study is part of my on-going project to analyze how computers can be used more effectively in teaching and learning. The purpose of this study is to find out how the use of technology makes a difference in learning in a class designed for teacher education students. Specifically, I explored the following questions:

a. How does the use of computers help teacher education students learn?
b. Aside from content knowledge, what do teacher education students learn when they use computers in a class?
c. What are some problems that students encounter when they use computers for learning? How do the students solve these problems?

A clearer perspective of what students actually learn and how they learn can help educators develop principles for designing effective lessons using computers.

Background

Technology is used in teacher education programs in a variety of ways. The review of literature shows that the use of computers is most helpful to teacher education classes because it helps promote interaction. Using technology in teacher education classes also allows students to use the technology in a meaningful way.

The most common use of technology in teacher education is the use of electronic mail (email). Email allows new teachers to interact with other professionals. Thomas, Clift, and Sugimoto (1996) conducted a study using email in teacher education. They wanted to find out how email functions as an environment for learning. Furthermore, the authors wanted to find out how the participants perceived the effectiveness of using email to promote learning. The authors concluded that electronic mail was an asset for meeting course requirements and for maintaining contact between students and teachers.

Although the use of email in teacher education classes is only beginning to be articulated, using email provides a promising way to increase dialogue and critical thinking among novice teachers. In order to ensure the effectiveness of email or other web-based discussions tools, Nonis, Bronack, and Heaton (2000) state that facilitators should address three key issues. First, both instructors and students should be aware of an agreed upon intended consequence for the discussion. Participants need to always be aware of what needs to get accomplished. Second, facilitators of on-line discussions must be "cognizant of the essential attributes of effective on-line discourse" (Nonis et al, 2000, p. 6). These essential attributes include convenience, familiarity, accessibility, meaningfulness and focus. Web base discussions will be effective if participants are able to access the technology without too much difficulty and are familiar with the technology and the rules for using the technology. Dialogues must also be meaningful and focused on content rather than on the technology. Thirdly, after the establishment of a discussion group, the instructor should make sure that facilitative structures exists to promote dialogue. Facilitators should create structures in the dialogue that allow students to connect the discussion to their own lives, encourage collegiality and ownership.

Another common use of technology for teacher education is the use of multimedia (Abell, Cennamo, & Campbell, 1998; Hatfield, 1996; Mazur & Bliss, 1998). Multimedia is used to create case studies that allow novice teachers and experienced teachers to talk to one another about teaching methodology. Case studies are at the heart of Mazur and Bliss' (1998) Common Thread Case project (CTC). The project incorporates video conferencing and electronic mail in the interaction. Through the interaction, a community of learners is created and teaching practices can be transformed. Mazur and Bliss (1998) state that in order for multimedia to be a successful tool for interaction, three dimensions must be included. The first dimension is the *instrumental dimension*. The information contained in the cases must provide rich information that is appealing to both novice and experienced teachers. The second dimension is the *relational dimension*. The technology must contain tools that teachers can use to elaborate on issues that are raised. The questions, interests, or concern of the users influences the structure of the program. The last dimension is the *communication dimension*. The technology must allow users who are studying the same cases to interact with one another. In so doing, "teachers can revise ideas, capitalize on the experience of others and engage in the critical discourse essential to the development of professional communities." (Mazur & Bliss, 1998, p. 109).

Teacher educators have also used technology for the creation of electronic portfolios. Reed and Cafolla (1999) discuss some of the benefits and challenges of using electronic portfolios. The authors implemented the use of electronic portfolios in a preservice teacher education class. The portfolios that were created could be posted on the World Wide Web. Students attended seminars and were given a template that they could complete and modify as they created their portfolios. The researchers discovered electronic portfolios encourage students to be more reflective and responsible for their learning. The project, however, also proved to be time consuming. Furthermore, financial and technical support from the institution was needed if the project was to continue. Most importantly, however, the use of electronic portfolios allowed the preservice students to use technology in a project that was relevant for them.

K-12 schools and Teacher education programs have collaborated successfully to prepare new teachers to use technology. Hruskocy, Cennamo, Ertmer and Johnson (2000) found that such collaborative efforts increase the motivation to use technology by all stakeholders (new teachers, mentor teachers, K-12 personnel, and university personnel), change learning styles, and have interpersonal benefits. New teachers who use technology in the classrooms of mentor teachers also are able to demonstrate how technology can be used to complement existing effective teaching practices (Johnson-Gentle, Lonberger, Parana, and West, 2000).

Methodology

In my Education class (Sociocultural Analysis of Education), I use technology in various lessons. After one particular lesson towards the end of the semester, I ask the students to reflect on the class that they just experienced. The students write down their reflections in a simple questionnaire that I developed. I ask the students to reflect on what they learned, how the use of the computers helped them learn, and the problems they encountered when using computers in the class. The feedback I receive from the students helps me determine if the use of computers made a difference and I often use the reflections as a guide to design future lessons. For the present study, I analyzed 119 questionnaires that I collected over a period of seven semesters.

The technology activity in this particular class was used to learn about Sociocultural theory. Aside from learning the major components of Sociocultural Theory, a goal of the lesson is for teachers to realize that it is important to see their students' prior knowledge as a resource rather than as a liability. This is an important concept to learn especially when teaching students of culturally diverse backgrounds.

Procedure: 1) Divide the class into 6 groups. Ask the students who are experts in PowerPoint to raise their hands. These students should be in separate groups. 2) Provide a brief overview of PowerPoint. Using a pre-formatted disk, demonstrate some of the features of PowerPoint. Highlight how to create new slides, change colors, and animation. Tell the students they each group will make a presentation using PowerPoint and all groups will be required to use animation in their presentations. 3) Tell the students that they will be creating a presentation on an aspect of Sociocultural Theory. The six terms that the class will explore are Lev Vygotsky, Sociocultural Theory, Schema Theory, Cooperative Learning, Zone of Proximal Development, and Constructivism. Each of these terms will be given to a group in a disk. They will need to perform a search on the web on the term that is given to their groups. 4) Give the students ample time to complete their presentations. If one group finds information that they feel another group should be given, then they should pass on that information. 5) After the students have created their presentations, ask the groups to present their slide shows. The professor should help the students make the connections between each term in between presentations. 6. At the end of the lesson, the teacher will ask the students to talk about the practical applications of Sociocultural theory to teaching.

Results

Does the use of technology make a difference? According to the students who completed the survey, technology did make a difference in their learning. Many of the students who completed the survey stated that the use of computers helped them better understand the topic for the class because it allowed them to experience the learning theory using computers. Without the use of technology, the theory that was being taught in class would have just remained an abstract theoretical construct. Using computers made the topic more relevant for the students. One respondent echoes this thought when she states, "The use of computers was very helpful in understanding Sociocultural theory, because I just did not hear about it, I actually did it". Another student says, "[Working with computers] helped solidify the new knowledge because I had an active role in presenting it".

Technology makes a difference learning because using technology provides a meaningful way for students to work cooperatively. The cooperative atmosphere allowed all students to contribute to the learning task. A student says, "I learned that each of us has something to give to the group". Students who self-identified as having low computer skills, were not intimidated by the learning task because of the presence of other students in the group. One student said, "It [technology] was instrumental in making us work together as a group and drawing on the strengths, knowledge, and interests of all in the group to achieve our mutual goal".

The students who completed the survey stated that technology made a difference because it allowed them to be more creative. One student stated he was willing to try out more things when he created his presentation with the use of the computer. The students also found the presentations to be more entertaining and sustained their attention even more. Computers also allowed students to "experiment, explore, and learn". The students felt they could continue creating products until they developed one that they really liked.

The results of the survey show that when using computers, students tend to learn more than what the teacher intended. Some of the learning outcomes could not even be anticipated. I wanted my students to leave the class with a good understanding of Sociocultural Theory. Aside from learning the various components of the theory, the students stated they learned how to conduct research on the Internet, create PowerPoint presentations, and effective ways of designing and implementing a cooperative learning lesson. During the class session, it was always interesting to see students discovered various aspects of PowerPoint that were never presented to them formally. The students also reported learning how to use computers for teaching.

During the lesson, the majority of problems reported by the students were technical problems related to the software. Some of these problems include, saving work, creating animation, cutting and pasting pictures from the Internet. Some of the students also reported tension as a result of working cooperatively with others. One student says, "We sometimes differed on what we wanted to include on the slides such as the color, font, and style". Many of the students stated they solved the problems by working within their groups and asking other groups. Others solved problems through trial and error or experimentation and exploration.

Most importantly, a majority of the students in the survey stated that they would be more willing to use computers in their teaching. The experience with technology in this lesson allowed them to see the benefits of technology. The study reinforces the concept that new teachers often teach the way they are taught. If we expect new teachers to use technology in their classrooms, they need to experience computer-based learning in their Teacher Education classes.

Conclusion

Effective technology lessons in teacher education classes create authentic learning experiences. Such lessons could encourage new teachers to use technology once they begin teaching in their own classes since they know first hand that one can learn using technology. The study shows that technology does make a difference in the learning experience of teacher education students. Teaching with technology allows students to see an alternative way of teaching and learning. In order to create more effective lessons using technology, I suggest a few guidelines:

a. When students have varied competence levels with technology, it is important for them to work in cooperative groups. Students who are more confident and experienced can assist and teach students who are less confident or less experienced.
b. Lessons must encourage active involvement by all participants. The lesson should encourage students with different computer abilities to participate.
c. Lessons must meet the needs of students with advanced and beginning computer skills. Students with beginning skills must feel that they have something to contribute and the lessons should not encourage advanced users to dominate a group.
d. Technology lessons must address issues that are meaningful to the teacher education students at the moment. Students need to see how technology is important to their own learning before they can use it to improve the learning experiences of their future students.
e. When working with technology, teacher education students need to create something that they will personally need. Students are more interested in a project when the end product is clearly defined. However, teacher educators must allow room for creativity, exploration, and experimentation.
f. Technology lessons should allow teacher education students to experience varied ways of learning and teaching.

References

Abell, S. K., Cennamo, K. S., & Campbell, L. M. (1998). Interactive video cases developed for elementary Science methods courses. In J. J. Hirschbuhl & D. Bishop (Eds.), *Computers in education* (pp. 112-115). Sluice Dock, Guilford, CT: Dushkin/McGraw Hill.

Hatfield, M. M. (1996). Using multimedia in preservice education. *Journal of teacher education 47* (3), pp. 223-228.

Hruskocy, C., Cennamo, K. S., Ertmer, P. A., & Johnson, T. (2000). Creating a community of technology users: Students become technology experts for teacher and peers. *Journal of technology and teacher education 8*(1), pp. 69-84.

Johnson-Gentle, K., Lonberger, R., Parana, J. & West, A. (2000). Preparing preservice teachers for the technological classroom: A school-college partnership. *Journal of technology and teacher education 8*(2), pp. 97-109.

Litton, E. F. (1999a). Integrating technology in teacher education and cultural diversity. In G. Cumming, T. Okamoto, and L. Gomez (Eds.). *Advanced research in computers and communications in Education.* Amsterdam: IOS Press.

Litton, E. F. (1999b). The World Wide Web and Teacher Education. In P. de Bra and J. Leggett (Eds.). *Proceedings of WEBNET 99 – World Conference on the WWW and Internet.* Charlottesville, VA: AACE.

Mazur, J. & Bliss, T. (1996). Dimensions of a knowledge support system: Multimedia cases and high bandwidth telecommunications for teacher professional development. In J. J. Hirschbuhl & D. Bishop (Eds.), *Computers in education* (pp. 112-115). Sluice Dock, Guilford, CT: Dushkin/McGraw Hill.

McDiarmid, G. W., Ball, D. L. & Anderson, C. W. (1989). Why staying one chapter ahead doesn't really work: Subject-specific pedagogy. In M. C. Reynolds (Ed.), *Knowledge base for the beginning teacher* (pp. 193-205). New York: Pergamon.

National Council for Accreditation of Teacher Education (1997). *Technology and the new professional teacher: Preparing for the 21st century classroom.* Washington, DC: NCATE.

Nonis, A.S., Bronack, S. C., & Heaton, L. (2000). Web-based discussions: Building effective electronic communities for preservice technology education. *Journal of technology and teacher education 8*(1), pp. 3-11.

Reed, D. & Cafolla, R. (1999). Multimedia portfolios for preservice teachers: From theory to practice. *Journal of technology and teacher education 7*(2), pp. 97-113.

Thomas, L., Clift, R. T. & Sugimoto, T. (1996). Telecommunication, student teaching, and methods of instruction: An exploratory investigation. *Journal of teacher education 47* (3), 165-174

Assessing Technology-Assisted Use of Information

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Abstract: This paper presented a two-year experience of assessing college students' use of information from different resources, including the methods, processes, instruments, results and some issues of the assessment. The assessment processes started from analyzing the goals of learning, defining the outcomes, then selecting or developing instruments, and the last, collecting data and analyzing results. A "qualitative-and-quantitative" (Q-Q) assessment package was developed and used, where we used portfolios to record the learning process and quantitative scores to measure the learning of specific skills. The Q-Q assessment procedures were employed into six classes during the past two years. This experience suggested that assessing the use of information and technology related outcome was a process rather than some one-time tests. The Q-Q procedures also provided a structure to develop an assessment model that should apply to other fields of information technology assessment.

Background

Due to the wealth of information resources, the Web is becoming a widely used research tool. By 1996, there had been a rapid proliferation of World Wide Web pages, estimated at over 20 pages per hour (Caverly & Broderick, 1996). Since then, this rate has kept increasing; thousands of pages are available on the Web, providing information on almost every imaginable topic (Tate & Alexander, 1996; Gilbert, 1996; Caverly & Broderick, 1997; Leshin, 1998; Morgan, Batovsky, Bennett, & Schrock, 1999; & Miller, 1999). Now, "it is growing at a rate of 20 million new pages a month" (Maddux, 1999). The over-exposure of information brings out a critical issue to the college students—whether they can effectively use the information for their studies; and a critical task to the instructors—what would be the appropriate way to assess the use of information. This paper presents a two-year experience of assessing college students' use of information from different resources.

The assessment was performed in an undergraduate course titled "Using Information Effectively in Education", which was the required course for all the undergraduate students in the College of Education, and was offered 15 to 20 sections each semester to prepare college freshmen for their studies in this information age.

Defining the Use of Information

The goal of this course was to improve students' skills and techniques of (1) searching and finding information on certain interested educational area, (2) evaluating the information, (3) managing the information, and (4) communicating the information. The use of information was defined as a combination of these four aspects. Therefore, assessing the "use of information" was undertaken in these four dimensions. In each of the four dimensions, students used certain technology tools, which makes the use of technology part of the "use of information" as well as part of the assessing content.

To ensure that we could assess the specific aspects and effectiveness of using information, we first defined the outcomes from the four dimensions. First, in searching and finding information, students learned to use a series of on-line tools, including library system, on-line databases, Web search. They were supposed to find information (articles, reports, ed/gov documentations…) from our university library system, from ERIC, EBSCO, WILLSON, and from other Web sites. Second, in evaluating information, students learned to develop a set of information evaluation criteria and use it to evaluate at least 40 pieces of information. They used spreadsheet to analyze and summarize the evaluation. Third, in managing information, students learned to develop a research portfolio and create a database to manage the information. Fourth, in communicating information, students learned the skills of telecommunication to work in team or within the class; they learned presentation tools such as PowerPoint to share the information with class; they created Web pages to post their findings; they also write a research paper, which they considered a medium to communicate information with a large audience or more readers.

Assessing the Use of Information

By analyzing the outcomes, we found that the nature of assessing technology-assisted use of information, in the current setting, was to assess a learning process as well as the learning of specific skills. This determined the "qualitative-and-quantitative" nature of the instruments—the instruments should include qualitative procedures to analyze the learning process, and quantitative measurements to analyze the learning of specific skills. Research suggested that portfolios have been widely used as the formative assessment capacity, measuring performances and learning process (Winograd & Gaskins, 1992; Camp, 1993; & Dwyer, 1993), and demonstrating what a student is capable of doing (Salvia & Ysseldyke, 1998). Therefore, in this study, the qualitative procedures were measured by four portfolios that recorded the learning process through the entire semester: (1) information search portfolio, (2) technology portfolio, (3) information evaluation portfolio, and (4) research portfolio.

Each portfolio was tailored for a specific purpose and the contents of the portfolio were consistent with the purposes for collecting work. The information search portfolio included six items/tasks/skills, providing the information of how well students used the search skills, as well as the coverage range of information in the on-line databases. The technology portfolio consisted of 12 techniques, reflecting capabilities of using technology to search, evaluate, manage, and communicate information. The information evaluation portfolio recorded the procedures that showed how students' evaluation skills were improved, the results of the evaluation tasks provided a pattern of qualities of information from different Web resources—which had a great potential to initiate another Internet information evaluation study. Finally, the research portfolio demonstrated, via 14 tasks, the development of critical thinking skills and the process of conducting educational research.

Furthermore, quantitative scores were used to measure (1) the specific tasks/skills within portfolios, (2) team presentation, and (3) individual research paper. The results served as quantitative data.

Q-Q Assessment Structure

This measurement suggested a "qualitative-and-quantitative" (Q-Q) structure to assess technology-assisted use of information. Using this structure and the Q-Q package, the authors obtained various sets of data from six classes during a two-year period. The Q-Q assessment procedure later was adapted to other instructional technology courses, such as Computer Based Instruction, Web Based Instruction, and Technologies in Reading; and found out to be effective for both students and the instructor. It is the hope of the authors that the Q-Q assessment procedures initiated the first step toward the development of an instructional technology assessment model; further studies are to be conducted to implement and test the model.

References

Caverly, D. C., & Broderick, B. (1996). Techtalk: Creating World Wide Web pages. *Journal of Developmental Education, 20*(1), 36-38.

Caverly, D. C., & Broderick, B. (1997). Techtalk: Professional development through the WWW. *Journal of Developmental Education, 20*(3), 36-38.

Gilbert, S. W. (1996). Making the most of a slow revolution. *Change, 28*(2), 10-23.

Leshin, C. B. (1998). Internet adventures: *Integrating the Internet into the Curriculum*. Needham Heights, MA: Allyn & Bacon.

Maddux, C. D. (1999). Technology and literacy: Is reading doomed to obsolescence? *Computers in the Schools, 15*(1), 109-113.

Miller, E. B. (1999). The Internet resource directory for K-12 teachers and librarians. Englewood, CO: Libraries Unlimited, Inc.

Morgan, N., Batovsky, S., Bennett, B., & Schorock, K. (1999). New Internet and Web resources. *Teacher Librarian, 26*(3), 21-28.

Tate, M., & Alexander, J. (1996). Teaching critical evaluations kills for World Wide Web resources. *Computers in Libraries, 16*(10), 49-59.

Winograd, P., & Gaskins, R. (1992). Improving the assessment of literacy: The power of portfolio. *Pennsylvania Reporter, 23*(2), 1-6.

Camp, R. (1993). The place of portlolios in our changing views of writing assessment. In R. Bennett & W. Ward (Eds.,) *Constructive versus choice in cognitive measurement: Issues in constructed response, performance test-ting, and portfolio assessment*. Hillsdale, NJ: Erlbaum.

Dwyer, C. (1993). Innovation and reform: Examples from teacher assessment. In R. Bennett & W. Ward (Eds.,) *Constructive versus choice in cognitive measurement: Issues in constructed response, performance test-ting, and portfolio assessment*. Hillsdale, NJ: Erlbaum.

Salvia, J., & Ysseldyke, E. Y. (1998). Assessment (7th Edition). Boston, NY: Houghton Mifflin.

CREATIVE USES OF DIGITAL TECHNOLOGY: DEVELOPING VISUAL LITERACY AND ICT CAPABILITY

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Abstract: The panel addresses the progression in practice and understanding in the development of visual literacy and ICT capability using digital media in seven projects over a period of five years. These projects were conducted as collaborations between artists, teachers, pupils, undergraduate students and university researchers working in primary and secondary schools within the core and extended curriculum. The participants explored the ways in which visual literacy and ICT capability could be supported and extended in a range of relevant and meaningful contexts. The work is analysed from two perspectives – an artist focusing on children's learning and expression of visual literacy and teacher educators focusing on the development of ICT capability within meaningful learning environments.

INTRODUCTION

How do we approach research into the creative uses of digital technologies and evaluate what we have learned from the progression of practice and understanding through our experiences in recent years? The three members of the panel and authors of this paper share a commitment to the promotion of the development of visual literacy and information and communication technology (ICT) capability in children and young people. A practising artist and two teacher educators represent different practices and priorities in researching this process which provide stimulating and provoking perspectives on the growth of our understanding of issues in the area.

Over a period of five years the authors have been involved in the co-ordination, implementation, research and theorising of a range of projects in which digital technologies have played a role in creative expression, dialogue and critique in the visual arts. (References to a range of associated publications and websites are given at the end of this paper.) In reviewing these projects it has been possible to identify progression in a number of key themes relating to the nature of visual literacy, the contribution of ICT, the development of ICT capability, conceptual frameworks of subject knowledge in art and ICT, links with contemporary culture, interactions between artists, teachers, mentors and students, models of resource management and evaluation of pupils' learning in art and with ICT. The paper and panel presentation address these issues, demonstrate and contextualise key themes by reference to examples of the work made by children and young people and discuss research questions which can underpin further project developments and collaborations.

THE PROJECTS

The projects, which have been written up and presented in a number of formats and forums, are described briefly below. The asterisks indicate those projects which had a specific research focus. The research paradigm was interpretive and hermeneutical adopting ethnographic methods and a grounded approach to analysis and interpretation.

**The Glebe Project 1995*
Focus: The observation and description of elements of visual literacy, the contribution of ICT to the activities and changes and challenges to pedagogy.

Context: The 24 primary pupils involved were eight and nine years old, working outside their usual classroom activities with a digital artist and a researcher, using a scanner and image manipulation software. The outcomes were presented with multi-media authoring software. The project lasted three months.

The Bristol Internet Project 1997
Focus: The collaboration between children in separate schools through the exchange and development of visual ideas
Context: Six and seven year old children in two primary schools in the city of Bristol worked with two artists who also worked in each school. Digital cameras, image manipulation software and e-mail were used to capture, develop and exchange images and text messages. The project lasted eight weeks.

**TheAccess Project 1998/99*
Focus: The development of visual literacy as a dialogue in making meaning. Collaboration between practising teachers and an artist.
Context: Three teachers in three primary schools worked with their classes of children aged from eight to eleven years. Using the artists' work as a starting point, ideas were explored in a variety of media. Digital cameras, image manipulation software were used to capture and develop images. The project lasted an academic year.

**Art on the Net 1999/2000*
Focus: The development of the role of artists in residence collaborating with practising teachers.
The contribution of digital technologies to art processes. The development of models of access to resources.
Context: Artists and Art teachers in four secondary schools worked with pupils from fourteen to eighteen years old. The artists all used a range of digital technologies within their work which encompassed sculpture, photography, video and performance art. The project lasted a year and was reviewed and exhibited a year later.

Ultralab VI Form Project 1999
Focus: The use of multimedia technologies to document and publish art work undertaken for Art Advanced Level examination. The role of 'multimedia mentors' working with school students.
Context: Seventeen and eighteen year old students from one school worked with undergraduates on a Multimedia Degree Course. The work was undertaken at Ultralab away from school. The project lasted eight months.

**MMM: Media and Messages Multimedia Project 1999/2000*
Focus: The use of multimedia technologies to relate the art curriculum to contemporary art practice.
Changes in the expectations in the teaching and learning environment.
Context: Secondary art teacher and university researcher planned and prepared. Fourteen and fifteen year old students worked within the art curriculum and examination preparation. The project lasted a year.

Genes and Makeup 1999/ 2000
Focus: An art/science collaboration to provide opportunities for young people to use multimedia technologies to explore future identities in relation to genetic engineering.
Context: Two artists and a scientist worked with a group of 8 fourteen and fifteen year old students. They worked away from the school at Lighthouse, the Brighton Media Centre. The project lasted a year.

KEY THEMES – LITERACY AND CAPABILITY

Visual literacy
The early project, The Glebe Project, recognised 9 elements of children's experience and expression reflected in their work and evaluation. These elements – narrative, content, audience, colour, text, design, approaches to the technology, affect and ways of working – went beyond those described in the English National Curriculum for Art and encompassed wider cultural influences and affect. It also identified a range of pedagogical practices and processes in which the artist and children were engaged when supporting and facilitating the work. Subsequent projects developed this approach to visual literacy as a

cultural practice by highlighting the nature of the dialogue which developed between the work and the maker who drew upon a range of influences and techniques in order to make meanings and develop visual, expressive ideas.

The contribution of ICT

ICT can be described as embodying four characteristics which interact with each other to provide opportunities and experiences which are distinctive in the use of these technologies – interactivity, provisionality, capacity & range and speed & automatic functions. (DfEE, 1998) A range of digital technologies was used for the construction, capture, manipulation, integration, projection and display of meaningful images incorporating visual art, sound and movement. The capacity for interactivity and provisionality in the use of the technologies supported the process and dialogue as the students expressed and developed their ideas, evaluated and reviewed the outcomes and displayed and discussed their work with a wider audience. Whilst the projects focused on the context of expression and learning in the art curriculum, not the technology as a medium or a tool, the characteristics of ICT played a significant role in the process and the priority of policy and funding of resources for the projects.

The development of ICT capability

ICT capability has been described as the ability to participate in a rapidly changing world of technology; use ICT tools to find, explore, analyse, exchange and present information responsibly, creatively and with discrimination; employ ICT to enable access to ideas, experiences, people, communities and cultures; and make informed judgements about the use of ICT and its implications for home and work. (DfEE, 1999) The term 'capability' encompasses far more than ability with particular ICT techniques and implies an active, informed and critical approach to using technology appropriately and purposefully. The development of ICT capability within formal schooling structures can range from the teaching of specific techniques to the use of ICT to support teaching within a subject area. The projects demonstrated the situated, contextualised nature of the ways in which students drew upon and developed their experience and expertise of using ICT. These embedded experiences highlighted tensions within the organisation of the students' ICT experiences in the school, raising questions about where ICT was 'taught' and whether students required specific ICT techniques or support in developing approaches to working with new technologies in a range of different contexts.

'Is this art?' - conceptual frameworks of knowledge of art and ICT and links with contemporary culture.

Each project highlighted students' responses to their understanding of the nature of their activity. Many did not consider the work to be 'art' as it related to their experiences within the more traditional art curriculum. The outcomes of the work were broadly described as 'media studies', 'drama', 'ICT' and 'playing', whilst the connections between the processes in which they were engaged and the variety of tools and techniques employed were often not considered to be 'art'. Issues were raised about the perceptions of art within the school curriculum, its relationship to the impact of digital technologies in wider culture and teacher knowledge of and access to contemporary practice with and through ICT. Students demonstrated a range of levels of the use of ICT which related to both their confidence with the tools and their active choices about the appropriate media in which to express and develop their ideas. A strong theme in much of the work was the personal nature of the expression of meanings.

Interactions between artists, teachers, students and mentors.

A significant aspect of all the projects was the range of interactions between the participants and the ways in which they shared and developed their knowledge of visual literacy and ICT capability. One approach observed was an open shifting and sharing of roles between students, teachers, artists and mentors to provide support and challenge in techniques, process, evaluation and audience. Another type of interaction highlighted tensions between practitioners and teachers in terms of role expectations, subject knowledge and pedagogy. Such tensions provided opportunities for discussion and action in trying to resolve the issues to reflect and model different ways of working. Questions were raised about 'what knowledge?', 'whose knowledge?' and the description of a 'community of practice' within a curriculum which enabled students and teachers to work with practising artists and multimedia specialists in a variety of settings, spaces and times.

Models of access to resources

The projects raised important practical and political questions about the allocation, organisation and management of ICT resources in models appropriate to learning and teaching processes within different subject areas. The National Grid for Learning Initiative in the UK has provided resources for networking capability in schools. The local management of these ICT resources does not always, however, reflect the needs and working practices of subjects, particularly Art. Many of the resources have been placed in central suites shared between all curriculum areas, rather than placed in subject departments and made available with space and software appropriate to the curriculum area, thus perpetuating an approach to ICT capability which focuses on decontextualised techniques and skills. The projects demonstrated the need for flexible and appropriate models of access to both physical resources and networks of support and professional development.

Evaluation of learning and teaching

The discussion of formative and summative assessment of the process and product of art in the curriculum highlights a number of issues of exchanging ideas, supporting process, identifying criteria for assessment and engaging in evaluative judgements. These discussions arose from the nature of the work itself and the working practices developed within the collaborations, but the issue was particularly pertinent in the school phase of 'high stakes assessment', that is, external examinations. The assessment and examination systems within schools define boundaries and gateways to particular choices and do not always reflect the knowledge and processes of practitioners. Within the projects which involved students undertaking work for examinations there were discussions of the nature of art and the type of work expected by external assessors and the degree to which students could explore new ideas and new media without 'penalty'. Some UK examination boards now recognise digital work with screen-based media, but the debate is ongoing as understanding develops within the profession.

The contribution of research

The overview of the work in this particular group of projects reflects a wide range of contexts, participants and areas of focus. It describes a variety of activities and interactions taking place within many different contexts. It is interesting to consider the ways in which the questions for research and enquiry which underpinned the projects have evolved and inform subsequent projects. The questions have changed in focus from enquiries into the expression of visual literacy and the development of dialogue, to the nature of the collaborations between students, teachers and practitioners and the different settings in which they can be developed. Enquiry into the particular contexts of the case studies has also identified some common themes, raising issues which reflect deeper questions and tensions in such work. These include questions about ways of knowing, expressing and analysing ideas - what knowledge?, whose knowledge?, how can it be expressed and developed? What role does ICT play in these debates? Is technology a tool, a medium, a catalyst or a new lens through which to view these questions? What is the impact of ICT in contemporary culture and how the art curriculum might play a more proactive role in the education of young people? What are the challenges to pedagogy and professional development highlighted by such collaborations? How do studies such as these provide rigour and evidence to inform decisions by practitioners and funders in future initiatives? What are the connections between being visually literate and ICT capable in the broader sense of being creative and confident learners, inspired to work with spirit and imagination; to make decisions which might be collaborative and difficult? No one case study or survey can provide easy answers to these challenging questions, but it is timely to consider the role of research in providing both a stimulus for new work and a space for reflection and critique. Patterns and processes can be observed in the 'bird's eye view' which indicate promising directions for further exploration and analysis.

Related References and useful addresses:

Department for Education and Employment (1998) DfEE (1998) *Teaching: High Standards, High Status (Requirements for Courses of Initial Teacher Training)* Circular Number 4/98, Annex B. London: DfEE

Langshaw, P with Millwood R. (forthcoming 2000) Chapter 11 Key Skills and the Post 16 Curriculum - An Innovative Approach in Leask, M (ed) (forthcoming 2000) Using ICTin Schools London:Routledge

Long, S (2000) MMM: Media and Messages Multimedia Project 1999/2000 unpublished MA dissertation, University of Brighton, UK

Loveless, A with Taylor T. (2000) *Creativity, Visual Literacy & ICT* in Leask, M & Meadows, J. (eds) (2000) Teaching and Learning with ICT in the Primary School London:Routledge pp65 – 80 ISBN 0-415-21505-6

Loveless, A. (1999), A Digital Big Breakfast: The Glebe School Project in Sefton-Green,J. (ed) (1999) *Young people, creativity and new technology: the challenge of digital arts* London:Routledge

Loveless, A. (1998) Brighton Digital Creativity Project: a case study in teacher development in Monteith,M & Underwood, J (eds) 1998 *Supporting the Wider Teaching Community: Case Studies in IT INSET* BECTA/ITTE

Loveless, A (1997) Working With Images, Developing Ideas, in MacFarlane, A. (Ed), *Information Technology and Authentic Learning*, London:Routledge

Loveless, A. (1997), Visual Literacy and New Technology in Primary Schools: The Glebe School Project, *Journal of Computing and Childhood Education*, Vol 8,No 2/3, pp 98 –110

URLs

Art on the Net and associated projects of work with young people:
http://www.lighthouse.org.uk/

Ultralab and Plume School outcome:
http://www.ultralab.ac.uk/projects/plumev2/

Classroom Community in Post-Secondary Classes: An Examination of Traditional and Distance Learning Environments

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Introduction

Many schools, particularly post-secondary schools, are moving toward increased use of technology to deliver courses and programs at a distance. Several models are presently in use, such as broadcast television, video and audio teleconferencing, and asynchronous learning networks (ALNs) -- people networks for anytime - anywhere learning via the Internet. An important outcome of this emphasis on delivering courses at a distance is the generation of interest among educators concerning the nature of distance learning environments and the learning possibilities achievable through technology. One aspect of this interest concerns the building and nurturing of a community of learners whose members are often physically separated from each other.

The purpose of this study was to determine how sense of classroom community develops in a higher education learning environment and to determine if there are differences based on type of learning environment (traditional or distance education). The distance education environment examined was an asynchronous Blackboard-based integrated distributed learning environment.

Method

Subjects

Students attending education, leadership, and science classes at two universities in a large urban area served as subjects for this study. The sample consisted of 452 undergraduate and graduate students, with 83 enrolled in distance education courses and 369 enrolled in traditional courses.

Instrumentation

The Sense of Classroom Community Index (SCCI) (Rovai & Lucking, 2000) was used to measure classroom community. It consists of a self-report questionnaire of forty items. Each item includes a statement followed by a Likert scale of potential responses: strongly agree, agree, neutral, disagree, and strongly disagree. The SCCI possesses a very high Cronbach alpha internal consistency ($p = .93$).

Design

A quasi-experimental approach was used for this research. Twenty-three groups were examined. Each group consisted of an intact class, ten distance education classes and 13 traditional classes. A state university presented 12 classes and a private university presented 11 classes. The groups were measured on sense of classroom community during the second class meeting (pretest), except for the Blackboard-based asynchronous courses, which were measured during a three day interval at the end of the first week of the course. All classes were again measured at the middle of the semester (posttest). The subjects were not presented any special treatment other than the scheduled courses in which they were enrolled.

Statistical analyses consisted of descriptive statistics, a Pearson product-moment correlation between class size and sense of classroom community, and a series of dependent t-tests to analyze the differences between pretest and posttest measurements across all classes.

Discussion and Findings

The relationship between class size and pretest was low ($r = -.284$, $p < .001$) while the relationship between pretest and posttest was not significant. These results suggest that students first entering a class feel a lower sense of community in larger classes, but by the middle of the semester the size of the class is no longer related to sense of classroom community.

Pretest sense of classroom community was higher for courses taught at a distance (M = 121.98, SD = 19.76) than traditional courses (M = 113.16, SD = 15.85). However, at the posttest, courses taught at a distance (M = 120.43, SD = 22.15) reflected a lower sense of classroom community than traditional courses (M = 131.69, SD = 19.80). An analysis of individual courses revealed that classroom community increased in all traditional courses and significantly so for most cases. However, only three Blackboard courses reflected increased sense of classroom community at the posttest (two were significant), while all others showed lower levels of classroom community (five of seven were significant).

An analysis of message patterns in the Blackboard-based courses was conducted in order to obtain evidence to help explain why three Blackboard-based courses experienced increases in sense of classroom community while seven experienced decreases in classroom community. The variable that appears to explain these differences is teacher immediacy. Teacher immediacy is the verbal and nonverbal communication that takes place in the classroom, such as smiles, head nods, use of inclusive language, and eye contact. Blackboard-based courses lack the non-verbal communication. Consequently the focus of the message analysis was on an analysis of instructor messages. This analysis showed that the instructors in the three Blackboard courses that experienced increases in classroom community posted on average 36.60 messages per week to the Blackboard discussion board, while the instructors of the seven Blackboard courses that experienced drops in classroom community posted on average 3.14 messages per week. An analysis of message contents revealed that the instructor message contents of three instructor immediate courses tended to be empathetic, mentioned self, family, or spouse, or had a cooperative tone, while for the remaining Blackboard-based courses the message contents tended to be factual.

References

Rovai, A.P. & Lucking, R.A. (2000). Measuring sense of classroom community. Manuscript submitted for publication.

The Uses of Computers For Instruction in the Classroom: A Comparison of Teachers' and Principals' Perceptions

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Abstract: This study surveyed teachers and administrators in 50 schools in a large school district in South East Texas. The purpose of this study was to compare teachers and principals in their perceived uses of technology for instructional purposes in the classroom. The teachers and principals were asked to rate the extent to which technology is used in their classrooms for the following purposes: a) drill and practice b) problem solving c) world wide web searches d) compositions e) newsletters or desktop publishing. They were also asked to indicate the frequency a typical student uses the computer in their classrooms. The computer was used significantly more often for the lower level skill of drill and practice than for worldwide web and desktop publishing. The principals perceived that students were using the computers more frequently for the higher-level skill of worldwide web use than the teachers reported.

Introduction

A survey of the literature in education points to the critical role of the principal as instructional leader in the school (LaRocque & Oberg, 1991; Henri & Hay, 1995). Pellicer, Anderson, Keefe, and McCleary, (1990) state that "...instructional leadership is likely the most important function in a school for creating a productive and satisfying environment" (p. 41). At the same time much of the current literature points to the need to reform our public schools (Sarason, 1997; Goodlad, 1997; Matthews, 1997; Wadsworth, 1997). As many States and communities across the country are learning, transforming industrial-age schools into information-age schools is easier said than done (Dyrli & Kinnamon, 1994).

The key to ensuring the success of technology in schools is the way in which technology is integrated into the school's curriculum. As Kinnaman (1994) observes, successfully integrating technology into education requires basic changes to our current model of schooling; anything less sells short both the value of today's technology and the future of education. School principals must understand the importance of technology for improving school management as well as its implications for improved instruction. Technology holds great promise for personalizing learning opportunities (Drake & Roe, 1999).

Technology is the means to increasing learning efficiency. Technology can be used to better display information, increase access to information, improve information sharing, and organize better class presentations. Technology is not a panacea for educational problems, but by combining technology with applicable learning models, the overall quality of education is enhanced. Students raised in an age of technology demand student-centered learning. Educators must discover and develop how to implement new technologies into the learning environments and focus efforts on facilitating learning (Adams & Jansen, 1997). Principals must accept the challenge to create supportive conditions, which would foster innovative uses of computers. Principals must respond to the public demand for increased use of technology to prepare our students to meet the expectations of the society in which they will participate.

Resistance to Technology

Schools are still limited in their ability to take full advantage of computer technology because of cost, lack of teacher preparation, and inadequacy of the school's infrastructure. Even schools that were built fairly recently do not all have an adequate power supply, and few schools have telephone lines in every classroom (Loveless, 1996). A national survey conducted by the U.S. General Accounting Office (1995) found that in 46% of schools the electrical wiring would not handle the power requirements of computers. That finding helped explain why more than half (52%) of the schools surveyed did not have access to a computer network (Seyfarth, 1999).

Principals must be prepared to deal with teacher resistance to technology being integrated into the curriculum. Many teachers perceive technology as another burden of responsibility added to the already overwhelming load of a teacher (Hartzell, 1996). Principals have to be prepared to provide extensive teacher training in the integration of technology into the curriculum (Weiss, 1994). Principals need to create an environment conducive to maximizing technology integration into the curriculum. A faculty that becomes comfortable with the ideas of technology will more easily integrate it into the curriculum.

Principals need to solve the dilemma of how to provide appropriate technology training for the entire faculty. Dyrli (1996) recommends a number of key elements for a successful staff development including: offering a variety of options, emphasizing skill development, providing hands-on experiences, tailoring programs to local realities, using genuine teaching examples and providing supporting materials. Principals need to be aware that if the teachers are not the focus of the technology training, then technology will fail (Guhlin, 1996). Teachers have to feel involved in the process of integrating technology into the curriculum. This involvement will ensure that the teachers take personal ownership for this responsibility. Once personal ownership has been established, it is easier for the teachers to work toward goals because they now have more purpose and meaning. The main thing to remember is whatever training the teachers have, it is crucial that it applies to them as professionals as well as individuals.

There are teachers and administrators who believe the lack of available money for technology is a problem when trying to integrate technology into the curriculum. It is important for principals to keep in mind that research shows that the amount of money available to a school district is not related to the innovative uses of computers. Exemplary teachers work in a representative range of communities and schools. However, they tend to be found in settings where school and district resources have been used to create supportive conditions (Becker, 1994).

Some researchers (Milone & Salpeter, 1996), have found teachers that use the computer for typical tasks, such as creating instructional materials and performing administrative tasks, perceived their computer use as having a positive impact on their work, making them more professional, more creative, better informed, and generally better educators. It is important therefore for principals to accept the challenge to create supportive conditions that would foster innovative uses of computers. After one prepares the faculty in the professional development plan for integrating technology into the curriculum, one must give the faculty the access to the computers during instruction time and planning time.

Teachers as Computer Users

The literature on teachers as computer user is complex and there are many different levels of reporting. The curriculum needs of elementary and secondary levels as well as the various preparations and backgrounds of teachers makes the understanding of computer uses more involved and difficult to study. Several authors about the use of computers in schools claim that the personal computer is the latest educational technology to fall short of its original promise (Loveless, 1996). The author goes on to claim that although United States public schools now possess 5.8 million computers, roughly one for every nine students, they are not widely used in classroom instruction. In neighboring Canada Stats Canada (1999), reports that, more than 9 out of every 10 students at the elementary, intermediate and secondary levels in Canada attended schools had access to the Internet for educational purposes. However, principals reported a number of obstacles to fuller use of computer technology in the classroom, the biggest of which were a lack of computers and lack of training opportunities for teachers. Principals of schools representing about two-thirds of students cited a need for more computers as well as more time for teachers to prepare courses that require the use of computers and to explore ways to use the Internet. In addition, these principals said teachers needed more training opportunities to upgrade their computer knowledge and skills.

Loveless (1996) argues that the most popular explanations for lack of computer use fix blame on recalcitrant bureaucracies and stubborn teachers. By enlisting technology in the cause of educational reform, computer advocates overlook some of the real obstacles to the use of computers in classrooms. These obstacles are rooted in organizational constraints of the school system and the essential nature of teachers' and students' work. We need to examine the world of teachers and students to uncover how their interactions limit the computer's impact on schooling and describes how these limitations are viewed. Computer advocates must separate their agenda from other reform agendas. Loveless (1996) states that the campaign to promote computer technology in the schools should stress three elements: (1) developing a strong technological infrastructure through investments in adequate school facilities; (2) using computers to make teachers' work easier and more efficient, not to redefine teaching; and (3) employing computers to increase student academic achievement, not for changing current ideas of valued knowledge.

Hoffman, (1996) points out that of the many barriers to integrating technology into classrooms, unmotivated teachers, inadequate access, lack of training, and lack of appreciation are critical. Principals can help by providing more administrative support, staff development and technical support, equipment availability, technology-use plans, technology coordinators, appropriately maintained equipment and facilities, program assessment, and broad decision-making participation. Liu, MacMillan, &Timmons (1998) observed secondary school students' use of computers for learning and identifies limited use of computers for learning by students, dependency of students on teachers for integration, and constraints of teachers on students in terms of teachers' difficulties and attitudes toward computers.

Baines, Deluzain,& Hegngi, (1998) studied teacher use of computers in Georgia and report that 96% of teachers profess to use technology, but found that only 4% of teachers actually integrated technology in their instruction. The majority of schools had few computers, fewer Internet-ready computers available for student access, and teachers who had never received any training concerning how to use computers. Most teachers lacked even a rudimentary knowledge of the Internet; many could not explain how to turn on a computer. The reality of public school classrooms contrasts sharply with the rhetoric and possibilities of using technology effectively in schools as exemplified by some interesting, high-tech classrooms. The disparity between reported and actual use of computers in instruction is an issue that should have great concern for principals.

Cuban (1998) claims that public school teachers make limited, unimaginative use of new technologies, despite having equipment available. This is partially the result of teachers' attitudes toward computers in the classroom, conflicting beliefs about the purposes of schools, and teachers' feelings about rapidly changing technology. Cuban and Kirkpatrick (1998) in determining weather the use of computers in a classroom are effective were able to categorize activities as computer-assisted, computer-managed, and computer-enhanced instruction.

Cuban (1999) in further analysis of the situation goes on to point out that teachers vary considerably in their classroom use of information technologies. At one end of the spectrum of use there are many star performers who, in the early 1980s, learned programming and fixed personal computers when they crashed. Such teachers he categorizes as serious users. These users he describes as the teachers who bought a home computer and, in subsequent years, between home and school, prepared classroom materials, compiled grades, used email, and constructed Web sites for their classroom or school. Such serious users have their students working daily on classroom or lab computers, multimedia projects, and other uses of technology. Were computers to disappear, such teachers would be upset because they have incorporated the powerful machines into the very fabric of their lives in and out of school. He classifies the middle of the spectrum as occasional users. These teachers took a beginning computer course, even purchased one for home, and, after three or four years, have found the computer a useful addition to their classroom repertoire. They use computers to prepare grades, attendance reports, and handouts for class. For instruction, these teachers place the computer in the same category as a videocassette or overhead projector "a useful tool". Were computers to become suddenly unavailable, such teachers would adapt without missing a beat because the technology had been marginal. The last category Cuban (1999) is the non-users at the end of the spectrum. He describes these teachers as the ones who may have taken a course and may even have a computer at home or possibly use the computer for administrative tasks, but seldom or never boot up a computer in their classrooms. Were computers to disappear from schools, students would note little difference in how and what these teachers taught.

These categories of teacher use of computer use for instruction should be useful for principals as they prepare professional development sessions for their teachers' growth plans. It is not unlike the concerns that business marketers have while trying to market their computer products. Moore (1999) in his best selling book on marketing and selling high tech products to mainstream customers is able to show on a bell curve that the categories are: innovators, early adopters, early majority, late majority and laggards. These categories are not unlike Cuban's (1999) and just as marketers have to plan special strategies to sell their products, principals should plan special strategies to have teachers integrate technology into their teaching. School administrators must take seriously the need to provide a viable program in communications education to prepare students for the next century and to avoid the emergence of a deprived social class consisting of those who cannot use computers (Martinson, 1998).

Purpose

The purpose of this study was to compare teachers and principals in their perceived uses of technology for instructional purposes in the classroom.

Subjects

Surveys were administered to teachers and administrators in 50 schools in the in a Southe East Texas School District. Of the 500 teachers and principals surveyed, 466 returned a completed questionnaire resulting in a response rate of 90.32%. The sample was made up of 87% teachers (n=404) and 13% administrators (n=61). The major demographics of the schools and subjects are shown in Table 1 below.

Table 1. Description of Schools and Subjects Participating in the Survey

Location of School:	Suburban	68%
	Urban	30%
	Rural	2%
Size of School:	30 or less teachers	9%
	31-50 teachers	50%
	51 or more	39%
% of Students on Free Lunch:		
Grade Level Of Subjects:	Elementary	70%
	Middle School	20%
	High School	10%
Ethnicity of Subjects	White	82%
	Black	4%
	Hispanic	15%
	Asian	Less than 1%

Instrument

The researchers developed a 24-item survey instrument. Items 1-11 were used to gather demographic information on the schools, teachers and principals. The remaining 13 items included 8 items related to the amount of training, implementation and support of computers in the classroom; 5 items asked respondents to rate the extent to which computers were used for specific purposes. The response format was primarily closed using either a 4- or 5-point Likert –type scale. In this paper, we will compare teachers' and administrators perceived uses of computers in classroom instruction.

Procedure

Teachers and principals in 50 schools were provided a survey and cover letter by a graduate student in one of the researcher's courses in the principal certification program. No names were used on the survey to ensure confidentiality and anonymity. The graduate student collected the surveys.

Analysis

The mean ratings by teachers and principals for each of the five uses were rank ordered. These rankings are displayed in a table. In addition, a 3(level) x 5 (use) mixed design ANOVA with repeated measures on the final factor was used to compare the mean ratings of the teachers and principals.

Results

The rankings of perceived uses of computers for instruction in the classroom by both principals and teachers are displayed in Table 1 below:

Table 2. Rankings of Teachers and Principals of the Perceived Use of Computers for Instruction in the Classroom

	Teachers		Principals	
Uses	Mean Score	Rank	Mean Score	Rank
Drill and practice	3.36	1	3.34	1
Problem solving	3.17	2	3.30	2
Worldwide web	1.73	5	2.84	4
Compositions	2.22	3	3.07	3
Desktop publishing	1.78	4	2.66	5

1 = Highest Rated Use

Based on a 5 point scale: 1 = Never, 2 = Once a month, 3 = Occasionally, 4 = Several times a week, 5 = Daily

The rankings are quite similar across the groups. The only differences were in the relative ranking of the use of worldwide web and desktop publishing. An inspection of the mean ratings of frequency, however, indicates some differences between the groups. This analysis was done using the ANOVA.

The results of the 2 (position) x 5 (Uses)) mixed design ANOVA with repeated measures on the final factor used to compare the teachers' and principals' perceived uses of computers in the classroom indicated the following. The main effect for use was significant [F (4, 449) = 43.95, p<. 001]. There was also a significant main effect for position [F (1, 449) = 27.35, p<. 001]. There was also a significant interaction of effect for position X barrier was found [F (4,449) = 10.22, p<. 001].

Selected post hoc comparisons indicated that the computer was used significantly more often for the lower level skill of drill and practice than for worldwide web and desktop publishing. Since the majority of the subjects were elementary-level educators, this is a predictable finding. Interestingly, the principals perceived that students were using the computers more frequently for the higher-level skill of worldwide web use than the teachers reported with means of 2.85 and 1.73, respectively. (This places the perceived use by principals somewhere between "occasionally" and "more than once a month" while teachers responded somewhere between "never" and "once a month"). Although not significant, in all other cases except drill and practice, principals assumed more frequent usage. The interaction effects of a repeated measures design are complicated and less meaningful.

Discussion

Overall, principals and teachers were fairly consistent in their rankings of the uses of technology in the classrooms. Interestingly, both ranked the lower level skill of "drill and practice" as the most used. Although "problem solving" was ranked second highest in usage, it became clear to the researchers that respondents viewed this as either mathematics drill and practice or students using popular problem solving software games independently. These findings appear to confirm Cuban (1998) contention that teachers do not actually integrate technology into their instruction and make somewhat limited and unimaginative use of technology despite having equipment available. It was encouraging to see that computers were used in composition slightly more than once a month on average. Since many classrooms still do not have online capabilities, it is not surprising that the use of the worldwide web is limited. Lack of appropriate screens for student access no doubt enters into this limitation in many schools. Another finding from the study suggests that for all uses, principals assume a higher level of usage than teachers reported. Although these differences were not always significant, the pattern was consistent. As Adams and Jansen (1997) suggest, principals must accept the challenge to create supportive conditions, which foster innovative uses of computers. Subsequent analyses by the researchers will examine the effect of level of teacher on the uses of technology. Preliminary examination of the data suggests that high school teachers use computers less frequently for drill and practice and more frequently for composition and desktop publishing than their elementary and middle school colleagues.

References

Adams W. J. & Jansen, J. (1997). Information technology and the classroom of the future. *Technology and Teacher Education Annual, 1997* Charlotteville, VA: Association for the Advancement of Computing in Education.

Baines, L.; Deluzain, R. E.; Hegngi, Y. (1998). The state of the net in secondary classrooms: Rhetoric and reality. In: WebNet 98 World Conference of the WWW, Internet, and ntranet Proceedings (3rd, Orlando, FL, November 7-12, 1998); see IR 019 231.

Becker, B. W. (1994). How exemplary computer-using teachers differ from other teachers: Imolications for realizing the potential of computers in schools. *Journal of Research on Computing in Education, 26,* (3) 291-321.

Cuban, L. (1999). *Why are most teachers infrequent and restrained users of computers?* Paper presented at the meeting of Technology, Teaching, and Learning of the BCTF Public Education Conference, Vancover, BC.

Cuban, L. & Kirkpatrick, H. (1998). Computers Make Kids Smarter--Right? *TECHNOS ,7* (2) 26-31.

Cuban, L. (1998). High-Tech schools and low tech teaching. A commentary. *Journal of Computing in Teacher Education, 14* (2) 6-7.

Drake,T.L. & Roe, W. H. (1999). *The principalship 5th ed.* Upper Saddle River: Prentice Hall, Inc.

Dyrli, 0. (1996). Essentials for telecommunications staff development. *Technology & Learning, 17*, (3), 7-8.

Dyrli, O. & Kinnaman, D. (1994). Preparing of the integration of emerging technologies. *Technology & Learning, 14* (8), 92-100.

Goodlad, J. 1. (1997). *In praise of education*. NY: Teachers College Press.

Guhlin, Miguel. (1996). Stage a well-designed Saturday session and they will come! *Technology Connection, 3* (3), 13-14.

Henri J. & Hay, L. (1995). Teacher-Librarians must be principally minded. *School Libraries in Canada, 15* (4)20-21.

Hoffman, B. (1996). Managing the information revolution: Planning the integration of school technology. *NASSP Bulletin, 80* (582) 89-98. Oct 1996

LaRocque, L. & Oberg, D. (1991). The principal's role in a successful library program. *The Canadian School Executive.* October: 27-30.

Liu, X; MacMillan, R; Timmons, V. (1998). Integration of computers into the curriculum: How teachers may hinder students' use of computers. *McGill Journal of Education, 33* (1) 51-69.

Loveless, T. (1996). *Why aren't computers used more in schools?* Faculty Research Working Paper Series, R96-03. Harvard Univ., Cambridge, MA. Kennedy School of Government. http://orders.edrs.com/members/sp.cfm?

Martinson, D. L. (1998). Educators and the new mass media technology: The good, the bad, and the ugly. *Contemporary Education, 69* (3) 150-54.

Mathews, D. (1997). The lack of a public for public schools. *Phi Delta Kappan 78* 740-743.
Milone, M.N. Salpeter, J. (1996). Technology and equity issues. *Technology and Learning,16* (4) 38-41.

Moore, G. A. (1999). Crossing the chasm: Marketing and selling high-tech products to mainstream customers. NY: HarperBusiness.

Pellicer, L.O.; Anderson, L. W.; Keefe, J. W,; & McCleary, L. E. (1990). *High school leaders and their school: Profiles of effectiveness Vol. II.* Reston, VA: National Association of Secondary School Principals.

Stats Canada (1999). Computer technology in schools. *The Daily Statistics Canada.* http://www.statcan.ca/daily/English/991012/td991012.htm

Wadsworth, D. (1997). Building a strategy for successful public engagement. *Phi Delta Kappan, 78* 749-752.

Weiss, J. (1994). Keeping Up With The Research. *Technology & Learning 14*, (5), 30-34.

Barriers to the Use of Computers in the Classroom: A Comparison of Teachers' and Principals' Perceptions

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Abstract: Principals need to encourage the use of technology in learning. The barriers to the use of computers in the classroom as perceived by teachers and principals is important. This study found the rankings for teachers and principals on barriers were identical. The highest-ranking problems for both groups were lack of time and lack of computers. None of the barriers were seen as major problems. Results of a mixed design ANOVA indicated a significant main effect for barriers, no significant effects for either level of educator or interaction of level and barrier were found. Selected follow up post hoc comparisons using Tukey's HSD were used to identify significant differences among the barriers for each of the two groups. There were significant differences in the mean ratings for the "Lack of Time" and the "Lack of Administrative Support". Both groups rated the lack of time as significantly more of a problem than lack of administrative support.

Introduction

There is a very definite demand from the public that our schools must be more current and appropriate for students (Rose and Gallup, 1998). Educators are being told they are not keeping up with the real world. Business leaders are complaining that schools are not producing enough qualified workers. Researchers (Fullan, 1996; Goodlad, 1997; Sergiovanni, 2001) have begun to question whether we are meeting the varied educational needs of all students. There is a growing demand from the public to ensure that our schools are adequately preparing our students for the challenges that an increasingly growing technology demands.

Students raised in an age of technology demand student-centered learning. Educators must discover and develop how to implement new technologies into the learning environments and focus efforts on facilitating learning (Adams & Jansen, 1997). The key role principals' play in schools is well documented and acknowledged (Buckner, 1997). Technology is a key tool in building a learning community within a school (Speck, 1999). The leadership responsibility of the principal is to encourage the use of technology in learning.

Principals need to be prepared to deal with teacher resistance to technology being integrated into the curriculum. They have to provide extensive teacher training in the integration of technology into the curriculum (Weiss, 1994). Many teachers perceive technology, as another burden of responsibility added to the already overwhelming load of a teacher (Hartzell, 1996) A faculty that becomes comfortable with the ideas of technology will more easily integrate it into the curriculum. As with all issues involved in collaboratively building an effective school environment, it is important that teachers and principals understand each other's perspective. Since so many resources are currently being allocated for technology, it is critical that budgetary decisions are based on commonly agreed upon needs and that there is planning to address perceived barriers.

Purpose

The purpose of this study was to compare teachers and principals in their perceived uses of technology and barriers to their use in the classroom.

Subjects

Surveys were administered to teachers and administrators in 50 schools in a large school district in South East Texas. Of the 500 teachers and principals surveyed, 466 returned a completed questionnaire resulting in a response rate of 92.20%. The sample was made up of 87% teachers (n=404) and 13% administrators (n=61).

Instrument

The researchers developed a 24-item survey instrument. Items 1-11 were used to gather demographic information on the schools, teachers and principals. The remaining 13 items included 8 items related to the amount of training, implementation and support of computers in the classroom; 5 items asked respondents to rate the extent to which computers were used for specific purposes. The response format was primarily closed using either a 4- or 5-point Likert –type scale. In this paper, we will compare teachers' and administrators perceived uses of computers in classroom instruction.

Procedure

Teachers and principals in 50 schools were provided a survey and cover letter by a graduate student in one of the researcher's courses in the principal certification program. No names were used on the survey to ensure confidentiality and anonymity. The graduate student collected the surveys.

Analysis

The mean scores for each of the barriers for both teachers and principals were rank-ordered. In addition, a 2(position) x 5(barriers) mixed design ANOVA with repeated measures on the final factor was used to compare the teachers' and principals' perceived barriers to computer use in the classroom. Selected post hoc comparisons using Tukey's HSD were made based on significant main effect for barrier.

Results

Table 1. Rankings of Teachers and Principals of the Perceived Barriers to Use of Computers in the Classroom

	Teachers		Principals	
Barrier	Mean Score	Rank	Mean Score	Rank
Lack of Computers	2.38	2	2.33	2
Lack of Software	2.16	3	2.04	3
Lack of Admin. Support	1.32	5	1.05	5
Lack of Training	1.75	4	1.73	4
Lack of Time	2.47	1	2.42	1

The rankings of perceived barriers to computer use in the classroom by both principals and teachers will be displayed in a Table. Interestingly, the rankings for teachers and principals were identical. The highest-ranking problems for both groups were lack of time and lack of computers. None of the barriers were seen as major problems.

The results of the 2 (position) x 5 (barriers) mixed design ANOVA with repeated measures on the final factor used to compare the teachers' and principals' perceived barriers to computer use in classrooms indicated the following. The main effect for barriers was significant [$F(4,454) = 80.34$, $p<.001$]. No significant main effect was found for position [$F(1, 454) = 1.11$, $p>.05$]. Likewise, no significant interaction of effect for position X barrier was found [$F(4,454) = .82$, $p>.05$].

Selected follow up post hoc comparisons using Tukey's HSD were used to identify significant differences among the barriers for each of the two groups. Among both teachers and principals, there were significant differences in the mean ratings for the "Lack of Time" barrier (means of 2.47 and 2.42, respectively) and the "Lack of Administrative Support" (means of 1.32 and 1.05, respectively). Both groups rated the lack of time as significantly more of a problem than lack of administrative support. Again, it should be noted that neither of these barriers was regarded as a major problem.

Conclusions

Based on the results of the survey, it appears that principals and teachers in a large urban school district are in close agreement as to the magnitude and relative ranking of perceived barriers. By identifying "lack of time" and "lack of computers " as highest rated barriers, these educators can move forward to discussions of how to work together to resolve or ameliorate these barriers.

References

Adams W. J. & Jansen, J. (1997). Information technology and the classroom of the future. *Technology and Teacher Education Annual, 1997* Charlotteville, VA: Association for the Advancement of Computing in Education.

Buckner, K. G. (1997). Introduction. *Bulletin: The National Association of Secondary Schools Principals . 81* (585) 1-2.

Fullan, M. (1997). *What's Worth Fighting for in the Principalship*. NY: Teacher College Press.

Goodlad, J. 1. (1997). *In praise of education*. NY: Teachers College Press.

Hartzwell, G. (1996). Wrestling with resistance. *Technology Connection, 3* (3), 10-12.

Rose, L.C. & Gallop, A. M. (1998). The 30' annual Phi Delta Kappan/Gallop Poll of the public's attitude toward the public schools. *Phi Delta Kappan 80*, (1) 41-56.

Sergiovanni, Thomas J. (2001). *The Principalship: A Reflective Practice Perspective.* Needham Heights, Maryland: Allyn and Bacon.

Speck, M. (1999). *The principalship: Building a learning community.* Upper Saddle River, NJ: Merrill/Prentice-Hall Inc.

Weiss, J. (1994). Keeping Up With The Research. *Technology & Learning 14*, (5), 30-34.

A Blended-Technology Approach to Distance Education Course Delivery

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Abstract

For several years Continuing Education and the Department of Education at Eastern Michigan University have used an Interactive Television (ITV) videoconferencing system to deliver a graduate course in Education. The course is Educational Research Techniques a graduate-level course required for students in several degree programs. Students are mostly teachers in K-12 systems located in or near three Michigan cities, Flint, Ypsilanti and Jackson. Initially, the ITV system (supplemented with printed materials) was the only distance learning technology deployed. However as the limitations of using a single technology became clear, a blend of delivery technologies were used. The additional technologies include online conferencing, occasional mailed videocassettes of course lectures, a PBS-produced telecourse, and printed coursepacks.
Student satisfaction levels were measured for the blended-technology approach as a whole. Academic achievement of course goals and objectives was measured, and compared to academic achievement by former students in that same course taught by that same instructor in face-to-face and interactive television (only) delivery formats.

Results found high levels of student satisfaction with regard to use of the blend of technologies and satisfaction levels were found to be much higher when asynchronous technologies such as online conferencing were used to supplement the synchronous ITV sessions. Deployment of the online conferencing technology allowed students to timeshift and participate in the discussions in accord with their own schedules.

Academic achievement was measured by two exams, participation in online and ITV class discussions, one short paper and a submitted research proposal consisting of three components; a) a problem statement, b) a review of related literature and c) a methods/procedures section which focused on research design and measurement strategies. The instructor found overall student performance to be virtually identical with performances of students in the same course delivered either in a traditional face-to-face format or via interactive television. However the levels of discussion that were conducted via the online conferencing option were substantially higher than those conducted in the ITV environment and higher than those in past face-to-face courses taught by the instructor.

Why A Blended Technology Approach?

There is an adage that states when all you have is a hammer, everything looks like a nail. Unfortunately, this statement typifies the approach taken to distance education course development by many colleges, universities and schools. In many cases, a single distance education technology has been implemented by the institution, and faculty members are expected to make all course and program objectives and learning activities conform to the attributes and characteristics of that technology.

For example, for the past several years two-way interactive television (ITV) has been among the most frequently-implemented distance education technologies. Faculty members are scheduled to teach courses via ITV and sometimes (but not always) provided with professional development opportunities to allow them to learn to use the technology. Typically, the only supporting technology that is used with ITV systems is the fax. Other distance education delivery systems such as on-line/Internet computer communications, videocassettes, and telephone audioconferencing, are often ignored and not made accessible to ITV faculty members.

The results have been predictable. Students and faculty members found that the ITV system worked well for facilitating learner achievement of *some* course goals and objectives, but was an abysmal failure for other course goals and objectives. Overall, student and faculty satisfaction levels with ITV systems have often been lower than anticipated. This is typically very disappointing to the institution s administrators who had supported substantial expenditures on ITV infrastructure and implementation.

In some instances this result is being met with a throw the baby out with the bath-water response, with some faculty members, students and administrators concluding that distance education is flawed as a concept, and cannot lead to user satisfaction and/or high levels of academic achievement. Distance learning practitioners in other institutions have concluded that it is the ITV delivery system that is lacking, and are advocating delivery of distance education courses via on-line/Internet technologies. Unfortunately total dependence on on-line/Internet delivery has the same critical flaw as ITV course delivery, i.e., it is a single-technology approach and any single technology will be appropriate for *some* instructional goals and objectives and inappropriate and ineffective for others.

This pattern has led some distance education course designers to conclude that what is needed is a multiple-technology approach to distance education course and program delivery. In the multiple or blended technology approach, the organization makes a wide range of distance education technology options available to faculty members and instructional designers who plan the delivery of distance education courses. For each course, the instructional or learning objectives and the characteristics of the learners form the basis for the technology application decisions. Thus a learner-focused and outcome-driven model for instructional delivery replaces the technology-driven model that is currently typical. With this logic in mind, many distance education planners argue that replacing technology-driven models with a learner-focused, outcome-based blended-technology distance education model will result in increased learner satisfaction and increased attainment of learning objectives by students.

The Technology Toolkit

The technologies which are essential to the success of a blended-technology approach to course and program development are often described as comprising the distance education technology toolkit. They typically include interactive television/video teleconferencing equipment and facilities, on-line/Internet course delivery hardware and software, video production facilities, access to nationally-produced and typically leased video-based telecourses, audioconferencing hardware and software, audio production equipment and printed materials production equipment (Figure 1). Distribution infrastructure is also essential, e.g., a system for duplicating and mailing videocassettes to distance learners). Professional development processes to help faculty learn to optimally utilize all components of the technology toolkit must also be planned and implemented.

The Course Development Team

Traditional courses and single-technology courses are often planned and delivered by a single assigned faculty member acting in isolation. However, the blended-technology distance learning course requires integration of several technology subsystems necessitating participation by representatives from each subsystem. This requires an active involvement in the course planning and implementation process by a planning group or team acting in concert. This distance education course development team will typically be comprised of faculty members, instructional designers, technicians familiar with

all equipment, librarians and support staff members. The need for including the librarian as a member of the instructional development team results from the team s need for knowledge of the content of specific databases and information websites and access strategies for getting the most from them (Wiltse, 1997).
The team analyzes the learners characteristics, including their access to and ability to use communication technologies, entry level knowledge and skills relative to course objectives, and ability to function effectively in distance education environments. With this analysis in mind, decisions are made with regard to course goals and objectives (outcomes) and the learning activities that will be used to assist learners in achieving them. Then, distance education technologies are selected to facilitate the application of the learning activities. This decision-making processes considers the critical attributes of each technology (e.g., synchronous versus asynchronous, ability to display video motion and images, etc.) with regard to their ability to facilitate critical learning activities. Access to the desired communication/learning technologies for specific course times and situations is then arranged, and the course is delivered, deploying each technology at its strength in facilitating the required communication patterns.

If the blended-technology approach to distance education course planning and delivery is truly a more effective model than single-technology implementation, then educational institutions will need to become much more comprehensive in their approach to infrastructure development and professional development. They will also need to encourage and support the use of course development teams, and focus careful attention on the scheduling of their communication technology systems. In short, they must commit to a new approach to distance education system development. To be seriously regarded, such a change must be based upon empirical evidence.

Conclusions

The highest levels of satisfaction are congruent with the analysis that the distance education student is typically a mature, employed student who has family and work responsibilities that make the opportunity to timeshift instruction very attractive. Videotaped lectures can be viewed at the student s convenience, and as often as the student would like. Similarly, e-mail correspondence can be accessed in accord with student schedules. It is interesting to note the high level of satisfaction with the students receiving course materials in a timely fashion. This is a testimonial to the importance of this logistical concern, and to the careful planning and attention to this component provided by the Director of Distance Education and the clerical staff assigned to the project.

Additional Conclusions and Recommendations

1. Distance education delivery systems will continue to grow in number and improve in quality. They are harmonious with other societal changes such as the demand for services delivered anywhere, anytime and in the format you want. They are arguably superior to traditional face-to-face instructional delivery systems in facilitating emerging employer-demanded skills such as a) self-directed learning, b) problem-solving/critical thinking, c) working in teams, and d) communication skill enhancement. They are also often aligned with constructivist pedagogical trends and learner empowerment, and support a focus on learning rather than teaching.

2. Many traditional faculty members and institutions are in the process of making the change from a focus on teaching to a focus on learning and in relinquishing control of instructional processes

3. Single-technology distance education systems will be replaced by multiple or blended technology distance education delivery systems. While many higher education institutions are resisting this change until the single technology models demonstrate their cost-effectiveness, eventually it will be clear that investments in the entire technology toolkit are critical if an institution wants to participate in the delivery of effective high-quality distance education courses and programs. One positive by-product of

the blended-technology instructional delivery system is the recognition that several courses could share certain limited-supply technologies. For example, the blended-technology approach could function effectively while using the interactive television system only five or six times in the twelve-week to fifteen-week semester. This means that one or two other courses could, if scheduling agreements could be reached, use the same interactive television infrastructure during that same time-of-day and day-of-the-week. This has the effect of expanding the capacity of the interactive television infrastructure by a factor of three without adding any new equipment.

4. Institutions will increasingly perceive the necessity of investing in high-quality professional development for distance education faculty members. Unfortunately, many will recognize this need only after student and faculty satisfaction levels are in a crisis state. Those who wait for the satisfaction crisis to hit will face a long road in the restoration of credibility for their distance education courses and programs.

5. Learners are accepting the requirement that they be technologically literate as a prerequisite for participating in the instructional process. Just as learners have accepted that certain minimum reading levels are necessary for them to benefit from instruction, they are now recognizing that they must also have a baseline of technology utilization skills. Some student-centered institutions are assisting these learners by providing comprehensive entry assessment of students technology skill levels and providing thorough student orientations that address technology application skill-gaps.

6. Successful application of a blended-technology approach requires collaborative efforts among representatives of several departments within an educational institution. Some members of these teams may report to different deans. It will be a challenge for many traditional educational institutions to generate sufficient collaboration to operationalize the blended-technology approach. Frankly, these units are often competitive and not used to cooperating with one-another. Team-building might often be the important first-step for educational institutions attempting to implement a blended-technology approach to distance education course and program delivery.

7. There is much to learn about optimally using the communication tools that comprise the blended-technology approach. Much work needs to be done to determine which conferencing software is optimally suited for which purposes. Similarly, the question of relative advantages of synchronous vs. asynchronous communication patterns will need to be carefully studied. Finally, the question of whether any of the instruction in a program or course needs to be site-based with students fulfilling a residency requirement is a critical issue to many program and curriculum designers.

8. There is a need for more pilot-tests of distance learning delivery systems. This process will provide an opportunity for planned growth based on data and cumulative experience. The alternative is to continue to add infrastructure haphazardly with the hope that successful applications will be developed. It is a common technology-explosion error to invest resources into hardware and software without corresponding investments into developing processes for its effective utilization.

9. It is the instructor s perception that students who participated in this pilot exhibited growth in their ability to engage in self-directed learning, problem-solving, teamwork and communication skills. Employers have long argued that these skills are critical to workplace success, and are therefore important skills for all curriculum areas. This growth is characteristic of learners experiences in distance learning programs and may be one of the more important reasons for exposing students (even on-campus students) to distance learning environments.

10. Distance learning is currently growing at a relatively slow pace. However, when a critical mass of an innovation or cultural change is reached, there is often a rapid acceleration in the rate at which the

innovation is diffused and permeates the culture. There is evidence that distance learning will fit this pattern, and that the explosive growth period is rapidly approaching. When that phenomena hits, those institutions who have established a solid delivery base and sound practices will flourish.

References

Anderson, Terry D. and Garrison, Randy D., (1995) Transactional issues in distance education: The Impact of Design in Audioteleconferencing. The American Journal of Distance Education 9 (2) 27-42.

Arnall, G. (1984). Instructional Television Fixed Services: An Analysis of ITFS operations. Washington, D.C.: Corporation for Public Broadcasting.

Baker, R.L. and Schutz, R.E. 1971. Instructional Product Development. Southwest Regional Laboratory for Research and Development. Van Nostrand Rinehold.

Barr, Robert and Tagg, John. (1995). From Teaching to Learning: A New Paradigm for Undergraduate Education. Change Magazine. November/December.

Biner, Paul M., Dean, Raymond S. and Mellinger, Anthony F. (1994) Factors underlying distance learner satisfaction with televised college-level courses. The American Journal of Distance Education 8 (1) 60-71.

Davis, Robert H., Alexander, Lawrence T., and Yelon, Stephen L. 1974. Learning System Design. New York. McGraw-Hill.

Gagne, Robert M. 1977. The Conditions of Learning, Third Ed. New York. Holt Rinehart and Winston.

Gubernick, L. and Ebeling, A. (1997, June 19). I got my degree through e-mail. Forbes.

Hardy, D.W. and Olcott, D. (1995). Audio teleconferencing and the adult learner: Strategies for effective practice. American Journal of Distance Education. (9). 45-57.

Johnson.J.L. and Silvernail, D.L. (1994, September/October). Impact of interactive television and distance education on student evaluation of courses: A causal model. Community College Journal of Research and Practice 18 (5), 431-440.

Jonassen, D., Davidson, M., Collins, M., Campbell, J. and Haag,B. (1995). Constructivism and computer-mediated communication in distance education. The American Journal of Distance Education. (9) 1 7-23.

Major, H.T. (1996, fall) Critical issues in interactive television delivery:: Instructional development, faculty development and faculty compensation. Media Spectrum, The Journal of the Michigan Association for Media in Education.

Major, H.T. and Grimes, G. (1992, fall). Teaching for learning at a distance. Media Spectrum, The Journal of the Michigan Association for Media In Education.

Major, H.T. and Levenburg, N.M. (1997, Summer) Designing multiple-technology marketing courses. Marketing Educator, 8.

Major, H.T. and Levenburg, N.M. (1997) Distance learning good for what? Featured Essay of the Instructional Telecommunications Consortium. August and September (two-part essay).

Moore, Michael G. (1994) Audioconferencing in Distance Education. The American Journal of Distance Education 8 (1). Editorial.

Murphy, K.L., Cifuentes, L., Yakimovicz, A.D., Segur, R., Mahoney, S.E. and Kodali, S. (1996) Students assume the mantle of moderating computer conferences: A case study. The American Journal of Distance Education. 10 (3), 20-35.

Perelman, Lewis J. (1992) School s Out. New York. Avon Books.

Ruberg, L.F., Taylor, C.D., and Moore, D.M. (1996). Student participation, interaction and regulation in a computer-mediated communication environment: A qualitative study. Journal of Educational Computing Research. 14 (3), 243-267.

Senge, Peter M. (1990). The Fifth Discipline: The Art and Practice of the Learning Organization. New York. Doubleday/Currency.

Smith, Robert M. (1990). Learning to Learn Accross the Lifespan. San Fransisco. Jossey Bass.

U.S. Department of Education, National Center for Education Statistics (1997). Distance education in higher education institutions., NCES 98-062, by Laurie Lewis, Debbie Alexander, and Elizabeth Farris. Bernie Greene, project officer. Washington, D.C.

Welsh, Thomas. (1997) From Multimedia to Multiple-Media: Designing Computer-based Course Materials for the Information Age. Techtrends, 42. (1), 17-23.

Wheatley, Margaret J. (1992) Leadership and the New Science: Learning About Organization from an Orderly Universe. San Fransisco. Berrett-Koehler.

Wiltse, Ric. (1997) Finding Your Way Through The Maize; Locating the Best Resources on the Internet. Media Spectrum: The Journal of the Michigan Association for Media In Education. Third Quarter. 9-10.

Scoring Activities on Integrating Technology Into the Curriculum During Pre-Service Training Using a Bloom/ACOT Scale

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A small, private college teamed with a suburban, public elementary school to use pre-service teachers to assist in integrating technology into a fifth grade curriculum. Eight pre-service Education students were assigned to instruct fifth graders on how to use multimedia technology in an innovative fifth grade curriculum which employed field experiences, cross disciplinary skill activities, and computer multimedia writing. We sought to see how these technology activities scored on Bloom's Taxonomy (Bloom, 1956) and selected fourteen activities for scoring. The observed activities of the pre-service students were:

1. Basic hands-on learning of word processor, spreadsheet, data base, and Hyperstudio.
2. Constructed data files to understand application.
3. Constructed draft lessons to teach basic application commands to students.
4. Basic hands-on learning of pre-service students on how to adapt applications to project use.
5. Constructed draft lesson plans to guide fifth graders in using applications for notes, budgeting, analysis.
6. Planned, organized, and supervised fifth graders lab experience.
7. Taught fifth graders to use the ClarisWorks word processor to keep a journal of their activities.
8. Taught fifth graders to use spreadsheet to construct a budget and estimate savings from coupons.
9. Taught fifth graders to use data base to manage the different food product categories.
10. Taught fifth graders how to access the Internet to research food products and topics on nutrition.
11. Taught fifth graders how to use Apple QuickTake 150 digital camera to take pictures.
12. Pre-service students used video camera to make movies later incorporated as Quicktime movies.
13. Assisted fifth graders in developing ideas about shopping, organizing these ideas in a virtual reality supermarket, and expressing idea in a multimedia/hypermedia presentation.
14. Final work product presented as presentation before local District Board of Education.

Since Bloom's scale does not specifically address developmental progression in technology, we selected an ACOT (Apple Classroom of Tomorrow) scale to accompany Bloom. Just as Bloom's scale points to higher cognitive operations, the ACOT scale, developed by researchers at Apple Computer (Dwyer, Ringstaff, & Sandholtz 1991), ranks the development of increasingly sophisticated uses of technology in instruction. By combining the two scales, we constructed a scoring instrument for cognitive behavior and technology activities providing a context for examining the relationships. The corresponding relationships of Bloom and ACOT categories, as we see them, are:

ACOT Stages	Behavior	Bloom's Taxonomy	Behavior
Entry	Little inclination to change mode of instruction.	**Knowledge**	Basic recall or recognition of facts.
Adoption	Adopt technology to support traditional approaches.	**Comprehension**	Ability to receive and use information.
		Application	Using information in concrete situations.
Adaptation	Venture beyond traditional approaches.	**Analysis**	Ability to break down or use elements or parts.
Appropriation	New instructional patterns and questioning of old patterns.	**Synthesis**	Ability to work with pieces to combine in a new pattern or structure.
Invention	New pedagogical approach developed by teacher.	**Evaluation**	Ability to make quantitative and qualitative judgments about information learned.

We classified (Table 1) and tallied (Table 2) the fourteen activities by Bloom/ACOT stages. The positioning was influenced by our knowledge of the literature and interpretation of the descriptions of activities occurring at different Bloom and ACOT developmental levels.

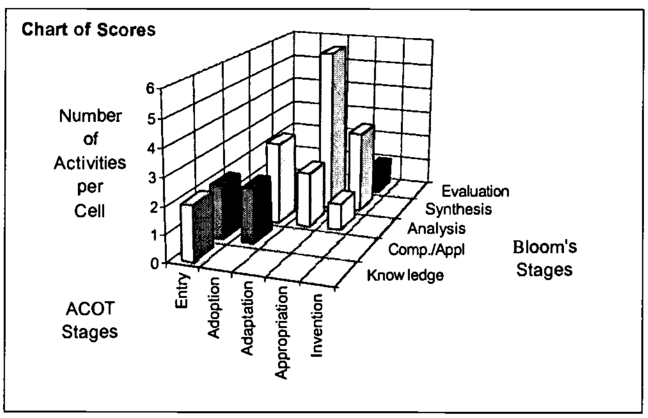
Table 1 Identifying and Placing Graduate Student Activities - Scores of Responses

Bloom's Stages ------>		Knowledge	Comp./Appl	Analysis	Synthesis	Evaluation
ACOT	Entry	#1, #2	#2, #3			
Stages	Adoption		#2, #3	#2, #3, #4		
	Adaptation			#5,#6	#7,8,9,10,11,12	
	Appropriation			#6	#6, #13, #14	#14
	Invention					

Table 2 No. Of scores

Bloom's Stages ----->		Knowledge	Comp./Appl	Analysis	Synthesis	Evaluation
ACOT	Entry	2	2			
Stages	Adoption		2	3		
	Adaptation			2	6	
	Appropriation			1	3	1
	Invention					

The chart below shows Table 1 and 2.



Our Bloom/ACOT scale showed that many of the activities reflected our students gaining a conception of computer use in new instructional patterns. We see the value of classifications on the scale, while not empirical data, as guides to planning pre-service activities in technology integration (Apple Computer, 1995). Future studies are needed to develop and strengthen the model. The authors recommend that pre-service students be given pre and post program surveys for correlation to and support of the classification of activities on the Bloom/ACOT scale.

References

Bloom, B. S. (1956). *Taxonomy of educational objectives: The classification of educational goals. Handbook I: Cognitive domain.* New York: McKay.

Dwyer, D.C., Ringstaff, C., & Sandholtz, J. H. (1991). *The Evolution of teachers' instructional beliefs and practices in high-access-to-technology classrooms.* ACOT Report #9, Apple Computer Corp, Cupertino, CA.

Changing the conversation about teaching and learning: A report on ten years of ACOT research. (1995). Apple Computer Corporation, Cupertino, CA.

Investigating the Benefits of an Educational Technologist in Middle School environments: A Qualitative Study

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Abstract: This paper is a report of a study conducted of a federally funded technology innovation grant, C*R*E*A*T*E for Mississippi. Qualitative techniques were used to examine the benefits of school based Educational Technologist in increasing teacher knowledge and integration of technology. Preliminary results indicate that teachers do benefit from the Educational Technologist. Teachers feel more confident in their use of technology, use more technological resources in planning and implementing their lessons, and are integrating technology into their lessons.

Introduction

Schools are gaining more and more access to technology. However, research indicates that teacher knowledge and integrated use of technology is not increasing proportionate to the technology available in the schools (U.S. Department of Education, 2000). A possible cause for this discrepancy may be the lack of training, support, and time that teachers have to learn how to effectively integrate technology into day-to-day classroom learning (U.S. Department of Education, 2000). A consortium of schools and other partners was funded through a Technology Innovation challenge Grant by the U S Department of Education to support technology integration. Four diverse middle schools were chosen from one congressional district to participate in the first year of the C*R*E*A*T*E for Mississippi project. The schools were chosen for their innovative insight and potential to infuse technology into learning. The administration at each chosen school named four core teachers to directly participate in the C*R*E*A*T*E for Mississippi project. The core teachers at each school were expected to interact with members of the C*R*E*A*T*E for Mississippi project and to help disseminate technology innovations to other teachers in their school and district. To address the lack of technology training, support, and time that middle school teachers have to integrate technology, core teachers participating in C*R*E*A*T*E for Mississippi were provided one hour per day of release time to use for planning and professional development. The position of educational technologist (ET) was created to assist the core teachers, other teachers, administrators, and students in the school in educational technology.

The educational technologist (ET) is responsible for providing support to core teachers, other teachers, administrators and students in the use of technology in all phases of learning. The ET is also expected to orchestrate the improvement of student learning and academic achievement through the effective use and integration of technology. This research was conducted to investigate the benefits of the educational technologist in increasing teacher knowledge and integration of technology.

The Study

Researchers in the four different schools conducted this qualitative study. The research data was collected through interviews, observations, and created documents, such as lesson plans and presentations.

Release time was studied at each school. Formal documentation of release time as well as observations during release time and interviews with teachers regarding release time was used to verify and study the use and benefits of release time at each school.

Researchers working both individually and in teams observed interactions between the core teachers and the educational technologist. Observations were also made to document the interaction of the ET with other teachers within the school and interactions between the core teachers and other teachers within the school.

Interviews were held with the educational technologist, core teachers, and other teachers. These interviews were informal and conducted with individual researchers as well as with teams of researchers. Interviews helped document the infusion of technology into the school culture. The attained information documented the relationship development between the educational technologist and members of the school community (i.e. teachers, administrators, and students).

The researchers also collected documents. Lesson plans developed by the teachers that integrate technology were evaluated for meaningful technology infusion and for evidence of the educational technologists' support and assistance in the development. The schools' curriculum plan and technology standards were examined for changes and improvements following the influence of the educational technologist

The observations, interviews and permanent products were used to form a cohesive description and explanation of the work performed by the educational technologist in each school.

Findings

Magnolia Middle School

The core teachers at Magnolia Middle School (pseudonyms will be used for all schools and teachers in this research) decided to take their release time one hour after school each day. Records indicate that core teachers work a minimum of five hours a week after school developing lesson plans which integrate technology, planning for technology integration, and learning new software to integrate into lessons. However, observations and interviews revealed that core teachers were not consistently working for one hour after school each day. Rather, the core teachers were managing their release time to accommodate day-to-day needs. For instance, if a core teacher was working on locating Internet sites to use with an upcoming lesson, that teacher did not necessarily log off and leave one hour after school was dismissed. Instead, the core teacher may search for sites, follow links, and investigate sites for periods of time up to three hours after school. Additionally, if a parent needed to visit with a core teacher after school or if a staff meeting was called for after-school hours, the core teacher may not stay the additional hour after the delay to complete his one-hour of release time. In each instance though, the core teacher kept up with time and spent a minimum of five hours per week on technology related activities. Observations of classroom activities, critiques of lesson plans, and interviews with core teachers and administrators indicate that the core teachers at Magnolia Middle School made very productive use of their release time.

Magnolia Middle School made unique arrangements for the position of their ET. Magnolia Middle School administrators did not feel they had any appropriate candidates to fulfill the duties of the ET. Hence, the role of ET was split between two individuals already on staff at the Magnolia Middle School. A journalism/technology teacher assumed the role of half-time ET, taking on the responsibilities of teacher technology support and technology integration. An administrative intern also assumed the role of half-time ET, taking on the responsibilities of technology curriculum development and in-house technology training for the staff.

The half-time teacher, halt-time ET has been observed to have a very good relationship with the core teachers. Her interactions with the core teachers, though limited, have been positive. The teacher ET teaches five classes per day and seems to have very little time to interact one-on-one with the core teachers. The core teachers do, however, seem to be independent, highly motivated individuals who do not require a lot of support from the teacher ET. The teacher ET has been noted to provide technical assistance to at least one core teacher.

The administrative ET has not been observed to have a strong relationship with the core teachers. The administrative ET has been observed to be pulled away from many of her ET duties by her administrative duties. Her administrative duties do not seem to permit much time to interact with the core teachers or with other teachers in the school. The administrative ET has attempted to maintain interaction with all the teachers by publishing technology tips via email to all the teachers every week. She also regularly invites all the teachers to request any assistance she can provide to them.

The teacher ET has been observed to have a very good relationship with other teachers in the school. The teacher ET has been noted to interact more frequently with other teachers in the school than with the core teachers. The teacher ET has provided technical support to other teachers, as well as as-needed assistance and training in such areas as sending attachments with email and finding feared lost. The teacher ET has also provided other teachers with researched Power Point presentations to use with lessons they teach. The time the teacher ET saves other teachers within the school (i.e. finding web sites for them and making Power Point presentations for them) has enabled other teachers within the school to integrate more technology into their lessons.

Interactions between the core teachers and other teachers within the school have been noted to be very positive. The core teachers have willingly shared lessons that they have developed during their release time. The core teachers have been noted to provide software training and technology support to colleagues who wish to implement their lessons, but who do not have the technological savvy. These other teachers have voluntarily stayed after school to get training and support from the core teachers without receiving any monetary compensation.

The researchers have noted positive changes in the use and infusion of technology in both the planning and teaching process at Magnolia Middle School. The core teachers, confident in their technology use and self-motivated, have recently added more technology use in their lesson planning process and have infused more technology into their lessons without the direct aid of either ET. However, each ET has been observed to have an impact on the technology use and infusion of other teachers in the school who may not be as confident or self-motivated as the core teachers.

Hilltop Middle School

The core teachers at Hilltop Middle School decided to take their release time during the school day. The administration at Hilltop Middle School hired a first year teacher as a half-time teacher, half-time coach to fulfill the teaching responsibilities of the core teachers during their release time. Therefore, the core teachers at Hilltop Middle School have their regular planning period each day in addition to an extra planning period of release time made available through the grant. The core teachers at Hilltop Middle School use their period of release time for planning technology infused lessons, researching internet sites for resources to use in lessons, and setting up technology for student use (i.e. setting up probes, bookmarking internet sites, preparing documents with linked sites for students to explore, etc.). The core teachers at Hilltop Middle School have faced some obstacles with their release time during the school day (i.e. the loss of their classroom during their release time, inflexible time frame to complete release time work within).

The ET for Hilltop Middle School was hired from a Technology and Education position at a high school in another district. Early in the academic year, interactions of the ET with the core teachers seemed to vary from good to a bit strained. The core teachers were noted to be somewhat dependent on the ET for guidance, support, and training. As the academic year has progressed, the interactions of the ET with the core teachers have been observed to be reserved with some and even strained with others. The ET responds to the core teachers' request for help in finding resources to integrate and infuse technology into their lessons, however, it has been observed that the core teachers do not use the ET as efficiently as the role was intended. For example, the core teachers do not call on the ET to assist with classroom exercises involving technology or to help train students in the use of technology used in the classroom.

Other teachers at Hilltop Middle School have been observed to have a good relationship with the ET. The ET readily makes herself available to the teachers for assistance, support, and training in educational technology. She also assists the technology coordinator in technical problems with computers within the school. Other teachers within the school seem to be comfortable calling on the ET for assistance and they appear to be confident in her ability to guide them.

Interactions between the core teachers and other teachers within the school have been observed to be limited. The sharing of information noted at Magnolia Middle School has not been evident at Hilltop Middle School. Likewise, the core teachers seem to somewhat resentful of the assistance of the ET to other teachers within the school. Additionally, some resentment has been noted from other teachers within the school toward the core teachers due to the extra planning period they get through release time each day.

Researchers have noted some positive changes in the use and infusion of technology into the lessons planned and taught at Hilltop Middle School. The teachers at Hilltop Middle School have had more access to technology than any of the teachers at the other schools. In the past, much of the technology available to the teachers at Hilltop Middle School sat dormant in the classrooms. The ET has provided training, support, and encouragement to the teachers to empower them to make better use of their resources. The researchers have observed increasing use of technology by the teachers, but for planning and for teaching.

Valley Middle School

Release time at Valley Middle School, like release time at Hilltop Middle School, is during the school day. During each core teacher's release time, the ET works one-on-one with the core teacher providing her with training in computer skills, help in locating websites for lessons, and assisting with lesson plan development. The core teachers decided on this release time format.

The ET at Valley Middle School was a teacher in the school system before accepting the position of full-time ET for the school. Researchers have observed a strong relationship between the core teachers and the ET at Valley Middle School. Interactions between the core teachers and the ET are very positive with the ET spending time in the classrooms assisting the teachers with lessons that integrate technology by working with groups of students in the classroom.

Other teachers at Valley Middle School have also been observed to have positive interactions with the ET. The ET has conducted professional development workshops for all of the teachers in the school. Researchers have noted that other teachers recognize the ET as an important resource person for troubleshooting and addressing their technology concerns.

Valley Middle School is a small, rural school with one teacher responsible for a content area for all the Middle School grades. Given the small size of the school, the core teachers are the only content area teachers for the Middle School grades. That is, all the middle grades teachers are core teachers. Interactions between the core teachers and other teachers at the school have not been observed or noted.

Researchers have observed that the ET at this school has proven herself and the position as vital to the growth in technology use by the teachers and students. This is a very small school with veteran teachers; change is slow to come. The change of teachers' practices has been evident in very small ways. The ET at this school has encouraged teachers to learn basic computer skills and shown them how to use technology in their lessons. Researchers have observed the teachers' excitement about their newly acquired skills. Yet, the researchers have noted a reluctance of the teachers to use their new knowledge with their students.

Leesburg Junior High

The school administrator decided the release time for teachers at Leesburg Junior High. Release time for the teachers is scheduled for one hour after school. After school hours were decided for Core teachers because teachers were already scheduled for two planning periods during the day. The planning periods were built into the school schedule before the release time for C*R*E*A*T*E for Mississippi was considered. Because the teachers work separately after school, there is no collaboration with the ET during release time. Release time documentation kept by the ET indicate that teachers use their release time to find technology resources to integrate into their classrooms, planning technology infused lessons, and searching for sites that will be useful for lesson enrichment. The researchers have noted that the teachers approve of the after school arrangement because of the flexibility that the hours offer.

The ET at Leesburg Junior High was hired from a technology coordinator position in a nearby school district. Previously, the ET had extensive professional experience in the community college and business sectors. The ET and the core teachers at Leesburg have not been able to establish a working relationship. The teachers are located in the main school building and the ET is located in a building separate from the teachers. The teachers do not readily seek assistance from the ET and have worked independent of the ET throughout the entire project.

The ET has yet to establish a relationship with the other teachers in the school. This may be attributed to the fact that the ET is located in a separate building. The ET does not make an effort to establish relationships outside of the building in which she is housed. The teachers do no go to the technology building unless they have a class scheduled for the computer lab located there. However, the ET does have a good relationship with the technology coordinator. The ET shares office space with the technology coordinator and this arrangement further fosters the relationship between them.

The core teachers interact positively with the other teachers within the school. There has been evidence of the core teachers sharing information with the other teachers about technology integration and lesson plan ideas. There have been cases where the core teachers have taken extra time to train other teachers on software in an effort to help the other teachers in their quest to integrate technology into their classrooms.

There has been evidence of changes in teacher use of technology from the beginning of the project to the present. During the previous school year, none of the four core teachers used the computer lab for their class sessions. This year, three core teachers have utilized the computer lab. One teacher who had previously been very uncomfortable using technology has used the computer lab this semester and has also trained another teacher on the technology skills that she has acquired. Researchers note that these changes occurred because the teachers are self-motivated. The ET had very little impact on the changes that occurred with these teachers.

Conclusions

The researchers have noted greater levels of positive interactions between the ET, the core teachers, and other teachers when the ET has a background similar to the teachers in the school. When the ET has teaching experience at the grade level of the teachers, there may be a greater level of understanding of the needs of the teachers and the students that the ET is attempting to assist.

The ET was noted to be more successful at interacting with both the core teachers and other teachers in the school when the ET was housed in the building with the teachers. This may be because the ET was more assessable to the teachers. The close proximity of the ET to the teachers may lead to the building of relationships in which the ET can better understand the needs of the teacher and the teacher will better trust the ET to provide appropriate assistance.

All of the core teachers have expressed positive reactions to the release time made available to them through the grant. The more independent, self-motivated core teachers were noted to be successful with after school release time for planning and infusing technology into their lessons. This may be due to the flexibility afforded to them for planning around interruptions and the ability to accommodate the varying times required exploring and navigating various software and Internet sites. Less confident teachers were noted to benefit from one-on-one daily assistance from the ET. This may be due to the support and encouragement that the ET is able to provide.

The researchers have noted varying degrees of success in technology learning and technology infusion into learning environments in this study. The schools in this study have experienced various benefits from the ET. It is noted that some schools benefited more than others, however, all schools in this study have experienced an increase in the technology used by teachers in the planning process and in the technology teachers have infused into learning experiences in the classroom.

Reference

U.S. Department of Education. National Center for Education Statistics, Teachers' Tools for the 21st Century: a Report on Teachers' Use of Technology. NCES 2000-102 by Becky Smerdon, Stephanie Cronen, Lawrence Lanahan, Jennifer Anderson, Nicholas Iannotti, and January Angeles. Washington, DC: 2000.

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Scientific and Technology Learning: Enhancing the Attitudes Toward Technology for Middle School Girls

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Abstract: Middle school girls, selected from several rural and urban school districts in northeast Louisiana, participated in a three-week program at The University of Louisiana at Monroe (ULM). Pre and post-attitude surveys as measured by the Computer Attitude Questionnaire were compared to assess the effectiveness of the program. The analysis measured the effects of attitude changes in the following categories: interacting with the WWW, a word processor, a database application, and e-mail. Significant changes in attitudes in three of the four categories were observed. Positive attitudinal changes were observed in the areas of the WWW, word processing, and e-mail.

Introduction

Living in the information age has increased the complexity of our forms of communication, especially in education (Casey, 1997). The forms of communication and access afforded by the Internet have helped to define cultural assumptions and realities in relationship to technology. Studies focusing on gender in conjunction with practices relating to technology offer an important insight for studying the impact of the union of technology and culture. From these abundant studies many researchers have focused on the imbalance in education particularly at the upper elementary and middle school levels. Whitley (1997) states that computer use, in our society, has been portrayed as more appropriate for boys than girls. The design and delivery of technological knowledge through educational software, web designed sites, and computer games appeal more to boys than girls (Kiesler, Sproull, & Eccles, 1985; & Swanson, 1997). Computer use in schools has traditionally been linked to 'masculine' subjects such as science and mathematics rather than traditionally 'female' subjects such as liberal art and literature (Hawkins, 1985). After conducting various studies on gender equity the American Association of University Women (AAUW) Executive Director Janice Weinman (1998) refers to the technology plight as "the new boys' club in our nation's public schools", while Janese Swanson, senior vice president of the Girl Tech Web site, states, "Shying away from technology not only restricts girls from certain life choices and successes, but also limits the potential for their future products, inventions, and discoveries – a disservice to the entire society" (Swanson, 1997).

Research has reported various explanations for the disinterest of girls with certain subject matters such as computer science, mathematics and science. Researchers have included factors such as, the societal views of an appropriate female career, the lack of female role models in these areas, gender bias in the classroom setting at this critical time in the female life, and gender stereotyping in computer software. The NSF/ Girls Research Opportunities in Computing (Girls R.O.C) project was designed to address these issues by conducting an intense three-week summer program that would encourage enthusiasm by providing female role models such as ULM computer science faculty and majors, a non-competitive environment and group research. The program provided both formal and informal activities for the girls in areas of computer science, computer application, Internet research, listserv activities, data mining, along with a variety of classroom and hands-on activities that exposed them to ways that computers are used in research, business, and the home.

The Study and Conclusions

The selection of the 24 participants for the program was from incoming eighth and ninth grade girls from predominantly rural school districts in northeast Louisiana. The girls were selected using several criteria that included a written essay, transcript of grades and a recommendation from a counselor or teacher. Special consideration was given to minorities and students with disabilities. This study consists of the pre and post survey results for 19 of the initial participants that finished the three-week program. The five participants that left the program and their five replacements were omitted from this study due to lack of either the pre or post testing survey results.

The research instrument used to assess the attitudes of the participants was the Computer Attitude Questionnaire (CAQ) (Knezek & Christensen, 1998). Emphasis was placed on the questions from the CAQ that addressed the issues relating to the WWW, word processing, database application, and e-mail. The pre-survey was conducted online with the girls on their arrival at the university, and a post- survey was conducted on the last day of the program. A paired t-test was used to perform the comparison of the before and after attitudinal responses relative to these areas for the group of participants. Table 1 lists the results of the paired t-test that evaluated the research hypothesis of what changes in attitudes did participants exhibit as a result of their participation in the three-week program.

Topic	*Means*		*T value*	*P value*
	pre-survey	*post-survey*		
WWW	3.9579	4.5868	3.9192	0.0010
Word Processing	3.4421	4.2000	3.7510	0.0015
E-Mail	4.1842	4.6140	2.8566	0.0105
Database Application	3.2982	3.6667	1.9647	0.0650

Table 1. Results of paired t-test

The participants' attitudes toward the WWW, word processing, and e-mail were significantly improved after the three-week program. The 19 participants collectively had an average of 3.95796, 3.4421, and 4.1842, respectively for these areas prior to the workshop. After the three week intensive study the average attitude improved significantly to 4.5868 (p=0.0010), 4.2000 (p=0.0015) and 4.6140 (p=0.0105), respectively. Even though the participants' attitudes toward database application did not reveal a significant change at the 0.05 significance level, it could be declared significant at the 0.0650 level. The average attitudinal responses for database application were 3.2982 and 3.6667, respectively for the pre and post survey.

From this study, it can seen that the Girls R.O.C. Program did have a positive impact upon its participants. Whether this impact will sustain over time is another question. The girls will return to ULM three times throughout the 2000 fall term to work on science fair projects with the project directors. The CAQ will be given each time to monitor any changes in attitudes toward technology along with the participants' attitudes toward school.

References

AAUW. (1998). *Gender gaps: Where schools still fail our children.* Commissioned by the American Association of University Women Educational Foundation. Researched by the American Institutes for Research. Washington, D.C.
Casey, J. (1997). Early literacy: The empowerment of technology. Englewood, Co:Libraries Unlimited, Inc. and its division Teacher Idea Press.

Hawkins, J. (1985). Computers and girls: Rethinking the issues. *Sex Roles*, 13, 165-180.

Kiesler, S., Sproull, L., & Eccles, J. (1985). Pool halls, chips and war games: Women in the culture of computing. *Psychology of Women Quarterly*, 9, 451-462.

Knezek, G. & Christensen, R. (1998) Computer Attitude Questionnaire (CAQ). Available: http://dataweb.cecs.unt.edu/surveys/demos/caq.asp.

Swanson, J. (1997). "A conversation with Janese Swanson." (speech, Conference on Women Girls, Technology, Tarrytown, NY, The Marymount Institute for the Education of Women & Girls).

Whitley, B. (1997). Gender differences in computer-related attitudes and behaviors: a meta-analysis. *Computer in Human Behavior*, 13, 1-22.

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Session 419

The Effect of Multimedia Training on Teacher-Centered Vs. Student Centered Classroom Behaviors

As we enter the 21st century, the questions remain: Are teachers creating active learning environments that enable student to become independent learners and creative problem solvers?

One tool that helps teachers shift the control of learning from teacher to students is the use of multimedia in the classroom. Multimedia can motivate students to explore new learning environments through research, collaboration, and problem solving. Students can gather information from online resources and create interactive presentations that combine text, graphics, sound, and digital video.

In order to integrate multimedia into classrooms, students and teachers must learn both the technical and application nature of multimedia programs. One of the problems with PowerPoint and other multimedia programs is that teachers have the tendency to use these programs to reinforce their presentations. The result is the reinforcement of teacher-centered behaviors.

In this study, 15 teachers from one school district representing various levels from K to 12, enrolled in a one-credit graduate course titled "Instructional Applications of Multimedia Using PowerPoint." The question asked in this study was "Does the introduction of multimedia training to teachers and students help shift classroom learning from teacher-centered behaviors to student-centered behaviors?"

The purpose of the graduate course was to teach the use and classroom application of Microsoft PowerPoint to practicing teachers. The course was offered at the beginning of the school year and none of the teachers had prior experience using PowerPoint. The school district installed PowerPoint software for all teachers who enrolled in the course. In

addition, PowerPoint was installed in all computer labs throughout the school district.

The graduate course required teachers to create PowerPoint presentations; however, the course also required teachers to have students integrate PowerPoint in student-centered projects. Thus, the teachers had to teach PowerPoint to their students and require students to create classroom projects utilizing PowerPoint software.

At the end of the course teachers were required to report and demonstrate the results of their projects. A survey was also conducted to determine (1) the teachers' attitude toward multimedia as a learning tool and (2) teacher plans to use multimedia in a teacher-centered vs. student-centered activities.

Some of the other questions this study addressed were (1) What is the teacher perception of the application of multimedia to student-centered activities? (2) What are the difficulties associated with incorporating multimedia into the classroom? (3) What learning difficulties are encountered with special-needs learners and younger learners in creating and using multimedia in the classroom?

Preliminary results indicate that the teachers enrolled in the course had a positive attitude towards multimedia. Most teachers planned to use PowerPoint for both teacher-centered and student-centered activities. Most teachers agreed that they would have the students use PowerPoint for both individual and group projects. Teachers reported problems with lab access, storage on floppy disks. Very few teachers reported technical problems. Teachers reported that the younger learners (K-2) had more problems working with PowerPoint than older learners.

Teachers will be surveyed throughout the school year to determine the frequency and type of PowerPoint use in the classroom.

Final results and recommendations will be reported at the conference.

CPR Lessons for Teachers: Current Trends, Practice, and Research in Educational Technology

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Abstract: Young scholars introduce a diverse selection of current trends, practices, and research findings A discussion of constructivist-oriented practices that support K-12 technology use is followed by discussions of the implications of technology integration and the cost-effectiveness of technology use in elementary and secondary settings. Technology application issues are addressed next, including the effectiveness of virtual field trips, instructional courseware, online discussion tools, and computerized tests. These areas represent just some of the research on educational of technology that effective teachers must remain aware of.

Educators at all levels from PreK-16 now have a vital need to be aware of current instructional technology trends, practices, and research findings in order to provide effective learning environments for their students. Findings of research in this area are often mixed, and best practices are frequently not shared among educators. This collaborative paper written by young scholars conducting research in the field will introduce a diverse selection of current trends, practices, and research findings in a sequence that will give the reader a unique overview of the educational technology field.

Constructivism Overview

Constructivism is the new educational buzzword in education. Dewey, Vygotsky, Bruner, and Johnassen have all developed principles that can be called 'constructivist natured', but what is constructivism? What does a constructivist classroom look like? What role does constructivism play in education? How do we apply constructivism to technology? This session will explain the key components of constructivism as well as the assumptions and myths.

Implications of Technology Integration

Technology plays a key role in how the world functions. Schools are now being faced with how to effectively and efficiently integrate technology into their classrooms and curriculums. Technology integration involves challenges--including access inequities among schools, courseware material purchasing decisions, and computer (il)literacy levels--of students and teachers. Schools need to meet these challenges one at a time.

Cost-Effectiveness of Educational Technology

Most schools are funding education technology but is the money being spent simply for the sake of technology or are these investments proving to be beneficial to students? Several large-scale studies, which give some insight on how computers can best be used to raise student achievement, will be discussed.

Virtual Field Trips

How effective is an educational museum web site as an alternative to a museum field trip? The data regarding the educational outcomes of a virtual field trip will be presented to provide a better understanding of the educational opportunities afforded when using the Internet in the classroom.

Courseware

Educators find it difficult to locate effective educational courseware that will work reliably, hold student interest, and meet the requirements of the curriculum. Factors that must be considered include appropriate teaching style to scheduling student computer time with limited computers availability. Findings on the impact of educational software on technological confidence, competence, and teaching effectiveness of high school teachers will lead to a better understanding of these issues to enhance the effectiveness of its use in a teaching and learning environment.

Online Discussion

Do social factors such as intimacy and immediacy, derived from the concept of social presence, affect student learning and satisfaction in computer conferencing? With the introduction of the Internet to education, computer-mediated group interaction has been facilitated for both online courses and face-to-face courses as an instructional supplement. This presentation will present factors that achieve effective student learning in computer conferencing from the sociological perspective.

Assessment

Recent technological advancements in the development of testing software allow teachers more flexibility in assessing student learning. Research and experiences in writing and developing computerized mathematics tests will be discussed. In addition, the advantages and disadvantages of generating computerized alternative forms of tests and of administering the tests via a computer will be presented.

Conclusion

The ongoing research introduced in this collaborative paper is one small portion of the research on the use of technology for teaching and learning that teachers must be aware of to remain effective. The sheer diversity among these few topics emphasizes the types of current trends, practices, and research that will impact teachers and students in the near future.

A Comparison of Preservice, Inservice, and Non Teacher Education Majors on Technology Confidence, Ability, and Use

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Abstract

This paper describes the findings from a study based on a newly enacted state technology standard for new and experienced teachers. Teacher education students rated their confidence level, ability, and usage on technology areas. A control group of non-education majors was used to determine whether the technology competencies were acquired within the teacher education program or general university requirements. The results of the study were also examined to determine whether there is a progression from juniors to seniors to graduate students, and whether there are specific criteria of the new standard that students have not met.

Introduction

The state of Kentucky has enacted a new standard for technology knowledge and use for new and experienced teachers (Kentucky Department of Education, 1999). Nationally, all teachers are expected to meet a new technology standard designed by the International Society for Technology in Education (ISTE, 1997). As a result of these new requirements, teacher preparation programs and graduate programs for experienced teachers must assure the opportunity for students to become competent in technology skills and usage.

At Eastern Kentucky University, faculty members in the College of Education have been busy infusing elements of the new technology standard into required courses at pre-service and in-service levels. In an attempt to assess needs and how well current courses were addressing those needs, an earlier study was conducted which surveyed skills in sample groups of students (Long & Reehm, In Press). However, the survey form used to collect data was not specifically related to the performance criteria outlined in the Kentucky Department of Education's (KDE) new technology standard. The current study addresses this limitation. The authors designed a new survey instrument, administered it to a larger group of students, included a control group, and used the data collected to answer questions raised by the earlier study. Results were examined to answer the following questions: (1) Is there a correlation between the three aspects of student usage of technology which were identified as confidence, ability, and frequency of use?, (2) Is there a progression of technological competence from juniors to seniors to graduate students?, (3) Were the specific criteria of the new standard met by senior preservice teacher education students? (4) Was there a significant difference between the mean scores of the control group of non-teacher education students and the preservice senior teacher education students?, And (5) When comparing the mean scores of the senior groups of elementary, middle, and secondary preservice teacher education students, is there a difference in the number and types of standard criteria met?

Study Design

The study was conducted at Eastern Kentucky University, a regional comprehensive university of approximately 15,000 students that serves primarily south eastern and south central Kentucky. The college of education offers a variety of undergraduate, graduate, and certification programs to approximately 1,300 students.

A computer survey was designed based upon the 16 performance criteria listed in KDE's new technology standard for teachers. Several of these performance criteria incorporated more than one technology area, which could lead to confusion in determining strengths and needs of students. Therefore the final survey form was delineated into 27 specific technology areas. Each subject who completed the survey was asked to respond to each of the 27 technology areas in relation to his/her level of confidence, ability, and frequency of use. The subjects were asked to indicate on a likert scale of 1 to 5 the following: their feeling of confidence for operating or applying the particular technology area; their current level of ability to use the technology area; and their current frequency of use of that technology area. A score of 1would indicate a low level of confidence, ability, or frequency of use. A score of 5 would indicate a high level of confidence, ability, or frequency of use. (See Table 1 for a list of the 27 specific technology areas)

The population surveyed included 180 undergraduate preservice teacher education students, 70 graduate inservice teacher education students, and 81 undergraduate non-teacher education students. Specifically, 59 elementary, 33 middle, and 37 secondary senior level methods course preservice teacher education students were surveyed. At the junior level, 51 elementary and middle grade preservice teacher education students enrolled in a course that was pre-requisite to the senior level methods block were surveyed. The graduate inservice teacher education students surveyed were enrolled in various elementary, middle grade, and secondary level education courses. The non-teacher education students surveyed were students enrolled in 200 and 300 level economics courses. The survey was given within the first half of the fall 2000 semester.

Analysis and Results

The SPSS program was used to analyze the data gathered from the survey instrument to answer the above written questions. In order to answer the first question (Is there a correlation between the three aspects of student usage of technology which were identified as confidence, ability, and frequency of use?) correlations were computed using the mean scores of the answers given by all the study participants in the areas of confidence, ability, and frequency of use as follows: (1) between confidence and ability means scores the correlation equals 0.99; (2) between the frequency of use and the ability mean scores the correlation equals 0.80; and (3) between the confidence and the frequency of use means scores the correlation equals 0.83. It was concluded that the means scores between all three participant response areas were highly correlated. Based on this conclusion, the rest of the analyses computed in this study were targeted at the ability response area.

A t-test was computed to analyze statistically significant differences of student group mean scores to answer question # 2, is there progression of technological competence from juniors to seniors to graduate students? Mean scores for senior level teacher education students were consistently higher than those for junior level students, but none of these differences were statistically significant. No significant differences were computed or observed between the means scores of the senior preservice students and the graduate inservice teacher education students. These findings indicate there is some progression from junior level to senior level, but not from senior to graduate levels.

In order to answer the third question, whether the specific criteria of the new technology standard were met by senior preservice students, an analysis of the ability means scores was conducted in all 27 technology criteria. The criteria was considered met if the mean score was greater then or equal to 3.00 on a scale of 1-5. Five criteria were not met by the elementary preservice teacher education group of students as follows: #6, #10, #11, #18, and #19. Three criteria were not met by the middle preservice teacher education group of students as follows: #11, #18, and #19. And, seven criteria were not met by the secondary preservice teacher education group of students as follows: #5, #6, #8, #10, #11, #18, and

#19. Only three criteria (#11, #18, and #19) were not met by all three groups of students.

Use of the control group was designed to determine the answer to question # 4, whether skills are gained during the teacher preparation program or as a part of general university requirements. Therefore, a t-test was computed to compare the ability area means scores between the non-teacher education undergraduate students and the senior teacher education preservice students. Eight statistically significant differences between the mean scores of these two groups were found. The non-teacher education student means scores were higher in the 6 criteria of #5, #6, #8, #4, #14, #17. The senior, teacher education student mean scores were higher in the criteria of #19 and #20.

A series of t-tests were computed to determine the answer to question # 5, whether there were statistically significant differences between the mean scores of the three different groups of senior teacher education preservice students (the elementary, the middle, and the secondary groups). Results of these analyses are as follows: (1) the elementary group's mean score for the criteria of #6 was statistically significantly higher than the middle group's means score, (2) the elementary group's mean score for the criteria of #25 and #26 were statistically significantly higher than the secondary group's means score, (3) the middle group's mean score for the criteria of #3, #4, #7, and #10 were statistically significantly higher than the elementary group's means score, and (4) the middle group's mean score for the criteria of #5, #7, #8, #10, #11, #18, #23, and #25 were statistically significantly higher than the secondary group's means scores ($p < .05$).

Discussion

High correlations between the mean scores of confidence, ability, and frequency of use computed from all survey participants indicate that students' self-reported perceptions did not vary significantly between all three areas. Therefore, the ability scores were used to pursue the answers to this study's questions. The focus on these scores was made to align language used by national, state, and teacher education program technology standards.

Although there was a slight progression detected between the junior and senior preservice teacher education ability mean scores, this progression was not statistically significant. Finding no positive increase between the senior preservice teacher education and the graduate inservice teacher education student ability means scores indicates a need to continue to implement the use of information technology into graduate level course work or other professional development efforts.

All three senior preservice teacher education groups of students met a majority of the 27 specific criteria in the new technology standard but there were some criteria that were not met. The elementary preservice teacher education seniors should specifically pursue study in the areas of: (1) demonstrating knowledge of the use of technology in industry, and (2) creating multimedia presentations using scanners. The secondary preservice teacher education seniors should specifically pursue study in areas of: (1) demonstrating knowledge in the use of technology in business, (2) demonstrating knowledge of the use of technology in industry, (3) demonstrating knowledge of computer/peripheral parts, and (4) creating multimedia presentations using scanners. All three groups of senior preservice teacher education students (elementary, middle, and secondary) should pursue the development of skills in the areas of: (1) creating multimedia presentations using digital cameras, (2) using computers and other technologies such as interactive instruction, audio/video conferencing, and other distance learning application to enhance professional productivity and/or support instruction, and (3) requesting and using appropriate assistive and adaptive devices for students/clients with special needs.

An unexpected finding was the significantly higher mean scores on 6 criteria for the control group as opposed to the preservice teacher education students. An examination of the demographic data collected in the survey provides insight into this finding. The control group reported a much higher number of technology courses taken (mean = 3.30) than the number reported by teacher education students (mean = 1.50). The teacher education programs are demanding and include few or no elective courses in their general education programs. This may explain the significant difference in the number of technology courses taken. In order to address the problem of limited exposure to technology courses, it is imperative that the teacher education faculty focus more on infusing technology into existing courses.

The differences found among the mean scores of the three different groups of senior teacher education students were a validation and an extension of the findings of the earlier study conducted by two of the authors (Long & Reehm, in press). Means for the middle grades teacher education students were generally higher than those for either the elementary or the secondary group. This is similar to the finding of the previous study, and suggests the infusion of technology into existing courses is currently more successful in the middle grade education courses than in either the elementary or secondary teacher education courses.

Means for the secondary group were generally lower than those for both of the other groups. The previous study did not include secondary teacher education students, so this was a new finding. It can be explained in part by the fact that secondary teacher education students take more content area courses and fewer education courses in which technology skills can be developed. It also indicates a need for incorporating techniques used in the middle grade education courses into the required secondary education courses.

The successful middle grade model involved having four middle school faculty members working as a team to decide on technology skills that they felt were important for the middle grades education students to use in their education methods classes. These instructors conducted technology seminars for students at the beginning of the semester and then required students to use skills taught as part of course assignments. The College of Education technology coordinator assisted in developing the seminars, and trained the faculty members to deliver the seminars to students. Through this process, faculty members became proficient in teaching one area of computer skills to five different groups of students. Faculty members also developed an online component for all courses in the middle grades education methods block. Resources such as course syllabi, schedule of class times, electronic addresses, forms needed for the course, assignment guidelines, and other materials were available to students only through this online mode. Students therefore found it necessary to use this web enhanced component of the course, and as a result became familiar with a distance learning application which used online materials for learning.

Recommendations

As indicated in the discussion section, one recommendation is that each of the three undergraduate teacher education programs (elementary, middle grades, and secondary) examine the list of criteria not met by students in the specific program. Faculty members in each program could use this list to design and infuse new strategies into required courses that would promote skill development for the specific criteria identified as a need area.

A second recommendation is that the teaming and training techniques used in the middle grades methods classes be adopted by both the elementary and the secondary programs, with the goal of increasing the overall technology skill level for students in each program. A key element seems to be finding ways to make the use of technological skills necessary for successful completion of course requirements.

A third recommendation is that future studies should continue to examine aspects of the new standard and the degree to which students are able to meet specific criteria of the standard. As changes are made in the education programs, data should be collected to determine the effectiveness of the changes. One way to do this is to develop a longitudinal data set. Another way is to collect data from graduates of the specific programs as they begin working in public school classrooms.

References

International Society for Technology in Education. (1997). ISTE Recommended foundations in technology for all teachers. {online}. Available: http://www.iste.org/specproj/standards/standard.htm

Kentucky Department of Education. (1999). Technology standard. {online}. Available: www.kde.state.ky.us/otec/epsb/standards/technology_std.asp

Long, S., & Reehm, S. (In Press). Aiming at a Moving Target: Keeping Pace with evolving technology standards in teacher education. Journal of Technology and Teacher Education.

Table 1: Technology Ability Survey	
Technology Area	**I have the ability to.....** 1 = not true 2 = somewhat true 3 = mostly true 4 = true 5 = very true
1. Operate a multimedia computer and peripherals to install a variety of software.	
2. Operate a multimedia computer and peripherals to use a variety of software.	
3. Use terminology related to computers and technology appropriately in written communication.	
4. Use terminology related to computers and technology appropriately in verbal communication.	
5. Demonstrate knowledge of the use of technology in business.	
6. Demonstrate knowledge of the use of technology in industry.	
7. Demonstrate knowledge of the use of technology in society.	
8. Demonstrate knowledge of computer/peripheral parts.	
9. Attend to simple connections and installations.	
10. Create multimedia presentations using scanners.	
11. Create multimedia presentations using digital cameras.	
12. Create multimedia presentations using video cameras.	
13. Use the computer to do word processing.	
14. Use the computer to create databases and spreadsheets.	
15. Use the computer to access electronic mail and the internet.	
16. Use the computer to make presentations.	
17. Use emerging technologies to enhance professional productivity and/or support instruction.	
18. Use computers and other technologies such as interactive instruction, audio/video conferencing, and other distance learning applications to enhance professional productivity and/or support instruction.	
19. Request and use appropriate assistive and adaptive devices for students/clients with special needs.	
20. Design lessons/projects that use technology to address diverse student/client needs and learning styles.	
21. Practice equitable and legal use of computers and technology in professional activities.	
22. Facilitate the lifelong learning of self and others through the use of technology.	
23. Explore, use, and evaluate technology resources: software, applications, and related documentation.	
24. Apply research-based instructional practices that use computers and other technology.	

25. Use computers and other technology for individual, small group, and large group learning/working experiences.	
26. Use technology to support multiple assessments of student/client learning/production.	
27. Instruct and supervise students/staff in the ethical and legal use of technology.	

Looking Out, Looking In: Technology's Impact on Teaching and Learning

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This paper presents the findings of three-year research project that explored the integration of technology in graduate teacher education classes and the impact of that on the K-12 classrooms in which these graduate students teach. Specifically, it addresses integration of technology in graduate teacher education classes, effective integration of technology in teacher education university classes, and how and in what ways is technology being integrated in the K-12 classroom?

In the 21st century, students will have access to more information than any other students before them. Students can use technology to gather information, produce and disseminate their work. Students are going to have to learn to use and access this information wisely and judiciously. Teacher educators have a responsibility to assist their students in becoming comfortable and facile in the integration of technology in their own and their future students' educational lives. This is particularly true in the area of literacy education. Surely, we know how vital it is for youngsters to become fully literate, but, especially in the information age in which we reside, reading and writing have become even more significant. Before teachers can effectively help their students read, write and utilize technology effectively, they must themselves be comfortable with technology and be cognizant of the additional rewards and demands the technological revolution has placed on education.

Teachers must use effective strategies to help their students read independently, additionally, they need to help them read independently with wisdom. Teachers too, must help their student's access information judiciously and critically. While there has been some concern among educators and other interested parties that technology will take the place of reading and writing, the reality is that reading and writing have taken on an even more significant role in our students' lives due to the internet. In order to access information and telecommunicate using email, our students must know how to read and write effectively. Teachers must also become knowledgeable and at ease with technology and its impact on literacy.

Teaching today's students involves an awareness of the strong forces that are impacting on their lives. Students today are in the throws of the information revolution where they are inundated with reading material. Clearly this is advantageous in terms of motivation for learning to read. But, reading in and of itself is not an end product. The end product is what do readers do with the information that they gather. As Bruning, Schraw and Ronning note, "The aim of teaching . . . is not so much to transmit information, but rather to encourage knowledge formation and development of metacognitive processes for judging, organizing and acquiring new information. (1995 p.216)" Our ultimate goal as educators was, and still is, to help our students become independent and thoughtful readers and learners who use a wide variety of reading materials. Technology is changing teaching and learning.

Any change or paradigm shift comes with attendant concerns and frustrations thus it is necessary for educators to look closely at the process as we engage in varying our classroom practice. The use of technological advances has been an easy accommodation for some educators. For others, this is not the case. Richardson (1990) notes the importance of reflection on the teaching/learning process and on affecting change. Educators must continually make decisions as to the role of technology in their classrooms and the form, function and feasibility of using specific computer programs. To make informed decisions we must clarify our view of the role of technology in our literacy programs and define their relationship to existing curricula. The primary consideration should be the purpose of using technology (Jordan and Follman, 1993). Programs should support interactions between teachers and students and not be used as "teaching machines" to supplant teachers.

While numerous questions arise as to the efficacy of technology integration in K-12 educative environments, we must also look to teacher education programs and why, how and in what ways they are preparing the teachers who will teach theses technologically savvy students of the new millennium. How do we realize the true potential of technology in our university classrooms? Similarly, how can K-12 teachers integrate and utilize technology effectively? This study was initially designed to look at technology integration in graduate literacy education classes. As questions from the students emerged, the study was then expanded to include an examination of the real world practice of those students who were teaching in K- 12 classes.

Many of us embrace the integration of technology in our classes but that doesn't mean that it is the right way to teach everything nor does it mean it is right for every teacher. Teachers, by the very nature of the profession, are continual decision makers. We (hopefully) decide how best to teach a particular subject to a particular group of students in a particular context. We decide on the pacing, and we decide what resources would be helpful to our students. These are informed decisions, based on years of study and experience. Decisions about the integration of technology must follow a similar thoughtful pattern. This paper explores what aspects of technology are helpful in given contexts and in what ways are they effective. This paper explores such issues as:

Does the integration of technology in graduate teacher education classes impact on students practice in K-12 classrooms?

How is technology most effectively integrated in teacher education university classes? How is technology being integrated in the K-12 classroom?

In what ways can teacher education programs facilitate the integration of technology in K-12 classrooms?

During the first phase of this project the process of engaging both preservice and in-service students in the use of technology in university classes was examined (Rhodes and Flank, 2000; Rhodes, 1998). The findings from these studies led to the current investigation.

Initial analysis of the findings from this current three-year study reveals several key issues and themes related to both teacher education students and those with whom they work. Themes specific to the graduate students include the level of knowledge and expertise they bring to the class; the impact of the use of technology in graduate teacher education classes; and graduate students' perceptions of their ability to incorporate technology into their teaching. The most recent and ongoing aspect of this study involves looking at the classes of those graduate students who were engaged in a technologically rich graduate literacy education class.

This study involved more than 140 students who were enrolled in five different graduate literacy education classes at two metropolitan universities within very close proximity to New York City. Although all of the classes were taught by the same professor the courses and their content was different in four of the courses. None of the courses were advertised or described as involving technology. Three of the classes were "theory to practice" literacy education courses, two were courses on research. With the exception of five students, all were teaching either in New York City Public Schools or schools in the neighboring suburbs.

In all cases, the prime focus of the courses was the content as described above. The manner in which the students were engaged however, often involved technology. Programs were demonstrated, students had the opportunity to work with software, but much of the technology infusion involved engaging students in distance learning environments as described in the previous cited studies.

Baseline data gathered at the beginning of each semester revealed that sixty percent of the students owned or had easy access to a computer but only five percent of the students were comfortable with their ability to use technology. Ninety percent of the students reported using computers only for typing term papers or doing assignments. Ten students indicated that they hated computers; three said they had no interest in learning about or with computers. The three self reported "technophobes" were in different classes but, upon learning that there would be a technology component to the class all indicated that they wanted to drop the class or transfer to another section—only one did. The other two were reassured by their professor and their classmates that they would help them through the process and if at any time they still felt uncomfortable with the technology, accommodations would be made. Almost all of the other students reported varying degrees enthusiasm or excitement at the prospect of using technology in our classes. The following case study of Jennie, typifies the experiences of those students who reported negative feelings about technology.

At the beginning of one semester, for example, Jennie, a self-described technophobe wanted to drop the course because "I have no interest in computers, I think they are a colossal waste of time. To do something with a computer takes too much time and energy." Jennie, like others was given assurances by her professor and classmates that they would help, but she reported having grave doubts and little interest. The semester progressed with the inclusion of an online component to our course. Although the class met face to face each week, there was additional work that had to be done online.

I met individually with Jennie and others each week to guide them through this process. Jennie described her feelings as "a little bit like I would imagine a child learning to read. . . it's clearly something I have to learn and perhaps something I need to learn, but I just don't want to do it. I don't want to go through the angst and pain especially, if I end up being unsuccessful." At another point Jennie wrote in her journal, "Sure Carole is there for me, and she's really trying, but I'm not sure she fully understands how difficult and frustrating this is for me. I'm trying to do something that I don't see the need for, something that makes me feel like a failure. I don't like confronting difficult tasks." The fifteen-week semester progressed with Jennie getting a bit less frustrated each week. Through her meetings with me, she began to voice her feelings and concerns. As she did so, her progress and interest began to emerge. Within two months, she was working on line by herself and her comments reflected her new, minimal level of confidence. She indicated, "This is not as bad as I thought. I don't fear it as much. . .I'm not so bad at it." By the end of the semester, Jennie delighted in sharing her technological expertise with other members of the class. At the last class meeting, she proudly announced that she told her husband that she wanted a computer for her birthday.

Jennie identified her biases early on in the semester and clearly struggled with them and worked through them as the semester progressed. She drew parallels to others aspects of her life in which she felt successful and those in which she felt unsuccessful. She related it to the plight of some of her students as they struggled with learning to read. She looked at the process of acquiring technological literacy and then thought about her students. She teaches in an urban school district where many of the students are from homes where the parents cannot afford computers. Though the school has some computers, they were not be used very often. At her request, this year, I began working with Jennie in her school since she wanted to incorporate the use of technology in her daily class activities. Jennie, like others has requested such assistance. Of the 140 students involved in this study, more than eighty percent (n=120) reported having computers in their classrooms, but approximately twenty percent (n=25) indicated that the computers were used for more than a half hour a week. Through extensive site visits and interviews, it was clear that the level of incorporation of technology in these teachers' classes was very minimal and usually engaged the students' in simple word processing tasks or basic internet searches. Technology, thus far, has not become an integral part of the teaching learning lives within theses classes. The current phase of this study is a response to the "cry of help" from many of the teachers who have experienced technology integration in their graduate classes but report needing assistance in doing so in their own K- 12 classrooms.

These in-service teachers reported many drawbacks in this process. Among these are that there are not enough multimedia computers available to children-- especially those from impoverished homes; there is not enough time for teachers to scrutinize materials or learn to use programs; too little thought is given by teachers as to whether programs are developmentally appropriate; there is not enough time devoted to teacher staff development and there is clearly a failure on the part of too many administrators and school boards to understand the importance of technology in the future.

The future of education will involve more, better, real, international and current materials; more sharing and collaboration; more threats of censorship; more need to emphasize the human side of teaching and learning; more use of critical thinking skills, more of a need to evaluate and use good judgment and above all more good teachers

Technology will not "fix" poor teaching. It will not take the place of the human side of teaching. It will not solve all of the problems related to teaching and learning. The most important thing we must remember is that the students we teach are going to live in the future and teacher education programs have a responsibility for preparing the teachers and supporting them in their classrooms.

References

Bruning, R, Schraw, G. and Ronning, R. (1995). Cognitive Psychology and Instruction: Englewood Cliffs, NJ: Merrill/Prentice Hall.

Jordan, W. & Follman, J (Eds) (1993). Using technology to improve teaching and learning. Hot topics: Usable research. Victoria, BC Canada: British Columbia Ministry of Attorney-General.

Rhodes, C. S. & Flank, S. (2000). Distance Learning: Coordination, Reactions and Reflections. Journal of Technology and Teacher Education. (forthcoming).

Rhodes, C. S. (1998). Multiple Perceptions and Perspectives: A study of faculty and students' responses to distance learning. In S. McNeil, J. Price, S. Boyer-Mehalls, B. Robin, & J. Willis (Eds.), Technology and Teacher Education (pp. 17-25). Charlottesville, VA. Society For Information Technology and Teacher Education.

Rhodes, C. S. (1997) Evaluating and selecting literature based software. Journal of Children's Literature. (23) 2. 102-105.

Richardson, V (1990). Significant and worthwhile change in teaching practice. Educational Researcher, (19) 7, 10-18.

Domains of Adaptation in Technologically Mediated Classrooms: An Ethnographic Report

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Abstract: An inductive analysis of the adaptation of graduate education students to an interactive televised (ITV) classroom generated four primary domains within which much of their adaptation occurred. These emically-derived categories – student relations, technological aspects, instructor's role, and content/class participation – provided a framework within which to assess the complex social and cultural aspects that influence student adaptation and consequent learning in ITV classes. The paper draws on analysis of hundreds of hours of observations, interviews and informal conversations with students, teachers and staff.

Introduction

Gibson (1998a), in her discussion of the success of distance learners reported that "by fall 1998, 90% of all institutions with 10,000 students or more and 85% of institutions with enrollments of 3,000 to 10,000 expect to be offering at least some distance education courses" (p. vii). Technologically mediated distance education has been around since the 1930's (Johnstone, 1991) and clearly will continue to be an increasing part of the University environment (Chute, Thompson, & Hancock, 1999). Therefore, the more we understand about teaching and learning in distance education the more capable we will be of improving it (Mitchell, 1997).

There is a significant amount of general literature on distance learning in higher education that is produced regularly (Chute et al., 1999; Ludlow & Duff, 1998; Moore & Thompson, 1997; Willis, 1993). It includes fairly standard suggestions for managing, implementing, and succeeding in interactive televised classrooms (Herrington, 1993; Moore & Kearsley, 1996; Ostendorf, 1989). Nevertheless, the call has gone out to researchers to move toward a thorough understanding of the complexities that affect teaching and learning and determine success in the distance classroom (Gentry & Csete, 1991; Gibson, 1998b; Thach & Murphy, 1995; Wagner, 1995).

In Gibson's (1998c) exploration of these complexities, she considered Bronfenbrenner's ecological theory and its relation to distance education. She concluded that the learner exists in a social context that can "profoundly affect success of the distant teaching and learning transaction." (p. 113). She challenges researchers to consider "the existence and impact of multiple forces" (p. 124) that are at work on the distant learner. In this paper we respond to that challenge by sharing some of the results of a yearlong ethnography of graduate students in an interactive televised classroom.

The Study

Cultural anthropology (Geertz, 1973) and symbolic interactionism (Prus, 1996) provided the theoretical framework for this study in which traditional ethnographic and qualitative research methods were used to gather and analyze data (Agar 1996; Maxwell 1996). Data was gathered during a one-year ethnography of graduate education classes in the inaugural year of an interactive televised distance learning classroom called the Interactive Distance Learning Studio (IDLS) (Clevenger-Schmertzing, 2000). There were two sites involved in the study, a host site which was the instructor's classroom and a remote site which had a facilitator and interacted with the instructor via technological media. Sites were located approximately 70 miles apart – one at the main university campus and the other at a branch campus. Of the 13 graduate classes included in the study the branch campus served as host for 2 courses. There were 278 students involved in classes that varied significantly in course content, course objectives, teaching style, and student responses. A database was constructed to house open-ended survey information that was completed by 140 students. The Ethnograph v.5.3 was used to analyze data that was gathered in more than 400 hours of participant observations in classrooms, formal interviews and informal conversations with students and faculty, weekly e-mail correspondence, focus group interviews, and transcripts of videotapes. Thematic coding, frequency counts, and frequent debriefings between ethnographers L. and R. Schmertzing contributed to interpretation and ongoing analysis of the data (Spradley & Mann 1975).

The quotes that have been incorporated into this paper are direct quotes from student participants that are thematically representative of statements that were made by significant numbers of students and are provided to substantiate the complex effects of elements across all four domains on students, their learning, and their attitude toward class. This data set was selected to enhance teacher educators understanding of students' dilemmas and adaptations in order to inform teacher educators on student needs and enhance their instructional design processes.

Domains: Frameworks for Data Analysis

Our approach in this study was to let students map out their significant cognitive territory around distance education and to see what categories emerged. From our analysis of student interview transcripts we defined four emic domains in which students worked to adapt. Although the domains are not unique to distance education the adaptation process through which students developed their own way to succeed within each domain was unique to the unfamiliar, complex environment of the interactive televised classroom. Consequently, establishing the domains as a way to process the complexity associated with the new technologically mediated learning environment offers insight into the multiple forces Gibson (1998c) recognized as at work in the teaching and learning processes. The domains localized issues of technological aspects of the environment, student relations within and across locations, the interrelated roles of student and instructor, and communication of content related information. In this paper we introduce three of the domains and provide examples of issues raised by students. For the domain related to instructor roles we provide only a brief overview. For a more complete discussion of Instructor Roles see Schmertzing and Schmertzing (2001).

Technological Aspects

Technological aspects of the environment surfaced as a domain in response to students who repeatedly voiced concerns about the complicated nature of the technology, the problem of associating the monitors with their traditional television viewing behavior, and their dislike of being on camera (Clevenger-Schmertzing, 2000).

In an e-mail received towards the end of the second semester of research, Milly, who had had two classes in the distance room shared her thoughts about the environment. Her primary issues during the first semester were related to technology. "I wonder what those black things are on top of the TV box things?

They really should tell us what all of this stuff does, some of us really do not know what all the 'bigger/better' stuff are supposed to do much less how it operates, its not like we have it at our school" (HP F E 150.6.26) !!! During her second semester she modified her position somewhat. "I am still learning by doing, but perhaps because it was not my first time, I felt less threatened by the equipment. I still feel an explanation of what it does, what it is, is in order at the opening session if we are to be put upon to work them" (HP F E 150.6.26).

Milly raised four significant issues in her comments. First, she had a curiosity about the technology but at the same time she felt somewhat threatened by it. Second, she did not think that she had enough training and information to get confident in her use of the equipment so she continued to "learn by doing." Third, she believed an explanation about the technology is "in order" and last, her perception was that she was being "put upon" to have to learn the equipment. These four technologically related issues were typical of the complex dilemmas that Milly and others struggled to resolve in their efforts to adapt to the distance classroom.

Mariah, a student who watched the instructor on television, realized that she was distracted because she had trouble accepting the TV as a two-way medium. "You forget that you are in a classroom. You are so used to watching TV this one way. You can do whatever you want in your living room in front of the TV and no one can see you but in this instance, it is two-way and you forget that. [...] I find myself doing things that I wouldn't do if an instructor was sitting right in front of me" (RFt F I v17). Mariah was aware that her behavior in class was different because she connected the television to her home atmosphere and had to force herself to work toward proper classroom behavior, something that came naturally to her in the traditional classroom. Other students identified feelings of "awkwardness" and "separatedness" and complained of "struggling" and "daydreaming" as consequences of having to "watch the TV screen."

In the IDLS, students were required to push a button to activate their microphone if they were to participate properly. When the button was pushed the camera focused on the student who could then be seen and heard at both sites. Essentially this technology required students to shift their cognitive processes away from the central issues of the course to the use of the technology in order to actively participate in the class. For some the shift was only a momentary distraction while for others it was monumental. Monique was asked about memorable experiences she had in her distance learning classes. She replied, "Not knowing which camera to look at. Oh dear, so that you're not facing the wrong way. The first few times that camera panned in on me, that was frightening and you pushed that button and you froze" (RFt F I v8.880). Monique initially admitted her own lack of understanding when she said she didn't know "which camera to look at," but then she shifted to talking about her response to what she saw as the action of the camera. The "camera panned in on me," she said. Then, as she described her reaction to being on camera, she used words like "frightening" and "froze." She was not alone in her perception that the technology acted on her. Molly e-mailed me to say, "I didn't speak for a couple of weeks in class because I didn't want my face to pop-up on the screen" (HP F E 10.5.17). In her mind the technology made her face "pop-up on the screen."

The active role students assigned to the technology and the complexity associated with understanding how it worked are two of the elements that defined the technological aspects domain and were of fundamental importance to students and teachers in the IDLS. When technological aspects of the room were attended to in intentional ways that allowed students to openly express their concerns or anxiety about the technology, students adapted more quickly to the environment and were more capable of maintaining a focus on learning.

Student Relations/Location

One of the elements that allows classrooms to function effectively is the symbiotic relationship between the social structure of the classroom and interaction that occurs there (Metz, 1978). In the IDLS when the physical structure of the classroom was changed such that the four walls of the room no longer defined membership in its social structure, students had to re-formulate their understanding of membership in their classes. Though membership in the academic structure of the classroom was defined by the schedule and the instructor that was not the case for membership in the social structure. The academic structure required all the students in a given class to meet at the same time with the same instructor to study the same subject even if they were in different locations. The academic structure did not, however, translate into a social structure that accepted all students as equal or like participants in the class. Moreover, the structure often spawned two separate and competitive groups with distinct ideas about membership in their own group, as well as membership in the other group (Clevenger-Schmertzing, 2000). The student relations/location domain accounts for this reformulation of class membership and the complications that accompanied it.

Mary judged her fellow classmates differently based upon whether they were members of her own site or the other site.

> I judge the people in my classroom [her sitemates] and I know they judge me. But maybe we get to know each other a little bit, maybe not on a personal level but you can listen to their conversations when they are talking with somebody that sits across from them, you pick up a little bit on that or you say, "Hi," to them. You chit chat for a minute, [...] So they become more a part of what your environment is when you're in there. Where the people in [the other site], I don't think are part of my environment. They're not people that I know and see their personalities, but they're like people on the screen. I don't know, it is weird. [...] It is different because they are not in your classroom. You don't walk in and see that they are sitting over there with their coke and talking to somebody about something. (HFt F I v14.1336)

Mary was struggling to make sense of classmates who were an extension of her class but not directly part of her environment.

Stan, one of the remote students also noticed that relations were different when all the classmates were not in the same room. "It's easier not to listen when they [other students] are not really in the room with you. [...] It's disrespectful when someone's talking to you and you are not listening. It's easier to be disrespectful when they are in another city. It's easier not to listen (RFt M I s11.8)." For Stan, the natural division created by the televised classroom changed the make-up of the class and introduced complications in the way he defined himself in the class in relation to his fellow classmates. Now, if he chose to accept the students at the other site as his classmates, he had to work harder to maintain the image of being a respectful classmate than if he chose not to accept "their" presence as part of his class.

Stephanie's comments provided further insight.

> Some people really get off to being on camera. [...] And, because I don't know her and she is in [the other site], not here, it is not fair for me to assess somebody that I can't be in the classroom with [...]. But my opinion, being over here and not knowing her is something else. And, it doesn't bother me but I just think, well, I guess it does bother me or I wouldn't be speaking about it but I think, is this just who she is or is it the fact that, "I can be on camera" and I just don't know. (RFt F I v14)

Stephanie was struggling with how to think of her separated classmates, but she did not quite know what to think or how to act.

As students made sense of the situation and developed their own way of adapting to the new physically divided, yet socially connected classroom, they constructed meanings about what it was to be a member of "their" site and what it was to be a member of the "other" site. These meanings affected the way students then related to one another, which in turn, had the potential to, and did, affect the class as a whole, most often in negative ways.

Understanding who constitutes a class is important because classes are shared experiences where interaction between students contributes to successful learning, (Burnett, 1973; Maher & Tetreault, 1994; Wilcox, 1982). On the simplest level such interaction may involve being courteous to others and on the more complex level it may involve the exchange of significant ideas (Musgrove, 1973). The level at which student to student interaction occurs in a class is effected by issues in the student relations/location domain. Those issues include how students feel about each other, how trusting they consider other students to be, and how they construct the list of who they think of as "their class" (Jackson, 1968).

Instructor Role

As students adjusted their thoughts on what the instructor's role in the new classroom was to be, they simultaneously adjusted their thoughts on what their own role was in creating successful classroom experiences. The patterns of adaptation that students worked through as they experienced classes in the IDLS seemed to take one of two directions. They either moved toward a team approach of sharing responsibilities with the instructor, or they moved toward maintaining expectations that the instructor was more completely responsible for activities and learning in the classroom. Student statements within this domain often expressed the expectation that the instructor needs to offer new rules for classroom behavior, bridge the distance gap between the sites, maintain a focus on content, and help students adapt to the new learning environment (Schmertzing & Schmertzing, 2001).

Content/Class Participation

"Competent participation in classroom contexts requires knowing what context one is in" (Mehan, 1980, p. 137). Context here refers to the complex interactions that occur as participants in the classroom build the floor of conversation by simultaneously listening and speaking to each other (McDermott & Roth, 1978; Shultz, Florio, & Erickson, 1982). In order for these interactions to occur in a way that communicates the intended course related content, participants in the traditional classroom learn to read the cues used by other participants to find the appropriate time and place to take the floor (Doyle, 1977; McDermott, 1977; Snow, 1968).

Students pre-IDLS understanding of how these cues worked was not sufficient to guide them in developing cues for efficient communication of content-related material in the distance classroom. The technological filter changed the procedures associated with speaking in class, the consequent pacing of the class, and the ways students viewed themselves and their involvement in class activities.

Mannie, a student from Pensacola, spoke of the way the technology changed communication patterns and disrupted the traditional ways that students were accustomed to participating in class.

> Usually [in a traditional classroom] their hand goes up, they are called on, usually start talking, and another thing, we're so used to interrupting each other. Even if we're quiet we wait until someone has finished and then just speak out before raising our hand. Now [in the IDLS] I think some people aren't, might not be, quite as willing to do that, because they have to, there's the button war over the microphones. If they were all open mics, that would be more fun I think, but we, being so spread out the camera needs to go to each of us. (HP M I p220)

In Mannie's words, the technology changed the procedure from "speaking out as someone finishes" to a hesitation to get involved in a "button war." Maggie, another host student, was concerned about the loss of freedom that accompanied the procedures that Mannie termed "button wars."

There's not this sense of, if we're in a classroom, you and I and many others in the class, we can just talk freely. And move in and out of conversations without being invited to do that. [...] I think in distance learning you cannot do that. I've seen a couple of times where people have pushed buttons at the same time, from [both sites], and they say, "Oh no, you go," and "Oh no, you go." And it tends to be like, "Well, maybe I didn't have anything to say," when it comes back to me, because it's no longer spontaneous. I think that discussions have really lacked, because of the environment of the system forming at this point in time. (HP F I p4.13)

What started out as a well-intended contribution to class got side tracked because of the awkwardness associated with trying to navigate the discussion through a technological medium.

> *Claire:* Often times, especially at the graduate level, jumping in [to a class discussion], in a smaller setting is acceptable. The rules are not quite as stringent as they are in an undergraduate setting with a large class. [...] I think it is a little more difficult to just jump into a conversation [in the DL classroom] because you have to actually, physically make an effort to hit a button and wait a second before you're recognized. You can't just say, "Oh yea, that reminds me blah, blah." I think a bit of the spontaneous comments are curtailed. [...] I know that I don't jump in unless I know that I know the answer, whereas, in another classroom, I might just throw something out. [...] Whereas, in a distance setting, I tend to not do that, but respond only when I'm pretty sure I have a good idea of what I'm saying.
>
> *Intrvr:* Why do you think that is?
>
> *Claire:* I don't know. I think there is something about everyone being in one room that feels more intimate, that feels more private and, I think that when you add the cameras, you feel like you're going public. I feel more like I'm speaking publicly, like I do when I'm standing in front of a class. [...] If I'm teaching a class and I stand up in front, I get this little nervousness, even if you do it every day, and you feel, okay, I'm on display, I'm on show, here we go. I get a little bit of the same feeling

when I jump into a conversation in [this environment] because everyone, all of a sudden, looks at you. Whereas, if you are sitting at a desk in a room and you just throw something out for comment, I don't feel in charge or on display or like I'm the presenter. Instead, I feel just like one of the group. (RFt F I v17.196)

Claire identified three things that inhibited the spontaneity that she expected in her graduate classes; the "physical effort" that was required, that there was a need to "get [formal] recognition," and the "intentional pause" that slowed things down. She also identified an awkward new awareness of herself in the class. Claire felt more like she was "speaking publicly," "standing in front of the class," "on display," and being looked at by everyone. Participation in class discussion in the IDLS did not "feel" the same to her as "being one of the group" in the traditional classroom where she would be "sitting in a desk and jump into the conversation." Thus we can see that the effort to adapt to the process of communicating course-related material through a screen of unfamiliar technology hindered students' class participation in the two-way interactive televised classroom. Furthermore, it is clear that teachers and instructional designers, who make an effort to understand the complexities associated with content related interaction in the distance classroom, will be able to make adjustments that will significantly improve the teaching and learning dynamic in such contexts.

Conclusions

This brief introduction to the four domains of an interactive televised classroom in which students attempt to adapt, suggest the complex and varied nature of that process. By identifying these domains we are locating the complexity of distance education in a research-based context that also allows us to begin to understand that complexity. We believe that this research has implications for the way instructional designers think about learner needs, provides important informational context for teacher educators who are concerned with facilitating student adaptation, minimizing their frustration, and freeing them to focus on content rather than process. Further, the concepts referred to in the domains not only provide a basis for a discussion of new strategies for instructors, but also incorporate the ideas of graduate students into the equation of what it takes to more effectively move both learner and instructor toward accomplishing their goals.

References

Agar, M. H. (1996). *The professional stranger* (2nd ed.). San Diego, CA: Academic Press.

Burnett, J. H. (1973). Event description and analysis in the microethnography of urban classrooms. In F. A. J. Ianni & E. Storey (Eds.), *Cultural relevance and educational issues: Readings in anthropology and education* (pp. 287-303). Boston, MA: Little, Brown and Company.

Chute, A. G., Thompson, M. M., & Hancock, B. W. (1999). *The McGraw-Hill handbook of distance learning.* New York: McGraw-Hill.

Clevenger-Schmertzing, A. L. (2000). *Graduate student perspectives on an interactive distance learning studio: Culture and adaptation in technologically mediated classrooms.* Unpublished doctoral dissertation, University of West Florida, Pensacola, FL.

Doyle, W. (1977). Paradigms for research on teacher effectiveness. *Review of Research in Education, 5,* 163-198.

Geertz, C. (1973). *The interpretation of cultures.* London: Perseus.

Gentry, C. G., & Csete, J. (1991). Educational technology in the 1990's. In G. J. Anglin (Ed.), *Instructional technology: Past, present, and future* (pp. 20-33). Englewood, CO: Libraries Unlimited.

The impact of instructional technology on student achievement

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Abstract

For the evaluation of The WEB Project, a Technology Innovation Challenge Grant (TICG), RMC Research Corporation developed a conceptual framework to measure the impact of instructional technology on student achievement, based on an extension of Sternberg's (1998) Developing Expertise Model. Structural equation modeling, using student surveys, teacher observations of student learning processes, and teacher-scored student products, revealed paths that correlated motivation -> metacognition -> learning processes -> student achievement. This model may be replicable for evaluators who must report impact on student achievement for TICG or PT3 grants using assessments other than standardized test scores.

The WEB Project is a five-year Technology Innovation Challenge Grant that was completed in September 2000. The purpose of this project was to infuse standards-based instruction in multimedia, digital art, music composition, and online discourse into the general arts and humanities curricula of Vermont K-12 schools. Multimedia technology was incorporated within six academic content areas: art, music, technology, history/social studies, English/language arts, and interdisciplinary studies.

Students shared their works-in-progress with a virtual community consisting of teachers; other students; and digital artists, traditional artists, musicians, composers, Web page designers, and other experts via a virtual learning environment called The WEB Exchange, which resided on The WEB Project's server. Through threaded design conversations, students requested feedback on their works of art, music, and multimedia, filtered the feedback they received, and used it to improve their final artistic products, which many of the participating students then posted on The WEB Exchange. Concurrently, language arts students, facilitated by language arts teachers and mentors from the Vermont Center for the Book, discussed curriculum-related texts. Moderating their own discussions, students engaged in deep, rich dialogue that focused on standards-based activities such as responding to text, substantiating arguments with evidence found in the text, informed decision making, and the like. These interventions were stable over the last 2-3 years of the 5-year grant.

One of the research questions posed by the RMC Research Corporation evaluation team in evaluating this project was, "What is the impact of The WEB Project on student achievement?" Our intent was to generalize our methodology to other instructional technology grants in which student achievement must be reported. Findings from an online survey of The WEB Project teachers and administrators, repeated in spring 1998, 1999, and

2000, indicated that a connection between student motivation, metacognition, and learning processes, as outlined in a conceptual model developed by Sternberg (1998), might be applicable.

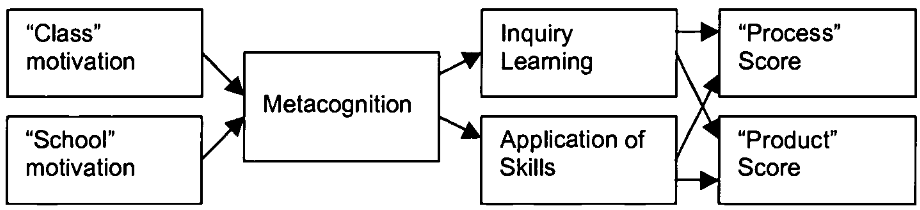
According to Sternberg, motivation drives metacognition, which, in turn, stimulates the development of thinking and learning skills. Thinking and learning skill development further stimulates metacognition, resulting in the development of expertise. The evaluation team extended the Sternberg Developing Expertise model to define "expertise" as student achievement, as measured by teacher-created rubrics. Participating teachers developed, refined, and benchmarked rubrics for student-created products over the past three years. Teachers also selected a rubric for measuring student learning processes from Marzano et al.'s (1993) Dimensions of Learning model. The rubric addressed depth and richness of revisions of student-created products and performances.

Using mixed methods that consisted of the online survey, student pretest and posttest surveys, and scores on teacher-created/selected rubrics that assessed students' learning processes and final products, the evaluation team used structural equation modeling to correlate the various elements of the extended Sternberg model. The hypothesis was that motivation would drive metacognition; metacognition would drive thinking and learning processes (specifically, inquiry learning and application of skills - two scales derived from WEB Project-based activities identified by participating teachers); and increases in thinking and learning processes would result in increases in teacher-scored measures of student achievement. The student survey was pilot-tested in spring 1999, and three derived scales (metacognition, inquiry learning, and application of skills) had high internal consistency (alpha = .72 to .84). Two ten-item sets of questions for "in this class" and "in school in general" motivation were added to the survey in spring 2000.

In January 2000, the survey was administered to 165 students in nine cooperating schools. 137 responses were from students who had not yet been exposed to the intervention, and could therefore be used as pretests. Internal consistency reliability for all scales (class motivation, school motivation, metacognition, inquiry learning, and application of skills) ranged from alpha=.70 to alpha=.87. In May 2000, at the end of the spring term, the survey was re-administered as a posttest to the same group of students. 131 completed surveys were returned by all nine schools as of August 2000. About 75% of the students who responded were from high schools, 25% from middle schools. Gender was about equally distributed.

Seventy-six valid data sets were matched in order to conduct a true repeated measures methodology (pretest vs. posttest). Only the "application of skills" scale increased during the spring term (2-tailed significance = .0165).

For the path analysis, the posttest survey results were correlated with teacher assessments. Participating teachers assigned a "product" score of "0" (no evidence), "1" (approaches standards), "2" (meets standards), and "3" (exceeds standards) to their students' final products. Products were re-scored by a jury of experts to increase reliability, resulting in 91 reported "product" scores. 107 teachers assigned a "process" score of "1" (low) to "4" (high) to each of their participating students for the quality and depth of revisions of their final products, which they construed as a measure of student learning processes. These data constituted two independent measures of student achievement, which served to complete the model.



Four separate simplified path analysis models were tested. The first pair addressed process and product outcomes for class motivation, and the second pair addressed school motivation. The statistically significant ($p<.05$) results were as follows:

Motivation was related to metacognition. The relationship between class motivation and metacognition was slightly stronger ($R=.307$, $p<.0001$) than the relationship between school motivation and metacognition ($R=.282$, $p<.0001$).

The relationship between metacognition and inquiry learning (Beta =.546, $p<.0001$) was stronger than the relationship between metacognition and application of skills (Beta=.282, $p<.0001$).

The relationship between inquiry learning and the student learning process outcome (Beta=.384, $p=.001$) was stronger than the relationship between application of skills and the student learning process outcome (Beta=-.055, not significant).

The relationship between application of skills and the student product outcome (Beta=.371, $p=.004$) was stronger than the relationship between inquiry learning and the student product outcome (Beta=.063, not significant).

Clearly, correlation does not imply causality. However, when each of these elements was considered as an independent variable, there was a corresponding change in associated dependent variables. For example, there was a significant correlation between motivation and metacognition, indicating that students' enthusiasm for learning with technology may stimulate students' metacognitive (strategic) thinking processes. The significant correlations between motivation, metacognition, inquiry learning, and the student learning process score indicate that motivation may drive increases in the four elements connected by the first path. Similarly, the significant correlations between motivation, metacognition, application of skills, and the student product score indicate that motivation may drive increases in the four elements connected by the second path.

Based on the significant correlations of the two teacher measurements of student achievement with the student survey data, these data validated the evaluation team's extension of the Developing Expertise model to explain increases in student performance as a result of engaging in technology-supported learning activities. Moreover, nearly all students across the project met the standards for both the teacher-created student product assessment and the learning process assessment. This indicates that, in general, the project had a positive impact on student achievement.

These preliminary findings suggest that teachers should emphasize the use of metacognitive skills, application of skills, and inquiry learning as they infuse technology into their respective academic content areas. Moreover, these activities are directly in line with the Vermont Reasoning and Problem Solving Standards, and with similar standards in other states. The ISTE/NETS standards for assessment and evaluation also suggest that teachers apply technology in assessing student learning of subject matter using a variety of assessment techniques; use technology resources to collect and analyze data, interpret results, and communicate findings to improve instructional practice and maximize student learning; and apply multiple evaluation methods to determine students' appropriate use of technology resources for learning, communication, and productivity.

Rockman (1998:3) suggests that "A clear assessment strategy that goes beyond standardized tests enables school leaders, policy makers, and the community to understand the impact of technology on teaching and learning". RMC Research Corporation's extension of the Sternberg model can be used to organize and interpret a variety of student self-perceptions, teacher observations of student learning processes, and teacher-scored student products. It captures the overlapping kinds of expertise that students developed throughout their technology-related activities.

One of the greatest challenges facing the Technology Innovation Challenge Grants and the Preparing Tomorrow's Teachers To Use Technology (PT3) grants is to make a link between educational technology innovations, promising practices for teaching and learning with technology, and increases in student achievement. We believe that this model may be replicable in other educational institutions, including schools, districts, institutions of higher learning, and grant-funded initiatives. However, to use this model, participating teachers must be able to clearly identify the standards they are addressing in their instruction; articulate the specific knowledge and skills that are to be fostered by using technology; carefully observe student behavior in creating and refining their work; and create and benchmark rubrics that they intend to use to evaluate student work.

References

Marzano., R.J., Pickering, D., & McTighe, J. (1993). Assessing student outcomes: Performance assessment using the Dimensions of Learning Model. Littleton CO: McREL Institute.

Rockman, S. (1998). *Communicating our successes: Issues and tactics.* Unpublished manuscript.

Sternberg, R.J. (1998, April). Abilities are forms of developing expertise. Educational Researcher, 27 (3), 11-20.

Use of Nvivo for Classifying Synchronous Dialogue Resulting from Web-based Professional Development

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Abstract: A SITE 99 paper by the author (Shotsberger 1999) extended the work of (Blanton, Moorman & Trathen 1998) to generate a framework for analyzing synchronous dialogue generated from a Web-based professional development program. The current study attempts to further refine the framework through the use of qualitative analysis software called Nvivo (Scolari Software 1999). The Nvivo program was used to analyze chat transcripts from two different years of a Web-based inservice program for mathematics teachers. The 1997 transcripts from the previous study were re-analyzed using the Nvivo program. Then transcripts from 1998 were analyzed using Nvivo to attempt to validate the new classifications suggested by the re-analysis.

Background

(Blanton, Moorman, & Trathen 1998) classified forms of dialogue that take place in a telecommunications environment, focusing exclusively on asynchronous dialogue. The authors defined Convergent situations as those in which participants assume one correct answer, as opposed to the Divergent condition in which multiple interpretations are possible. Critical situations are defined as those involving some kind of analysis, questioning or perhaps skepticism, and this is contrasted with an Inclusive environment in which each participant's contribution is valued and accepted. The classifications therefore represent intersections of pairs of these situations: Instruction (convergent-critical), Debate (divergent-critical), Inquiry (convergent-inclusive), and Conversation (divergent-inclusive).

A SITE 99 paper extended this framework to encompass synchronous dialogue generated from a Web-based inservice program for mathematics teachers (Shotsberger 1999). Chat transcripts were analyzed from online meetings held during Fall semester 1997 among 13 participants and three facilitators. Participants were primarily high school and middle school mathematics teachers. Analysis focused on the portions of the chat transcripts that dealt specifically with some aspect of the training materials. The following categories of synchronous dialogue emerged from the analyses (an example of each is provided in parentheses):

Affirmation of another participant's efforts ("I like that ....")

Belief about teaching/learning ("I think that a group needs half and half strong [students].")

Concern about implementation ("The really smart kid may talk too much like a teacher...and turn the weaker kid off.")

Current practice ("I use groups on the average of once a week...it is not my main thing.")

Desire to implement ("I also want to do some on line researching for some things that I don't have time to search for now.")

Intent to implement ("I had planned to use the scoring sheet and their scores as part of the analysis.")

Question about implementation ("Does everyone else sit [students] in rows and then move to groups or are your desks in groups?")

Result of implementation ("My other 2 groups with the exception of a very few that are full of raging hormones really work well in groups.")

The categories of dialogic behaviors identified from the chat transcripts seemed to fall under the classification proposed by (Blanton, Moorman, & Trathen 1998) in the following way:

Instruction: *Current practice; Question; Result*

Debate: *Belief; Concern; Current practice; Result*

Inquiry: *Affirmation; Desire; Intent; Question*

Conversation: *Affirmation; Current practice; Belief; Concern*

The 1999 study was presented as a work in progress. The current study attempts to further refine the framework through the use of qualitative analysis software called Nvivo (Scolari Software 1999). As an organizational tool, Nvivo is superlative. It allows for annotations of transcripts using any desired classification scheme, and thus affords the user the ability to generate reports that can isolate one category of dialogue as well as compare instances of a given category across transcripts. (Fig. 1) shows one page of search results for instances of participant *Beliefs about teaching and learning*. Nvivo also provides the capability to graphically organize categories into an integrated whole, building up nodes and connections layer by layer in order to derive a sound theoretical framework from the analysis. (Fig. 2) displays the theoretical framework resulting from the (Shotsberger 1999) analysis.

The Nvivo program was used to analyze chat transcripts from two different years of the Web-based professional development program. The 1997 transcripts from the previous study were re-analyzed using the Nvivo program. Then transcripts from 1998, which represent dialogue generated by a different group of eight middle and high school teachers and one facilitator, were analyzed using Nvivo to attempt to validate the new classifications suggested by the re-analysis.

As a result of using Nvivo, the following additional categories and sub-categories of dialogic behavior were identified:

The category of *Current practice* needs to be differentiated into sub-categories that include separate considerations of Students, Curriculum, and Methods.

The category of *Results of implementation* needs to explicitly address whether outcomes were Positive or Negative.

The category of *Affirmation* needs to add sub-categories that differentiate between affirmation for Actual Implementation or Proposed Implementation.

A new category of *Realization* needs to be added to the framework, which will take into account new participant understandings resulting from dialogue with other participants. This new category of *Realization* might be classified under either Inquiry or Instruction in the framework.

Presentation of project results at SITE 2001 will include a demonstration of the Nvivo program, samples of annotated transcripts, reports and graphics generated using Nvivo, as well as the latest version of the framework.

Document 'Teacher's Role First Chat -- Fall 97', 18 passages, 1364 characters.

Section 0, Paragraph 34, 55 characters.

the questioning part is the key to most of my teaching

Section 0, Paragraph 41, 125 characters.

basic classes have to be "led" a bit differently...but once you get them to listen to ecah other...it can be quite productive

Section 0, Paragraph 49, 81 characters.

I think that good questioning is one of the most valuable teaching skills we have

Section 0, Paragraph 50, 81 characters.

It is still hard for them to think of anyone but themself at the 8th grade level

Section 0, Paragraph 63, 135 characters.

I think it's important to let students think alone for a few minutes before putting them into groups. Lets the slower ones participate

Section 0, Paragraph 64, 40 characters.

think-pair-share is also good for groups

Section 0, Paragraph 94, 96 characters.

i believe the eoc will be "covered" if the kids really understand...that's why they need to talk

Figure 1: Sample of Nvivo search results

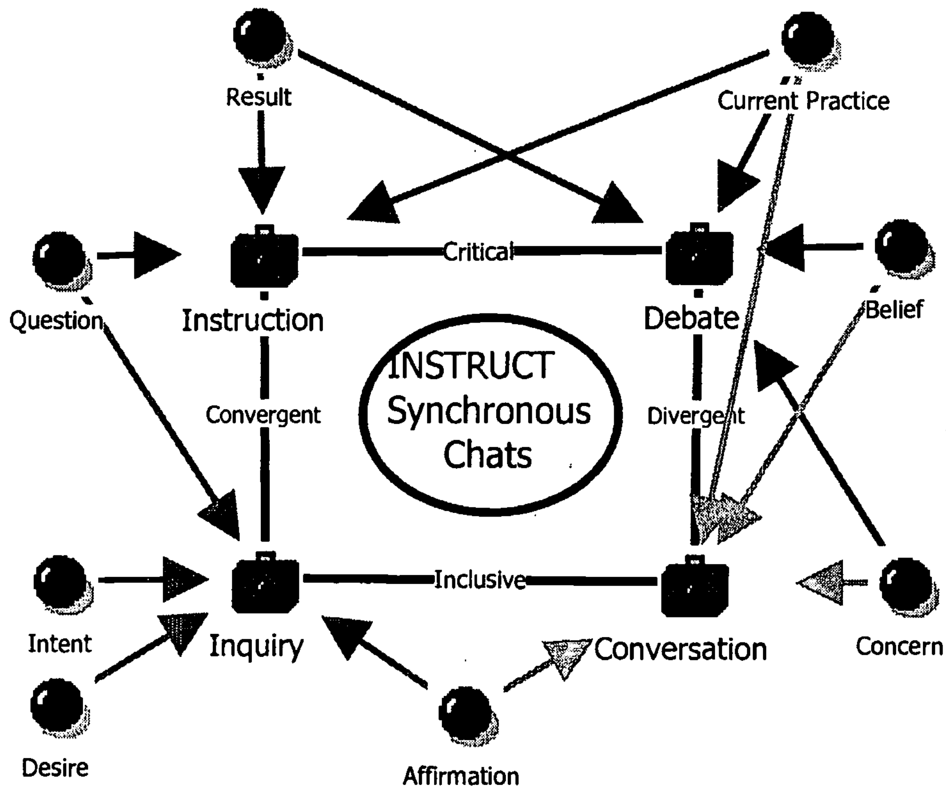

Figure 2: Sample of Nvivo graphical organization

References

Blanton, W.E., Moorman, G., & Trathen, W. (1998). Telecommunications and teacher education: A social constructivist review. *Review of research in education, 23* , 235-275.

Scolari Software (1999). Qualitative Solutions and Research Nvivo 1.1. SAGE Publications, Thousand Oaks, CA.

Shotsbergerp, P.G. (1999). Forms of Synchronous Dialogue Resulting from Web-based Professional Development. *Technology and Teacher Education Annual, 1999.* Association for the Advancement of Computing in Education, Charlottesville, VA. 1777-1782.

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Professional Development On-line - Doing IT Pedagogically

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Abstract: This paper describes the first phase of a research study to examine the role played by Internet-based teacher professional development in the implementation of an innovation. The innovation in this study is the software application (*StageStruck*) for the performing arts. The professional development web site has been developed to support inservice teachers in best practice use of the software. The cases investigate the effect of this the on-line professional development strategy and teacher implementation of the software with elementary and secondary inservice teachers.

In this first phase the web site portal (http://www.stagestruck.uow.edu.au) has been established to build and support a community of practice in the performing arts areas of learning. The web site development has been an iterative process based on an understanding of best practice in professional development, a review of the literature and exploration of cases available in and about on-line communities, and the contributions and ongoing evaluation of our community members (teachers and students). The current phase of the research begins the data collection of data on the efficacy of the on-line professional development strategy employed.

Professional Development

There is an imperative for new professional development strategies and for teachers themselves to take more control and have ownership of their personal professional development (Fullan 1993). Principles of effective professional development emphasise ongoing activities that build on current practices, in a climate where teachers can take risks as part of a "learning community"(Bull et al. 1994, ACOT 1995, US Dept Education 1996, Grant 1996, Loucks-Horsely & Hewson 1998, Stager 1998). This learning community can be a space where teachers support and learn from each other and take the time to reflect on the effectiveness of change. Novices in the community may collaborate with peers, work alongside experts, share, explore and learn as part of a network. Members can embrace more than a change in skill-set, they can test out new pedagogical frameworks and environments. Technology allows such a community to break out of its geographic confines by linking the members on-line. It is recognised that the best work with on-line communities of practice is still to come. It is suggested that this will happen as the technology becomes more accessible and projects develop that embody the research findings (Ravitz 1997).

The on-line technology has become quite readily accessible. In 2001 nearly all Australian schools will access the Internet through ISDN (64K) connections and figures from a 1999 census show 22% of Australian homes had Internet access with projections showing this figure steadily increasing (ABS 1999). There is much the same picture of technology uptake across many other nations.

The research findings alluded to by Ravitz (1997) relate to new paradigms for professional development and web site design. Designs of on-line communities that are needed to support teachers as professionals in both technical skill development and the broader issues of implementation of constructivist learning theories in their classrooms. Much of the on-line professional development available for specific information technologies or programs will deliver activity directed toward skill development and mastery of the application. Many web sites deliver step by step tutorials to develop competence in the mechanics and productivity of the software. However there is good evidence that teachers, like many other professionals, will not take the time to learn a new piece of software unless they perceive sound practical classroom use which is in keeping with the needs of the curriculum.

This study employs an on-line approach to facilitate not only teacher development of skills but, most importantly for them to explore, model, lead, design and evaluate constructivist learning activities and environments in their classrooms. The site offers teachers many opportunities to make explicit for themselves the connections between activity, pedagogy and curriculum.

The Innovation

StageStruck, the University of Wollongong's award winning interactive CD-ROM product, introduces the learner to the world of performing arts by exploring a performing arts venue (the Sydney Opera House) which showcases contemporary companies, performances, processes and people, and provides theatres and 'tools' with which a learner can create and direct scenes. The StageStruck project sought to focus on the construction of multiple meanings in a field that many would argue is highly subjective and open to numerous interpretations.

Many students have a narrow perception of how a theatrical performance is devised due to the lack of exposure or opportunity to view or take part in the performing arts. By extending the boundaries of interactivity in the context of a virtual setting, learners are provided with opportunities to express their own cultural interpretations and understandings. In this theatrical journey there is the advantage of working with many visual metaphors. The world of theatre, opera, music theatre, dance and contemporary performance styles can be explored through devices such as 'The Green Room' where the user can interrogate a database of the contemporary world of performing arts. The 'Stage' space provides the opportunity to view sample scenes from productions which have been created by professional directors, and more importantly to individually direct and design their own scenes with access to the same theatrical elements. In this process individual users explore processes of visual design, sound development, and the concept of direction and motivation. In this project the construction tools have also been extended to enable the user not only to collect from a defined set of resources, but also to construct their own resources based upon combinations of sets, costumes and performers. This supports the theatrical outcomes of many interpretations of each scene.

Key to the communication of the experience within this application is the facility to save and share files between learners or to re-present a constructed performance and interpretation to others located within the same classroom or across the Internet. This last act offers the potential to create a range of resources that are not bounded by the storage capacity of a prepackaged CD-ROM but are collected and shared from an ever growing unbounded Internet learning environment.

Emerging software programs like *StageStruck* offer teachers a pedagogical sophistication unavailable until now. This software itself is an innovation. The program's learner centred approach gives students the opportunity to write, build and direct performance pieces, theatrical sets and costumes. It allows them to design, experiment and problem solve in a visually rich and stimulating environment. Use of StageStruck therefore, like many other technological innovations, will go through a process to reach implementation. Diffusion is defined by Rogers (1983) as the process by which an innovation is communicated through certain channels over time among the members of a social system. The four main elements are the innovation (StageStruck), the communication channels (the on-line technology), time and the social system (performing arts teacher K-12). The on-line community has been chosen because it has the potential to be an efficient and cost effective way to promote all these elements and to realise professional development goals.

Professional Development and Information Technology for Pedagogy

Current literature and best practice for professional development and on-line learning converges on the concept of on-line communities of practice. What is a community of practice and how might it serve to offer pedagogical support to practicing classroom teachers? Community is a much-argued concept. Long before the "community" went on-line social scientists had disagreed about what a community was. Thousands of print and web pages are devoted to trying to adequately define, refine and finesse what an on-line community is. Rather than define the term 'community' this study examined the available on-line activities that were promoted as communities, their goals, attributes and activities. We did this in order to develop a set of hallmarks for community.

We found community in Tenenbaum's (1998) Media Center Project and Cannings & Stager's (1999), NetAdventure, EdNet@UMass (Reilly, 1999) and the Indiana University (1999), Internet Learning Forum to mention a few. These projects have all explored the development of communities of practice with a particular

focus on support for pedagogical change, a focus that is critical to the StageStruck Professional Development Community. The hallmarks of these projects are:
- A clear focus driven by the members
- Employment of appropriate technologies and styles of communication
- Membership of a social network where their expertise, leadership, content, and contributions are valued.
- Providing ongoing discussion, sharing of, and collaboration on, commonly valued things.

The StageStruck Professional Development Community web site strives to be recognised by its community members for the same hallmarks. Preliminary research has provided insights Ito member's needs and laid the foundation for the community's goals. The web professional development approach incorporates varied opportunities for teachers to be leaders and mentors, learners, and to share their teaching programs and products to support the main goal of creating a community of best practice.

The Research Program

The professional development program has been designed for cognitive flexibility to allow teachers (and students) to visit and revisit aspects of the site and enter from many different perspectives. Whether through animated tutorial sequences or a series of events, units of work, student work samples, mentor and project activities or discussions, teachers have the opportunity to share, reflect on and lead the practice of their peers.

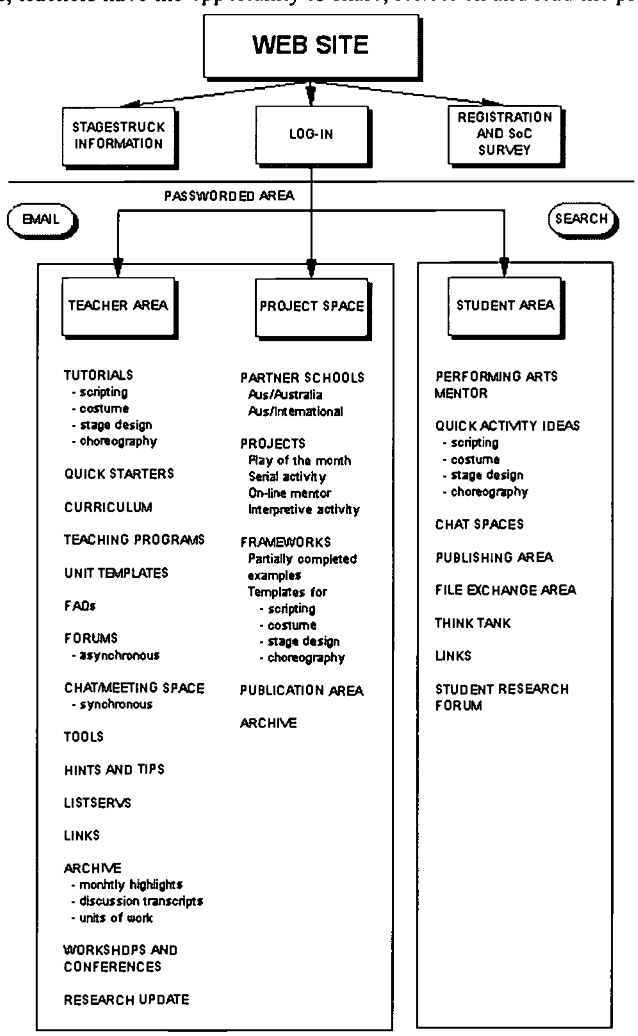

Diagram 1 The Community Web Site Design

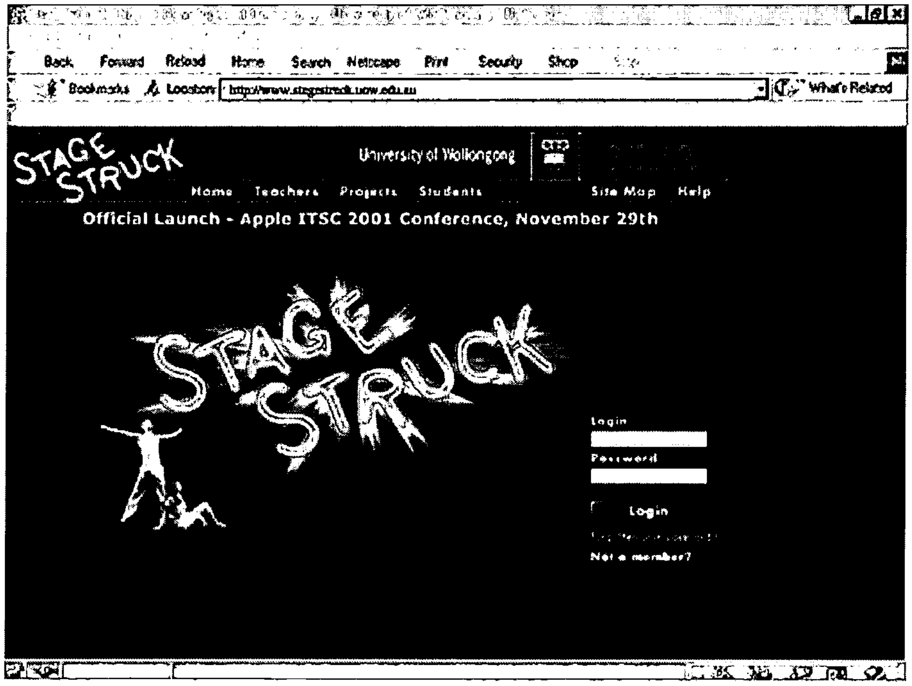

Diagram 2 The Interface Design

Clear focus driven by the members		
• Think tanks • On-line tutorials • On-line meetings	• Resource upload/download • Quick Starter pages • Links to professional associations	• Publication area • Member project proposals • Feedback and suggestion forms
Employ appropriate technologies and styles of communication		
• Resource database • FAQs • Listservs • Threaded discussions	• Chat topic and guests • Links • Browser-based publishing • Archives	• Project activities • Template and PDF files • Ideas forums • F2f functions & events
Members feel part of a social network where their expertise, leadership, content, and contributions are valued.		
• Groups (K-6, 7-10) • Leadership & mentor program • Buddy activities (novice/expert) • Collaborative project development	• Member moderated/lead discussion • Experts on-line program • Rewards and accreditation for member activity • Promotion of local f2f activity	• Student publishing on-line • Schools link-up for local & International project partners • Publicising and encouraging member workshops & publications
Provides ongoing discussion, sharing of, and collaboration on, commonly valued things		
• Syllabus forums • Links • Celebration of student works & achievements • Teaching programs	• Database to support sharing units of work • Classroom practice forums • Member moderated/lead discussion	• Tutorials • Student research forum • Calls for participation in member developed projects • Workshops & conferences

Table 1 Community Hallmarks Mapped Against Planned Internet Activities and Features

A central tenet of professional development and school reform is the creation of an enabling participant-driven environment for students and teachers alike. Web technology shares and promotes this same imperative. The key dynamics of the World Wide Web and school reform are exactly the same. (Tenenbaum 1997 p485)

The StageStruck Professional Development Community aims to test this tenet over a two year period. The research seeks to explore how and to what extent an Internet-based professional development network can support the implementation of innovation. The research seeks to answer the following questions.

- What affordances of Internet technologies (WWW, e-mail, listserv, chat, Java, and CGI) can be harnessed to create effective professional development experiences?
- Through which professional development experiences can teachers express and work to address their needs and concerns about the innovation?
- How can Internet activities be designed and developed over time to attract and maintain a community of users?
- What Internet activities best build and sustain a community of practice?

The central research methodology uses instruments adapted from the Concerns Based Adoption Model (Hall et al 1973, Hall & Hord 1987). These instruments are used to assess teachers' entry level of adoption of StageStruck and the level after 6 months, 12 months and 2 years of involvement as a community member. The innovation configuration (best practice components of use) will be surveyed to describe the pedagogical environment that teachers have developed in their adoption of StageStruck. Structured interviews, focus groups, and system logs will also used to build a thick set of quantitative and qualitative data about the efficacy and life of the community.

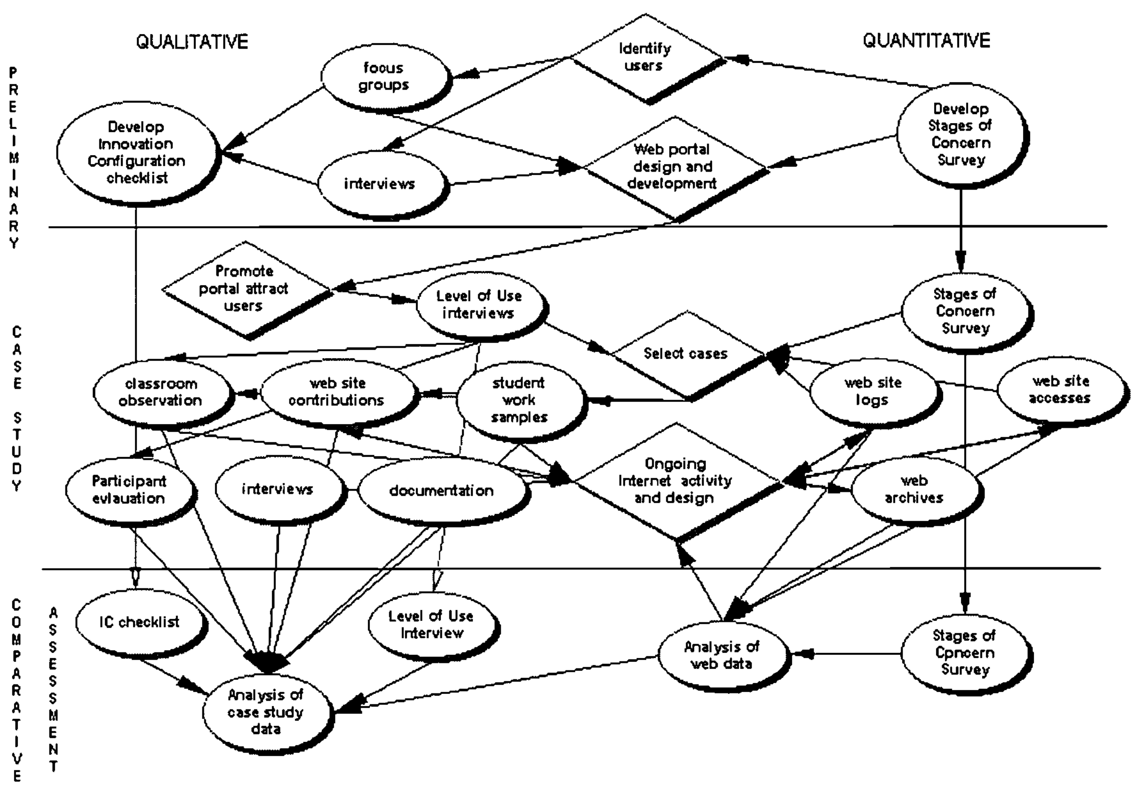

Diagram 3 Mixed Mode Research Design

The research and consultation into community building and design was carried out over 2000. The web site was designed and refined with consultation and feedback from inservice and pre-service teachers during latter half of that year. The site was promoted widely to schools in NSW and internationally during November and December through faxes, conferences and presentations. During this time content was sought from teacher to initiate the resource database and to prepare the site for its first case study selection in early 2001. The StageStruck Professional Development Community web site was launched on 29th November at the Apple Innovative Technology Schools Conference 2001 and first member registrations and activities began on the same day. The main project activity and teacher support will begin with the start of the Australian school year in February 2001. The research will follow the community and its members into 2002. The preliminary phase presented in this paper and conference presentation describes the challenges for, and successes of, the community design, content development, recruitment of teachers and initial implementation. Data collection is in a very early stage but we are able to report on the willingness of teachers to join the community and their motivation for involvement Teachers have responded very positively to the site design and activity ideas, most particularly to the opportunities to share and publish.

References

Australian Bureau of Statistics (1999). - ABS Cat. no. 8147.0.

Bull, B. et al (1994). Professional development and teacher time: Principles, guidelines and policy options for Indiana. Bloomington., Indiana Educational Policy Center, School of Education, Indiana University. ERIC Clearinghouse ED 384112.

Cannings, T. & Stager, G. (1999). On-line Communities as a Vehicle for Developing Secondary Mathematics Educators In NECC ?98: Proceedings of the National Educating Computing Conference (19th, San Diego, CA June 22-24).

Fullan, M (1993). Change Forces: Probing the depths of educational reform. London Falmer Press. Indiana University Internet Learning Forum: Building a community of practice of Indiana maths and science teachers [available at http://ilf.crlt.indiana.edu/ (last accessed 10/10/00)].

Hall, G.E., Wallace, R.C., & Dosset, W.A. (1973). A developmental conceptualization of the adoption process within educational institutions ERIC Clearinghouse ED095 126.

Hall, G.E. & Hord, S.M. (1987). Change in Schools: Facilitating the Process State of University of NY Press Albany NY.

Kim, A. (2000) Community Building on the Web, Peachpit Press. Berkeley, CA.

Ravitz, J. (1997). An ISD Model for Building On-line Communities: Furthering the Dialogue. ERIC Clearinghouse on Information Resources, Ed 409 863.

Reilly, R.A. (1999). EdNet@Umass: Providing Quality Professional Development via the Internet, The Journal Technical Horizons in Education March 1999 v26 p60.

Rogers, E.M. (1983). Diffusion of Innovations, Collier Macmillan London.

Stager, G.S., (1998). Demystifying Professional Development. Curriculum Administrator. Feb 1999 [available at http://www.stager.org/articles/pdforca.html (last accessed 20/11/00)].

Tenenbaum, B. (1997). A Virtual Instructional Media Center Unifying Professional Development and School Reform ERIC Clearinghouse ED413858

Wilson, B. & Ryder, M. (1998). Dynamic Learning Communities: An Alternative to Designed Instructional Systems [available at http://www.cudenver.edu/~mryder/dlc.html (last accessed 20/11/00)].

Yocam, K. (1996). Creating an Alternative Context for Teacher Development: ACOT's Two-Year Pilot Project. ACOT Report 17.

A Web-based Precision Teaching Approach to Undergraduate Physics

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Abstract: The current research involved an undergraduate electromagnetism course at a reputable engineering university with traditionally high levels of attrition. A team of physicists, psychologists, and computer scientists engaged in a five year project in an effort to improve student performance in the course. Based on an extensive task analysis of both expert and novice performers, poor performance was determined to result from a lack of fluency on lower-level skills involved in solving problems. Subsequently, an extensive series of web-based materials were developed based on the principles of precision teaching (Lindsley, 1972). The current research reviews the precision teaching approach in general. Then, in turn, the paper discusses the process of the development of the materials, the computer-based presentation of the materials, and the successful application of the materials at Georgia Tech. Finally, the advantages of using the web-based materials are discussed.

Introduction

Over 80,000 students enter engineering programs as freshman each year (Lashley, 1997). Unfortunately, research shows that less than half will graduate with an engineering degree (Astin, 1993; Hayden & Halloway, 1985). Further, most of this attrition has been found to occur within the student's first two years on campus. For example, Budny, Bjedov, and LeBold (1997) found that over one third of engineering majors left Purdue by the end of their second year. More generally, McCaulley, MacDaid and Walsh (1987) found 40% attrition prior to the third year for a heterogeneous eight-school engineering consortium in the United States. Indeed, our own research at Georgia Tech (Marr, Thomas, Benne, Thomas & Hume, 1999) indicates that the majority of academic-related attrition results from poor performance in basic core courses such as calculus, chemistry and physics. Interestingly, this attrition often occurs prior to students taking classes in their chosen engineering major. Given the social and economic costs associated with such high attrition rates, interventions that improve performance in these courses are clearly warranted.

A common complaint voiced by educational psychologists is that they develop effective teaching techniques only to see them fail to be implemented in mainstream education. Viable solutions to America's so-called "educational crisis" are developed by researchers but are not applied by teachers in the classroom (Goodlad, 1983). Alternatively, they are applied and proven to be effective in the classroom only to simply fade away over the course of time. The current paper will first reintroduce the basic tenets of precision teaching (PT) as a potentially viable instructional technique. Then, a brief discussion of a five year project designed to improve student performance in an introductory physics course will be discussed. The resulting set of web-based materials, the procedures for their use, and the success of the intervention will then be described. Finally, the benefits of using the web-based approach instead of traditional paper-and-pencil implementation will be evaluated.

Precision Teaching

The basic tenets of PT are fairly straightforward. According to Lindsley (1972), in order to develop fluency on higher-order skills, fluency must first exist on lower-level skills. A task must be broken down into the basic skills necessary to complete it. Then, fluency must be established on each of these so-called "tool skills." These "tool skills" must then be recombined into bigger pieces, and fluency subsequently obtained on these larger chunks. Daily measurements are necessary to determine the learning rate and to serve as a vital source of reinforcement for the learner (Pennypacker, Koenig, & Lindsey, 1972). Stringent but realistic fluency goals are established and the learner is not allowed to progress to the next level until fluency has been attained on the preceding level.

The most important point that differentiates PT from traditional methods of instruction is its emphasis on fluency. For precision teachers, fluency consists of much more than simple accuracy. If an individual could only speak 10 words a minute in a foreign language we would not describe that individual as being fluent. This would be true even if the individual enunciated and utilized all 10 words perfectly. Generally speaking, most people would consider a person fluent in the foreign language only if they speak correctly at a "normal" speaking rate. That is, true fluency is a function of both accuracy and speed. PT is quite novel in its emphasis on speed, not accuracy, as the true measure of learning. Traditionally, of course, our educational system has emphasized percent correct and other measures of accuracy as the bottom-line criterion of student performance.

The most often cited example validating the effectiveness of PT is The Great Falls Project (Beck & Clement, 1991). This project started as remedial instruction aimed solely at mildly handicapped students. The investigators found that 79% of precision taught groups performed better than control groups receiving traditional instruction. When PT was implemented in the regular curriculum, PT students out-performed control groups on the Iowa Basic Skills Test by 40 percentile points in math and 20 percentile points in reading. In a separate study Johnson & Layng (1991) found that PT instruction resulted in learning disabled (LD) children improving their reading level by two years per year of study. This is quite impressive in that LD children traditionally show only about a half-year gain in reading level per year of study. Finally, William Beneke (1991) introduced PT principles in an introductory psychology course at Lincoln

University. With an intervention that lasted less than five minutes a day, Beneke increased college students' reading rate by 49%. This increase in reading rate was also accomplished with a 75% increase in the recall of the material. Thus, the intervention resulted in the students reading both faster and having greater retention of what they had read.

The Problem

Despite the above examples, numerous other success stories, and a journal dedicated solely to PT research (*Journal of Precision Teaching*), PT has failed to catch the eye of mainstream educators. Four primary reasons may be given in explaining this lack of mainstream support. First, there is a perception that PT can only be applied to very low-level skills. Most examples discussed in the literature have indeed involved remedial-level skills. Second, PT is also assumed to be very expensive by most people. As traditionally implemented, PT requires a very low student to teacher ratio due to the need of constant monitoring and continual feedback/reinforcement for the learner. Third, PT requires a large investment of preparation time by the teacher. A large data-bank of "tool skill" items is required for daily practice by the student. Moreover, this large investment of time must be undertaken before the student ever enters the classroom. Combined with the short term focus of many educators this large investment of preparation time is seen as a major shortcoming of PT. Finally, PT has been termed a bureaucratic nightmare due to the extensive paper-work involved. PT emphasizes the need to graph and plot student performance and provide the student with the continuous feedback. This process results in much more data tracking and performance monitoring than traditional instructional techniques.

One Potential Solution: Computer-based Presentation

The advent of computer technology and the world wide web provide some answers to these commonly voiced complaints, however. First and foremost, web-based PT would reduce the man-hours involved. The computer could handle the presentation, measurement, feedback, data tracking, and record-keeping. Not only would this reduce the bureaucratic nature of PT, but the time saved here could be used for the identification of tool skills and problem generation required up front. In fact, researchers have shown that when implemented correctly PT actually saves total teacher time (Haring, Liberty, and White, 1970-1980). Second, the amount of paperwork would no longer be a concern since all of the data could be easily tracked and stored by computer. Similarly, student feedback can be directly presented to the student via the computer. Third, the teacher-student ratio would no longer be a concern since immediate reinforcement is accomplished by the computer, not by the teacher. The only remaining concern would then be to see if such a proven instructional approach can be implemented on a non-remedial high level skill. The problem course investigated in the current study was a sophomore level introductory electromagnetism course at Georgia Tech where traditionally 40% of students fail to make C or above in the course.

Task Analysis

The development of the current web-based materials involved a five-year collaboration of physicists, psychologists, and computer scientists. The first step was to determine the cause of poor performance in the electromagnetism course in question. An extensive task analysis was undertaken. First, several focus groups were conducted with both good and poor performers. Second, skills analysis of both expert and novice performance was conducted in the actual testing situation. Students completed the tests long hand and several subject matter experts analyzed both performance and procedural consistency for all students. Finally, to validate the conclusions reached by the subject matter experts, several laboratory studies with verbal protocol of problem-solving behaviors by both expert and novice performers were also conducted. All in all, the three approaches found clear differences between expert and novice performance. For a full discussion of the methodology used to determine these differences please see Cabrera, Marr, Thomas, Walker, Thomas, Wood, Hodges, and Thompson (1994).

In short, the conclusions reached in Cabrera et al. (1994) were that expert performers had automated the lower-level skills involved in solving the more complicated physics problems. This manifested itself on several lower-level skills such as calculator skills, basic math skills, basic physics skills, etc. Novice performers seemed to engage in much more controlled processing of information at all levels of problem solving. These results are quite similar to the well-published differences often found between expert and novice performance on various different skills and abilities (Koedinger & Anderson, 1990; Simon & Simon, 1978).

Material Development

Based on the overwhelming evidence that poor performance in electromagnetism resulted from a lack of fluency on lower-level skills, we felt precision teaching might be an effective instructional technique. Further analysis found that physics novices suffered from a lack of fluency in, at least, four main areas. The first problem area was a lack of fluency in basic math skills. Many students could solve basic quadratic equations and vector sums, for example, but were far from being fluent in those tasks. Thus, come test time, valuable time was lost recalling and solving the quadratic equation during the testing period. Given the speeded nature of the test this deleteriously effected their grade. A second troublesome area involved what might be termed intuitive skills. These skills included such concepts as knowing the direction of an E field without actually working the math of the problem or knowing what $1/X^2$ looks like without explicitly having to take the time to plot it. Again, time spent on such issues during the testing period negatively affected student performance on the test. A third lower-level skill deficiency demonstrated by novices as compared to experts concerned units of measurement. Experts just "knew" that a joule was a newton-meter or even a kg-m^2 per s^2. Novices had to "think" about the appropriate units and often gave numerical answers that could have been eliminated as incorrect based solely on the presence of inappropriate units. Finally, novices lacked fluency on simple one and two-step physics problems. For example, novices took extensive time and expended valuable cognitive resources solving basic Coulomb's law problems or Gauss' law problems that experts could solve automatically. When combining several of these simple problems into an entire problem on the test, these skill insufficiencies were only magnified.

The Materials

Based on these four areas of deficiency in fluency, a team of physics professors and teaching assistants developed thousands of problems for each of the four areas. Additionally, the content of each domain was carefully tied to the traditional flow of an electromagnetism class. That is, math skills early in the quarter were concerned with fractions and vector addition since traditionally Coulomb's Law and Gauss' law are covered early in the quarter. Later in the quarter, math skills were more likely to be concerned with skills traditionally needed later in the quarter. For example, given the Biot-Savart Law is usually covered quite late in such a course, the math skill materials for that week might heavily stress integration and differentiation. Eventually, ten sets (weeks) of materials were developed. For each week or set, there were five days worth of materials. Each day contained four modules: math, intuitive, units, and basic physics.

Implementation of the Materials

While the material development was a long and tedious process, the implementation of these materials may be more important in determining the success of any precision teaching program. Students were instructed to go onto the web page daily during the week. Once on the web page, the students were prompted by the computer to complete each of the four modules for that day. The sessions were timed with math, units, and intuitive sections limited to around five minutes each and the physics modules averaging about 25 minutes (specific times varied due to the number of skills necessary during various parts of the quarter). It is important to note that this meant that the student was on the computer for only around 40 minutes per day.

Students were carefully instructed about the nature of fluency. Again, the students were instructed that the program emphasized fluency instead of accuracy. Each day, the student completed the math section, then the units section, then the intuitive section, and finally the physics section. The student received instantaneous feedback on each item; however, the program immediately went to the next item in an effort to promote the development of fluency. At the end of that section (i.e. math, units, intuitive, or physics), feedback was given for performance on the entire section. At that point, the student could assess their performance for that section. Then, the student went to the next section until all four sections were completed. This process was repeated for five consecutive days. It is also possible to display day-by-day performance on each section across the five days. The materials and the procedures utilized can be found at www.blackbox.psych.gatech.edu.

Program Evaluation

Over the course of several years this procedure was evaluated against various other educational techniques. In particular, in successive quarters interventions were conducted where the web-based precision teaching approach's effectiveness was compared directly to several carefully designed control groups. These included: groups doing extra homework problems equated for time on task, groups doing paper and pencil precision teaching, groups receiving traditional recitation instruction equated for time on task, and control groups receiving no extra intervention. Generally speaking, students receiving precision teaching instruction outperformed those that did not receive PT by an average of one full letter grade. The intervention was especially successful for students predicted to be at risk in the course. Combining the various control groups, fully 54.6% of students that did not receive the PT materials made a C or below. In comparison, only 22.7% of the precision taught students made a C or below. This is a truly amazing result if one realizes that traditionally at Georgia Tech around 40% of all students take this course more than once due to poor performance. Precision teaching resulted in not only these students completing the course at a much higher rate, but also in 77.3% of PT students making either an A or a B. The overwhelming success of these materials have been presented elsewhere (Marr et al. 1999) and due to space constraints will not be repeated here. Suffice it to say, the intervention has been extremely successful to date.

Conclusions

The current effort demonstrated that PT can be efficiently implemented at the collegiate level. First, the instructional approach was highly successful despite the high-level skill involved in the training. Further, the web-based approach was able to track the performance of several hundred students at a given time. Likewise, the program provided instant feedback for the students without requiring any additional expenditure of teacher or teacher-assistant time. In fact, when compared to both traditional recitation instruction and additional homework assignment, the PT intervention actually required less total teacher time. Finally, the availability of the materials on the web, complete with timed modules and programs for data management allowed students the flexibility to complete the materials at their own pace and according to their own schedules. Similarly, the availability of these materials via the web should allow other educators easy access to both view and implement the materials (in whole or in part) in their own programs.

The main goal of this project was to resurrect a proven approach to teaching. Precision teaching is a very effective means of instruction. In fact, Binder and Watkins (1989) called it the most powerful instructional tool ever developed. PT failed to be adopted in the 1970s simply due to the fact that there was no way to efficiently implement it at that time. The cost of implementation far outweighed the benefits of PT. Today's technology provides us with a new way to implement this proven approach. This project has proven that the proliferation of personal computers and the world wide web make it possible to implement PT efficiently and very effectively via the internet.

References

Astin, A. W. (1993). Engineering Outcomes. American Society for Engineering Education Prism. 27-30.

Beck, R. & Clement, R. (1991). The Great Falls precision teaching project: An historical examination. *Journal of Precision Teaching*, *8*, 8-12.

Beneke, W. M. (1991). Precision teaching to enhance reading skills of introductory psychology students. *Journal of Precision Teaching*, *8*, 37-43.

Binder, C. & Watkins, C.L. (1989). Promoting effective instructional methods: Solutions to America's educational crisis. *Future Choices, 1*, 33-39.

Budny, D., Bjedov, G., & LeBold, W. (1997). Assessment of the impact of the freshman engineering courses. *Proceeding of the Institute of Electrical and Electronics Engineers Frontiers in Education Conference*, 1100-1106.

Cabrera, A., Marr, M. J., Thomas, A., Walker, N., Thomas, E. W., Wood, J. W., Hodges, L., & Thompson, C. (1994). Cognitive psychology and behavior analysis meet in an instructional setting. *Proceedings of the International Congress of Applied Psychology*, Madrid, Spain.

Goodlad, J. L. (1983). A study of schooling: Some findings and hypotheses. *Phi Delta Kappan, 6*, 465-470.

Hayden, D. C., & Halloway, E. L. (1985). A longitudinal study of attrition among engineering students. *Engineering Education, 75*, 664-668.

Haring, N. G., Liberty, K. A, & White, O. R. (1970-1980). Field Initiated Research Studies of Phases of Learning and Facilitating Instructional Events for the Severely/Profoundly Handicapped. (Available from the United States Office of Special Education, Project number 443CH60397A, Grant Number G007500593.

Johnson, K. R. & Layng, T. V. J. (1991). Breaking the structuralist barrier: Literacy and numeracy with fluency. Invited address at the 99th annual convention of the American Psychological Association, San Francisco, CA.

Koedinger, K. R. & Anderson, J. R. (1990). Abstract planning and perceptual chunks: Elements of expertise in geometry. *Cognitive Science, 14*, 511-550.

Lashley, P. (1997). Enrollments 1996: Inching Downward. *American Society of Engineering Education Prism, September*, 35-37.

Lindsley, O. R. (1972). From Skinner to Precision Teaching. In J. B. Jordan & L. S. Robbins (Eds.), *Let's try something else kind of thing*, (pp. 1-12). Arlington, VA: The Council on Exceptional Children.

McCaulley, M. H., MacDaid, G. P., & Walsh, R. (1987). Myers-Briggs type indicator and retention in engineering. *British Journal of Engineering Education, 3*, 99-109.

Marr, M. J., Thomas, E. W., Benne, M. R., Thomas, A., & Hume, R. M. (1999). Development of instructional systems for teaching an electricity and magnetism course for engineers. American Journal of Physics, 9, 789-802.

Pennypacker, H. S., Koenig, C. H., & Linsley, O. R. (1972). Handbook of the Standard Behavior Chart. Kansas City, KS: Precision Media.

Simon, D. P. & Simon, H. A. (1978). Individual differences in solving physics problems. In R. Siegler (Ed.), Children Thinking: What Develops. Hillsdale, NJ: Erlbaum.

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TEACHERS' ROLES When In The CLASSROOM *With* COMUPUTERS And *Without* COMPUTERS

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Abstract: This study investigated preservice teachers' perceptions of the teachers' role in classrooms *with* computers versus in classrooms *without* computers. Based on the literature review, three research questions were formulated. (1) What are the preservice teachers' perceptions of the teachers' role in the classroom with computers? (2) What are the preservice teachers' perceptions of the teachers' role in the classroom without computers? (3) Do the preservice teachers' perceptions of the teachers' role in the classroom with computers differ from their perceptions of the teachers' role in the classroom without computers? The teachers' role is to be measured as teacher-centeredness versus student-centeredness.

INTRODUCTION

The information age presents teacher education with a new challenge - preparing future teachers to teach with computers. "Learning environments based on new technology impose new challenges on the teachers and on the teacher training system" (Haugen et al., 2000; p. 205). Not only should teacher education train future teachers on how to operate computers, efforts should be taken to ensure that future teachers develop appropriate teaching styles and a clear vision of the teachers' role when they teach with computers.

LITERATURE REVIEW

Microcomputers were made available in school settings since the 1970s. Although technology opens possibilities for innovative and creative learning environments, its potential to impact student learning has been thwarted by ineffectual teaching practices. "Teachers' use of technology often forces it into traditional teaching paradigms that have existed for decades" (Sprague, 1995; p. 52). Technology was primarily used to support the traditional instruction mode (Becker,1991; Dwyer, Ringstaff & Sandholtz, 1991). Computers were routinely used to reinforce memorization of facts rather than promote higher-order thinking and problem-solving skills. "In spite of this increased variety of available software, though, the pattern of software use in typical subject-matter classes remains fairly traditional" (Becker,1991; p. 7).

Teaching with computers requires a shift from the traditional teaching practice. In order for technology to transform teaching and learning, there is a need to redefine the teachers' role and to change existing teaching practice. "To make real changes in classrooms, so that technology is truly used each day as a thinking, creative, and research tool, requires significant work in changing instructional approaches, assessments, and management strategies" (Wiburg, 1997; p. 181).

Teachers' teaching behaviors were rooted in their perceptions of the teachers' role in teaching and learning. Teachers teaching with traditional approaches in the classroom with computers had to confront their deeply-held beliefs and perceptions of their roles as teachers in order to alter their teaching practices (Dwyer, Ringstaff & Sandholtz, 1991). "Technology forced a re-evaluation of the authoritative teacher role" (Chin & Hortin, 1993-94; p. 83). Technology-rich classrooms tend to be more student-centered rather than teacher-centered (Collins, 1991; Grabinger & Duffield, 1996; Kolderir, 1990; Sheingold, 1990). "Roles and teaching and learning strategies are changing because technology fosters the use of more student-centered learning strategies" (Norum, Grabinger & Duffield, 1999).

The discussion of the teachers' role shift has significant implications for teacher education. "The way that teachers teach is a product of their own schooling, training, and experiences as teachers" (Becker, 1991; p.8). Earlier studies found that preservice teachers' computer use during the practicum fell into the similar traditional pattern. Preservice teachers generally used computers in a limited way. Computers were used as a supplement to their teaching. Drill-and-practice was their first choice for classroom use (Byrum and Cashman, 1993; Downes, 1993; Wang & Holthaus, 1998-99; Wang, 2000). Preservice teachers did not seem to consider the computer's role as one of helping to develop students' higher order thinking skills as much as their students' computer skills (Dunn & Ridgway, 1991). These studies were not designed to explore preservice teachers' perceptions of their roles as teachers when teaching with computers. Possibly, preservice teachers' perceptions were influencing their computer use.

Up to now, little research has investigated preservice teachers' perceptions of the teachers' role when teaching with computers. Research on preservice teachers' perceptions in the field of educational computing primarily focused on their computer attitudes and computer competence (Beaver, 1990; Boone & Gabel, 1994; Reed, Ervin, & Oughton, 1995; Savenye, 1993).

Preservice teachers' beliefs and perceptions about teaching plays a central role in shaping their professional development and subsequent teaching behaviors. Understanding preservice teachers' beliefs will help to improve their professional preparation. Unexplored beliefs and perceptions of preservice teachers might result in the perpetuation of inefficient teaching practices (Pajares, 1992). With computers becoming an essential part of the learning process in classroom settings, it is imperative to investigate preservice teachers' perceptions of their roles as teachers in this new digital learning environment.

The STUDY

This study was designed to explore the preservice teachers' perception of the teachers' role in teaching and learning. The preservice teachers' perception of the teachers' role is measured as teacher-centeredness and student-centeredness. Three research questions were formulated based on the review of literature.

(1) What are the preservice teachers' perceptions of the teachers' role when they teach in the classroom *with* computers?
The review of literature established the importance of investigating preservice teachers' perceptions of the teachers' role teaching in the classroom with computers. The research hypothesis for this question is that preservice teachers would perceive their roles to be more teacher-centered rather than student-centered when they teach in the classroom with computers. The null hypothesis is that preservice teachers would not perceive their roles differently in terms of the teacher-centeredness and the student-centeredness when they teach in the classroom with computers.

(2) What are the preservice teachers' perceptions of the teachers' role when they teach in the classroom *without* computers?

The review of literature points to the fact that teacher-centered teaching behaviors in the classroom with computers are guided by teachers' beliefs and perceptions about teaching and learning in traditional classrooms. If preservice teachers would more likely take the teacher-centered role while teaching with computers, it indicates that preservice teachers' perceptions about teaching remain within the paradigm of traditional teaching and delivery. Therefore, the research hypothesis for this question is that the preservice teachers would perceive their roles to be more teacher-centered rather than student-centered teaching in the classroom without computers. The null hypothesis is that preservice teachers would perceive no difference in the teacher-centered role versus the student-centered role teaching in the classroom without computers.

(3) Do the preservice teachers' perceptions of the teachers' role in classrooms *with* computers differ from their perceptions of the teachers' role in the classroom *without* computers?

Based on the first two hypotheses, it is hypothesized that preservice teachers' perceptions of the teachers' role in classrooms *with* computers would not differ significantly from their perceptions of the teachers' role in classrooms *without* computers. There would be no significant difference between the preservice teachers' perception of the teacher-centered role in classrooms *with* computers and their perceptions of the teacher-centered role in classrooms *without* computers. There would be no significant difference between the preservice teachers' perceptions of the student-centered role in classrooms *with* computers and their perceptions of the student-centered role in classrooms *without* computers.

SAMPLE

The setting for the study was at a public university in an unincorporated territory of the United States in the Pacific Rim. The sample for this study was all the preservice teachers (N=78) who had completed all their course work and were ready for student teaching. All the 78 students participated in the survey. Out of 78 questionnaires, four were deemed not usable because of missing items.

INSTRUMENT

The data collection instrument for this study was a survey questionnaire adapted slightly from one originally developed by Bichelmeyer, Reinhart and Monson (1997) at Indiana University to measure teachers' beliefs about the teachers' role when teaching with technology. Two constructs were tested in the survey; teacher-centeredness and student-centeredness. Two scenarios were presented, teaching in the classroom without computers and teaching in the classroom with computers. The participants were asked to answer the questions on their perceptions of the teacher's role teaching in the two different scenarios - in the classroom without computers (e.g. When I teach in the classroom without computers, I believe my role is to keep quiet and order in the classroom.) and with computers (e.g. When I teach in the classroom with computers, I believe my role is to provide individualized learning objectives).

DATA ANALYSIS

Data was analyzed by using SPSS (Statistical Package for Social Sciences).

(1) What are the preservice teachers' perceptions of the teachers' role in the classroom *with* computers? The result showed that there was no significant difference (t=.48 p=.630) between the preservice teachers' perceptions of the teacher-centered role (M=4.1227, SD=.598) and their perceptions of the student-centered role (M=4.0926, SD=.672). The null hypothesis is not rejected.

(1) What are the preservice teachers' perceptions of the teachers' role in the classroom *without* computers? The test showed that there was significant difference (t=.2.85 p=.006) between preservice teachers' perceptions of the teacher-centered role (M=4.1366 S.D.=.578) and their perceptions of the student-centered role (M=3.9861 S.D.=.647). The null hypothesis is rejected.

(3) Do the preservice teachers' perceptions of the teachers' role in classrooms *with* computers differ from their perceptions of the teachers' role in the classroom *without* computers? The comparison showed that there was no significant difference between the preservice teachers' perceptions of the teacher-centered role in the classroom *with* computers and their perceptions of the teacher-centered role in the classroom *without* computers (t=.21 p=.837). The preservice teachers' perceptions of the student-centered role in classrooms *with* computers did not differ significantly from their perceptions of the student-centered role in classrooms *without* computers (t=1.49 p=.141). The null hypothesis is not rejected.

DISCUSSION

When placed in a classroom with computers, the preservice teachers would likely take balanced teacher-centered roles and student-centered roles when the computers are available in the classroom. To put it in another way, the preservice teachers were neither more teacher-centered, nor were they more student-centered when teaching with computers. It appears that due to the presence or mediation of computers in classroom settings, the preservice teachers considered they would become less teacher-centered, if not more student-centered, than they were in the classroom *without* computers.

There is no doubt that the computer is a tool that can be used to transform teaching and learning. The review of literature points out that technology can serve as a catalyst to change teachers' teaching pedagogy. Nevertheless, unless preservice teachers confront and restructure their deeply-held teacher-centered beliefs and perceptions, they would not be able to take the full advantage of the technology to impact student learning.

Worth mentioning here is a study conducted by the same researcher focusing on the same group of preservice teachers (Wang, in press). This group of preservice teachers were tested on specific computer use by means of a survey. Six items in this survey were teacher-centered computer uses and six items were student-centered computer uses. Preservice teachers overwhelming pursued teacher-centered computer uses. There was a significant difference between the preservice teachers' choice of teacher-centered computer uses and the student-centered computer uses. The preservice teachers would more likely use the computer as a teacher-centered tool than as a student-centered tool. This study, as well as the other studies investigating preservice teachers' computer use, demonstrates clearly that preservice teachers need to restructure their perceptions about teaching in order to transform their teaching practices in classrooms with computers.

The result of the second research question lends support to the claim that there was a need for the preservice teachers to reconstruct their beliefs and perceptions about teaching. The preservice teachers were more teacher-centered when teaching in the classroom *without* computers, which obviously is the result of their own educational experiences in the traditional classroom. This result supports findings of the previous studies on preservice teachers' perception of teaching. Despite the current trend in teacher education of the paradigm shift from the traditional didactic delivery of instruction to the constructivist learner-centered approach, preservice teachers' perceptions of teaching gives cause for concern. Most preservice teachers entered teacher education with perceptions that teaching is telling, lecturing and dispensing information. Teachers are information givers. The preservice teachers often underestimate children's capability of understanding and learning (Kagan, 1992). Most studies found that preservice teachers' perceptions about teaching are resistant to change. Faculty were more likely to reinforce preservice teachers' beliefs and perceptions rather than confront and restructure them (Brookhart & Freeman, 1992).

This study found that there was no significant difference between the preservice teachers' perception of the teacher-centered role in classrooms *with* computers and their perception of the teacher-centered role in classrooms *without* computers ($t=.21$ $p=.837$). The preservice teachers' perception of the student-centered role in classrooms *with* computers did not differ significantly from their perceptions of the student-centered role in classrooms *without* computers ($t=1.49$ $p=.141$). This result could well be interpreted that preservice teachers would conduct teaching business in the classroom with computers as they do in regular classroom, guided by their beliefs and perceptions of the traditional way of teaching.

CONCLUSION

This research investigated preservice teachers' perceptions of the teachers' role in the classroom *with* computers and *without* computers. Few would argue that computers will be more pervasive in our schools in the future. Preservice teachers are potential change agents. It is imperative that preservice teachers develop appropriate teaching styles and perceptions about teaching, especially about teaching with computers. More research needs to be conducted in this area. Such investigations would provide useful information to teacher education training programs. Although preservice teachers' perceptions of teaching is often resistant to change, research has shown that preservice teachers were capable of going through a transformation of their beliefs and perceptions. It is up to teacher educators to guide and direct preservice teachers to challenge, confront, and reconstruct their beliefs and perceptions about teaching and learning.

REFERENCES

Beaver, J. F. (1990). A profile of Undergraduate educational technology competence: Are we preparing today's education graduates for teaching in the 1990's? New York. (ERIC Document Reproduction Service No. ED 332 985)

Becker, H. J. (1991, May). When powerful tools meet conventional beliefs and instructional constraints. *The Computing Teacher, 18* (8), 6-9.

Bichelmeyer, B. A., Reinhart, J. M., & Monson, J. (1998, February). Teachers' perceptions of teacher role in the information age classroom. Paper presented at the 1998 National Convention of the Association for Educational Communications and Technology, St. Louis, MO.

Boone, W. J. and Gabel, D. (1994). Computers and Preservice Elementary Science Teacher Education. *Journal of Computers in Mathematics and Science Teaching, 13*(1), 17-42.

Chin, S. S., & Hortin, J. A. (1993-94). Teachers' perceptions of instructional technology and staff development. *Journal of Educational Technology Systems, 22* (2) 83-98.

Collins, A. (1991). The Role of computer technology in restructuring schools, *Phi Delta Kappan, 73* (1), 28-36.

Downes, T. (1993). Student-Teachers' Experience in Using Computers During Teaching Practice, *Journal of Computer Assisted Learning, 9,* 17-33.

Dwyer, D. C., Ringstaff, C., & Sandholtz, J. H. (1991, May). Changes in teachers' beliefs and practices in technology-rich classrooms. *Educational Leadership,* 45-52.

Grabinger, R. S. and Duffield, A. J. (1996). Problem-Based Learning as a Rich Environment for Active Learning. Paper presented at the Annual Convention of the American Research Association, New York, NY.

Haugen, H., Ask, B., Bratseth, B. O., Engelsen, K. S., Lysne, S. O., Tvedte, J. (2000). Shifting focus from teaching to learning - ICT as an incentive to reform teacher education. In D. A. Willis, J. D. Price, & J. Willis (Eds.), *Technology and Teacher Education Annual* (pp. 204-209). Charlottesville, VA: AACE.

Kagan, D. M. (1992). Professional growth among preservice and beginning teachers. *Review of Educational Research,* 62 (2), 129-169.

Kolderir, T. (1990). How Structural Change Can Speed the Introduction of Technology. In K. Sheingold & M. S. Tucker (Eds.), *Restructuring for Learning with Technology* (pp. 91-103). NY: Center for Technology in Education, Bank Street College of Education and the National Center on Education and the Economy.

Norum, K., Grabinger, R. S., & Duffield, A. J. (1999). Healing the Universe is an Inside Job: Teachers' Views on Integrating Technology. *Journal of Technology and Teacher Education, 7*(3), 187-203.

Pajares, F. M. (1992, Fall). Teachers' belief and educational research: Cleaning up a mess construct. *Review of Educational Research, 62*(3), 307-332.

Reed, W. M., Ervin, J. R. JR., and Oughton, J. M. (1995). Computers and Elementary Education Students: A Ten-Year Analysis, *Journal of Computing in Childhood Education , 6* (1), 5-24.

Sheingold, K. (1990). Restructuring for Learning with Technology: The Potential for Synergy. In K. Sheingold & M. S. Tucker (Eds.), *Restructuring for Learning with Technology* (pp. 9-27). NY: Center for Technology in Education, Bank Street College of Education and the National Center on Education and the Economy.

Savenye, W. C. (1993). *Measuring teacher attitudes toward interactive computer technologies.* In Proceedings of Selected Research and Development Presentations at the Convention of the Association for Educational Communications and Technology. (ERIC Document Reproduction Service No. 362 200)

Sprague, D. (1995). ITS changing teachers' paradigms. In J. Willis, B. Robin, & D. Willis (Eds.), *Technology and Teacher Education Annual* (pp. 352-356). Charlottesville, VA: AACE.

Wang, Y. M. (1999-2000). A Comparative Study of Student Teachers' Computer Use During the Practicum. *Journal of Educational Technology System, 28* (2), 171-184.

Wang, Y. M., & Holthaus, P. (1998-99). Facing the World - Student Teachers' Computer Use During Practicum. *Journal of Educational Technology Systems*, *27* (3), 207-223.

Wiburg, K. M. (1997). The Dance of Change: Integrating Technology in Classrooms. Computers in the Schools, 13 (1/2), 171-184.

Internet Based Learning Environments in Higher Education: Experiences from the HALÜBO-Project

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Abstract:
In our paper we present experiences from a joint Project, which was started in 1998 and since then has been realised every summer term by the Universities of Hamburg, Lüneburg and Bochum (HALÜBO)(GER), involving at times up to 80 students. In the respective seminars selected European policies and practices in general and higher Education were studied and discussed by means of traditional seminar working techniques as well as new working tools, e.g., the internet, chat rooms, etc. In our paper we reflect on the advantages and restrictions related to such a mixture of working techniques in view of developing social competence within the Internet.

The European process of integration is steadily moving forward, since 1993 and the coming into force of the Maastricht contract also with a greater effect on European general education systems. Even though this development is by no means yet a central topic for future teachers and others in higher education, it clearly affects their professional and personal future. Another world-wide rapidly developing movement takes place in the field of the new media, especially in the area of internet based teaching and learning: Virtual contact situations, claiming for intercultural as well as media competencies. Why are these important competencies? Intercultural competence in virtual contact situations can contribute to a globalized and regionalized society, permitting peaceful co-existence and leading to the dismantling of prejudices and stereotypes. Up to now the interaction between intercultural and media key competencies has been rarely considered; the subject of social competence, which can be regarded as decisive in global as well as regional contact situations in the Internet, is by no means a central topic of academic research and practice. In our presentation of the HALÜBO-project we will deal with the relationship between intercultural competence and the Internet, in order to enrich the very technically oriented discussion by an often neglected aspect: Based on the presumption of a mutual influence between the Internet and intercultural competencies, the influence of a social competence through the Internet will be discussed on the basis of three case studies, which, due to their paradigmatic character, are of definite importance for the development of a 'global social competence' in the Internet.

Just how far the Internet poses a chance for intercultural learning depends very much on how far the Net lends itself to learning processes. So the important question is, which new opportunities the Internet-based learning environments offer for the development of intercultural competence for learners of different cultural backgrounds. One possible target size lies in the connection of the effects of the new media with a differentiated understanding of society. At the same time, the technical development allows for the integration and creation of an interactive design of the various media. It is at this point where the process of community building becomes increasingly important, since social actors can join forces with one another or with many others because of a common interest. This process will be encouraged in the international context and by the Internet, creating trans-national societies, consisting of many sub-societies. The new media therefore has the potential of being identity-founding, because trans-national societies unite people of different cultures; for example, through trade, immigration and emigration or shared activities in the Internet. This doesn't mean though that the state or the related concept of the international community becomes obsolete nor that the artificial particalization of the society must increase (Kleger 1997). But because trans-national spaces are at the same time trans-cultural, they require a corresponding competence from the social actors going beyond the traditional intercultural understanding. It must concern itself with a trans-cultural competence which allows the social actors to deal with many cultures of the trans-national society, since with the multitude of contact possibilities, not all specific cultural competencies can be conveyed. Objectives for a global social competence can therefore be culture-overlapping fundamental competencies, of which a trans-cultural social competence is one, consisting of sociability, communicative flexibility and sensitivity.

The three case studies of the HALÜBO-project represent typical characteristics of international learning environments within the Internet; and although the range of possibilities for their technical design will continuously change, they are of a paradigmatic character because they are based on the following three basic sensitization possibilities: The project is concerned with learning environments working by sensitization through explanation and training (Type 1), through consensus creation (Type 2) and through knowledge construction (Type 3). For Type 1, case study CCED (Cross-Cultural Explorations and Dialogue) was chosen, chan online-communication training which since winter 1998 has been expanded by accompanying video conferencing. DEMETER (Distance Education Methods in Teacher Education and Research) was chosen for Type 2 and HALÜBO (Hamburg-Lüneburg-Bochum) for Type 3. On the whole, all three learning environments proved capable of initiating a learning process centered around the creation of a social competence going beyond one culture toward a sociable, open and considerate learner. Within the framework of the exploratory character of the study, it can be suggested that the Internet is well suited to the construction of trans-national societies since, through the development of social competence, the process of community building is supported, whereby people of different nations and cultures band together out of common interest. This bond can also be understood in terms of the perceptions of one's own subjectivity which is part of identity and culture developmental processes.

The best learning effect though, we are convinced, would be the result of a combination of the three types of seminars, since a comprehensive trans-cultural competence cannot be provided by just one type of Internet learning environment. This would be conceivable in serial modularity, a type of seminar not easy to realise in the European university system because of its organisational constraints. The teletutoring structure should therefore have a more pronounced influence on the virtual and partially virtual universities of the future (Geyken et al. 1998). At the same time, only a few universities are likely to prevail as truly virtual institutions (single model). Instead, they are more likely to become Add-on or More-Quality models (dual mode), which perform parts of their services virtually.

References

Geyken, A. et al. (1998). Selbstgesteuertes Lernen mit Tele-Tutoring. Schwarzer, R. (ed.): MultiMedia und TeleLearning, Frankfurt/New York: Campus. 163-180.

Kleger, H. (1997). Bausteine transnationaler Demokratie. Kleger, H. (ed.): Transnationale Bürgerschaft, Frankfurt/New York: Campus. 287-335.

Technology in Arizona: A Summary of the Report to the Arizona Board of Regents

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Abstract: The significance of technology in today's society is self-evident. What is less clear is how to ensure that today's children, the workforce of the future, will have the technological literacy and skills to successfully function and support our highly technological society. Public education is charged with the mission of providing the foundation in not only the basic workplace and personal skills of reading, writing, numeracy, language, and communication, but also, "a high level of competence with computers, telecommunications...and the ability to quickly adapt to new technologies and new ways of working" (National Governor's Association, 1999). In considering the charge to prepare a future technological workforce the school's role is to demonstrate technology as an object that is to be used and manipulated. On the other hand, the school's role as society's institution of cultural perpetuation emphasizes the use of technology as a tool for learning. These two roles are not necessarily mutually exclusive but they are distinct and schools must have an idea of which role they play—where, when, and how. It is this situation which shaped the Technology in Arizona study—an overview of the state of technology in Arizona's schools at all levels.

Introduction

...To succeed in the nation's economy, workers must be well versed in computers and other high-technology systems. In addition, workers must be able to adapt to changing work structures and be willing to perform a wide range of tasks. Workers today and tomorrow can expect to change jobs several times during their careers. As a result, workers will have to constantly upgrade their skills and expand their knowledge base. They will be lifelong learners. (National Governor's Association, 1999)

The significance of technology in today's society is self-evident. What is less clear is how to ensure that today's children, the workforce of the future, will have the technological literacy and skills to successfully function and support our highly technological society. Public education is charged with the mission of providing the foundation in not only the basic workplace and personal skills of reading, writing, numeracy, language, and communication, but also, in today's world "a high level of competence with computers, telecommunications...and the ability to quickly adapt to new technologies and new ways of working" (National Governor's Association, 1999). Schools across the nation are struggling to educate children about a technological revolution using the technology itself.

In considering the charge to prepare a future technological workforce the school's role is to demonstrate technology as an object that is to be used and manipulated. On the other hand, the school's role as society's institution of cultural perpetuation emphasizes the use of technology as a tool for learning. These two roles are necessarily mutually exclusive but they are distinct and schools must have an idea of which role they play—where, when, and how. It is this situation which shaped the Technology in Arizona study—an overview of the state of technology in Arizona's schools at all levels.

The report is divided into three parts. Part one focuses on Arizona's universities and how they prepare pre-service education students with respect to technology. Part two focuses on the results of two roundtables, one involving business and technology industry leaders and one involving educational leaders, examining the role of technology in education. Part three focuses on five case studies of K-12 schools/districts around the state whose technology programs, and in particular professional development programs, were considered exemplary by K-12 educators, technology coordinators, and education professors.

The Project

The project began when the Senior Project Coordinator of the Arizona Board of Regents (ABOR) asked the Arizona K-12 Center to assist in assessing and evaluating how K-12 schools and universities in Arizona were preparing a technologically literate workforce. A five-part project was initiated to look at various components of Arizona's education system to try to get the "big picture" of exactly how Arizona's schools are preparing students to take their places in an increasingly technological society.

The project team faced its first challenge in finding a frame of reference to shape the project: the standards of business and technology industries or the standards of education could be used. Because the study was sponsored by the ABOR, being carried out by the Arizona K-12 Center, and the team was made up of educational and educational technology participants it seemed appropriate to use educational standards from the International Society for Technology in Education (ISTE) to frame it. Consequently, though the study benefits from the input of the business and industrial sector, it emphasizes how teachers and professors at the K-16 levels can improve the delivery of educational technology education to ensure that students are well-prepared to be successful as a computer/technology workforce and for successfully utilizing computers and technology in their personal and professional lives.

The report begins with the chapter examining the syllabi of educational technology syllabi courses at the three state universities with respect to the International Society for Technology Education (ISTE) standards.

Syllabi of Educational Technology Courses

Using the ISTE Recommended Foundations in Technology for all Teachers as a guide, the project team found that Arizona's universities prepare pre-service teachers in educational technology very differently.

Syllabi of required undergraduate teacher preparation courses in technology from three of the Regent's universities were reviewed for a match with the ISTE Recommended Foundations in Technology for all Teachers in three categories: (1.) Basic Computer/Technology Operations and Concepts; (2.) Personal and Professional use of Technology; (3.) Application of Technology in Instruction. Results of the review indicate that two of the universities mention the ISTE Standards in their syllabi and, in some way, address each of the three general foundational categories. One university does not note the ISTE Standards in their syllabi, but offers activities in courses supporting one category, Basic Operation and Use of Applications. It would seem that there would be less variation about what educational content is taught in required courses. However, it should be noted that the findings of the evaluation were based solely on the syllabi and do not reflect what may have actually been taught, nor does it take into consideration the variability of instructors.

Clearly, universities differ among their conception of educational technology courses and which ISTE standards should receive highest priority if included at all. Whether this is problematic is another issue. If the three Arizona Regent's universities are preparing at least fifty percent of the Arizona teacher workforce, there should be some articulation *within* and *among* them as to what content is being covered in educational technology courses. This articulation might help ensure that at least a basic and uniform level of competency and expertise in integration and application of technology in classroom instruction occurs.

In addition to the analysis of the syllabi to determine educational technology course content, it is equally important to know the students' perceptions of their own technology skills. A survey based on the ISTE standards was designed for student teacher participation. A discussion of the survey and its results follow.

Survey of Student Teachers Using ISTE Standards

Again using the ISTE Recommended Foundations in Technology for all Teachers as a guide, the team designed and created a web-based survey to determine how the 243 student teachers at the three Regent's universities perceived their own levels of computer technology competence. Researchers designed and created a twenty-five item Likert-type survey questionnaire based on the ISTE Foundations for All Teachers that included items about Basic Operations and Concepts, Personal and Professional Use of Technology, and the Application of Technology in Instruction. The survey response choices were on a five-point scale ranging from (1) Strongly Agree, to (5) Strongly Disagree, with (3) as Not Sure.

The survey site on the World Wide Web (WWW) allowed students to complete the questionnaire on line. Email listservs (distribution lists that allow for one message to be sent simultaneously to may people) provided communication access to student teachers at U1 and U3 to inform them of the survey web site and provide information about the study. Student teachers at these two universities received an emailed invitation to participate through the listserv set up at each school. Students at one university were given the invitation and survey to complete with paper and pencil when they met for a general student teacher orientation. Included in both on-line and hard copy invitations was the added incentive for participation of being entered in a drawing for a gift certificate. With data collected from the student teachers on the questionnaire, researchers sought to determine the perceptions of competence of student teachers graduating from Arizona institutions with respect to meeting the ISTE standards.

The results of this survey have significant implications. First, they provide an indication of which areas of technology in which newly graduated teachers feel they are most and least competent. Second, such results might provide insight into how universities should and/or can better prepare teachers in educational technology.

Results of the survey suggest that the students feel very competent about their basic computer skills and knowledge, but less confident about their competence in more advanced uses of educational technology, such as integrating technology in diverse classroom settings. As this is the area which has the greatest potential direct impact on K-12 students, specifically high school graduates about to enter the workforce, there is a concern about the current preparation of pre-service teachers.

The first finding from the survey questionnaire was the lack of participation from the student teachers who were contacted through email and directed to the survey web site: a total of forty three respondents from two universities, out of five hundred sixty contacted. There are several possible explanations for this low level of on line participation: (1) student teachers were very busy and felt that they could not take the time; (2) student teachers did not use their university email addresses and so did not get the invitation; (3) student teachers were uncomfortable taking surveys on line; (4) student teachers were not interested in supporting the study, even with the incentive of a gift certificate drawing.

In general, the student teachers reported competence with, Basic Operations and Concepts, Personal and Professional Use of Technology, and the Application of Technology in Instruction. Although there is little difference among the means, the lowest reported competence is the Application of Technology in Instruction or Integration, and the highest competence level reported is for the Basic Operations. This finding seems reasonable and indicates that teacher education technology courses should perhaps emphasize curriculum integration concepts rather than the basic concepts of using hardware.

Although one might be tempted to claim that student teachers believe they are well prepared to meet the ISTE Foundational Standards, a few important exceptions should be noted. Students appear to have become competent with respect to simple standards that affect their personal use of computers, however significant numbers of students teachers do not feel competent in the more complex uses of computers, especially more complex instructional uses. As this is the area which has the greatest potential direct impact on K-12 students, specifically high school graduates about to enter the workforce, there is a concern about the preparation of teachers.

The ISTE Foundational Standards for Teachers guided the syllabi review and student teacher survey. To explore how Arizonans viewed the use of technology in education two roundtable discussions were held. First, in order to determine what technological skills high school graduates need to enter the workforce, a business roundtable was held. There, recommendations were collected from professionals in business and labor about what high school students should be learning in school in order to improve their chances for employment.

Following the business roundtable, an education roundtable was held, with educators from different schools in Arizona, to share the list of recommendations from the business roundtable. The educators came up with their own recommendations concerning pre-service and in-service teacher education. The ultimate goal for both roundtables was to determine what should be done so that teachers can prepare graduating high school students for the workforce.

Roundtable Discussions

Two roundtable discussion sessions were held to solicit input from various stakeholders in the educational technology in Arizona issue. One roundtable consisted of business and technology industry leaders from companies such as Hewlett Packard, General Motors and US West (Q-west). The main goal was to collect a set of recommendations from three tables of participants about how to better prepare students for the future workforce.

The second roundtable included educators from K-12 schools, universities, and community colleges. The main goal of this roundtable was to collect a set of recommendations regarding both pre-service teacher preparation in using technology as part of instructional delivery and in-service teacher professional development.

At both roundtables participants discussed, from their unique perspectives, their perceptions of how the educational system in Arizona is preparing students to be technologically literate citizens. Business leaders and educators agreed that teachers and their preparation are critical in meeting the workforce needs of the new economy. To provide students with the experiences they need to enter the workforce, teachers need better preparation and professional development that provides them with rich and sustained opportunities to observe, develop, practice, reflect upon, and evaluate technology lessons that meet important content objectives. Roundtable discussion participants recommended that school-university and school-business partnerships could play an important role in improving technology education.

The next section discusses six districts/schools whose technology programs were considered exemplary. Through interviews and on-site visits, six case studies were developed that focused on each school's technology programs and more specifically professional development in this area. Professional development of teachers is a crucial factor because it ultimately impacts how technologically adept students will be.

K-12 Case Studies

Six case studies examined the technology programs of a variety of Arizona K-12 districts and schools that were deemed "exemplary" by professors, K-12 educators, and technology directors around the state. The case studies focused on the professional development programs and activities in educational technology to determine how in-service teachers are being educated in technology skills and literacy. Six case studies were conducted. Forty-seven individuals were interviewed in thirty-three sessions. This information summarizes findings across all the cases, which varied along many socio-economic and geographic dimensions. Schools and districts in the northern, central and southern part of the state were represented. Large urban districts and small rural districts were represented. Districts with 100%, 50%, and 0% free and reduced lunch were represented. Finally, districts with high and low minority populations were also represented. Thus, the schools and districts making up this part of the project are a diverse set.

These descriptive studies revealed that a complex set of variables impact professional development and the implementation of technology programs for in-service teachers. Professional development programs that promote the effective use of educational technology are based on:

- Ongoing substantial support by the school district
- Commitment of resources
- Leadership with a clear vision
- Clear communication
- Meeting the real needs of the participants
- Partnerships

Teachers interviewed in the case studies appear to believe strongly that the above components lead to the improvement of teaching and learning.

Conclusions and Recommendations

The Technology in Arizona project highlights a number of areas in Arizona's K-16 educational system in which the teaching of educational technology might be enhanced. The following recommendations stem from the four parts of the study: review of university syllabi, survey of student teachers, business and education roundtables, and the case studies.

Arizona's Regent's Universities

- University educational technology courses should further focus on and emphasize the ISTE Foundation Standard category Application of Technology in Instruction
- All the university teacher education programs should ensure that all the ISTE standards are addressed through any combination of courses offered
- All course content offered in the Regent's universities' educational technology courses should be assessed using performance-based measures rather than just content knowledge assessment
- University faculty working with pre-service teachers should have the necessary skills to teach and model the integration of technology in diverse K-12 classroom settings and do so in their own instruction
- University faculty teaching educational technology courses should be provided opportunities for ongoing professional development
- Exemplary teachers who integrate technology should serve as mentors to pre-service teachers

- All graduating pre-service teachers should be held accountable by demonstrating a minimum level of proficiency with respect to a set of educational technology standards, i.e., the ISTE Recommended Foundations in Technology for all Teachers.

K-12 Instruction

- Encourage teachers to be "coaches" of learning in order to facilitate their students' learning of technology
- Promote team teaching partnerships between teachers and mentors from business and the technology industry
- Provide options of different tracks in schools for student who want to enter the workforce immediately following high school rather than attend college, but ensure that students of either track have basic literacy, numeracy, and technology skills
- Integrate technology into the school curriculum with a focus on providing a "wholistic," integrated educational model for the student of reading, writing, numeracy, problem-solving, and technology skills
- Provide opportunities for authentic applications of technology both inside and outside the classroom
- Hold practicing teachers accountable to a minimum level of educational technology proficiency, i.e., ISTE Recommended Foundations in Technology for all Teachers, through their district evaluation process
- Develop district technology plans to guide the implementation of the classroom and computer lab use of technology
- Ensure equitable access to computers and technology for both students and teachers

Professional Development for Educators

- Use a peer mentor "teacher-coach" model for staff development in educational technology
- Ensure that professional development in educational technology is relevant to teachers' needs and the school curriculum
- Provide time during the school day and school year for ongoing professional development
- Develop professional development activities in educational technology which are continuous and sustained
- Obtain the support and endorsement of school and district administrators for professional development and evaluation in educational technology
- Base professional development in educational technology on research in best practices in learning and teaching
- Evaluate and reward teacher proficiency in computer/technology use in the classroom

S C I E N C E

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The 2001 SITE Annual Meeting Science section offers 21 presentations that encompass a wide range of topics related to use of instructional technology in a variety of classroom settings, from the elementary school classroom through the university setting. Authors provide information about both preservice and professional development projects, specific project and program reviews, and research about how students and teachers learn. Inquiry in teaching, integrating the science disciplines, is a common theme across the articles. Roach has a Ph.D. in science education. She teaches science methods courses and curriculum courses at Northwestern State University of Louisiana. Her e-mail address is roachl@alpha.nsula.edu.

Project and Program Reviews

Assumpcao, Passow, Corder, Baggio, and *Ortiz* describe a unique, on-line, distance learning teacher training project called Earth2Class. This series of workshops focuses on integrating technology into an Earth Science curriculum. Presented by scientists, teacher-participants gain content background about earth science concepts through videoconferences and work through classroom-ready instructional materials at a supporting website. Other resources on the Earth2Class web pages provide links to scientific, education, and government sites.

Beal explains an innovative project in which preservice teachers work with middle school students to preserve a North Carolina inner city wetlands area. After completing real-world, action research the participants compiled data and presented their research to the North Carolina State University Spell of the Land Symposium. Beal describes the process of building a meaningful service learning program.

Coverdale presents results of research on the value of a technology-rich interdisciplinary curriculum, *Quests* (i.e. *AfricaQuest, AsiaQuest, AmericaQuest*). It analyzes the projects with respect to students' abilities to conduct investigations, and understand both science concepts and the nature of science, after completing the curricular units. Preservice teachers' reflections on their own participation in *Quests* are also reported.

Dove and *Zitkovich* report on a collaborative project, *Boardman Local Schools Our Lake Online*, in which elementary students take a digital expedition to the Lake Erie shoreline. Results of one set of 33 students' onsite observations and experiments were digitally transmitted to over 450 students who participated remotely through asynchronous inquiry-based science. High school students provided technology training and assistance for the elementary teachers and students. Information about student learning about science and technology are presented as well as "lessons learned" by the researchers in undertaking this innovative learning experience.

Gao reviews a technique for embedding problem-based-models into a class web site as a supplement to traditional instruction. The model includes problems to be solved, review, tutoring, hints, self-tests, and solutions.

Hochman, Marshall, and *Oyenarte* demonstrate how technology can make outdoor education more authentic. At *Camp Crystal Lake*, 2nd grade and 5th grade students collect data in each of three ecosystem environments. Prior to their field experiences, students participate in on-line activities which coincide with the types of activities they will be doing in the field. This presentation provides an overview of the camp experiences, including data collection techniques and the connectedness of the on-line and field experiences.

Lustigova and *Zdena* review an Internet-based package called Remote and Open Laboratory based at Charles University in Prague, Czech Republic. Geared toward both initial teacher training and inservice professional development, participants use modern tools and techniques for data acquisition and processing. Large databases of experiments and computer models provide teachers with a wealth of information and allow them to compare the results of their own experiments to those of others. Users can download experiments and models and adapt them to their own classroom conditions and needs.

Technological Field Trips

Clark, Hosticka, Schriver, and *Bedell* report on use of technology to create virtual field trips. They provide advantages and limitations of such and undertaking and review types of technology commonly found in public schools which can be utilized in such efforts.

Slator, Saini-Eidukat, and *Schwert* take us into a virtual world where learners become geologists, planning an expedition, and dealing with the virtual environment to report their findings. As goals are satisfied, learners move to progressively higher levels of expertise as they learn to think and act like real geologists. In addition to a description of the field trips, a report of research into student learning and accomplishments is presented.

Technology in the Classroom

Akpan outlines the use of computer simulations to prepare students for dissection activities.

Jones, Superfine, Taylor, and *Andre* use advanced technology in high school classrooms. They provide detailed information about the use of the Atomic Force Microscope, controlled by scientists, via the World Wide Web, in biology classrooms. Research conducted by this team with regard to gender differences, students' understandings of the nature of science, scientists, and scientific careers is also reported.

Mochon offers a description of a program in New Mexico that utilizes mathematical based explanations to support science teaching at the high school level. Students use spreadsheet technology to enhance science learning.

Molenaar presents multimedia techniques used in a high school physics classroom and preliminary research results.

OToole and *Doe* provide strategies for integrating diversity issues into the science classroom through the use of the Internet. A review of the web-site is presented as well as suggestions for use at all grade levels.

Ray, Patterson, Jenks, and *Hocutt* show how to use Palm Pilots, hand held computers to grade student laboratory activities in real time.

Slough, Chamblee, and *Aull* describe an integrated middle school weather unit. Local weather measurements, taken by students, are supplemented with TV weather reports. With Internet enhancement, climatological data, not previously available can be included in classroom experiences. A fully developed unit will be shared.

Suits shares results of three types of instructional technology are used to help students make meaningful connections between phenomena and scientific principles. Microcomputer-based laboratory experiences, computer-simulated experiments, and multimedia learning modules are discussed.

At The University

Garcia and *Faria* present an integrated, Environmental Science based inservice studies via an online course. Teachers develop integrated learning activities for use in their own classrooms.

Kiser, Bell, Flory, Miller, and *Pushnik* work to enhance the basic core university science curriculum with an integrated course based on the topic of Global Warming. Using computer modeling, traditional laboratory experimentation, web-based research, and problem-based learning in an integrated format, the emphasis is on the processes of doing science.

Marshall, Pringle, Dawson, and *Hochman*, at the University of Florida offer an integrated math, science, and technology block to undergraduate education majors. They offer information about the course, program planning, and preliminary research results.

Teixeira describes a game developed to teach students the intricacies of lymphocytic immunogenetics. It consists of steps which simulate the developmental stages of lymphocytes.

Using a Computer Simulation Before Dissection to Help Students' Learn Anatomy

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Abstract: The scientific community and the nation's schools have been experiencing a self-proclaimed ethical crisis over animal dissection in classrooms. While this issue involves intractable ethical and philosophical positions, one ethical implication of the debate is that if dissection is used in schools, it should be used for maximum educational benefit. One intriguing previous finding was that use of an interactive videodisc dissection learning from subsequent actual dissection. This study examined the prior use of simulation of frog dissection in improving students' learning of frog anatomy and morphology. There were four experimental conditions: simulation before dissection (SBD), dissection before simulation (DBS), simulation-only (SO), or dissection-only (DO). Results of the study indicated that students receiving SBD and SO learned significantly more anatomy than students receiving DBS, DO. The genders did not differ in achievement.

Introduction

Use of computer simulations for dissection in the classroom has gained popularity. The idea that experiences are most essential to conceptual development is central to several theoretical perspectives. Piaget's (1954) theory argues that knowledge is constructed through action. Bruner (1966) adapted Piagetian theory into the idea that learning requires experiences at an enactive level before iconic and symbol experiences can become meaningful. Andre (1986) argued that developing effective problem-solving schemata required appropriate experiences to promote the development of the pattern recognition component of a schemata. Simulations provide a potential means of providing learners with experiences that facilitate conceptual development. As Thomas and Hooper (1991) put it, when a simulation precedes didactic instruction, the simulation experience may provide motivation, improve performance, provide an organizing structure and may reveal misconceptions. Thus, a simulation of frog dissection provided before actual dissection may function as a conceptual model that allows students to better understand and encode the dissection presented information. Students who experience simulation after dissection may not have a meaningful model with which to assimilate the dissection information. The effects of engaging students in simulation tasks either before or after completion of actual dissection have been the focus of a number of research studies for example Kinzie, Strauss, & Foss (1993) compared the achievement and attitudes of students who conducted a frog dissection either with or without the use of interactive video (IVD) simulation as a preparatory tool before actual dissection. In these studies, students who received simulation as preparatory tool before actual dissection learned more effectively than those students who received no preparation and more effectively than students whose preparation consisted of viewing the linear videotape. We further explore the use of simulation before or after dissection in the present study.

The Study

The participants were approximately 127 students (59 males, 68 females) ranging in age from 13-15, enrolled in a seventh grade life science course in a mid-size mid-western middle school of 800 students. These students had some experience in animal dissection, but had no experience in the use of a simulated dissection. These students participated in the study as part of a normally scheduled laboratory involving frog dissection. Because it was a regularly scheduled class activity, all students in the classes participated in the activity. Data, however, were used only for those students for whom signed permission was obtained from both the student and a parent. Of the 127 eligible students in the participating teacher's sections, 44 were absent during at least one of the experimental sessions due to illness or inclement weather. Two students whose identifiers could not be matched with their ITBS scores were also excluded from the study. These factors reduced the total number from 127 participants to 81 (34 males, 47 females). To maintain student confidentiality, all data were coded with assigned identification numbers rather than names.

Design

Participants were unsystematically assigned to the periods at the beginning of an academic school year based on teacher recommendation and final grade in sixth grade science in a manner so as to roughly equalize ability across sections. In this study, class periods were randomly assigned to four experimental conditions: In the simulation before dissection (SBD) condition, students completed a simulated dissection before completing an actual frog dissection. In the dissection before simulation (DBS) condition, students performed an actual frog dissection before the simulated dissection model. In the dissection only (DO) condition, students completed an actual frog dissection only. In the simulation only (SO) condition, students completed only the simulated dissection.

Simulation sessions

The simulation sessions for the SO, SBD and DBS conditions were conducted as follows. Students met during class times in the regular computer lab. The participants were seated individually at computer stations. The participants were introduced to the computer simulation and given an instructional guide, which included pictures of dissected frog parts and a description of their functions. The students were shown six systems of the frog dissection that they could navigate on their own in any sequence they chose. They were also shown four interactive minilabs, in which they could investigate the frog's respiration, digestion, circulation and muscular capacity.

Dissection sessions

In the dissection laboratory, student worked at one lab table side by side in the room. Two researchers were present during dissection sessions. When a student was not able to perform an assigned step or could not remove an organ, the researcher assisted the student after the finished dissection products had been evaluated. The achievement posttest was administered three days after the dissection was completed.

Findings

The anatomy and morphology achievement test. Preliminary internal consistency analysis using Cronbach's alpha indicated that five items had negative or zero item total correlations. These items were eliminated from the achievement pretest for that reason. The internal consistency estimate (using Cronbach's alpha) of the remaining 20-item scale was 0.55. The alpha for the posttest was 0.60. While low, these reliabilities were judged acceptable for this research. Lower internal consistency should increase error variance and reduce the likelihood of finding a significant effect. Thus relatively low internal consistency should increase condifidence in any significant effects found.

Pretest Data

In the analyses of differences between conditions, an alpha level of .05 was assumed unless otherwise specified. F-values are reported for significant effects only.

Achievement pretest. Differences between the four conditions on the pretest were assessed by Gender (male versus female) X Treatment (SBD, DBS, SO, DO) ANCOVA with ITBS Science score as the covariate. There were no significant main effects or interactions found indicating pre-experimental equivalence of the four conditions and the two genders. The treatment means are reported in Table 1.

Table 1. Cell means, F-ratios, p-values, and standard deviations for each of the variables for each of the conditions.

Factor		Treatments						
		DBS[a] (n=28)	SBD[b] (n=21)	SO[c] (n=17)	DO[d] (n=16)	Total (n=81)	F- ratio	p-value
Pretest Achievement score (25-items)								
	M[e]	8.1	8.5	8.5	8.9	8.7	1.17	.326
	SD[f]	3.2	2.8	2.0	3.1	2.7		
Posttest Achievement score (43)								
		15.6	20.0	18.5	14.9	17.2	12.64	.000
		3.4	3.0	2.2	3.2	3.6		

[a]DBS = Dissection before simulation
[b]SBD = Simulation before dissection
[c]SO = Simulation only
[d]DO = Dissection only
[e]Mean
[f]Standard deviation

Posttest Data

The anatomy and morphology achievement posttest. The posttest achievement data were analyzed using a 2 (Gender) X 4 (Condition) X Test Time (Pretest vs. Posttest) between/within ANCOVA with ITBS science score used as a covariate. Test time was the within subject variable. The ANCOVA revealed a significant main effect of Condition, $F(1, 72) = 53.135$, $p = .0001$, and of Test Time, $F(1, 72) = 18.746$, $p = .0001$, but these main effects were modified by a significant Test Time by Condition interaction, $F(1, 72) = 13.080$, $p = .0001$. As shown in Table 1, students in all conditions seemed to improve in anatomical knowledge from pretest to posttest. However, students in the SO and SBD conditions appeared to improve more than did students in the DBS and DO conditions. This apparent difference was assessed by conducting follow-up gender by time between/within ANCOVAs for each condition. These tests indicated a significant improvement from pretest to posttest the SBD and SO conditions, but not for DBS and DO condition. It had been expected that males would do better than females. This prediction was not confirmed. No main effect or interaction involving gender were significant. The ITBS covariate was significant, $F(1, 25) = 19.609$, $p < .0001$.

Discussion

The results of this study supported the theory that prior use of a simulation before dissection can improve learning. The treatment group that completed the simulation activities before the actual hands-on dissection performed significantly better on the achievement posttest and dissection performance test than the other three groups. These results are consistent with those of Kinzie, Strauss, and Foss (1993) who compared the achievement and attitudes of students who conducted a frog dissection with and without the use of an interactive video-based simulation used as a preparatory experience for the actual frog dissection. As in the present study, their results indicated that students in the interactive video simulation preparation group scored significantly higher on the posttest achievement measures than did other three conditions.

The results obtained in the current study offered little support for the hypothesis that there would be a significant difference in the learning patterns of male and female on the posttest achievement means and the dissection performance test. No differences in posttest achievement or dissection performance were found between male and female participants in any condition. This failure to find a gender difference in the present study run counter to the results of Andre and Haselhuhun (1995). Andre and Haselhuhun found that males who completed a simulation activity before reading a text on principles of motion learned more from the text than males who did not use the simulation before reading. For females, no significant differences were found. In a followup study, Andre et al. (in preparation) found positive effects of a prior simulation on learning the principles of motion for both males and females, but overall males did better than females. The differences between the Andre and Haselhuhn and the present study may be due to gender differences in interest and experience with the content. The present study focused on biological content whereas the Andre and Haselhuhn study focused on physics. Differences between females and males in interest in the biological sciences are substantially smaller than differences in interest in physical science and in physical science course taking (Kahle & Meece, 1994; Andre, Whigham, Hendrikson & Chambers 1997).

A second possibility is that the nature of the simulations used related to the gender differences. The simulation used in the Andre and Haselhuhn (1995) study was more exploratory and less directive than the simulation used in the present study. In the present study, the simulation directed students to remove particular organs.

It may be that directiveness and prior knowledge, experience, or interest interact. When interest, experience or knowledge are low, as is typically the case with women and physical science, students may have difficulty connecting experience in an open-ended exploratory simulation to later didactic instruction. With higher knowledge levels, or greater directiveness in the simulation activity, connections between a simulation experience and a later experience may be easier for students to perceive. However, these interpretations are speculative; the large number of differences between Andre and Haselhuhn (1995) and the present study preclude firm conclusions. But the differences in the studies raise fruitful lines of inquiry for subsequent research.

In the current study, the lack of gender differences support the results of Tylinski (1994) who found no significant difference in the learning patterns by gender when using either a computer simulation or traditional hands-on method of dissection. The present results also are consistent with Choi and Gennaro (1987) who found no gender differences in their study of the use of simulations to teach volume displacement to eighth grade students.

The most intriguing result of the present study was that a simulation used before dissection led to better achievement performance than a simulation used after dissection. This difference cannot be attributed to a difference in the amount of instruction received as the students in the simulation before dissection and dissection before simulation conditions had equivalent amounts of instruction. Nor can the difference be attributed to a Hawthorn effect of using a new instructional tool or to a motivational effect of the computer based simulation. Both the simulation before dissection and dissection before simulation conditions received the same computer experience. The difference has to be due to the sequence of presenting the simulation before the dissection.

The study also looked at the students' attitudes toward dissection. The dissection-only condition was more accepting of dissection than the other two conditions; dissection before simulation and simulation before dissection. However, attitude toward dissection did not change differentially as a function of experimental condition over the study. Similarly, the students' attitude toward computers and attitude toward school and science scale remained consistent from the pretest to posttest. These results supported Kinzie, et al. (1993) who found that the attitudes toward dissection remained relatively stable from pretest to posttest. McCollum (1988) also compared lecture versus dissection in a high school biology and found no significant differences in group attitudes toward frog dissection before and after the end of the experiment. One reason why the student attitudes did not change may be that their opinions were formed across experiences in six school grades. A single experience is unlikely to change such long-term attitudes.

The results obtained in the current study offered little support for the hypothesis that there would be a significant difference in the learning patterns of male and female on the posttest achievement means and the dissection performance test. No differences in posttest achievement or dissection performance were found between male and female participants in any condition.

There are a number of limitations in the present study. The participants were mostly white, middle class, seventh grade middle school students in a single, midwestern, homogeneous school district. The limited diversity in students obviously limits generalization to students in other environments and grades or from different cultural and socioeconomic backgrounds. Nevertheless, it is assumed that students in the present study were reasonably typical of the population of white, middle-class, midwestern middle school students. In addition, we excluded data from all identified special education students from the study; generalizations to special needs students should not be made. It is possible that taking the pretest influenced posttest scores. This potential influence may mean that data obtained from the study could not be generalized to situations in which pretests are not used. Because the pretest was administered three weeks prior to the time of the actual dissection, it is possible that learning occurred between the pretest and the beginning of the study. However, as this difference occurred for each of the groups, it is unlikely that it influenced the different results found between the conditions. Finally, because the standard error of the statistic is decreased with an increased in sample size, the smaller sample size of this study may limit its generalizability.

Conclusion.

The results of the present study suggest that presentation of a computer simulation before the actual dissection may provide an experiential base that enhances learning. This finding suggests that computer-based simulations can offer a suitable cognitive environment in which students search for meaning, appreciate uncertainty, and acquire responsibility for their own learning. These results are in agreement with previous results that the use of computer simulation before actual dissection or alone can provide a better experiential base for students to master the anatomy and morphology of frogs than can the use of simulation after dissection or dissection-only.

Although the use of simulation before actual dissection may provide an experiential base that enhances learning of new information, simulation may not be equally effective for all students. The degree to which students benefit from simulation before actual dissection may depend on the prior interest, knowledge, and experience that the student brings to the instructional situation.

References

Andre, T. (1986). Problem solving and education. In G.D. Phye and T. Andre (Eds.) Cognitive Classroom Learning. San Diego: Academic Press, Inc.

Andre, T., & Hasclhuhn, C. (1995). *Mission Newton! Using a computer game that simulates motion in Newtonian space before or after formal instruction in mechanics.* Paper presented at the American Educational Research Association Annual Meeting, (April 1995).

Andre, T., Whigham, M., Hendrikson, A., & Chambers, S. (1997). *Attitudes of elementary school students and their parents towards science and other school subjects. Paper presented at the annual convention of the National Association of Research in Science Teaching*, Chicago, (April 1997).

Bruner, J. S. (1966). *Toward a theory of instruction.* Cambridge, MA: Harvard University Press.

Choi, B., & Grennaro, E. (1987). The effectiveness of using computer simulated experiments on junior high students' understanding of the volume displacement concept. Journal of Research in Science Teaching, 24 (24), 539-552.

Kahle, J. B., & Meece, J. (1994). Research on gender issues in the classroom. In D. L. Gable (Ed.), Handbook of research on science teaching and learning, New York: Macmillan. (pp.552-557).

Kinzie, M. B., Strauss, R., & Foss, M. J. (1993). The effects of an interactive dissection simulation on the performance and achievement of high school biology students. *Journal of Research in Science Teaching,* 30(8), 989-1000.

McCollum, T. L. (1988). The effect of animal dissection on student acquisition of knowledge and attitudes toward the animals dissected. (ERIC Document Reproduction Service No. Ed 294-749).

Piaget, J. (1954). *The construction of Reality in the Child.* New York: Basic Books.

Thomas, R. & Hooper, E. (1991). Simulation: An opportunity we are missing. *Journal of Research on Computing* in Education, 23 (4), 497-513.

Tylinski, J. D. (1995). The effect of a computer simulation on junior high students' understanding of the physiological systems of an Earthworm Dissection Unpublished doctoral dissertation, Indiana University of Pennsylvania, 1994.

EARTH2CLASS: A UNIQUE WORKSHOP/ON-LINE/DISTANCE-LEARNING TEACHER TRAINING PROJECT

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Abstract: "Earth2Class" (E2C) is a unique science, math, and technology learning resource for K-12 students, teachers, and administrators created through the collaboration of researchers at the Lamont-Doherty Earth Observatory, curriculum and technology integration specialists at the Institute for Learning Technologies, a Maury Project Peer Trainer, and teachers from the New York City metropolitan area and rural upstate New York. During the winter and spring of 2000, E2C presented workshops for teachers at the Lamont-Doherty campus in Palisades NY that were transmitted live to others in Glens Falls. Before, during, and after each workshop, participants and others were able to utilize the resources available on the E2C Internet site, www.earth2class.org. E2C relies on a unique synergy of specialists in curriculum, educational technology, and scientific research, but the key feature is involvement of the Lamont scientists. Their availability through workshops, web site postings, and e-mail expose teachers to stimulating cutting-edge research that help the teachers develop K-12 curriculum activities linked directly to "real world questions." Drawing on the scientists' expertise, teachers can show students how the science they are learning applies outside the classroom, as well as to other aspects of their studies.

Introduction

While expectations for student achievement are increasing, many teachers do not have adequate content knowledge to effectively teach science or math; nor do most undergraduate-level science and math courses model the pedagogical approaches prospective teachers will need in the K-12 classroom. Once in the classroom, beginning teachers are usually expected to be fully qualified, and often do not receive the support needed to improve and refine their content knowledge or pedagogical skills (CEO Forum on Education and Technology, 1999).

Teacher education should be viewed as a career-long process that allows teachers of science, mathematics and technology to acquire and regularly update the content knowledge and pedagogical tools needed to teach in ways that enhance student learning and achievement in these subjects (CEO Forum on Education and Technology, 1999; Getting America's Students ready for the 21st Century: Meeting the Technology Literacy Challenge, 1996).

"Earth2Class" (E2C) is a unique science/ math/technology learning project that combines workshops by research scientists with on-line resources available at www.earth2class.org and distance-learning staff development programs. E2C has the potential to become a major resource for educators in the atmospheric and related sciences. This paper provides a general description of the "Earth2Class" project.

Project Background

"Earth2Class" developed out of a series of workshops organized by AMS Maury Project Peer Trainer Michael J. Passow and held at Columbia University's Lamont-Doherty Earth Observatory in Palisades NY. In each session, participants gained background information concerning atmospheric, oceanographic, climatic, and other concepts related to the theme, then interacted with the featured scientist describing his/her cutting-edge research. In addition, teachers worked through teacher-training and classroom-ready instructional materials developed by the Maury Project, Project Atmosphere, and other AMS Education Program efforts, among others. Kelly Corder proposed a collaboration that could make the benefits of the scientists' presentations available to more teachers, using as a pilot program those associated with the North Hudson Electronic Education Empowerment Project. Cristiana M. Assumpcao and Frederico Dalmas Baggio from the Institute for Learning Technologies, Teachers College, Columbia University, provided the hardware and expertise to develop the supporting web site (www.earth2class.org) and handle the videoconferences, as well as bring in the technology integration components to the curriculum. Through teleconferencing links with the North Hudson Electronic Educational Empowerment Project (NHEEEP), based at Adirondack Community College, Glens Falls NY, they were able to present the "live" presentations at LDEO to teachers more than 320 km away. Using a supporting web site, www.earth2class.org, participants were able to access and work through some of the workshop activities as they were being presented. These were later edited and made available to anyone interested in the PowerPoint, activities, and other components of the workshop. In addition, other resources on the www.earth2class.org web pages provide educators and their students with links to many useful government, science and science education, and other Internet sites; web-based classroom activities; and examples of appropriate curriculum and assessments.

Workshop Themes

Briefly, the themes for this year's Spring series and guest scientists included:

"Predicting Natural Disasters" with Arthur Lerner-Lam

"Nothing can beat the excitement of collecting a singular piece of data, of measuring it delicately, of pronouncing it fit, and extracting its story. One thing an academic program in science must do is communicate science by current example and past history. Columbia's Department of Earth and Environmental Sciences and Lamont-Doherty Earth Observatory combine to do this very well. Whether we're in the field, at the bench, or in front of a computer, we all seem to feel and draw on the institutional memory here. You have to keep poking at the earth to learn its secrets. As a seismologist, I do a lot of field work collecting data from earthquakes and explosions. I use these data to model the structure of the upper mantle and crust."

But just how predictable are natural disasters? How can appropriate information and warning reach the general public? What about other kinds of natural hazards--hurricanes, tornadoes, winter storms, heat waves, etc? This workshop will provide the chance to find out more about such problems, and develop some ideas about how to present these topics to your students.

"El Nino, La Nina, and the North Atlantic Oscillation" with Martin Visbeck

My main research interest is to understand the ocean's role in the climate system and its consequences for society. How is decadal climate variability orchestrated? Does the ocean influence atmospheric variability in mid-latitudes? What is the North Atlantic Oscillation? Does primary productivity depend on decadal variability? Can we forecast deep convection in the Labrador Sea? And what role do the polar oceans have in the climate system? I have worked on a number of problems using ocean models and data from sea-going expeditions and enjoy thinking about the nuts and bolts of the daily science as much as developing new multidisciplinary research programs for the years to come.

"Winds, Currents, and Cores" with Donna Witter and Rusty Lotti Bond

The recently launched QuikSCAT satellite scatterometer (NASA) is returning high-quality data that will be used by oceanographers and atmospheric scientists to study winds over the ocean on a wide variety of time scales. From a climate perspective, one of the most exciting applications of this technology is that statistical analysis of short records of satellite data can be used to improve estimates of wind variability on long time scales (e.g., decades to a century). On these longer time scales, the wind record from ships at sea is spatially and temporally filled with gaps and subject to larger errors. Several of us at LDEO are using satellite wind observations to better understand deficiencies in the historical data sets and to develop new wind climatologies for the historical period. My presentation will describe this work, and discuss its use for assessing climate change during the past century. The specific topics which will be covered in the presentation include: 1) the technological aspects of measuring winds from space; 2) using these measurements to understand recent wind variations, and 3) using these measurements to understand wind variations on climatologically significant time scales and for times prior to the launch of wind-observing satellites.
Rusty Lotti Bond, Curator of the Lamont-Doherty Deep-Sea Sample Repository, oversees the collection, processing, archiving and physical properties analyses of the largest collection of material from the below the ocean floor. The Lamont-Doherty Deep-Sea Sample Repository collection of sediment samples provides material for scientists worldwide to research many facets of our earth's systems. Deep-sea cores contain microfossils and minerals that can be used as environmental indicators, or reveal climate change. The cores hold a permanent record of geological events such as earthquakes, changing sea levels and shorelines, and the earth's magnetic history. Variations of color and texture resulting from changes over time in the sediment are clearly visible in the cores. Samples from the different intervals can be easily processed for observation of the variations in number or kinds of microfossils or minerals. The dynamics and significance of these changes will be explored in the workshop.

"Climate Changes over Various Time Scales" with Joseph D. Ortiz

The objective of this workshop was to provide teachers with an introduction to the factors that drive climate change on a variety of time scales. Dr. Ortiz will discuss processes that drive climate on a variety of timescales from the seasonal to 10's of thousands of years. Study of the Monsoon system serves as an example of how some of these climatic forcing functions interact. On seasonal timescales, Monsoon circulation systems in African, India and Asia are driven by the thermal contrast between land and sea. Likewise, during times in the geologic past when orbital parameters maximized seasonal contrast, enhanced Monsoon systems existed. This effect has been successfully simulated with global climate models (GCMs) and observed using geologic data such as lake level records. Material presented in the workshop, including a presentation of educational software on the Monsoon, and lists of internet-based educational material provides a rich context for teacher to explore the natural phenomenon of climate with their students on a variety of levels.

"Studying the Sea Floors and Sea Surface from Space" with Christopher Small

Studying the sea surface and deep ocean floors has come a long way from the lead weights on piano wire lowered over the side of the "HMS Challenger," and even from sonar so widely used since the 1940s. Today, satellites flying high above the surface can send radar and other beams that reflect off the sea surface and bottom, and can be translated into detail images. Such satellite data has made possible new understanding of how changes in sea surface temperatures can affect global climates. They can measure variations in sea surface heights, revealing that the "sea level" is actually far from "level." They can discover previously-unknown volcanoes and other features lying in the ocean depths.

Dr. Christopher Small shared his expertise in Geophysics and Remote Sensing. His current research involves analyzing seamount volcanism in the southern Indian Ocean using multibeam sonar data and image processing software.

"EarthView Explorer (part 1 and 2)" with O. Roger Anderson, Raymond Sambrotto, John Armbruster and Kevin Griffin.

Earth View Explorer (EV) is a novel, computer-based learning application based on constructivist principles that encourages students to explore data, invent hypotheses and test them, and in many respects inquire about their environments as do scientists. The EV application contains four units: 1. Geosphere, 2. Hydrosphere, 3. Atmosphere and 4. Biosphere. In the first session, we will introduce the basic rationale for this curriculum innovation and its use, and through group, hands-on, experience develop with the workshop participants how to use the first two modules in teaching. All participants received a free copy of the CD-ROM disk.

In the second session, we explored the use of the modules on Atmosphere and Biosphere though presentations by Columbia University scientists and science educators and explore, through hands-on use of the modules, how these can be applied to teaching earth and environmental sciences in pre college education.

General Workshop Setup

Briefly, for each session, video cameras and two-way audio connections enabled participants at each location to view what was happening on large-screen projections, so interactions were easily made. Computer connections allowed participants to work through activities as the presentations were in progress. By using Netmeeting, one computer was connected just to share the desktop of the scientist's computer in order for the distance teachers to be able to follow more easily what was being demonstrated, while a second computer was connected with video and audio, so that the distance teachers could see the presentation and ask questions. Teachers could also explore other aspects of the CDs and web-based activities during the sessions. In this way, the workshops moved far beyond the "talking heads" often involved in distance-learning formats.

Teacher Enhancement

Announcements about these workshops were distributed through List-Servers, regional teacher centers, conference fliers, and other formats. Teachers involved in the workshops at the LDEO campus came from a variety of public and parochial schools in the New York/New Jersey area. They paid a nominal fee of $10 per session toward costs. Credit for attendance was possible, but no graduate course credit arrangements were available. Teachers at Adirondack Community College were participants in the North Hudson Electronic Educational Empowerment Project, a three-county consortium serving many districts in the region. Assessment of E2C workshops was obtained from the teachers through an on-line section of the web site. Information from the responses is being used to shape future offerings to enhance technological skills and subject area knowledge of participants.

Future Plans for Earth2Class

Based on the experiences obtained in this series, the "Earth2Class" team is engaged in efforts to expand the scope of the program considerably in the 2000 – 2001 academic year. Nine workshops are planned for the current year. These include updated presentations by most of the past presenters, stand-alone online asynchronous modules using the scientists as instructors in association with Earthscape, Columbia University Press, as well as new themes dealing with applications of educational technology, rocks and minerals, core/mantle studies, and hydrology. Partnerships with established Columbia University electronic education programs are underway that will significantly improve the technological basis of E2C offerings, as well as expand the potential participatory base.

Conclusions

"Earth2Class" provides an excellent example of how research institutions schools of education can work with classroom educators to enhance science achievement. Despite occasional glitches from pushing the limits of bandwidth and other aspects of currently available technology, this approach received excellent responses from participants. E2C will expand to include additional scientific areas, for-credit training in both science content and educational technology, and more effective use of Internet-based resources.

References

CEO Forum (1999). Professional Development: A Link to Better Learning. http://www.ceoforum.org/reports.cfm?RID=2

Riley, R., Kunin, M., Smith, M.; Roberts, L. (1996) Getting America's Students Ready for the 21st Century: Meeting the Technology Literacy Challenge. *A Report to the Nation on Technology and Education*. U.S. Department of Education.
http://www.ed.gov/Technology/Plan/NatTechPlan/

Using Technology to Help Strike a Blow for Education and the Environment -- A Case Study in *Real World* Preservice Teacher Education

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Abstract: This research paper follows a process used to build a meaningful service learning project that integrated all core subjects and the arts and enabled preservice teachers to aid classroom teachers in teaching and learning about issue driven curricula whose study is enhanced by technology. The project was built around an effort to study and save an inner city wetland. The team of teachers, preservice teachers and students used computer technology to research the issue and build a case for preservation which they presented at a university-wide symposium. This project clearly demonstrates that technology integration is most powerful when used as a tool for real learning, especially about real world issues.

WANTED: Early adolescents and their teachers in need of a reality based/service learning project to serve as a capstone for their eighth grade year, preservice teachers eager to put middle school teaching and learning theory into practice and university professors seeking meaningful ways to teach the importance of sense of place, interdisciplinary curriculum development and technology integration. JOB DESCRIPTION: Work with a coalition of church groups, Partners for Environmental Justice, to learn about and champion a woefully neglected wetland area in the capital city that is home to plants, animals and educationally and economically deprived minority citizens who have been under served by their city government representatives.

One hundred eighth graders and their four teachers teamed up with North Carolina State University professors and their students and representatives from the State Department of Public Instruction to become part of a reality based integrative service learning project. It was a match that enabled the middle school students to see that what they learned in school could be applied to solve real world problems. College students found the same. Theories of adolescent development and approaches to teaching and learning using technology could be observed and practiced in a middle school setting rather than just read about in college textbooks. University teacher educators were able to demonstrate theory to practice by developing a service learning project that partnered schools and community in an issue driven curriculum (Beane, 97).

Schools are struggling today to balance the teaching of discrete facts and skills demanded by the testing craze with the importance of students understanding how to apply what they have learned in a thoughtful and reflective manner. Increasingly, it has also become more difficult for teachers to compete with the high tech toys that promise flash and dash and give immediate feedback and gratification. Helping students focus on their studies, set goals for their own achievement and see themselves as successful learners demands meaningful, worthwhile lessons. The added pressure of having all students ready for tests and jobs that require technology competence leaves teachers wondering how to get it all done.

Selecting a high interest service learning project is the answer to many of the challenges that face teachers today (Arnold & Beal). Students achieve focus in their study of a meaningful project and see the application of what they have learned in school to a real world situation. They are able to apply technology skills to the study of that problem and understand the importance of developing and using technology to get facts and information that was previously unavailable through conventional means. They are empowered and feel valued by the contributions they make to their community.

Teachers at the Centennial Campus Middle School and at North Carolina State University in Raleigh, North Carolina , joined forces to engage the middle school students in an environmental service project of a neglected capital city wetland that bordered an impoverished housing area. The middle school teachers taught a theme based, multidisciplinary, integrative unit that addressed all facets of wetlands research from the study of science -- living systems and habitats, flowcharts of problem cycles, topography mapping, social studies -- GIS mapping of demographics, disenfranchised groups and social change throughout history, community activism, city government and history (Beal, 92), environmental justice, laws and the decision making process, understanding diversity and respect for differences, math -- study of proportions/ratio, cost calculation, preparation of a spreadsheet to show the types and amount of garbage found at the site, language arts -- reflective and creative writing, preparing effective letters to city officials. Case studies of the Centennial Campus development and Neuse River water quality, as well as labs that dealt with erosion, river systems, and area profiling were augmented by exploratory classes in the use of Excel to graph data findings, word processing and PowerPoint to prepare presentations, use of the arts to express appreciation or concern through photojournalism, song writing and sketching.

Preservice teachers were part of the process from the beginning. One student teacher with expertise in environmental education planned and presented a workshop about the plants and animals that students would see in wetland areas. She and a botanist brought in tubs of wetland plants for the students to touch and feel. They discussed environmentally sensitive ways to conduct a field trip to a wetlands. Students brainstormed what was needed to live, how much of our own bodies were water and the importance of water to everyday life. They discussed the purpose of the wetlands and shared the information that they had gleaned from their weeks of research on the web. College students from a middle school foundations class attended the workshop and had the opportunity to interact with the students. Following the hands-on workshop at the school, 100 students did field research in the wetland area.

The field trip involved an entire day. Fifty students conducted action research in the morning and fifty did the same in the afternoon. Each time the fifty were divided into three groups. One group sketched and observed the area, another heard from community leaders about the history, scope and timeline of the project and a third walked the area and took digital pictures of interesting flora and fauna, planted trees and shrubs and kept a tally of the trash as well as identified types and sizes of trees. Middle school teachers, parents, university faculty and student teachers were involved in the planning and execution of the trip.

Teams of preservice teachers spent several days with the students at the end of the unit to help them prepare for a university-wide presentation of their findings. The middle school students and their research project were featured at the Tenth Annual Spell of the Land Symposium. The title of the symposium was *Sense of Place, Use of Space*. The students reflected on how their own sense of place changed as they became proactive for a better use of space for the wetlands area and the neighborhood. They developed their own 30 minute program to share their research findings and help the audience understand the importance of stewardship of the land. They determined that the questions they had investigated would guide their presentation. Questions: 1. Where does your water come from and is it safe? 2. How does a massive, new interstate highway built next to the wetland area impact the nearby creeks and the neighborhoods? 3. Why should we save a wetland? 4. Does development always equal progress? 5. How do you break a cycle of environmental injustice?

Preservice teachers helped the groups prepare a mock newscast that described this wetland, discussed its purpose and importance, issues and conditions that influenced how this particular wetlands was being addressed by city government, the importance of an open space bond issue that the voters would vote on and what would happen if the wetland was so destroyed that it would not be able to serve its purpose. Students also prepared dances and poems to be recited. The presentation culminated with a digital picture stream that showcased their field research. Many students took part in the digital presentation as they rose and spoke from the audience about their feeling and hopes and dreams for the wetland area.

This technology enhanced community service learning project was a success for all of its participants. Teachers successfully taught an integrated unit that captured the interest of their students, students developed a strong sense of place for their community and felt empowered through the recognition of their accomplishments to involve themselves in more community projects, university faculty were able to demonstrate to preservice teachers how theory informs practice and visa versa and preservice teachers got valuable observation and practice with early adolescents. Finally, everyone saw that technology is most powerful when used in the context of a real world problem. It captures the interest of the students, enables timely action research and is seen as a tool to help everyone achieve success.

References

Beal, Candy. (1992). *Raleigh: The First 200 Years*. Raleigh, North Carolina: Martini Press.

Beane, James A. (1997). *Curriculum Integration, Designing the Core of Democratic Education*. New York, New York: Teachers College Press.

Teacher's Stages of Development in Using Visualization Tools for Inquiry-Based Science: The Case of Project VISM

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Abstract: Scientific visualization tools have shown tremendous promise in drawing today's increasingly visual learners into in-depth inquiries in mathematics and science. One of the critical questions surrounding the use of these relatively advanced tools is the stages which teachers go through in moving these tools into their own practice. In this paper we examine existing schemas for these stages of development. Then we relate one of those schemas to Project VISM, an ongoing NSF-funded project intended to help middle school and high school math and science teachers learn the techniques and application of data visualization for their own classroom. We describe these stages of development for each of four different scientific visualization tools. Then we conclude the paper by proposing some further development of the models based on our experience followed by a brief discussion of related issues.

Scientific visualization tools offer a rich use of the more powerful computers that are becoming more and more plentiful in school districts today. These are a set of inquiry-based tools, many of which were originally designed to help scientists understand and explore different datasets or physical phenomenon. Visualization tools have shown great promise in drawing today's increasingly visual learners into in-depth study of scientific and mathematical topics (Baker and Case, 2000; Greenberg et. al, 1993; Gordin and Pea, 1995; Jonassen, 2000; Thomas, 1996;).

Both the promise and the relatively advanced nature of this software leads to the question of how to get more teachers involved in using visualization tools in their classrooms. Many projects offer extended training for teachers in one tool, but extended training is often too much, too soon. Project VISM is an NSF-funded project intended to focus more broadly on the techniques of visualization and not so much on particular tools. In addition, the project intends to build a cadre of trainers able to introduce teachers to techniques in short, focused sessions and then enable them to go back to their classroom and try an initial lesson or two.

One of the critical questions surrounding the work of this project is the stages which teachers go through in adopting these new and relatively advanced technological tools (such as scientific visualization) into their own practice. In this paper we first examine two existing descriptions of these stages of development: The CERA conceptual framework and the ACOT model. Then we describe Project VISM in greater detail, relating the ongoing work of the participating teachers in the project to the ACOT model. We propose some refinements to the ACOT model in conjunction with our work in Project VISM and conclude with a brief discussion of some of the larger questions related to how teachers bring these tools into their teaching practice.

Stages of development in using technological tools

Discussions of using inquiry-based technological tools to promote better learning in science and mathematics often begin with concerns about the preparedness of teachers to use these tools in the chronically undersupported technological infrastructures of K-12 education. In the midst of these concerns, it is often recognized that teachers progress through identifiable stages of development in using these tools in their classroom. There are two outlines of these stages of development that are particularly noteworthy for consideration: the CERA framework and the ACOT model. Both of these have been articulated in the context of long-term professional development efforts carried out in the field with practicing educators.

Researchers at the Center for Highly Interactive Computing in Education (hi-ce) proposed a conceptual framework called CERA. CERA stands for Collaborative construction of understanding; Enactment of new practices in classrooms; Reflection on practice, and Adaptation of materials and practices (Krajcik et. al, 2000). This framework provides the background for a number of collaborative professional development efforts carried out with a particular urban school district. Thus far their work suggests that it takes teachers about three years to become proficient in doing inquiry-based science supported by technological tools (Blumenfeld et. al, 1994). These researchers have used this framework to enact five middle school curriculum projects that address particular topics using an inquiry-based science approach that utilizes scientific visualization tools.

A second and more general model of the stages of development teachers progress through in adopting technological tools into their teaching practice was first articulated as part of the Apple Classroom of Tomorrow (ACOT) project. The ACOT model suggests that teachers may progress through as many as four stages of development in using technological tools in their teaching practice (Sandholtz, et. al, 1997). Those stages are:

- *Entry* level-competent using the tool
- *Adopt* the tool into their teaching practice
- *Adapt* the tool into their teaching practice
- *Innovate* with the tool in their teaching practice

The ACOT model suggests that it often takes about three years to progress through these various stages, and that in fact adopting the tool often corresponds to the first year's use, adapting the tool corresponds to the second year's use, and innovating with the tool corresponds to the third year's use. It is important to note that this is not a causal model. It is not suggested that all teachers inexorably progress through these stages. Many remain at one or another stage of development. In fact, with the proliferation of different software tools of increasing sophistication, it may not be possible (or even desirable) for many teachers to reach the innovation level with all the tools they use in their teaching practice.

Project VISM

The Integrated Science and Technology program at James Madison University (with the sponsorship of the National Science Foundation) is holding summer workshops in the techniques and application of data visualization for math and science teachers. These three-week long workshops are intended to help teachers see the forest (data visualization possibilities in the classroom) as well as the trees (software and curricula). Teachers will learn four specific data visualization tools:

- Image processing with NIH Image or Scion Image software
- Geographic Information Systems (GIS) with ArcView GIS software
- Molecular visualization with RASMOL and Chemscape Chime software
- Systems modeling simulations with STELLA software

The overall intent of the project is to help more teachers and students involved in using data visualization to learn more about science and mathematics. Below is a brief description of each of these four tools.

Image processing involves the manipulation and analysis of digital images. It has a significant heritage in biomedicine and planetary science research, and images can come from spacecraft in the far reaches of the solar system or from a digital camera in a student's hand. Geographic Information Systems (GIS) have been described in a recent popular journal as "mapping applications that take spatial data for a variety of topics and layer them one on top of the other in order to see a correlation that is otherwise difficult to notice" (Geographic Informations Systems in the Classroom, 2000). GIS systems are currently being used in everything from environmental research to urban planning to marketing and law enforcement. Molecular visualization is a technique that has long been in use by research scientists on high performance computers. But recently the tools have become available for students and teacher to be able to create sophisticated molecular models that play in readily available web browsers with the use of a simple plug-in. Systems modeling tools such as STELLA allow students to create a linked set of processes in a given situation without first getting bogged down in the mathematics. Teachers and students can create models of the spread of infectious diseases, or the trajectory of a water balloon, or the stresses in the life of a high school senior.

Instructors who have used these tools in their own classrooms, both high school and university faculty teach these sessions. This ongoing project has already worked with its first cadre of teachers in the summer of 2000. Online and limited in-person follow-up in the classrooms of these teachers will permit us to follow the stages of development that they follow in moving these tools into their own teaching practice. In addition, the project is recruiting participants for the next two summers. Middle school and high school teachers who have experience in using technology and want to learn to use these new visualization tools in their classes and share their skills with other teachers are encouraged to apply at the Project VISM (2000) webpage listed in the references section: http://www.isat.jmu.edu/common/projects/vism/summer.htm

Deliberate discussions of the ACOT model were held with the instructors during this past summer's workshop. Initially they were presented with a summary of the model and then asked to specify what the use of each of their respective tools would look like at the entry, adopt, adapt, and innovate level in the classrooms of the teachers in the project. In this way they were asked to make explicit their expectations for the participant's use of each tool.

Table 1 lists the a summary of those conversations. This matrix was initially developed to assist in identifying each participant's stage of development for each tool at the end of the first year of the project. Thus some of the descriptors may be a bit cryptic for readers not involved in the project, and further explanation is in order. The first column of the figure lists the four different tools. Then the at the top of the next four columns there is a list of the four stages of tool development: entry, adopt, adapt, and innovate.

For this project we defined the *entry* category as being competent to use the listed tool after the workshop was completed (see Table 1). Under each tool we listed what the instructors described as the competencies that each participant accomplished through the course of the workshop. For example, the instructor for the image processing portion of the project listed the specific image processing skills that were taught. The instructor for the molecular visualization tool listed the particular software-related skills, and then described the tutorial that each participant created that applied those skills to telling a molecular story. The instructor for the geospatial analysis tool listed the three main activities that all participants completed in the course of the workshop. The instructors for the systems modeling software took a somewhat different approach. They listed in order of increasing difficulty the things they hoped the participants would be able to accomplish using STELLA software. Thus at the entry level they state that the participants will be able to add an interactive "shell" or front end to an existing simulation and use it with their students. That is precisely what the participants did during the workshop with the instructors, but the next step for the participants to take is to create such a front end for a model that relates to their own curriculum.

The *adopt* category in Table 1 is defined as having the participants use the tool with their students in the context of their own teaching. Typically it is associated with the first year of use of a new tool. For the image processing and geospatial analysis tool, this stage is characterized by the participants taking one of the activities from the workshop and trying them out with their students. This process of adoption was facilitated by the instructor of the molecular visualization tool by an activity she had the participants carry out at the end of the workshop. The participants compiled a list of RasMol files of other molecules to use with their own students. These files, also called .pdb or Protein Data Bank files, are 3-D macromolecular structure data files. One of the ways in which the participants might adopt this tool into their teaching practice is to use this list to build molecules related to topics that they are studying in the classroom. Two other ways in which participants might use RasMol are listed in the adopt category: 1) participants might use RasMol files to create molecules for presentations to their students and 2) participants might use the interactive webpage they created in the workshop with their students. The instructors of the systems modeling portion of the workshop described the adoption phase in two different ways as well. First, participants in this stage will operate a STELLA simulation with their students, perhaps in a teacher-directed activity to simulate something related to a topic in their curriculum. This might be a part of a lecture or demonstration in the class. Second, participants in this stage will

Tools	**Entry**-competent in using *the tool* at the workshop	**Adopt** *the tool* into their teaching practice (Year 1)	**Adapt** *the tool* into their teaching practice (Year 2)	**Innovate** with *the tool* in their teaching practice (Year 3)
Image processing: *NIH Image* or *Scion Image*	Skill set taught to participants: • Open an image • Manipulate LUTables • Measure/set scale • Profile plot/surface plot • Stacks and animations • Capture their own JPEG images • Average images • Copy/Paste images	Participants select one of the workshop activities and successfully use it with students (preferably on a regular or recurring basis).	Participants significantly modify one or more of the workshop activities into their own teaching practice.	Participants bring in their own images and apply a variety of image processing skills as part of a student-initiated inquiry.
Geospatial Analysis: *ArcView GIS*	Participants successfully completed the identified activities in the workshop • ArcView project intro • Exploring Projections • GeoProcessing Wizard	Participants successfully do one or more activities from the workshop with their students	Participants significantly modify an activity from the workshop to fit the needs of their curriculum/students/ technical constraints and incorporate found data.	Participants can create their own GIS activity using an original data set/source
Molecular Visualization : *RasMol* and *Chemscape Chime*	All participants were successfully able to: • embed Chemscape Chime structures within a web page • write scripts to interact with and animate the Chime structures. They used these skills to create tutorial websites on molecules that they selected as part of the "mineral web."	• Participants use existing .pdb file collections to manipulate molecules to create graphics, make measurements, and show molecular properties. • Participants use the web page they created in the workshop to teach a concept in their curriculum. • Participants use the list of .pdb resources (for their content area) with students.	• Participants are able to find and download .pdb files from Internet sources and use those to write scripts in RasMol. • Participants are able to write animated scripts in RasMol that tell a molecular story related to their teaching.	Participants are able to embed Chemscape Chime structures within a web page and write scripts to interact with and animate those structures to create tutorial websites on molecules they have selected.
Systems modeling: *STELLA*	Participants put an interactive front end on an existing STELLA model and adapt it for their own use in their teaching.	Participants operate a STELLA simulation with their students. Participants read & interpret STELLA system diagrams with their students.	Students can name and document an existing STELLA model , e.g.: • Given a generic system diagram and a physical description of a system, students can name and document the model and input the equations that run the system	Students can build their own STELLA model from a written description of a system with the assistance of the participants.

Table 1. A matrix of the stages of tool use by the participants in the VISM project

read and interpret STELLA system diagrams with their students as part of efforts to better understand a particular topic that is being studied.

The *adapt* stage in this model is the step when the participants begin significantly changing the activities that they have already adopted into their teaching practice. Judi Harris describes this process in another context as "tweaking" an activity (Harris, 1998), pointing out that good teachers modify activities to make them their own. In fact she points out that this reinvention process is a critical part of effectively using any new learning. This stage is generally not reached until the second year of use of a new tool, though it is not expected that all participants would necessarily reach this stage. For both the image processing and geospatial tools in this workshop, the adapt stage is described in Table 1 as modifying one of the activities that was completed in the workshop in such a way that it better fits the curriculum of the participant's classroom. For the molecular visualization tool, the adapt stage was described in two possible ways. First, that participants would locate new.pdb files from the Internet and use them to write new scripts in RasMol. A second possibility is that participants would write animated scripts in RasMol that tell a molecular story related to a topic in their curriculum. Note that both of the activities could be part of enhancing teacher presentations of material to their students, versus being tools that the students themselves would use for their own projects. For the systems modeling tool, the adopt stage is described as when the participant's students can name and document an existing STELLA model. For example, if the students are given a generic system diagram and a physical description of a system, the students can name and document the various features of the STELLA model and input any necessary equations. Note this is not the same as "authoring" a STELLA model. In a sense it is the ability to "rough out" such a model on paper before working to write such a simulation with STELLA.

The *innovate* stage is the one that almost any workshop leader hopes their participants reach for any given tool. But as was pointed out earlier, it was not an expectation of the leaders of Project VISM (nor is it a realistic expectation for any suite of software tools) that all participants would reach this stage. In the ACOT project it was generally found that it took at least 3 years to get to this level. For all the tools in Projects VISM, the innovate stage can be summed up in one word: authoring. With the image processing tool, the innovation stage means that participants help their students bring in their own images and use their image processing skills to help students carry out (or author) their own scientific inquiries using this tool. In the case of the geospatial analysis tool, the innovate stage means that the participants create (or author) their own GIS activity using original (and, in many cases, local) data. For the molecular visualization tool, the innovation stage means that the participants create (or author) their own webpage that uses Chemscape Chime structures to create a tutorial for their students. For the systems modeling tool, it means that the students can build or author their own STELLA model from a written description of the system with coaching from their teacher.

Refinement of the ACOT model for scientific visualization tools

As part of our work with the instructors and participants Project VISM, we have developed some refinements to the ACOT model that we think are pertinent to the kinds of more advanced tools we are asking teachers to use with their students. The current ACOT model bases each of the stages on a given level of competency with the technological tool, and describes their development in using that tool with their students. But in working with scientific visualization tools with teachers we have noticed that this competency really has three component parts. Those three parts are:

- Competency with the software **tool**
- Competency with the scientific **data** that the tool uses
- Competency with the **pedagogical content knowledge** needed to teach curricular content using the tool

We believe that these three components help determine a teacher's ability to move forward into the next stage of development in using a given tool. For example, imagine a teacher has just attended a workshop and learned how to use NIH Image, an image processing tool, and also has some images and classroom-ready activities prepared for their first efforts at using this tool with their students. What I've just described there is a teacher ready to *adopt* image processing into her classroom because she has the capabilities to use the tool (NIH Image), has the necessary data (the images) and has a first "cut" at knowing how to "chunk" this activity to achieve particular educational objectives that are in her curriculum (classroom-ready activity she received or created at the workshop). These same three components come into play as that teacher moves to the *adapt* level of development. For example, in the second year that same teacher uses the activity, she might significantly "tweak" the materials and/or the approach she uses to teach the same material. One might argue that this "tweaking" is a prerequisite for even first time use of the activity, but the kind of changes we are suggesting here are more substantive and often require teaching the material once to "kick the bugs out" of a given lesson or project. In addition, tweaking the activity might also involve learning some new aspect of the software tool, or refining one's approach to teaching the tool to students. Then in the *innovate* stage many teachers begin to bring in their own (and often locally more meaningful) data with their students. In NIH Image that might mean learning how to bring in a JPEG file from a digital camera at the best level of resolution, or how to find uncompressed TIFF files at a NASA website and download them onto their local computer from the World Wide Web. Moving to the innovate stage is often dependent on learning how to bring in new data sources. Or it might be dependent on certain kinds of new pedagogical content knowledge, such as how to better enable student-initiated projects in the context of increasingly high stakes testing and standards-driven curriculum. Our idea is that significant development in one of these three components is consistently linked with moving forward to the next stage of development for many teachers.

Discussion

At this writing we are still completing our discussions with the first year participants in Project VISM. We have not yet determined what stage they have reached with each of the different tools nor whether our notion of the importance of these other three components will be confirmed in our experience. We do expect that there will be some of the tools that they will have adopted into their practice and some that have not yet been used.

But we do note that in many of our conversations with colleagues about the journey that teachers go through in using new technological tools to enable better learning situations in their classrooms, there is a good deal of discussion of "building capacity" in the system and "ramping up technological change." To our ears these sound like production metaphors. And while they may be helpful in reminding us to strive to create "sustainable" professional development efforts, they may also miss the fundamentally constructivist nature of teacher learning. In following up with our participants in the coming years we look forward as much to the parts of their professional development that do not find a place on matrices such as we have included in Figure 1, but nevertheless have terrific personal significance to the teachers in their day to day work in the classroom.

References:

Baker, T.R. & Case, S.B. (2000). Let GIS be your guide. *Science Teacher* 67 (7), 24-26.

Berman, H.M.; Westbrook, J.; Feng, Z.; Gilliland, G.; Bhat T.N.; Weissig, H.; Shindyalov, I.N.; & Bourne, P.E. The Protein Data Bank. *Nucleic Acids Research*, 28 pp. 235-242 (2000). Accessed at http://www.rcsb.org/pdb/

Blumenfeld, P., Soloway, E., et al. (1994). Motivating project-based learning: Sustaining the doing, supporting the learning. *Educational Psychologist*, 26: 369-398.

Geographic Information Systems in the Classroom (2000). *Educator's Guide to Computers in the Classroom*, 1, 1-5.

Gordin, D.N. & Pea, R.D. (1995). Prospects for scientific visualization as an educational technology. *The Journal of the Learning Sciences*, 4 (3), 249-279.

Greenberg, R.; Kolvoord, R.A.; Magisos, M.; Strom, R.G.; and Croft, S. (1993). Image Processing for Teaching. *Journal of Science Education and Technology*. 2,14-18.

Harris, J. (1998). *Virtual Architecture: Designing and Directing Curriculum-Based Telecomputing*. Eugene, OR: International Society for Technology in Education. Accessed at http://ccwf.cc.utexas.edu/~jbharris/Virtual-Architecture

Jonassen, D.H. (2000). Systems modeling as mindtools. In *Computers as Mindtools for Schools*. Columbus, Ohio: Merrill, Prentice Hall.

Krajcik, J.; Marx, R.; Blumenfeld, P.; Soloway, E.; Fishman, B. (2000). Inquiry based science supported by technology: Achievement among urban middle school students. Accessed at http://www.letus.org/papers.htm.

Project VISM (2000). Accessed at http://www.isat.jmu.edu/common/projects/VISM/

Sandholtz, J.H.; Ringstaff, C.; Dwyer, D.C. (1997). *Teaching with technology: Creating student-centered classrooms*. New York: Teachers College Press.

Thomas, D.A.; Johnson, K.; and Stevenson, S. (1996). Integrated mathematics, science, and technology: An introduction to scientific visualization. *Journal of Computers in Mathematics and Science Teaching*. 12 (3), 267-294.

Teacher Created Virtual Field Trips

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Abstract: This paper will discuss the use of technologies, commonly found in schools, to develop and create virtual field trips. The discussion will focus on the advantages of both using and creating these field trips for an instructional situation. A virtual field trip to Cumberland Island National Seashore, St. Marys, GA will be used to discuss the technologies involved and the value of their use for instruction in a science classroom. While this field trip is being used as a discussion point, the techniques and advantages identified can be applied over a P-16 grade range in all subject areas. Thus creating a virtual field trip can be as simple as using digital pictures and text in Microsoft Power Point or Hyper Studio or as complex as using digital video and panoramas in Macro Media Director. The level of complexity will depend on the technology available and skills of the developers.

Virtual field trips are a hot buzz word for integrating the Web into the curriculum. If one does a web search using "Virtual Field Trip" as a key phase, hundreds of sites will be identified. These sites overwhelmingly provide an abundance of pictures with limited information about locations that are deemed to have educational value. Krupnick states that, "The Web is now crowded with sites that are considered "Virtual Field Trips" and they vary a great deal in content and usefulness." She further states that, "For teachers who already have a curricular unit assembled and are looking for online enhancements, these are adequate. But for teachers who are looking for a source of new and exiting curriculum such sites are only a starting point. In order to make them useful, an instructor would need to develop curriculum." (1998, p. 43) A virtual field trip should be much more than a web-based presentation of a location. The focus should be to design a field trip, not confined to the WWW, that allows the student to "learn" from the field trip in a way that is similar to actually taking the field trip. Coulter states, "The key is for (instruction) to drive the technology implementation and not vice versa, despite pressures to integrate technology into the classroom....Virtual field trips in the form of Web sites...enable students to refine and extend their growing understanding as they explore other parts of the world" (2000, p. 49). In addition, a virtual field trip coupled with an actual field trip to the site will vastly increase the educational value of the experience. However, this requires teachers to control creation of the trip to meet their curricular needs.

A major concern of using field trips in educational situations is that they are 'just a day away from school', with limited tangential educational purpose. Many teachers state that there is not time to take full advantage of what the site has to offer, so by definition the experience becomes superficial. Bellan and Scheurman (1998) discuss ideas about actual and virtual field trips and list the pitfalls of both. In their article, they outline the teacher involvement necessary to alleviate some of the pitfalls. Among these are; the teacher visiting both the actual and virtual site, the teacher's plan for student use of a virtual site, student use of the virtual site before visiting the actual site, and follow up instruction using both the virtual and actual trip experiences. All the concerns about how field trips are used are not eliminated by taking the field trip on the computer. Two important points are made, first that the virtual field trip is usually not sufficient by itself and second that pre-planning the trip and the follow-up experiences should all be an integral part of the teacher's curriculum.

Definition of a Virtual Field Trip

Stainfield, Fisher, Ford, & Solem (2000) feel that virtual refers to 'digital alternative representations of reality' and that a virtual field trip is not an attempt to create a virtual reality. Virtual field trips are computer based simulations of an actual field trip which allow the user to experience the environment of the intended location. They provide the teacher and learner the opportunity to experience aspects of an actual trip without leaving the classroom. They should include all elements of a well designed field trip and provide the student with experiences that are beyond those that could be obtained from a pamphlet or a photo display of the location.

Advantages of Creating a Virtual Field Trip

The main advantage of a teacher created virtual field trip is that it can be specifically designed to meet the objectives of the curriculum and the needs and ability levels of the students. Other advantages of virtual field trips are that they:

- can be used either as a replacement for or in conjunction with an actual trip to the same location.
- provide opportunities for repeated visitations to the site for further study.
- encourage learners to plan and prepare for activities to be carried out on the trip.
- allow the teacher to focus on one specific aspect of the trip at a time.
- provide for the presentation of a wider variety of experiences than may be possible on one trip.
- can be designed to illustrate time sensitive issues, i.e. seasonal changes, etc. that could not be viewed on a single actual trip.
- provide integration of multiple aspects of the field trip into a number of different curriculum areas.
- allow for commonality of experiences.
- allow students to take a closer look at areas that they could not fully explore during an actual field trip.
- provide a simulation for students who may not have been able to attend an actual field trip.
- can be used for assessment purposes.
- can be shared with colleagues and parents.
- can be used repeatedly by the teacher year after year.

Limitations of Creating a Virtual Field Trip

The main limitation is the time needed to create the experience. However, if the teacher views the design of the field trip as dynamic, construction of both the actual and virtual field trips will grow over time. Also, involving others; colleagues, community members, students and parents can help to reduce the extended amount of time that the teacher spends in creating a virtual field trip.

Because curriculum design requires content expertise, another limitation is the teacher's knowledge of the content area of the field trip and the curricular objectives. As teacher's get involved with the design they often need to extend their knowledge of the content of the field trip thus increasing the time necessary to design the experience.

A third limitation is the availability of the technology. However with the increasing availability of technology in the schools, homes and work places this is becoming less of a barrier. Coupled with the availability of the technology is the teacher's ability to use the technology effectively. Again this can become a learning situation and thus increases the time to create the product. This limitation can also be minimized by the involvement of colleagues, community members, students and parents.

Student Involvement in Creating a Virtual Field Trip

Student involvement in the creation of the virtual field trip can take the form of; collecting information at school, using aspects of the technology in the construction of the product, taking the actual field trip and gathering the images and information to present in the virtual field trip. This involvement focuses student attention and learning on the intricate aspects of the content presented. In addition, it provides ownership by the student of the project. Last, but not least, it provides opportunities for students to use the technology in a real world situation, which addresses the NETS standards by preparing them to function in a technology rich information society.

Creating a Virtual Field Trip

The field trip we chose to illustrate the process of creating a virtual field trip is used within a course for Middle Grades pre-service teachers. This trip is a visit to Cumberland Island National Seashore. The objective is to prepare pre-service teachers to design and use field trips effectively in their classrooms.

The steps for creating a virtual field trip are:

1. Examine the objectives of the course and choose a field trip that includes experiences that fit within the realm of the objectives while enhancing learning.

The purpose of this virtual field trip is two fold, it provides information that will be used on an actual field trip and it provides information about parts of the island that are inaccessible to the students. The objectives of the field trip are: to learn about the ecosystems of a barrier island located off the southeastern coast of the United States; to understand the history of man's inhabitation of the island and his impact on its ecosystem; and to design and carry out experiments that survey the island and its inhabitants.

2. Create a concept map of the experiences to be included in the field trip.

A concept map provides an overview of all the elements to be included in the virtual field trip and acts as an organizing framework to build upon in construction of the final product. The concept map should not be considered the final blueprint for the field trip, rather it should be seen as a dynamic overview and a starting point from which the product evolves. The concept map for the virtual field trip to Cumberland Island can be seen in Figure 1.

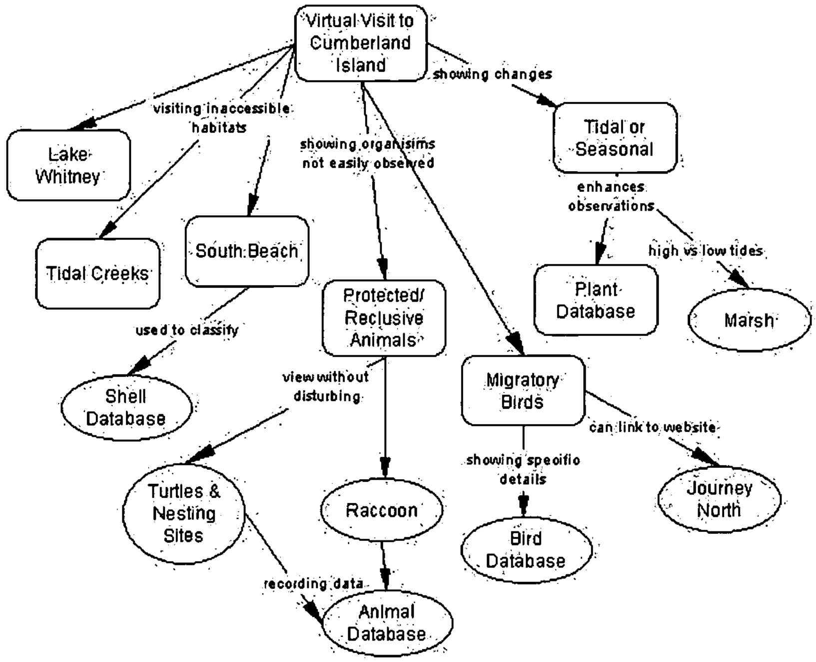

Figure 1: Concept Map – Virtual Field Trip to Cumberland Island National Seashore

3. Select the appropriate technology to be used based on the content and the curricular objectives of the field trip. The technology includes the organizing program and tools for collecting and presenting data.

The equipment and software used will depend on the complexity of the trip and the grade level of the students. Virtual field trips can vary in their complexity based upon the experience of the creator with the technology available.

Based on the concept map, the technology used for the Cumberland Island trip included; digital cameras, computers, scanners, CDR's. In addition, a variety of software was utilized including: word processing, database management, electronic spreadsheet, graphics program, Quicktime VR, and an authoring program.

4. Collect and organize materials to be included based on the curriculum objectives to be accomplished and the concept map. Examples of desired materials might be;

- still pictures, both digital and photographs,
- videos,
- text,
- databases and graphs,
- sound clips.

As materials are collected and organized decisions must be made. For example, panoramic videos can be used to give an overview of the location. If panoramas are to be used, decisions will have to be made before hand as to the location and the concept to be illustrated.

The decisions made for the Cumberland trip were centered around the curricular objectives. Decisions were made concerning:

- whether flora and fauna should be presented as single pictures organized as a field guide or presented in a database which could be continually updated.
- presentation of the history of man's inhabitation of the island.
- presentation of time sensitive aspects of the ecosystems (high/low tides, seasons, effects of long term drought, etc).
- the use of panoramas to give the learner a holistic feel for the elements of each ecosystem and location. Both panoramas and time-lapse videos were used to show the ebb and flow of tides in the marsh areas.

5. Convert all materials to digital format.

When converting materials to digital format the question of designing for dual platforms (Windows and Mac OS) must be considered. While designing for dual platforms is not more difficult or time consuming, the decisions made about the format of the individual parts (pictures and text) must be considered to insure that they are appropriate for the platform(s) chosen.

When converting the materials for the Cumberland Project we converted all images to JPEG format. Both the Windows and Mac platforms have the ability to use the JPEG format and if at some future date the decision is made to make the materials web based this format is standard to the web. Apple Quick Time was chosen for all video production for the same reason and at this time is the only program that allows one to view 360-degree panoramic movies. Since some text came from National Park Service brochures or previously written documents they were converted to digital format with the use of a scanner. The scanner also was used to convert photographs taken with non-digital cameras, such as the historic pictures.

6. Assemble all elements in the organizing program based on the concept map.

Here decisions on the presentation format of the field trip must be made. Will it be one stand-alone program presentation or a series of parts that can be accessed separately? Also, before assembling the materials one must consider the platforms that can present the materials. Will the field trip best meet the needs of the teacher if it is dual platform or is one platform sufficient? These decisions along with the assemblers knowledge of presentation programs will determine if Macro Media Director, Hyper Studio, Power Point or any of the other available authoring program meet the needs of the designed field trip. The choice of the authoring program used is often the assemblers personal choice based on familiarity and skill with the program

For the field trip to Cumberland Island the authoring program Macro Media Director was used to provide access to all the different parts of the field trip. For development of the field guides and databases File Maker Pro was chosen. The main reasons for choosing these two programs were; their power, their dual platform capabilities, and copyright issues. These programs provide run-time viewing programs that can be provided to the user royalty free. (Hyper Studio and Power Point also provide the dual platform and royalty free advantages.)

7. Evaluate the finished product to be sure it meets the objectives.

In a teacher created product, evaluation will be formative in nature, providing a continuously changing and evolving product. There will always be questions of: how could the product be improved, what additions should be made; have the needs of the learners using it changed; and how can new learner groups add to the information presented?

The Cumberland Island field trip has evolved over several years. At first, it was designed as an actual one day field trip. Then the question of how technology could be used on the field trip arose. Teacher use of digital cameras to record student participation in information collection was added. Next, students were provided with digital cameras and recorded information on the ecosystems and other related data. The use of technology to present pre and post field trip information and the teacher's organization of student input was the next challenge. The most recent effort is the result of trying to solve the question of how to present material that was not available to the student on a single trip and how to organize all elements into a product that will be available to the students in an easily accessible manner.

This paper uses the terms teacher created, creator, and assembler in an interchangeable manner. This is due to the principle that while the teacher is the driving force in the design and creation of the virtual field trip, the tasks can be done in conjunction with students, parents, interested community members and colleagues. The technologies used to develop and create Virtual Field Trips are commonly found in public schools today. The Cumberland Island Project used Macro Media Director whose cost at this time may prohibit public school usage, but the project was not dependent on this choice. The process of creating virtual field trips can be as simple as using digital pictures and text in Microsoft Power Point or Hyper Studio or as complex as using digital video and panoramas in Macro Media Director. The technology skills necessary in the creation of the field trip all are within the scope of the National Educational Technology Standards (NETS) for Teachers, and many are within the scope of the NETS for students.

References

Bellan, J.M., & Sheurman, G. (1998). Actual and virtual reality: Making the most of field trips. *Social Education, 62*(1), 35-40.

Coulter, B. (2000). What's it like where you live? *Science and Children, 18*(6), 48-50.

Krupnick, K. (1998). Dog sleds online: Creating a virtual field trip. *Social Studies Review, 38*(1), 43-46.

Stainfield, J., Fisher, P., Ford, B., & Solem, M. (2000). International virtual field trips: A new direction? *Journal of Geography in Higher Education, 24*, 255-262.

The Quest for scientific inquiry: A document analysis of Quest projects

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Abstract: The 1996 release of the *National Science Education Standards* (NRC, 1996) energized the national focus on improving U.S. science education in K-12 schools. The standards provide a strong emphasis on inquiry as the primary pedagogical framework in promoting science literacy. Similarly, the recent release of the National Educational Technology Standards (ISTE, 2000) has catalyzed the process of integrating information technology across the curriculum. The ISTE standards provide a curricular framework for technology integration and correlate technology-rich learning activities to standards in several content areas. Thus, these two policy documents provide teachers and students a detailed roadmap for pursuing science and technology literacy; the cornerstone of both literacies being the inquiry process. This paper is a qualitative document analysis of one commercially produced Quest project: AsiaQuest. The paper also examines preservice teachers' reflections on their participation in Quests as part of their professional preparation.

Introduction

In reflecting about the history and philosophy of the natural sciences, Edward O. Wilson (1998) states:

> Today the greatest divide within humanity is not between races or religions, or even as widely believed, between the literate and illiterate. It is the chasm that separates scientific from prescientific cultures. Without the instruments and accumulated knowledge of the natural sciences—physics, chemistry, and biology—humans are trapped in a cognitive prison. They are like intelligent fish born in a deep shadowed pool. Wondering and restless, longing to reach out, they think about the world outside. They invent ingenious speculations and myths about the origin of the confining waters, of the sun and the sky and the stars above, and the meaning of their own existence. But they are wrong, always wrong, because the world is too remote from orderly experience to be merely imagined (p. 45).

While Wilson's view of the natural world seems to ignore the world view of indigenous peoples and non-Western cultures, it does delineate the two periods of human existence: the scientific and the nonscientific. A similar chasm exists in K-12 schools today vis-à-vis the use of information technology as a learning tool. A so-called digital divide (Tapscott 1998) exists in society, in individual school districts, and within individual schools. Even though current technology standards require teachers to be technologically literate, there remains a long continuum from the technophobe to the technophile. Most K-12 teachers whom I have observed or worked with are somewhere in the middle of the continuum.

The purpose of this paper is twofold. First, the paper provides a qualitative document analysis of Classroom Connect's AsiaQuest curriculum guide. Next, the paper examines preservice teachers' reflections on their participation in Quest projects as part of their professional coursework requirements.

Rationale

The National Science Education Standards (NRC 1996) established the direction of science education for the 21st century in K-12 schools. In contrast to traditional science instruction, the standards promote inquiry-based learning situated in constructivist classrooms (NRC 2000). The inquiry standards (NRC 2000) describe the following essential features of classroom inquiry:

- learners are engaged by scientifically oriented questions;
- learners give priority to evidence, which allows them to develop and evaluate explanations that address scientifically oriented questions;
- learners formulate explanations from evidence to address scientifically oriented questions;
- learners evaluate their explanations in light of alternative explorations, particularly those reflecting scientific understanding;
- learners communicate and justify their proposed explanations (p. 25).

The National Educational Technology Standards (ISTE 2000) boldly pronounce "our education system must produce technology-capable kids" (p. 2). The reasons are utilitarian and pragmatic: "Parents want it! Employers want it! Communities want it! The nation wants it!" (ISTE 2000, p. 3). This mandate sets the table for establishing classrooms and learning environments that are technology-rich and produce a technologically literate populace.

The NETS standards are congruent with most content area standards in that they promote inquiry as the key vehicle to teaching and learning. The standards also promote a new paradigm of educational practice that highlights increased emphasis on collaborative work, information exchange, inquiry-based learning and informed decision-making, all situated in a real-world context (ISTE 2000).

Over the past decade, network science projects have extended the curriculum to include the integration of emerging technologies into the extant curriculum. These technologies allow students and teachers to create electronic communities of learners who are focused on common, "real science" problems (Feldman et al. 2000). These projects have evolved from simplistic email exchanges in the late 1980's to sophisticated web-based projects today. How effective is network science as an instructional strategy? What do these projects look like? How much real science is involved? These are all questions posed by classroom teachers and curriculum developers interested in taking the plunge into network science projects.

Study Participants

In teaching elementary science and social studies methods courses, I have integrated several Quest projects into my syllabi as a method of introducing preservice teachers to thematic, interdisciplinary, technology-based projects. While the number of students in these classes is relatively small (n = 150) they encompass a sample from two different universities: a small liberal arts college in the Midwest and a large, research institution in the northeast. My rationale for introducing Quest projects in preservice education classes focuses on two salient points: 1) the need for novice teachers to develop technological literacy and 2) to expose students to a sample of Quest and other network science projects.

AsiaQuest Project Overview

Classroom Connect Quest projects are Internet-based, interdisciplinary, and focus student inquiries on a common issue or question. For example, the inquiry question in the AsiaQuest project is "Did Marco Polo actually go to China?" Anyone can participate in the month-long Quests on the Internet but a subscription is necessary in order to utilize all the Quest features. Subscribers are provided user ids, passwords, and the curriculum guide to help teachers implement the Quest in their classrooms. Below is a description of the AsiaQuest project:

> AsiaQuest is an adventure into a fascinating and complex world. For five weeks, you and your students will travel with our team of explorers on an exciting expedition to China. Together, we'll search for clues regarding the history of Marco Polo's expeditions and we'll investigate the contemporary culture and environment of the areas we visit, attempting to determine the effects of one upon the other. Along the way, we'll mount camels, cross deserts, visit temples, and explore cities of the past and present. AsiaQuest's interactivity makes it possible for students to have an effect on the expedition logistics, latest scientific developments, and ethical debates (Classroom Connect 1999, p. 3).

Thus, unlike many Internet-based activities, teachers and students are active participants in the Quest. This interactivity is further described in the analysis section below.

AsiaQuest Curriculum Guide

The curriculum guide is 142 pages in length and provides a step-by-step set of instructions for K-12 teachers to follow. The guide begins with a 10-page overview that introduces teachers to the project, provides a detailed map of China, and provides a weekly and monthly schedule called the Trek Calendar. The features of the web site are explained and the navigation bar includes areas for research, communication, and accessing online resources (Classroom Connect 1999).

Teaching tips are delineated into different grade levels: K-2, 3-5, 6-8, and 9-12. Thus teachers at any grade level can utilize a specific section of the guide without feeling the need to browse the whole guide. Teaching tips also include a useful section on assessment, a piece that is often missing from network science projects (Feldman et al. 2000). Descriptions of assessment methods include sections on ongoing embedded assessment, self-evaluation, portfolio use, and culminating activities. Sample evaluation rubrics cover the following: cooperative learning project, portfolio, and oral presentations.

The technical tips section provides a step-by-step procedure for setting up the computer, downloading plug-ins, setting the preferred browser, setting preferences, registering and using passwords, and navigating the site. Instructions are also given for the interaction component of AsiaQuest. Students are encouraged to email the AsiaQuest travel team in China to help set travel schedules and explorations strategies. Students can also email content experts, subscribe to the listserv, participate in online discussions, and access an extensive Quest library. Thus, one of the hallmarks of the Classroom Connect approach to designing network science projects is the high degree of embedded interactivity.

The rest of the curriculum guide is devoted to a large Background section for teachers, and specific descriptions of the Quest activities. Each week, activities are focused on specific themes. The tables below illustrate the daily activities and the thematic sequence of the project.

Monday	Tuesday	Wednesday	Thursday	Friday
Team Update	Fox's Files	Team Update	Cool Science	Culture Shock
Christina's Critters	Gross & Disgusting	Myths & Legends	Kid Profile	Week in Review
Set the Course	Get a Clue!	Dan's Dilemma	Science Stumper	History Mystery
Mystery Photo	Mystery Photo	Mystery Photo	Mystery Photo	Mystery Sound

Table 1 – Week At A Glance

Week 1	Unity and Diversity
Week 2	Stability and Change
Week 3	Cooperation and Conflict
Week 4	Conservation and Waste
Week 5	Solutions and Resolutions

Table 2 – Curricular Themes

The activities listed above are designed to allow students to probe the topic from a variety of perspectives. The scope of this paper does not allow detailed descriptions of the activities, but every activity allows students to engage with the inquiry questions embedded in the project and in students' own research.

Preservice Teacher Reflections

Preservice teachers in this sample were asked to reflect on their own participation in the Quest projects. Specifically, they were asked to describe how the Quest promoted scientific literacy and inquiry, and how they might implement a Quest project in their own classroom. Responses include reflections from the AfricaQuest and AsiaQuest projects.

How did the Quest promote inquiry?

Teacher 1: I found that all of the different sections promoted inquiry. This was done through the way the information was presented. For instance, in Dan's Dilemmas, Dan asked questions as if he were having a conversation with a person about the dilemma. The dilemmas make you stop and think. The next thing you know, you're trying to figure out a solution. In all the different sections the material was presented with questions that left you wondering. If I were working with students and AfricaQuest I would encourage the students to act on the questions that the team posed. Although the sections make students wonder, it takes a teacher to move them beyond wondering and toward inquiry.

Teacher 2: This AfricaQuest team offers numerous opportunities for students to go beyond the traditional classroom walls and interact with experts, team members and other students. The interactive features on the Web site pose challenging questions and compelling mysteries for students to solve. Voting and posting in these areas enable students to take an active role as they direct the expedition and help solve the mystery. As the students take part in this interactive adventure, they broaden their research skills, their communication skills, and their skills in accessing online resources.

How did the Quest promote scientific literacy?

Teacher 1: AfricaQuest promotes scientific literacy and technological literacy. This occurs by allowing students to interact with the scientists, asking them questions and helping them find a solution to problems that scientists are investigating. The adventure team poses problems every week to the students and makes them a part of the research. It promotes inquiry with the students as they work to find answers to the problems. It also allows the students to respond, and express their ideas with real scientists.

Teacher 2: While using AfricaQuest, students are also exposed to scientific and technological literacy by following individual interests and sharing their findings with the rest of the class and with people from around the world. In order to get students to explore science in more detail and become scientifically literate, teachers need to allow their students to build on their own ideas. Whether stumbling onto their theories by accident or by intentions, students love the challenge of discovering new ideas or inventions, especially if it comes from them. Thus, by including the Internet in the classroom, teachers can provide the students with an opportunity to navigate, investigate, experiment, and extend their scientific inquiry through active scientific investigations rather than through passive lectures about science facts.

How might you implement a Quest project in your own classroom?

Teacher 1: To incorporate a project like AsiaQuest in the classroom, the teacher needs to be familiar with the background of the program and how to use it. For instance, one evening when I accessed AsiaQuest, I read a comment from a student and wanted to respond. However, I could not figure out how. I then discovered there are directions on how to use their web site. To use AsiaQuest in my classroom, it would be necessary to first understand how to navigate the site. I would also have to be able to connect with other teachers so I could share and get ideas of how others are using the project.

Teacher 2: Since not every person has the same interest I think it is important for each child to find a topic in AsiaQuest that interests them. I have a strong interest in literature and would like to integrate trade books into the AsiaQuest project. For example, I would read a trade book relating to an Asia elephant. The children could then find information about Asian elephants in Christine's Critters. The children could then create a collage based on Asian elephants.

Findings

The activities included in AsiaQuest provide ample opportunity for students to pursue inquiry-based science. The activities and related projects described in the curriculum guide are closely aligned to national standards in several content areas, including science. Information technology is central to the project's design and thus many of the national technology standards are met.

Most participants found Quest projects to be exciting new technology tools although data indicate many students also found some aspects of Quests to be problematic. The table below summarizes some of the implementation issues raised by participants.

Issue	Participant Comment
Time	I was overwhelmed trying to find the time for this…
Access	Several times I could not log on when I wanted to…
Feedback	I did not receive nor view much email feedback that was in-depth…
Communication	When the teacher didn't write back, I totally lost interest…
Content	I often found it superficial…
Availability	Many schools may not be able to afford the Quest…

Table 3 – Problematic Issues of AsiaQuest

Conclusion

Network science projects such as Quests present teachers with a bold vision of learning and technology integration. In their recent findings, Feldman et al. (2000) have found that in many cases, network science projects fail to live up to their stated vision. Areas for further research might include a closer analysis of the vision of Quest projects and how teachers and preservice teachers implement this vision.

References

Feldman, A., Konold, C. & Coulter, B. 2000. *Network science a decade later: The Internet and classroom learning.* Mahwah, NJ: Lawrence Erlbaum Associates.

International Society for Technology in Education. 2000. *National educational technology standards for students: Connecting curriculum and technology.* Eugene, OR: Author.

National Research Council. 1996. *National science education standards.* Washington D.C.: National Academy Press.

National Research Council. 2000. *Inquiry and the national science education standards: A guide for teaching and learning.* Washington D.C.: National Academy Press.

Tapscott, D. 1998. *Growing up digital: The rise of the net generation.* New York: McGraw-Hill.

Science Investigations: Onsite – Online – On the Mark!

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Abstract: The evolution of Internet-based communications and capabilities of mobile digital technologies have empowered teachers and students to move beyond "click and learn" science classroom environments to one whereby learners can conduct onsite science expeditions and showcase their investigations online. This paper documents the collaborative efforts of a public school system, a county joint vocational school, a non-profit outdoor learning organization, telecom corporations, a state park system, a state division of wildlife, and universities to launch a digital expedition to study environmental conditions. The paper examines the opportunities related to these emergent technologies and elementary students' abilities to engage in onsite group investigations at the Lake Erie shoreline. The Our Lake Online project involved more than a year of collaborative planning and was funded by a foundation grant, telecom corporate financial support, and non-profit organizational sponsorship. The expedition can be viewed at [http://www.digitalexplorers.tzo.com/erie/default.htm].

Introduction

The use of the Internet as a tool to facilitate collaborative projects for science data-sharing investigations is a fairly recent phenomenon (Berg & Jefson, 1999). However, the evolution of Internet-based communications and capabilities of mobile digital technologies have empowered teachers and students to move beyond "click and learn" science lessons posted on URL sites. Now learners can use mobile digital technologies, laptops, the Web, and environmental analysis tools to launch expeditions at onsite/outdoor locations and conduct their own science investigations. Students that are driven by their own curiosity and natural exploratory instincts can gather scientific data and conduct independent analyses that they can post and share with fellow students and the WWW community.

This paper describes the Boardman Local Schools Our Lake Online project, a first-of-its kind "digital expedition," to the Lake Erie shoreline. The Our Lake Online expedition was conducted by thirty-three elementary students (identified as gifted and talented) from Boardman Local Schools located in Northeastern Ohio. The fourth, fifth, and sixth grade elementary students' Internet-enabled outdoor learning adventure can be viewed at the website [http://www.digitalexplorers.tzo.com/erie/default.htm]. The students' digital pictures capture the day they spent collecting baseline data for an environmental study of the Lake Erie shoreline contiguous to Geneva State Park, Geneva, Ohio. The results of the students' onsite work and experiments were transmitted via digital connections back to students at their respective six home schools, thus also enabling approximately four hundred and fifty students to participate remotely in the online adventure.

Descriptive Narration About the Our Lake Online Website

Digital photographs posted on the website show students, teachers, parents, administrators, and resource experts engaged in collaborative learning as well as individual inquiry-based science investigations. Rotating through five workstations, this community of learners used digital cameras to photograph erosion control practices and wetland plants and creatures, including plankton samples. From a microscope lab housed in a tent near the shore, students magnified images of the microscopic samples and digitized these images for transmission. Sensor-based lab kits by Imagiworks and PASCO Scientific Corporation were used by students to gather data about the water quality of Lake Erie. The students graphed water temperature readings, analyzed oxygen levels, conducted salinity readings, and determined pH levels. The graphs were then downloaded to four of eight laptop computers set up at base stations (two tents and a recreational vehicle). From the four laptops housed in the RV, information was sent via four temporary telephone lines provided by ALLTEL Corporation to students at the six home schools to enable remote participation.

Background Pertinent for the Design and Implementation of the Our Lake Online Project

The expedition, which involved more than a year of planning, was the first-of-its kind to be conducted in Ohio or on one of the Great Lakes. It was primarily organized and headed by expedition leader Joyce Zitkovich, teacher for Boardman's Gifted Services program, Boardman, Ohio. The model for the digital expedition was drawn from the goals and methodologies of the Digital Exploration Society (DEX) [www.digitalexplorers.com]. DEX refers to its excursions as "digital expeditions" or DEXpeditions. Joyce Zitkovich first worked with DEX in 1999 when the non-profit group launched a DEXpedition to Carlsbad Caverns in New Mexico. Based in Los Angeles, California, DEX was founded in 1998 to foster a better in understanding of the interdependence between people, our planet and the technologies we create. The all-volunteer organization supports and launches Internet-enabled learning adventures for students and educators, and was instrumental in providing the guidance and technical support to ensure the success of Our Lake Online Erie project. DEX also hosts the Our Lake Online website. Robert Lindstrom, executive director for The Digital Exploration Society traveled to Ohio to participate in the expedition.

Implementation of the Our Lake Online digital expedition was also made possible by grant monies ($3,984) awarded by the Martha Holden Jennings Foundation, Cleveland, Ohio. ALLTEL Corporation provided telecom services free of charge. PASCO Scientific provided the Science/Workshop Interface 500 Starter Bundle for students to use free of charge, as well. This kit included the Science Workshop and DataStudio Software on CD, an experiment library, teacher's guide, student workbooks, and a set of Starter Sensors that were used to conduct shoreline and water experiments.

Technology assistance and training sessions for Boardman students and teachers were provided by the Mahoning County Joint Vocational School under the direction of Steve Bennett, Susan Dunn and Melissa Thomas- Hackett, vocational education instructors. Eleven MCJVS high school students served as technology assistants and provided the help necessary to support elementary students' technological endeavors at Lake Erie. Four Bloomington, Indiana high school students and two Indiana University college students also provided onsite technical assistance. These students had prior experience with an ongoing environmental study program known as the Wetlands in the Wild Project. Under the guidance of project director, Jo Gilbertson, the Indiana students guided the elementary students in the use of the water quality sensors and palm-held computers.

Few technology projects are successful unless a lot of other people want them to be and are willing to share their expertise. Additional members of the digital expedition included: Carl Myer, ALLTEL Corporation; Neil Cramer, PASCO Scientific; Kevin Kayle, aquatic biology supervisor at the Fairport Fish Station, ODNR Division of Wildlife; and, Jonathan Fuller, Lake Erie Geology Group, ODNR, Division of Geological Survey. Geneva State Park personnel included: Doug Burgett, Park Director; Rick Alderman, Park Ranger; and Dean Heisey, Marina Manager. Support and consultation regarding gifted education teaching models (group investigation and problem based learning), evaluation procedures, and construction of evaluation survey instruments was provided by Marianne Dove, Department of Teacher Education, Youngstown State University.

Boardman Local School District personnel that participated remotely from the six home school sites (Boardman Center Middle School, Glenwood Middle School, Market Street Elementary School, Robinwood Lane Elementary School, Stadium Drive Elementary School, West Boulevard Elementary School) included: Claar Barbour, David Brenner, Eva Convery, Jan Harvey, Mark Haverstock, Debbie Hinkle, Judy Lipkovich, Lee Messerini, Terry O'Halloran, Paula Ritter, Janet Sandy, Marilyn Scheetz, and Pam Tabak. Educators who served as onsite teachers were Bob Campbell, Pam Murray, and Michele Nespeca. Bob Wright, District Technology Coordinator, coordinated technical services at the six home schools and also provided technical assistance at the Lake Erie site. Librarians Cathy Santangelo and Judy Carson catalogued and housed reading materials and resources at the school system's libraries. Elaine Raffety, retired mathematics teacher, graciously permitted the expedition team to use her recreational vehicle as a home base for the expedition. In addition, thirteen Boardman parents served as chaperones for the expedition.

Purpose and Goals for the Our Lake Online Project

The purpose for designing the Lake Erie expedition centered on investigating the ecological vulnerability and sustainability of Lake Erie, the eleventh largest lake in the world. Although Lake Erie is the most biologically productive of the Great Lakes in the United States (e.g., the walleye fishery is considered the best in the world), discharge of municipal and industrial wastes by the early 1970's had severely polluted the water and threatened the ecosystem. Thus, an onsite/outdoor experiential learning opportunity such as Our Lake Online held promise to spark students awareness about their connection to this important natural resource and their understanding about environmental interdependence. The digital adventure to the lakeshore also held promise as the means to enable students to understand the power technology holds to study, analyze, and investigate present day ecological conditions of this vitally important natural resource.

Goals for our Lake Erie digital expedition included the following: (a) to develop learning activities that integrate best practices in gifted education and reflect science learning goals stated in the National Science Education Standards; (b) to integrate emerging technologies in the elementary curriculum to personalize learning; (c) to extend the public school's classroom walls electronically; (d) to design onsite/outdoor learning activities that spark children's intrinsic joy to learn; (e) to work collaboratively to facilitate children's learning opportunities; (f) to understand the power technology holds to study and communicate ecological concerns; (g) to learn and experiment together as a local and co-local community of learners.

Our Lake Online Project Learning Activities

In the initial planning stage, (September 1999), Joyce Zitkovich, expedition leader, contacted several agencies, and requested curricula and resource materials specific to the environmental study about Lake Erie. These materials were used for in-service sessions with teachers and were also used as research resources by the elementary students. Some of these materials were the *Great Lakes Atlas* from the United States Environmental Protection Agency and the Government of Canada, numerous materials compiled by the Ohio Sea Grant Program/Ohio State University, and *The State of Ohio - 1998 State of the Lake Report: Lake Erie Quality Index* prepared by the Ohio Lake Erie Commission. Librarians catalogued and housed these materials in the schools' libraries to ensure easy access for teachers and students.

In January 2000, all fourth, fifth, and sixth grade gifted learners began to read, study, and discuss the ecological state of the Great Lakes and specifically, Lake Erie. Students became aware of the major issues regarding the vulnerability of Lake Erie. Since Lake Erie is the warmest and shallowest of the Great Lakes, it is the most easily affected Great Lake in regards to pollution, endangered aquatic plant and animal life, and invader species. Viewing the film "Great Lakes Ecology: Unwelcome Visitors in America's Great Lakes" produced by Jim Danielson for Ohio Educational Telecommunications also served to establish a motive learning state with the children.

Based on these initial studies, the fifth and sixth grade academically gifted children selected independent study topics to research and develop reports and presentations. The children were given guidelines for these individual research projects that included student reading logs and completing all necessary steps of the research process (e.g., library research, Internet searches, note card compilation, research paper writing according to Modern Language Association [MLA] style, and bibliographic documentation). Regarding class presentations, students were required to deliver oral reports, and develop a visual aid related to their topic. The students were afforded the opportunity to select a visual medium of their choice. Student choices for visual aids included: PowerPoint presentations, art work, puppets, models, mobiles, photographic displays, posters, story boards, flip charts, and brochures.

Boardman Local Schools employs the strategy of curriculum compacting for academically gifted learners, therefore some of the children's instructional time was freed so that they could use the school library and computer labs for their individual investigations. Students also used the public libraries to obtain resources, and conducted Internet searches and visited established science URL sites from both school and home computers. Notably, six students engaged in telementoring experiences with science experts throughout Ohio. Email exchanges between the students and telementors were made on a weekly basis for approximately two months. Professionals who served as telementors were Jonathan Fuller, Lake Erie Geology Group, ODNR, Division of Geological Survey; Nancy Leonard and Geoffrey Steinhart, Aquatic Ecology Laboratory, The Ohio State University, Columbus, Ohio; and, Joseph Koonce, Department of Biology, Case Western Reserve University, Cleveland, Ohio. Some student research projects were entitled: "Round Gobies Invading Lake Erie," "Zebra Mussels," "The Spiny Water Flea," "Erosion Control Practices at Lake Erie," "The Effects of the Eurasian Watermilfoil and Purple Loosestrife Plants on Lake Erie," "Yellow Perch," "Identifying Rocks on the Shore of Lake Erie," "Sea Lamprey: An Invader Species," "Plankton," "Wetland Aquatic Creatures," and "Shoreline Pollution on Lake Erie." The academically gifted students made research presentations to classmates in the regular class rooms two weeks prior (early May 2000) to disembarking on the expedition to Lake Erie. The students also made formal presentations about their Lake Erie adventure to graduate students at Youngstown State University, Youngstown, Ohio in July 2000.

Fourth grade academically gifted students' learning tasks did not involve independent research projects. After assessing learner readiness, educators believed that directed study was most appropriate to engage fourth graders in mini lessons regarding topics such as microorganisms, aquatic life, water quality, shoreline erosion, and wetland plants and creatures. These mini lessons were taught by teachers of gifted educational services, and provided the necessary foundational learning these young children would need to successfully accomplish onsite tasks at Lake Erie. These fourth grade students, however, were required to make oral presentations about these mini lesson topics to classmates in the regular fourth grade classrooms two weeks prior (early May 2000) to the expedition to Lake Erie.

All fourth, fifth, and sixth grade gifted students completed two days of training (March 30th and April 7th, 2000) at the Mahoning County Joint Vocational School (MCJVS) to learn how to use several forms of technology prior to their Our Lake Online expedition (May 18, 2000). On the first workshop day, students learned several basic technology skills in the Visual Arts & Design Lab and Tech-Prep Computer Lab. For example, the elementary students learned about the operation and features of the digital camera and the use of photo editing computer software. To determine if students could apply these newly learned skills, they were asked to venture outdoors and take digital photographs of the natural setting, download these images to laptops, and send them as email attachments to their home schools. Thus, students practiced the procedures they would use the day of the onsite expedition. Vocational education teachers also shared design possibilities for students to use to compose web pages, storyboards and PowerPoint presentations to create dynamic records about their Lake Erie experience. The second workshop afforded students the opportunity to use microscopes, micro projectors, and Elmo visual presenters to magnify and project samples from pond water found at the MCJVS site. Once again, students were directed to apply these skills with the help and guidance of the vocational education teachers and twenty- nine MCJVS student assistants.

The Our Lake Online expedition was conducted on May 18, 2000. Students embarked for the expedition at 6:30 a.m. (1.5-hour bus ride, one way, to lake) and returned to Boardman schools by 5:30 p.m. Five workstations were set up on the Lake Erie shoreline so students could conduct group investigations about the natural environment. These work stations dealt with pollution, geology, wetland plants, microorganisms, and water quality. The educational technologies used to complete assignments were IBM and Mac laptop computers, palm-held computers, water quality sensors, digital cameras, microscopes, and a micro projector. Results of the students' onsite work and experiments were transmitted via digital connections back to classmates at their respective six home schools, thus enabling approximately four hundred and fifty students to participate remotely in the online adventure.

Evaluation

The recent literature on evaluation regarding technology implementation indicates that "effectiveness is not a function of the technology but rather of the learning environment and the capability to do things one could not do otherwise" (Jones, Valdez, Nowakowski, & Rasmussen, 1999). Certainly this onsite digital adventure provided learning opportunities that had previously not been possible for Boardman school children. The Our Lake Online expedition was the first-of-its kind in many respects. It was the first DEXpedition to be conducted on Lake Erie or any one of the Great Lakes in the United States. It was Boardman Local School District's first pioneering effort to discover and understand the potential of digital technology and Internet-based communications for expanding learning beyond the boundaries of the classroom. In addition, it was the first time students had used environmental analysis tools such as water quality sensors and palm-held computers; it was the first time students had used mobile digital technologies; and, it was the first time a collaborative effort of this magnitude had been implemented. According to these "firsts," the Our Lake Online expedition has been considered a highly successful undertaking.

Evidence of effective teaching and learning that occurred during the Our Lake Online project was also compared to criteria specified by Barbara Means of SRI International. This researcher identified variables that, when present, indicate engaged and effective learning. These variables include: (a) children are engaged in authentic and multidisciplinary tasks, (b) assessments are based on student performance of real tasks, (c) students participate in interactive modes of instruction, (d) students work collaboratively, (e) the teacher is a facilitator in learning, and (f) students learn through exploration (Jones, Valdez, Nowakowski, & Rasmussen, 1999). The Our Lake Online project participants were involved with collaborative online learning opportunities that concerned real-life tasks that valued learners' personal interests, and supported multidisciplinary learning. The data students collected serves as an ongoing baseline for study of the lake region by Boardman students as well as the WWW community. The Our Lake Online project is a prototype for other teachers of gifted services to use for onsite/online learning opportunities.

Evaluation data that involved triangulating students, parents, and educators' responses to survey instruments about the expedition also revealed a resounding endorsement for the digital learning adventure. Parent chaperones were delighted to watch the children "actually do science" and see "state-of-the-art technology" in use. Parents also indicated they enjoyed being part of a "leading edge experience" and acknowledged the "tremendous effort" undertaken by the expedition organizers and teachers. Educators were very pleased with the development of students abilities to use advanced technologies; engage in research projects; collaborate with fellow students; and, demonstrate problem solving, communication, and presentation skills. Perhaps most important were the responses from the student surveys that indicated overwhelmingly that they would like to participate on another expedition and that they greatly valued the opportunity to study and learn in an environmental setting.

Conclusions

Designing an Internet-enabled outdoor learning expedition that integrates mobile digital technologies and environmental analysis tools is a multifaceted task. The Our Lake Online project required months of planning and collaboration with countless individuals, corporations, organizations, universities, and state agencies. Our experience with the project has revealed that educators should embark on such a venture with the understanding that this is an emerging process. Therefore, it is realistic to expect that technology glitches and disruptions will occur. Although the Web environment is rapidly moving toward complete interconnectivity, we experienced a number of connectivity challenges. At times, it was impossible for the students to quickly and efficiently log on to the network. We also experienced difficulties due to hardware and software incompatibilities given our attempts to use both Macintosh and IBM platforms with young children. Also, given the budgetary constraints of public school systems, educators often do not own the hardware and software necessary to embark on mobile digital adventures. Simply stated, the Our Lake Online project would have been impossible without the digital equipment, environmental analysis tools, and technical assistance provided by ALLTEL, Pasco Scientific, and the Digital Exploration Society as well as grant monies awarded by the Martha Holden Jennings Foundation.

Indeed, the use of new technologies translates into trouble shooting at a moment's notice, being able to accept product failure, and coping with systems' incompatibility. Traditional teaching practices are also inadequate for such learning expeditions and onsite student learning requires a radical departure from students seated at classroom desks. Onsite learning requires student mobility and invites learners to be actively engaged and independent to investigate their interests at multiple workstations. The Our Lake Online project represents a significant pedagogical shift as compared with traditional science instruction, and definitely a step beyond using the Internet as a static tool. In the traditional classroom, the role of the teacher is one of transmitter of knowledge. The role of the teacher on a science digital expedition is one whereby the teacher is a guide and facilitates the students' ability to use technologies to learn and create their own dynamic learning records. It enables teachers to teach to the moment quite unlike teaching to a specified, sequential lesson plan. Although a digital learning expedition requires formulating a well thought out plan, there simply is no teacher's guide appropriate for such an adventure. In fact, the highly experimental and exploratory nature of the project embodies the learning philosophy on which it is based. Namely, a digital expedition is an attempt to encourage and enhance the natural tendencies in young children to explore, discover and share.

Today, the true power of digital exploration is connectivity. One day, it will be routine for students to explore, discover and share with others all over the planet in real time from anywhere. Although the Our Lake Online project is an account of just a single digital expedition, we hope that this description will encourage others to embark and experience the power and promise of using mobile digital communications for Internet-enabled outdoor learning adventures.

References

Berg, C.A., & Jefson, C. (1999). Top 20 collaborative Internet-based science projects of 1998: Characteristics and comparisons to exemplary science instruction. *Society for Information Technology and Teacher Education*, 1999, Association for the Advancement of Computing in Education, Charlottesville, VA. 1496-1501.

Fortner, R.W., & Jax, D. W. (1997). *Lake-Aware Kids Engaged in Relevant Science (LAKERS): Coastweeks Activity Guide*. Produced by the Ohio Sea Grant Education Program for the Ohio Lake Erie Commission. Columbus, OH: The Ohio State University.

Danielson, J. (Producer). (1999). *Great Lakes Ecology: Unwelcome Visitors in America's Great Lakes* [Video Recording]. (Available from Great Plains National [GPN], P.O. Box 80669, Lincoln, NE 68501-0669)

Jones, B.F., Valdez, G. Nowakowski, J., & Rasmussen, C. (1999). New times demand new ways of learning. *Plugging in: Choosing and Using Educational Technology*. [Online]. Available: http://www.ncrel.org/sdrs/edtalk/toc.htm (1999, June 10).

Maker, C. J., & Nielson, A. B. (1995). *Teaching models in education of the gifted* (2nd ed.). Austin, TX: Pro.ed.

National Research Council (1996). *National Science Education Standards*. Washington, DC: National Academy Press.

Ohio Lake Erie Commission. (1998). *State of Ohio - 1998 State of the Lake Report: Lake Erie Quality Index*. Toledo, OH: Author.

Slattery, B. E., (1991). *Wow!: The wonder of wetlands an educator's guide* (3rd ed.). Baltimore, Maryland: Environmental Concem, Inc.

United States Environmental Protection Agency and Government of Canada. (1995). *The Great Lakes: An Environmental Atlas and Resource Book* (3rd ed.). [EPA 905-B-95-001]. Chicago, IL: Great Lakes National Program Office.

Problem-solving-based Model of WBI

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Abstract: This paper describes a problem-solving-based model of web-based instruction. The model is based on the idea that the teacher can model a problem-solving process to help students to solve problems as an expert does. It was designed and embedded in a class web site that was designed for Heat and Mass Transfer, a engineering class. There are five parts in this model: answer(s) and relevant reading, your own tutor, hints and solutions, self-test your understanding, and report generation. Informal feedback from students showed positive results from using this model.

There are two broad categories of Web-based instruction. One is using the Web as a supplement to a normal class, while the other is using the Web as the sole instructional resource for the teaching. In the first category, a class web site is created to provide valuable information such as course, syllabus, assignments, grades, projects, and useful links (Rank, 2000). This kind of class web site provides students convenience in getting class information, checking their grades, interacting with the instructor and other students, and finding other information online. However, this approach may not help improve students' problem-solving skills very much. Another format of Web-based instruction focuses on improving students' problem-solving skills by integrating cooperative learning strategies with asynchronous communication technologies like listserv, newsgroup, bulletin board, and discussion groups. Currently, the first category of using the Web as a supplement is the most popular format. We explored how to make use of this supportive format to improve students' problem-solving skills when we implemented a class web site. In addition to maintaining the basic format of a class web site, we explored embedding a problem-based-model into the class web site to foster students' capability to build models and solve problems.

It is believed that modeling plays a very important role in the problem-solving process and is actually an essential part of the problem-solving process not only in science and math education but also in other disciplines (Starfield, Smith, & Bleloch, 1990). One way to solve a problem is to build a model and then refine it. To help students learn skills to build models and solve problems with a class web site, the problem-solving-based model was developed and embedded in the ME315 class web site. The idea is that the site acts as an expert tutor to guide students to build a model based on a specific problem, to get the answer(s), to use existing knowledge, to refine the model and explore further, and to reflect on the problem-solving process.

The model is composed of five components: answer(s) and relevant reading, your own tutor, hints and solutions, self-test your understanding, and report generation.

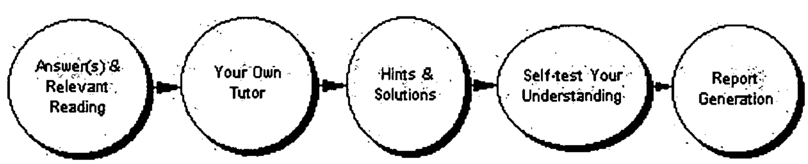

Figure 1. Diagram of problem-solving-based model

Answer(s) and Relevant Reading gives students the answer(s) and the information needed to solve the problem either from the textbook or/and other resources with the intention of helping the students locate and review the needed materials related to the problem. The purpose of providing relevant reading is to lay the foundation for the students to get the needed prior knowledge to solve the problem.

Your Own Tutor asks students questions to help them really understand the problem and acquire the needed information to solve the problem. In this part, very specific questions about equation(s) and variables, and how to interpret the relationship among variables in students' own words, were asked to ensure that students really understand them.

Hints and Solutions provides some clues to students for solving the problem and one or more ways of solving the problem. The first part provides some clues that could lead to a solution by the students themselves. If students still have problem(s), the second part provides a diagram model of the problem and one or two ways to solve the problem.

Self-test Your Understanding asks students about the solution (s), how to interpret the solution (s), what if the conditions change, if the solution is efficient or not, and finding the cause (s) if an error occurs.

Report Generation asks students to write a report for the whole process. This process lets students reflect on what they have learned from their problem-solving process.

This model is a variation of the ideal process of how to teach a novice to solve a problem as an expert does. Research shows that novices have a different problem-solving process from experts due to their different knowledge structure and ways of seeking additional information and better definition of the problem (McCowm, Driscoll, & Roop 1996). However, the teacher can model a general approach with the students, which includes identifying, defining, representing the problem, making assumptions, predicting solution(s), evaluating solutions, and reflecting on the problem-solving process to train them to solve problems as an expert does. That is the theoretical base for using this model.

The model was implemented and embedded in the HEAT AND MASS TRANSFER class web site, which is a class for mechanical engineering students, for a one-semester trial. During the trial, students tried one specially selected representative problem each week and twelve problems for the semester by using the class web site. Due to time limits, no formal evaluation was done to evaluate the impact of this model on students' learning. However, feedback from some of the students showed that this model has positive results. A student was even inspired to go to graduate school because one semester's learning made him feel that doing research was very interesting. More trials and formal evaluations need be conducted in the future.

Although this model was implemented with an engineering class, the author believes that it has very positive implication to Science and Math Education in K-12 and can provide a way to use regular web sites for improving students' problem-solving skills.

References:

McCown, R. R., Driscoll, M. and Roop, P. (1996). Educational psychology: a learning-centered approach to classroom practice. Simon & Schuster Company.

Rankin, W. (2000). A survey of course web sites and online syllabi. Educational Technology, March-April, 38-42.

Starfield, A., Smith, K. and Bleloch, A. (1990). How to model it: problem solving for the computer age. McGRAW-HILL Publishing Company.

Sustainable Environmental Education for Brasilian Teachers

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Abstract: Environmental Education (EE) is considered, in international declarations and in brasilian laws, as a dimension of the Education itself. One implication of this is that all teachers are involved in it. In Brazil the 9795 law, April 27 1999, determines that all teachers have to study EE, when they are in graduation or by inservice studies. In order to facilitate these studies for teachers from all the country, we began at Brasilia University an online course in EE. The methodology they learn at the course helps them to insert EE in their own school discipline, considering their own surrounding reality. The focus includes sustainability, and we call the methodology "Sustainable Environmental Education".

Introduction

The need for an increasing awareness on environmental problems is being emphasized in several forums and congresses especially since the early seventies. Indeed the decrease of human impacts upon the environment and the sustainability perspective depend, to a large extent, on the education of new generations that will take care of the local and global problems in the future.

At the First World Conference on Environmental Education (Tbilisi, 1977), Environmental Education (EE) was identified as a dimension given to Education contents and practices. This aspect of *dimension* was a new way to see the question. It was not a matter of introducing new isolated contents, such as pollution, contamination, water quality, solid waste disposal, bio-diversity, deforestation and reforestation, nature conservation and management of natural resources. In order to live in harmony with the environment, and to promote sustainable development, it is essential to create methods, techniques and new approaches to EE, as an important part of Education in general.

The solution of environmental problems also needs an interdisciplinar approach. So, EE needs to be inserted at all disciplines and to promote the active and responsible participation of the society. In this perspective, EE represents a way to see things, a new focus on reality.

Environmental Education in Brazil

One implication of this way of thinking EE is that all teachers must be involved in it. But in Brazil, only recently EE is reaching the schools. It is more given as isolated initiatives, by associations for nature protection or even public initiatives, in extra-curricular activities.

Statistics of 1999 (MEC/INEP/SEEC, 1999) show that Brazil has 36 million students at the first 8 years of school and 7 million from the 9^{th} to the 11^{th} series. It's a large population to receive EE.

Recently, Environmental Education National Policy was regulated by 9795 Brazilian law, April 27 1999. This law determines that:

- EE is an essential and permanent component of national education, and needs to be present, in articulated manner, in all levels and modalities of the educative process, in formal and informal types.
- The environmental dimension must be present in the curricula of teachers' formation, in all

levels and in all disciplines.

- Teachers in activity must receive complementary studies in their actuation areas, in order to adequately approach the principles and goals of the Environmental Education National Policy.

We have, in order to reach these goals, to offer inservice studies to a great deal of schoolteachers. Statistics from 1999 (MEC/INEP/SEEC, 1999) show that Brazil has over 2 million teachers in activity at Basic Education.

Inservice studies for teachers

How can teachers from all the country, however, take inservice studies? Thinking about that, we began at Brasilia University an online course in EE for teachers. The objective of this course is to enable teachers at any place in Brazil for the insertion of EE in his own school discipline (Faria 1997). Along the course teachers learn fundaments in EE and in pedagogic methodology, doing also practical exercises (Faria & Garcia 1997). At the end of the course, they have a study program (made by themselves) to apply with their students (Garcia 1997). .

The focus of the EE given by us includes sustainability and sustainable development. The methodology is itself sustainable, because it is adaptable to all circumstances of the students and teachers. So, we call it *"Sustainable Environmental Education (SustEE)"*.

SustEE is a methodology, a way to give EE at school Education. It goes through the curriculum and does not suppose the study of any specific environmental question. On the other hand, it allows the treatment of any environmental problem or goal that is important to that community at that moment.

All teachers do their work in the course considering their own reality. So, they work with their students in context situations.

The online course involves a group of tutors, so every teacher that is our student can have a personal guide. He can make questions by e-mail and he sends, also by e-mail, all the personalized activities he has to do for his personal learning and evaluation. We have also a discussion list and some chats.

Our students can be from any part of the country. We have the opportunity, so, to change ideas with fellows that live in very different circumstances, and have to cope with many different environmental problems: from those characteristic to big cities as São Paulo to those existing in areas of recent (or maybe present) deforestation. In a new course version, we are introducing mechanisms of cooperative learning, with activities in which the students work together on a teaching program proposal. Afterwards, each of them works on his own proposal, considering his own circumstances.

SustEE methodology

An important aspect of SustEE methodology is the link that is made between EE and all contents of the official curricula. We will describe here the basic steps teachers do to apply it in school, after learning the SustEE in the course. Really, most of them do both things together and bring to discussion the results and the problems they have.

Step 1: Survey of the *necessities, interests and problems* (NIPs) of the community, particularly the students. This is done by the application of questionnaires to the students and their parents, interviews with school and /or local authorities, observation of the surrounding environment. At this moment we are interested in all NIPs they have, independently of an involvement of environmental questions.

Step 2: Determination of the region and the community profiles. To do that they consult region statistics and other data, verify local documents and so on. Here we are interested in social, economical, technological educational profiles. They see also the environmental policies for the region and the community initiatives and habits referring to the environment.

Step 3: Analysis of the official or school curriculum. At this point they study some principles of pedagogical sciences and apply them on the analysis of the school programs and of their own practices.

Step 4: General elaboration of *Integrated Learning Unities* (ILUs). To do that, they consider together what they have after the first 3 steps. ILUs congregate some of the disciplines – or preferably all them – over a same goal, which is related with a NIP, frequently a local environmental question. At this point we try to encourage the teacher to be creative, looking for themes that could be attractive for the students.

Step 5: Proposition of some interdisciplinar activities, to be made by the students, that could "nucleate" the ILUs. Those activities could be: a visit to some place, a search in Internet (if they have access to it), a laboratory experiment, a bibliographic investigation, prepare a theater presentation and so on. They can think about some independent activities or also plan a school project.

Step 6: Determination of specific links that can be made between the contents of the curriculum and the ILUs, on each one of the activities; selection of disciplinary contents, ethical and behavioral aspects that will be developed on each activity.

Step 7: Elaboration of a teaching program, in the discipline of the teacher that is having the course, covering all the contents he selected to that ILU. It is the moment to specify *Learning Generating Nucleus* (LGNs). A LGN is a nucleus that congregates contents of his own discipline and the collective goals of the interdisciplinar activities. Each LGN is expressed in a creative manner, trying to attract student's attention and interests.

EE at hotspots and other significant regions

Although everybody needs EE, some need it urgently. Brazil is a country of continental dimensions, and is widely recognized as the world's leader in terrestrial biological diversity, a significant portion of which is threatened today. (Mittermeier et al. 1999). We can focus on 5 very different biomas that deserves a citation here:

Atlantic forest is considered one of the most threatened ecosystems on World. It has been reduced to less than 8% of its original area. Even the name of the country, Brazil, is derived from "pau-brasil", a tree from this forest that began to be devastated in the early 1500, by the first portugueses that arrived at the country. 70% of Brazil's population resides in this region. In spite of it, this bioma still contains an extraordinary amount of biological diversity and levels of endemism. For example, it is estimated that 54% of the region's trees and 80% of its primates are not present at any other place on Earth.

Amazon is the largest remaining tropical rain forest, with 4,2 million square kilometer. It expands into 9 South American countries, but 62% of it are in Brazil. It has from 5 to 30 million living wild species, only 1,4 million already identified. Today it is the target of rapid economic development, with 16 million habitants already living in the region. Projects to improve conservation and sustainable development are very important to Amazon.

Caatinga is the prevalent ecosystem on the least populated and poorest region of the country. The long cycles of severe droughts periodically force local populations to either migrate to urban zones or temporarily exhaust the region natural resources. Understand their ecosystem characteristics and identify possible alternatives of economic development is very important for the communities there and EE has a central role on it.

Pantanal covers 140,000 square kilometers and are home to the largest concentration of wildlife in South America. Its wetlands are vital to the survival of countless migratory birds. There are very beautiful places there and tourism is increasing rapidly. It could be an excellent alternative for improving sustainable development of the region, if adequately accomplished. Otherwise, it can be very dangerous to the ecosystem if not controlled.

Cerrado is the ecosystem at the central region of the country. Agriculture, cutting for crops and cattle has destroyed much of the forest. Heavy pollution from nearby cities and from pesticides used in agriculture contributes to the degradation of forest ecosystems. It was recently included among the hotspots. One reason for that is its diversity of plants. Of the 10,000 species of plants, 44% are endemic, being not found anywhere else on Earth.

Except the Atlantic forest, most of these regions are distant to big cities and the more developed centers. In many cases the teachers working there haven't even the necessary formation in the discipline they inservice studies. Communication technologies, however, are reaching rapidly these places, by government and private initiatives.

So, online studies appear as an excellent alternative to these teachers. In fact, we have already in our course students that live in all of the mentioned ecosystems. Some of them acquired a computer and a phone line in order to do the course. They bring very interesting experiences to change with their colleagues and are already applying SustEE at the schools they work.

We know that capacitating teachers, we can multiply our effort to preserve our environment and to have a real sustainable development.

References

First World Conference on Environmental Education (Tbilisi, 1977)

MEC/INEP/SEEC (1999) School census, official publication of the Education Ministry. Also at http://www.inep.gov.br

9795 Brazilian law, April 27 1999

Faria, D.(1997) Educação Ambiental e Científico-Tecnológica. Editora da UnB.

Faria, D & Garcia, L A M. (1997) Análise e desenvolvimento de currículos e
da UnB.

Garcia, L A M. (1997) Prática de Ensino de Ciências através de Núcleos Geradores de Aprendizagem. Editora da UnB.

Mittermeier, R., Mittermeier, C G., & Myers, N. (1999). Hotspots: Earth's Biologically Richest and Most Endangered Ecoregions. Conservation International.

Helping teachers and students use advanced technology in teaching high school science: A preliminary feasibility study of the use of a WWW-controlled atomic force microscope in high school science

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Abstract: This exploratory study investigated the use of an Internet controlled nanoManipulator and atomic force microscope to allow students to explore properties of viruses. The activity was embedded in a week long learning experience in which students interacted with scientists. The study demonstrated the technical feasibility of using such advanced equipment in classrooms. It also demonstrated that students gained in the understanding of the structure and functioning of viruses and changed their conception of scientists as people and science as an activity. A majority of the students were excited about the activity.

Science classes around the world have become involved in Internet-based investigations such as the JASON Project and Journey North (e.g. see http://njnie.dl.stevens-tech.edu/cyberteacher/realtimeprojects.html). These internet-based science programs engage students in using the technology for conducting and sharing science. The American Institute of Physics (1997), and Linn, Shear, Bell, and Slotta (1999) argue educational technology should: a.) focus on learning <u>with</u> technology; not <u>about</u> technology, b.) emphasize content and pedagogy, not just hardware, c.) provide accessible goals so students can connect new ideas with those they already have, d.) ensure the social context of learning supports the process of building on ideas of others, and e.) promote autonomy by creating learners who can move on into life with new skills and knowledge. In the present study, we investigated a new technological innovation called the nanoManipulator (nM) connected to an Atomic Force Microscope (AFM) . The nM allows students to investigate nanometer-sized materials through an Internet connection to an AFM located at a university. An unusual aspect of this technological tool is that students get tactile feedback about the nanometer-sized object they are studying.

When using the nM, students move a pen-like joystick that sends signals to the AFM. The AFM probe moves across a sample (such as a virus) and the deflection of the probe is used to provide tactile feedback through the nM. The feedback includes sensations of hardness, elasticity, friction, shape, and stickiness. The combination of physical manipulations and tactile feedback is known as haptic perception (involving kinesthetics and touch). The nM also uses 3D graphic technology to provide a visual 3D image of the sample. Haptic perception potentially provides the learner with information about viscosity, softness, texture, elasticity, graininess, pressure, temperature, and involves kinesthetics (muscle, tendon, joint). Klatzky, Lederman, and Reed (1987) noted that haptics is oriented towards the encoding of substance (microstructure). By providing haptic as well as visual feedback, the nM technology provides students with the opportunity to combine visual and verbal representations with haptic. In this exploratory study we sought to understand how students' use of the nM and AFM in collaboration with scientists influenced their knowledge of viruses, microscopy, nanometer scale, the processes and nature of science, science as a career, and perceptions of scientists.

Method

Participants

24 male and 26 female students in two introductory biology classes (n=22, n=28) in a rural-suburban high school in North Carolina participated. The school included 72% Euro-American, 24% African-American, 3% Hispanic students, and 1% other. In each class 6 males and 6 females were followed for qualitative research.

Instruments

Pre-Knowledge Test (PKT). The researcher developed PKT had four constructed response items to assess students' knowledge of viruses. Students were asked what viruses looked like, how viruses function, how viruses cause disease, to draw a virus, and to describe nanometer and name things measured in nanometers,.

Beliefs Questionnaire (BELQ). The BELQ assessed students' ideas about scientists and their reactions to science. It asked: *What do scientists do when they are doing science, describe scientists as people, and have you ever had a scientist come to your class.*

Pre Opinion Questionnaire (PROQ). Students rated, on a six point Likert scale, their reactions to working with a microscope and indicated their degree of belief about how scientists work and what they do.

Post-Knowledge Test (POKT). The 6-item POKT asked 6 students were asked to describe the nM and AFM, different types of microscopes, adenoviruses, to list things measured in nanometers, and to draw a virus.

Post Experience Questionnaire (EQ). The 5-item EQ asked students to describe how the instructional experiences influenced their feelings about science, additional experiments they would have performed with the AFM, what scientist do when they are doing scientific research, and any new impressions they had of scientists.

Post Opinion Questionnaire (POOQ). The POOQ contained the eight reaction items from the PROQ and two additional rating items. They asked students to rate how much they had learned and how much the instructional experience had changed their views.

Pre- and Post Interview Questionnaire. The pre and post interview questionnaire contained questions that guided intensive interviews with the subsample. The items asked about the AFM and nM, adenoviruses, how big viruses were, and their perceptions of the learning experiences. Items were used to initiate interactions with the students; interviewers probed their understandings more deeply than with written response assessments. Also, students were asked to constuct and explain a clay model of a virus.

Equipment

The students used a Phantom nM device connected to a desktop computer to access, over the Internet, an AFM . A second computer connected to the internet provided two-way video-audio access to the scientist running the AFM.

Procedure

Pretesting. 1.5 months before the instructional activity, participants received an explanatory letter and permission forms. Two weeks later, participants completed the PKT, BELQ, and PROQ. *Instructional Activity.* The instructional activities occupied 5 science class periods. At the beginning, students were told that they would write a newspaper article that would be published in a Web newspaper. An activity packet was provided which gave directions for each activities described below and suggestions their newpaper article. On the first day, a participating scientist lectured on metric scale, the AF microscopes and how the nM/AFM provided magnified images and tactile feedback. For the next three days, students (divided into teams of four or five) completed two activities per period with each activity lasting for 20-25 minutes. The activities were: use of nM/AFM, use of a simulation of the AFM, interview a scientist, and writing, (described below). *Nanomanipulator/atomic force microscope.* In this activity, each student used the nM/AFM guided by a physicist. Each student controlled the nM to touch a virus and use the nM to make individual investigations such as moving viruses or trying to break the protein coat of the virus. The students were encouraged to talk to scientist running the AFM while one of their team members was using the AFM. *Simulator Activity.* The Simulator activities consisted of a mechanical model of the AFM. The model could allow a tip to travel across a stage and over a sample. A tracing was produced on a sheet of paper. Students made a model of an icosahedral adenovirus from a cut out cardboard sample and used the Simulator to trace it. This activity help students the scale of cells and viruses. The students were told that if a human cell were magnified 300,000 times it would be about the size of their classroom and an adenovirus magnified 300,000 times would be about the size of their softball-sized model. The students completed tracings of their model adenovirus. The tracing activity demonstrates how the AFM images only the top of objects. The scientist in charge asked probing questions to help students understand the AFM. *Interview a scientist.* Students had 2 opportunities to interview scientists including physicists, information scientists, and computer scientists. The instructional packet had suggested questions, but encouraged the students to be creative and to their interest. This activity gave students an opportunity to learn about scientists in different contexts and to provide a image of scientists that contradicted popular stereotypes. *Writing Activity.* In the writing activity, students planned and began writing their newspaper story. Students were provided with a possible outline, but were encouraged to be creative in their story. Students were asked to give readers a description of what they personally found worth noting about the experiences. *Post-Test Activities.* On the fifth day, students completed the post-assessment instruments (POKT, EQ, and POOQ) and their newspaper stories. *Individual Interviews.* The first two authors interviewed students in the subsample individually two weeks before the instructional week. Each interview took about 15 minutes. Interviewers audiotaped and took field notes. Post interviews were conducted similarly to the pre-interviews in the week after instruction. *Analysis.* The knowledge test, opinion questionnaire, and interview questions were analyzed by item for pre- and post-assessments. Interview tapes were transcribed and pre- and post-instruction item responses were placed in a matrix for comparison. Frequencies of responses for each item on the knowledge tests, opinion questionnaires, and interviews were determined and for open-ended items student responses were grouped into categories (described below). Videotapes of the clay models were categorized. These categories included: *presence of: angles, 2-dimensions (2D), 3-dimensions (3D), irregular edges, bumps, appendages, 20-sided, spherical and angled, cell-like, phage-like, rounded icosohedral, ball-shaped, and amoeba-like.* Students' responses to the beliefs questionnaire about science and scientists were compared to students' responses related to the learning experiences on the experience questionnaire and the post-interview transcripts to examine how the investigations influenced their perceptions of scientists and science. The newspaper stories were read and reread across individuals and categories of analysis were identified by the major areas addressed in the stories. The categories that emerged and were subsequently coded included references to or descriptions of: *the research team, feeling or manipulating the virus, the shape or texture of the virus affective reactions to the experience and changes in students' ideas or opinions..*

Results

The knowledge tests, opinion questionnaires, and interview questions revealed changes in students' knowledge of viruses, microscopy, nanometer scale, understandings of the nature of science, knowledge of science as a career, and understandings of scientists. The qualitative analyses of students' drawings, responses, and clay models also found important pre- and post-differences.

Knowledge of viruses

On each of the knowledge test questions that were parallel from pretest to posttest, students improved significantly and substantially on the: structure of viruses question -- 0% correct to 60% correct; how viruses cause disease question -- 0% correct to 32% correct. Prior to instruction most of the students typically represented viruses as similar to cells, amoebas, or paramecia. The results of the clay model virus task showed that students' concepts of viruses moved from conceptions of bumpy, round, 2D images, to conceptions that were more typically 3D, angular, 20-sided, and spherical with angles (like the isocahedral paper models made during instruction. The clay models and the drawings showed an increase in the number of dimensions represented. After instruction, 35% of the students' drawings were 3D, no pre-instruction drawing was. After instruction, about 16% of the drawings included the bumpy surface features of the adenovirus. The changes form 2D to 3D conceptions of viruses were noted also on the written pre- and post-knowledge tests. We coded description as 2D or 3D (88% interrater reliability). A chi-square indicated a significant change from 2D to 3D language from pre-test to posttest [$\chi^2(1)=18.5$, $p<.01$, $N=41$]. On the pretest, students described viruses as "circles" or "curvy lines,"; on the posttest references such as "dice," "spaceship," or "robot."

Knowledge of Scale

Responses were scored as correct, partially correct, or incorrect. Chi^2 indicated a significant increase from incorrect to partially correct or correct descriptions from pretest to posttest. ($\chi^2(1) = 29.4$, $p< .01$, $N=43$).

Knowledge of Microscopy

Prior to instruction students typically named only the light microscope (70%); a few named the electron microscope (20%). After instruction 50% also named the AFM. Students' post descriptions went beyond the naming to include how the nM and AFM operate and the impact of tip size on images produced. Tammy, one of the students explained the use of the nM and the AFM in her story: "(T)he nM... is a little box with a pen attached to it. The box is attached to a computer. When we walked in, we saw a purple bumpy surface on the computer screen. You then touched the pen to the surface by looking at the computer. Rapidly you start to feel the pen jump and vibrate as it makes you feel as if you are touching the virus." Darren wrote: "The nM is pretty complicated to explain. There was a colorful image on a computer screen. The image looked like a globe with the actual elevations on it. It was a flat surface with different lumps. We used a hand-held pen to move a point on the screen around. When you moved the point over the lump, which is an actual virus, you could feel the surface of the virus..."

Knowledge of Scientists and Science Careers

Students were asked during the pre-interview if they had met a scientist. 82% said no. Students also were asked to describe a scientist. Their pre-responses reflected the typical stereotypes scientists, boring old white men. On the posttest, students were asked if the activities had given them new impressions of scientists. 63% said "yes." Many students who said no also noted that they already had high opinions of scientists and the activities reinforced their positive impressions. Students who indicated a change in perceptions described changes in their feelings about science, science careers, and characteristics of scientists. For example, Fred wrote "Yes, they aren't just old men that sit in a lab all day."

erspectives of their work as well as the scientists' lives outside their research. Nearly all the students commented on scientists' lives outside of work.

Students' Affect For Science

Eight students noted that they had more positive feelings about science as a result of the experiences. Responses included: *"It showed me that there was more to these jobs than old men in white lab coats doing boring experiments; they showed it can be fun."* Sixteen students commented that after the instructional experiences their understandings of the nature of science careers had changed. For example: *"They have a fun, hard job to do. They are not all that boring after all." "I never knew that science can vary in meanings. Like people consider computers to be science when it doesn't deal with science at all." "I enjoyed my experience learning about viruses. It opened my mind to a possible new career path as a scientist and gave me a new outlook on viruses."*

Students were asked on the pre- and post- questionnaires to describe what they thought scientists do when they are doing scientific research. Twelve of the students' responses showed a change from a pre-conception of scientists as searching for answers to a post-conception of scientific research as a more dynamic and flexible process of inquiry. A recurring theme that emerged from the interviews and written reports was new understanding of the collaborative nature of modern science research. The stereotype of the isolated scientist working alone shifted to a concept of teams of scientists working together as noted by these students.

In summary, the investigations with the nM and the AFM influenced students' conceptual understandings of the morphology and 3-dimensionality of viruses, microscale, microscopy. Students' beliefs about science, science careers, and scientists were also altered as a result of the experience.

This study was exploratory in nature and the results should be viewed in light of the limitations of the study. It isn't possible to separate the impact of the technology from the influence of working alongside the university scientists. It is also highly likely that the mere novelty of participating in this type of unusual instructional experience would alter students' motivation and interests. The writing task was a rich source of information for the research but was generally disliked by the students. As a result, some of the students' wrote little and did not elaborate on their ideas.

Discussion

Students' understandings of virus morphology and dimensionality changed as a result of learning experience. Students' mostly depicted viruses as having 2D before using instruction and as 3D after instruction. These results suggest that the use of haptics as a tool for learning about morphology of invisible materials may be of benefit. The nM technology adds physical manipulation and an element of "hands-on" exploration to the study of nanoscopic objects. This study showed that use of an Internet-based nM/AFM technology in classroom was technically feasible. Further research is needed to examine how manipulation of nanometer sized materials contributes to conceptual understandings and how to scale up this technology to make it more widely available. The rapid development of Internet-based high quality 3D graphics and virtual reality software opens up new worlds to science teachers. The potential for students to visually and physically explore microworlds is within our grasp. The challenge for researchers is to develop new ways to measure how these technological innovations influence students' learning. Students also made gains in their understanding of microscale as a result of participating in these investigations. Scale is a difficult topic for students to understand and yet is a major theme that cuts across science disciplines (AAAS 1993). As a result of using the simulator and the nM/AFM, students began to develop understandings of the limitations of trying to visualize in 3D an object that is laying flat on a surface. The use of the nM to move, roll, and probe the viruses appears to have made a difference in the dimensional concepts students held of viruses.

Interviewing and working with scientists on the nM/AFM appears to have changed students' understandings of scientists and their work. Students were particularly interested in the normal lives that the scientists held outside of their work. They were surprised that the scientists actually had families, pets, and did normal things like go dancing and play in sports. These interactions with the scientists made science as a career seem plausible.

References

AAAS, (1993). Benchmarks for Science Literacy. Oxford University Press, New York.

American Institute of Physics (1997). Using technology for education: Panel recommendations. American Institute of Physics Bulletin of Science Policy News, No. 107.

Klatzsky, R., Lederman, S., & Reed, C. (1987). There's more to touch than meets the eye: The salience of object attributes for haptics with and without vision. Journal of Experimental Psychology: General, 116, 356-369.

Linn, M., Shear, L., Bell, P., & Slotta, J. (1999). Organizing principles for science education partnerships: Case studies of students' learning about rats in space and deformed frogs. Educational Technology Research & Development, 47(2),61-84.

The Internet science education environment (ROL)

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Paper deals with the ROL (Remote and Open Laboratory) – a component of the open educational and informational electronic supportive environment for science education of a broad scale of target groups (from pupils and teachers to technicians). The ROL on the Internet contains different kinds of materials (experiments, models etc.) and tools for teaching and learning science via network. A brief description of the content and ways users can work with the ROL is given. Some examples starting from " sharing ROL environment via the Internet" to the Web delivery of online courses and learning environment are presented.

ROL – history and brief description

The Internet based "Remote and Open Laboratory" (ROL) - is a part of the Laboratory for Computer Aided Physics Instruction at the Department of Physics Education, Faculty of Mathematics and Physics, Charles University in Prague. At the beginning (1996) the ROL was mostly oriented to initial teacher training. Now, thanks to increasing number of schools connected to the Internet the laboratory serves more and more in-service teacher training and classroom applications.

The ROL is focused mainly on support of experimental activities in physics, biology and chemistry, gives teachers and students possibilities to get familiar with methods of data acquisition and data processing, offers large number of experiments and models for studying and better understanding of different phenomena and systems behaviour.

The aim and idea of the ROL

The Remote and Open Laboratory's main aim is to give:

- supportive environment for teaching and learning experimental and modelling skills and for getting familiar with useful modern tools and techniques for experimenting and modelling
- learning environment with a set of well structured online courses with tutoring and with large amount of slightly structured learning materials in open learning area, both mostly oriented to initial teacher training (laboratory works), but also relevant to in-service teacher training
- flexible, easy and powerful tools for communication and desirable co-operation among students, users, teachers, experts and developers (using the Internet to share laboratory working desk)

Content of ROL

1/ Information sources and databases

The Remote and Open Laboratory contains large databases of physics, chemistry and biology experiments (including downloadable data), computer models, descriptions and explanations of many phenomena.

Experiments with computer measuring systems

This largest part of the Remote and Open Laboratory consists of more than two hundred experiments for computer measuring systems complemented with downloadable data and multimedia descriptions of experiment set-up. This database can be viewed by keywords, titles and areas, enriched with fulltext searching.

Most of the experiments was developed originally for the measuring system ISES [1] and cover the following areas: acoustics - musical instruments sounds and their frequency analysis, mechanics, optics, electricity and magnetism, electronics - semiconductors, and so called "mismatch" - e.g. a human heart and blood-vessel system measurements, etc.

The user can use the database in following two ways: If his laboratory is equipped with the software and hardware supported by Remote and Open Laboratory, he can launch an application, carry out the experiment described and, for example, immediately compare the results of their experiment with the downloaded data.

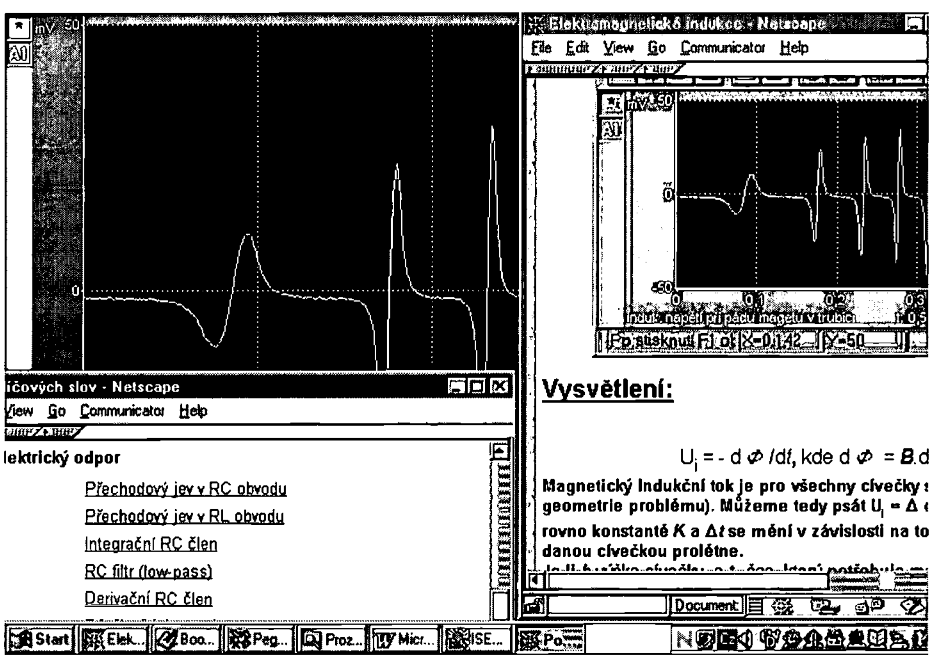

Figure 1: The database of computer aided experiments (left lower window), the description including images and downloadable data (right window), launched application (the background).

If the user's laboratory is not equipped with the measuring hardware, he can download data prepared for different kinds of application (e.g. ISES demo, spreadsheets like MS Excel, QuatroPro, etc) and work with the data in this environment.

Computer models

In the Remote and Open Laboratory a user can find sets of computer models and simulations, from the simplest to highly developed ones. These models are created in different modelling environments which allow users to choose and to reflect their modelling preferences, competence, skills or the tools they know.

The models and simulations were developed in different modelling systems - e.g. Interactive Physics [3], Famulus, IP Coach [4] and spreadsheets. Models are mostly ready to be used in schools by students or by teachers. Some of them are completed with commentaries, others are intended to be refined by teachers or students. Models are presented in many different ways and they are usually combined with questions to be answered. If users do not have the modelling system in which the model has been developed, they can use a spreadsheet or have a look at the model as a movie and continue studying the problem in a slightly different way.

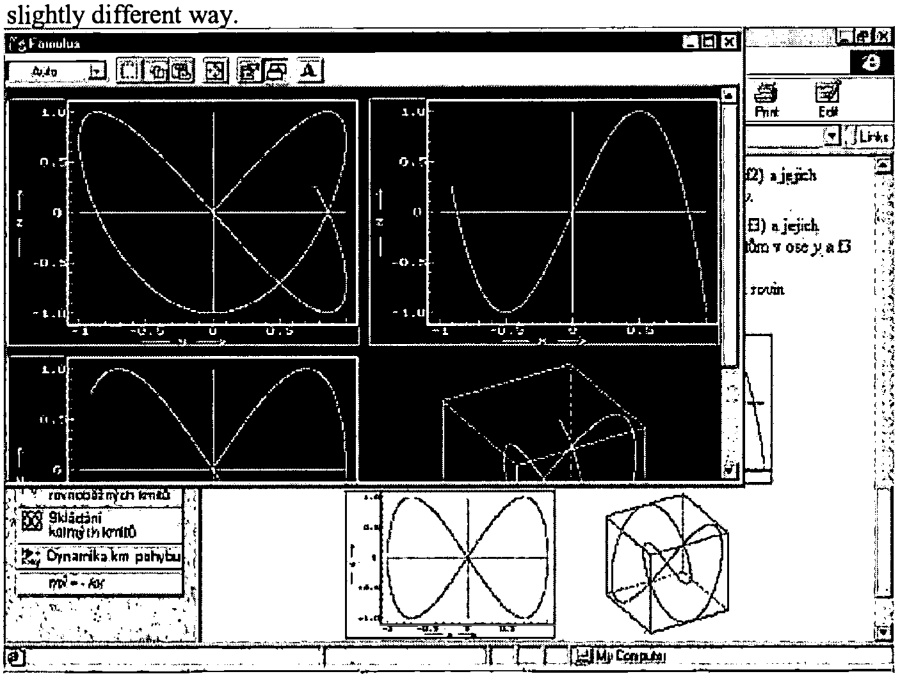

Figure 2: Living "3-D Lissajoux patterns" pop up as a running model from the WWW page specifically structured learning materials.

Experiments without computers

There a certain number of experiments in Remote and Open Laboratory which do not need any computer measuring system. These experiments are presented in form of hypermedia guides including video records, animations or series of pictures and schemes. Usually they are extended by questions and suggestions for further experimenting and complemented with brief remarks about how to perform and explain the experiment. This explanation is usually supplemented with useful data, additional knowledge and references.

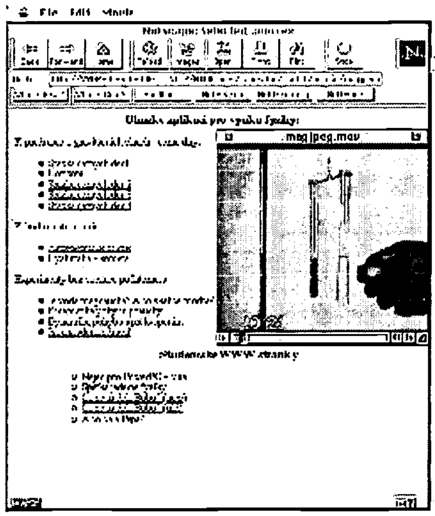

Figure 3: Web page with movie - recorded experiment on "Surprising magnetic behaviour of distilled water"

Technical and general information

The indispensable part of the ROL contains important information on computer measuring systems: technical details of hardware and software, recommendations, manuals, and guides.

2/ On line courses

The ROL offers different kinds of on-line courses mostly oriented to future teacher training and in service teacher training. These courses are offered as a part of combined courses [5] (together with face to face training) or delivered independently for different purposes (e.g. for "home preparation" of university students).

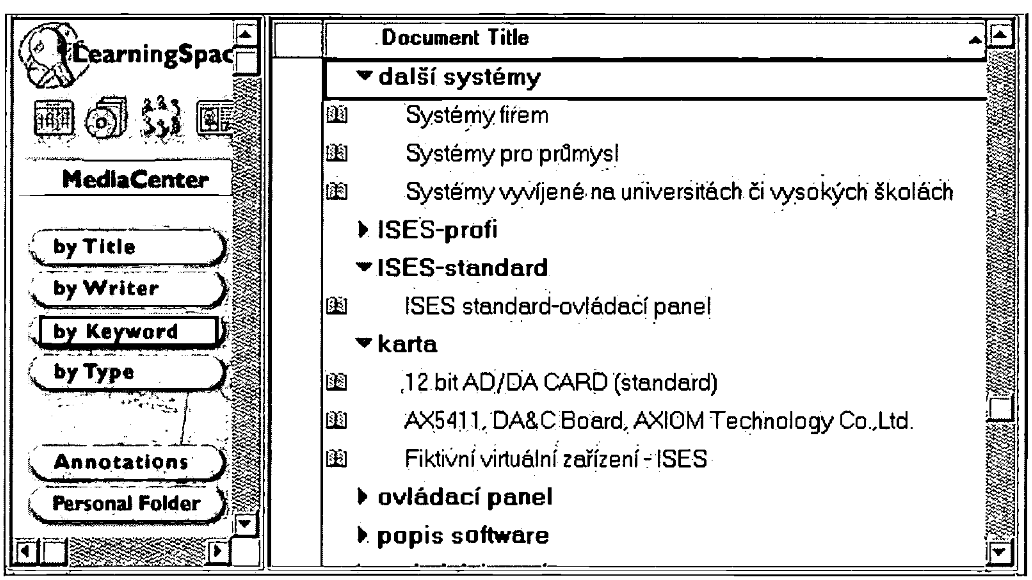

Figure 4: Part of course CAL (Computer aided laboratory) media room.

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3/ Communication tools of the ROL

The ROL uses standard Internet communication tools for "off-line problem-sharing": FTP, e-mail, Web forums, last both with attachments. We use the capabilities of videoconferencing tools, the Internet telephone , and chats for "on-line" consultations.

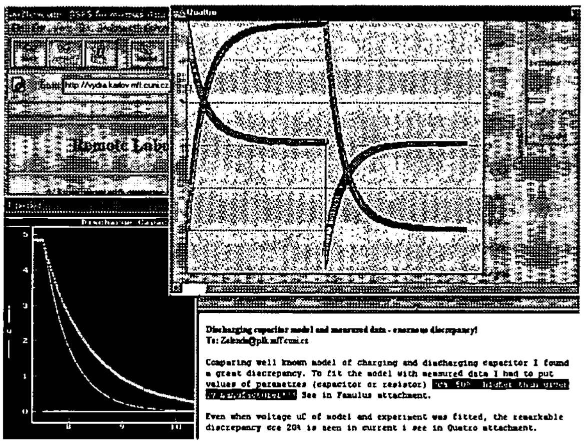
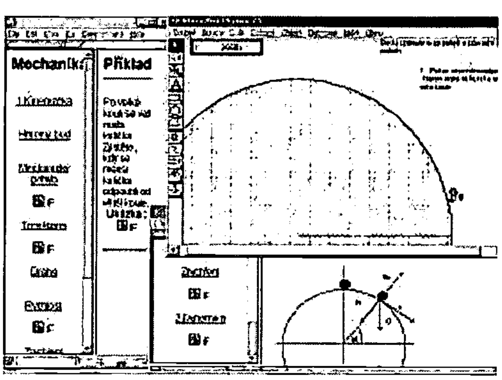


Figure 5: The user working with downloaded models "Charging and discharging capacitor - comparison of experimental data with models" and performing the recommended experiment (using downloaded set-up of the experiment and different modelling environments Famulus, QuatroPro) found and emailed a severe problem. The ROL addressee can immediately rerun the whole problem situation –"shares the problem situation with the user: "

The Remote and Open Laboratory in action

The Remote and Open Laboratory is able to become an open environment for learning , teaching and co-operation among users (students, teachers) and developers, providers (experts, students, teachers etc.). Simple examples of work in ROL learning environment follow.



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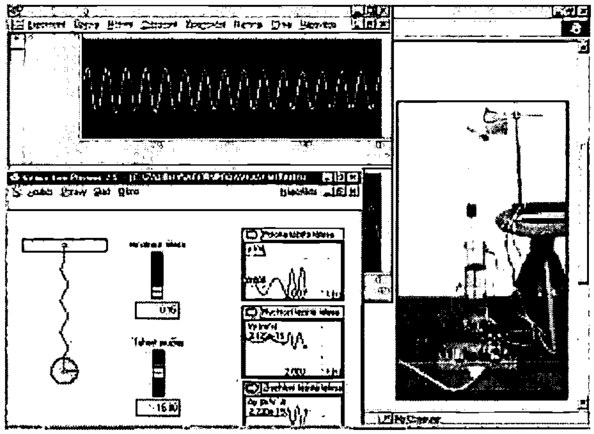

Figure 6: Example of the learning environment in the ROL (right frame – configuration and setup of the experiment, upper frame – experimental data obtained by system ISES, left lower frame – description and theoretical explanation, including simulations).

Figure 7: Example of learning environment in ROL (background window – content items and problems, lower right window- "a hint on the problem situation", upper right window – a simulation of the studied phenomena.

Users can change downloaded models and experiments, adapt them to different conditions or needs. They can also develop, verify and describe their own experiments or models and present them to other users in theRemote and Open Laboratory.

Users can simply ask authors and contributors the Remote and Open Laboratory for more information, send their comments or ideas via e-mail or other ROL communication channels.

Teachers can use their own modification of the ROL in the school LAN to distribute data or tasks to students via ROL environment. In the same way they can "open" school science labs to students, allowing them to learn science by exploring data, modelling, verifying hypotheses and looking for interpretations, whether the school labs are occupied or not.

REFERENCES

1. Lustig, F. - Lustigová, Z.: ISES for Windows. User's Guide. PC IN/OUT, Prague. 1996.
2. Dvorák, L.- Ledvinka, T. - Sobotka, M.: Famulus 3.5. User's Guide. Famulus Etc.,Prague. 1993. p.315
3. Interactive Physics 2. User's Guide. Knowledge Revolution. 1994.
4. IP-Coach V 4.0 (Users manual) CMA Amsterdam. 1993
5. Zelenda, S.: PSP98 – Measuring with computer systems: A combined course for physics teacher students. MFF UK Prague. 1998.

Meeting the Need for Technology Integration: Math, Science and Technology Integration for Pre-service Teachers

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Abstract
Historically, teacher education programs offered methods courses offered in isolation, neglecting the integrated manner in which many elementary classes are taught. This presentation focuses on the importance of curriculum integration in pre-service teacher education programs. The presenters explore the Math, Science and Technology (MST) integration block developed by the School of Teaching and Learning at the University of Florida for its Proteach II teacher education program with a focus on the technology integration course. The MST program goal is to develop the skills required by teachers to effectively create and implement an integrated curriculum.

Introduction
Historically, teacher education programs offered methods courses, such as science, math, reading, language arts, and social studies, taught in isolation. Although elementary educators often integrate subject matter, teacher-education programs have limited the inclusion of this skill in the coursework. Implemented in the fall of 2000, the School of Teaching and Learning at the University of Florida began the Math, Science and Technology (MST) Integration Block, providing pre-service teachers with opportunities to learn curriculum integration in a technologically connected environment.

Unable to conceptualize what curricular integration requires of teacher and student, pre-service teachers find it difficult to effectively integrate technology with multiple content areas. Carlson and Gooden (1999) state that "in order to become fully comfortable with use of educational technology, pre-service teachers need to actually see technology use modeled by their professors and their supervising teachers." This applies to all content areas. The MST block implements curriculum integration in a manner that allows pre-service teachers to benefit through both university learning and classroom activities. Specifically, the pre-service teachers are taught in the manner in which they are told to teach.

According to Carlson and Gooden (1999), technology mentoring is an essential component of pre-service development. Pre-service teachers also need better preparation in the use of technology (Carlson and Gooden, 1999), making them ready for what they will face in the 21st century classroom. By modeling effective and appropriate technology implementation, MST instructors offer students a vital component to the teacher education program.

The MST Block
Creating an integrated teacher education program offers many learning experiences for instructors and students. Bringing together departments that have taught independently elicits many challenges. How do instructors bring three separate courses together? How do you create a curriculum that focuses on the integration of the material yet accounts for the individual needs and requirements of the subjects? How do you maintain an integrated environment and still prepare your students to enter a classroom guided by standardized tests and isolated content? Answering these three questions is essential in creating a program

capable of providing pre-service teachers with the skills necessary to integrate content areas and technology.

Although the three courses are taught separately, content integration serves as the focal point for each class. In the integrated environment, students are provided with first-hand experience of how subjects can be integrated with technology serving as a tool to enhance the learning. Instructors teach about content and technology integration through unified lessons while maintaining the importance of the respective subject area material. Examples of lessons and experiences include trips to Camp Crystal Lake, an outdoor science education environment operated by the School Board of Alachua County. While visiting the camp, university students work with elementary school children as they complete water quality surveys , ecosystem investigations, and other camp activities. Math and technology are integrated throughout the traditional science curriculum. Activities include estimation, measurement, and calculation, followed up by entering the collected data into web-enabled database from wireless computers. Students and pre-service teachers take digital pictures as well as video tape of students participating in the lessons. The images and video are later combined into presentations.

The MST block provides an additional opportunity for student-teachers to experience curriculum integration in the elementary classroom setting. During the course of the semester, student-teachers are placed in elementary classrooms with the intention of observing integrated lessons involving math, science and technology. While in their field placements, the pre-service teachers observe how integration works (or in some cases does not work) and apply that to what they learn in the university classroom. These experiences are intended to extend the student-teachers' knowledge beyond the theoretical framework of the university setting.

During the course of the semester, the professors and graduate assistants met to evaluate and adjust the course material. In addition to these meetings, instructors (from math, science and technology) met to evaluate student projects. Although this proved time-consuming and difficult to schedule, the thorough feedback the instructors provided offered the students an opportunity for tremendous growth. While the feedback focused on the integration aspect of the assignments, comments specific to subject content reinforced the importance of maintaining the specific content of each subject. Although the student-teachers initially missed the value of the collaborative assessment, they understood its importance by the end to the semester.

Conclusion

Three times during the semester, students in the MST block had the opportunity to write reflective journals about their experiences. The first journals written by the students could best be characterized as tentative and uncertain about how they would benefit from the technology portion of the MST block. Students expressed concerns ranging from being unsure about their technical skills to being incapable of learning the technical skills necessary to integrate technology and teach students whose technical skills may likely exceed that of the teacher. By the end of the semester, students' attitudes changed dramatically. In their final journal entry, most students expressed surprise and satisfaction with how far they had come. Many students stated that they were looking forward to entering the classroom and providing meaningful learning for their students.

As today's pre-service teachers are prepared to teach in 21st century schools, education programs must ensure that pre-service teachers are able to meet the educational objectives while avoiding the lack of technological expertise that is the "norm" in today's teacher (Carlson & Gooden, 1999). If future teachers are to be qualified to present a technologically integrated curriculum that meets the ever changing demands of a standardized world, they must be trained through modeling and experience. The Math, Science and Technology block is determined to provide those necessary skills modeled in manner that allows the pre-service teacher to see its effectiveness. In its first semester, the MST block has taken huge strides in improving the way in which methods courses are taught. Although only time will tell how effective it will be, the MST block is on track to impact many pre-service teachers, making them ready for the 21st century classroom.

Reference:

Carlson, R.D., & Gooden, J.S. (1999). Are teacher preparation programs modeling technology use for pre-service teachers? *ERS Spectrum*, 17(3), 11-15.

Clinton, B., & Gore, A. (1995). An open letter to parents. *The President's Educational Technology Initiative*. [On-line]. Available: http://www.whitehouse.gov/WH/EOP/OP/edtech/index-source.html.

Dias, L.B. (1999). Integrating technology: Some things you should know. *Learning and Leading with Technology*, 27(3), 10-13, 21.

National Council for Accreditation of Teacher Education. (1997). *Technology and the new professional teacher: Preparing for the 21st century classroom*. Washington, DC: Author.

Office of Technology Assessment. (1995). *Teachers and technology making the connection*. Washington, DC: United States Congress, Office of Technology Assessment.

Porter, T., & Foster, S.K. (1998, October). From a distance: Training teachers with technology. *T.H.E. Journal*, 69-72.

Sheingold, K. (1991). Restructuring for learning with technology: The potential for synergy. *Phi Delta Kappan*, 73, 17-27.

Smith, S.J., & O'Bannon, B. (1999). Faculty members infusing technology across teacher education: A mentorship model. *Teacher Education and Special Education*, 22(2), 123-135.

Stuhlmann, J.M. (1998). A model for infusing technology into teacher training programs. *Journal of Technology and Teacher Education*, 6(2/3), 125-139.

Wetzel, K., Zambo, R., Buss, R., & Arbaugh, N. (1996). Innovations in integrating technology into student teaching experiences. *Journal of Research on Computing in Education*, 29(2), 196-214.

Wetzel, K. (1993). Teacher educators' uses of computers in teaching. *Journal of Technology and Teacher Education*, 1, 335-352.

Aiming a Better Understanding in Science Courses through Mathematical Reasoning

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Abstract: In this article we present a project which has the purpose of using mathematical based explanations to support the teaching of the sciences (chemistry, biology and physics) at the secondary level in Mexico. The article describes the structure of the worksheets developed and the pedagogical model followed within the classroom to ensure an efficient use of the activities. Spreadsheet models to be explored by the students accompany many of the worksheets. We will also show some of these spreadsheet models designed for this educational project.

Introduction

We can predict natural phenomena because it follows some ordered behavior. Behind this order, we find a few principles that can be formulated mathematically. A deeper understanding of science requires the use of these principles as mental tools. For example, diffusion can be better explained and understood using Fick's law about the net flux of particles being proportional to concentration gradient.

Thus, this project is based on the idea that the students can achieve a better understanding of some scientific phenomena if they are imbedded in proper mathematical formulations that will give them a more precise structure and the possibility of quantification.

In some countries like in UK, mathematical modeling is used as a strategy to teach math and science. In this didactical approach, we are interested in the construction of the math model as a tool to learn the surrounding mathematical and scientific topics.

The Ministry of Education of Mexico has being sponsoring, since 1997, a national program to teach mathematics and physics with technologies at the secondary level. Parallel to this educational project, there is an ongoing research project that has as its main purpose to investigate the impact of this technological implementation in students' learning, teaching practices and curricular transformation.

The project presented here was born as an extension to the previous project to cover the subjects of chemistry, biology and physics, but with the difference of stressing the math modeling approach and de-emphasizing the technological aspect. In this paper we will describe the materials that were designed for this educational project.

In each of the science courses, chemistry, biology and physics, we developed around 60 worksheets on different topics. About half of them can be used in the science classroom directly since they do not require any computational tool. The other half, guide the students to explore mathematical models constructed on spreadsheets. We will talk about both of these types in the following sections.

The activities developed for this project have the aim of complementing the normal presentation of subjects done by the science teachers in their classrooms. Although they have a mathematical content, the purpose of these activities is to learn scientific concepts and ideas and not math (although the students also learn math as an extra benefit).

In addition to the activities proposed to the science teachers, there are also computational tools to support them in expanding these mathematically oriented activities. For example, Figure 1 shows a prepared spreadsheet where the students can introduce any data very readily to obtain the corresponding graphs.

There are more graphing tools, like a pie chart graphing spreadsheet or a spreadsheet drawing automatically the least square approximation line to some given data.

Worksheets Requiring only Paper and Pencil

Within the classroom, we have used very effectively a teaching strategy that in part consists of coupling a math modeling approach with worksheet guidance.

An antecedent of this method is a collaborative Mexico/UK research project (Sutherland et al. 1996) aimed at investigating the role of modeling with spreadsheets across a range of subject areas (physics, chemistry, and biology). In this early research, the spreadsheet was introduced into the students' science classrooms to construct models, called by Mellar (et al. 1994) "artificial worlds". This activity helped the students to understand the scientific concepts behind the model.

x	y1	y2
0	50	10
1	40	18
2	32	20
3	25.6	30
4	20.48	40
5	16.384	50
6	13.1072	52
7	10.48576	45
8	8.388608	35
9	6.7108864	23
10	5.36870912	15
11	4.294967296	10
12	3.435973837	6
13	2.748779069	4
14	2.199023256	2.5
15	1.759218604	1.8
16	1.407374884	1.4

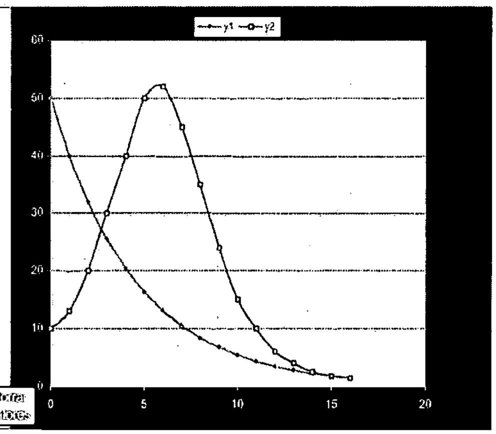


Figure 1: A graphing tool within a spreadsheet

In this new project presented here, we were not interested in the students constructing models but on the advantages of exploring and analyzing some aspects of a mathematical model to enhanced students' understanding of the scientific ideas related to the model.

For the design of the worksheets, we defined a structure that turns out to be very useful. In the next lines we give the sequence followed:

i. Posing a real situation as background.
ii. Asking some intuitive questions for the student to reflect on the problem.
iii. Analyzing the situation through questions and feedback.
iv. Expand on the analysis, giving questions about results, challenges and open questions.
v. Discussion and conclusions (it is important for the students to summarize their conclusions).
vi. Extra work (for fast thinking students).

The worksheets start with very directed tasks and progressively leaves the student with more freedom to try his own ideas.

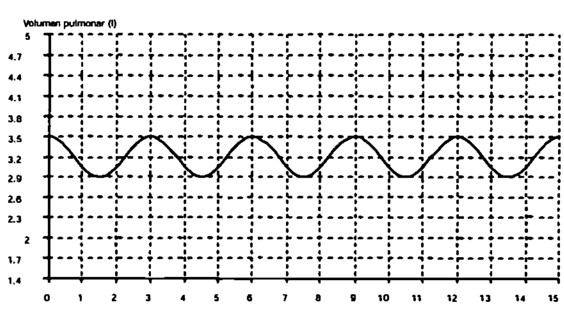
The worksheets designed fall into two different categories. About half of them described a scientific situation using mathematical ideas but no computational tools were needed. The other half were based on mathematical models constructed on spreadsheets. In the first type then some aspect of a mathematical model was analyzed through the use of graphs or tables. In the second type, the students explore the spreadsheet model.

To illustrate the previous points, the following is a worksheet of the biology series of the first type:

The breathing cycle.

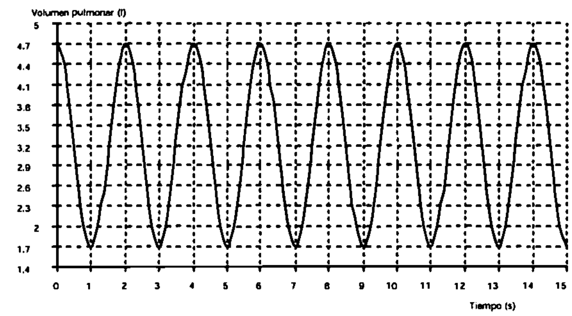
Observe the graph of the variation with time of the lungs' volume of a person (in liters) during rest. Note how the graph repetitively goes up and down. Explain why: _____ *Show in the graph the intervals where the person is breathing in and breathing out.*

Which is the maximum volume reached by the lungs? _____ Which is the minimum volume reached? _____ Do they empty



* The actual lines in the worksheets are bigger so the students have enough space to answer. Here we reduce them for lack of space.

out completely? _____ How much air comes in and out during each breath? _____
Now observe the time axis to answer: How many seconds lasts each breath? _____
Note in the graph that there are 5 complete breaths in 15 seconds. According to this, how much time does a single breath lasts? _____ (Compare this answer with your previous one). How many breaths will this person take in a minute? _____
We obtained above that this person inhales 0.6 liters of air in each respiration and that he takes 20 breaths per minute. How many liters of air does the person inhale per minute? _____ The air contains 20% oxygen. How many liters of oxygen does the person introduce to his body per minute? ________ The air coming out of the lungs contains only 15% oxygen. How many liters of oxygen does the person take out of his body per minute? _____ How much oxygen does his body use per minute? ________ (this is 36 liters per hour).
Observe now the graph of the variation with time of the lungs' volume (in liters) of a person right after exercise. Show on the graph the intervals where the person is breathing in and breathing out.
What is the maximum volume reached by the lungs? _____ What is the minimum volume reached? _____ Do they empty out completely? _____ How much air comes in and out during each breath? _____ How many seconds does each breath last? _____



Note on the graph that there are 5 complete breaths in 10 seconds. According to this, how much time does a single breath last? _____ (Compare this answer with your previous one). How many breaths does this person take in a minute? _____
In this more intense respiration, the person inhales 3 liters of air in each breath and he takes 30 breaths per minute. How many liters of air does the person inhale per minute? _____ The air contains 20% oxygen. How many liters of oxygen does the person introduce to his body per minute? ________ The air coming out of the lungs contains only 15% oxygen. How many liters of oxygen does the person take out of his body per minute? _____ How much oxygen does his body use per minute? ________ (this is 90 liters per hour).
Compare the values obtained for the person at rest with the ones after exercise. Write down and explain the differences and draw some conclusions from these findings.

Worksheets to Guide Exploring Math Models in Spreadsheets

As we mentioned before, about half of the worksheets were designed to guide the students to work with prepared spreadsheets. Some of them have data about a specific topic or facilitated calculations. Others contained mathematical models for the students to explore.
In this section we will show some of the spreadsheet models with controls that were designed to support this project (we can only show here a static version of the screens. The dynamic power of these spreadsheets will be shown during the conference).
Some of the spreadsheets have the purpose of facilitating calculations, making it easier for the student to concentrate on the scientific content. For example, in the first two columns of a spreadsheet (not shown here), the student introduces the symbols and the number of atoms of the elements in a given formula. The program returns the molecular weight of the compound and the percentage participation of each element. Also using this spreadsheet, the students discover formulas if the percentages of the elements are given.
Figure 2 shows a simulation of the process of electrolysis (for the chemistry course). As the level of water is reduced, the amounts of hydrogen and oxygen increase accordingly. The students can take data and learn the relationships of mass and volume of these three substances (the control makes the effect of a dynamic process).
Other spreadsheets for chemistry have reaction models, distribution of electrons in orbits for each element, etcetera.

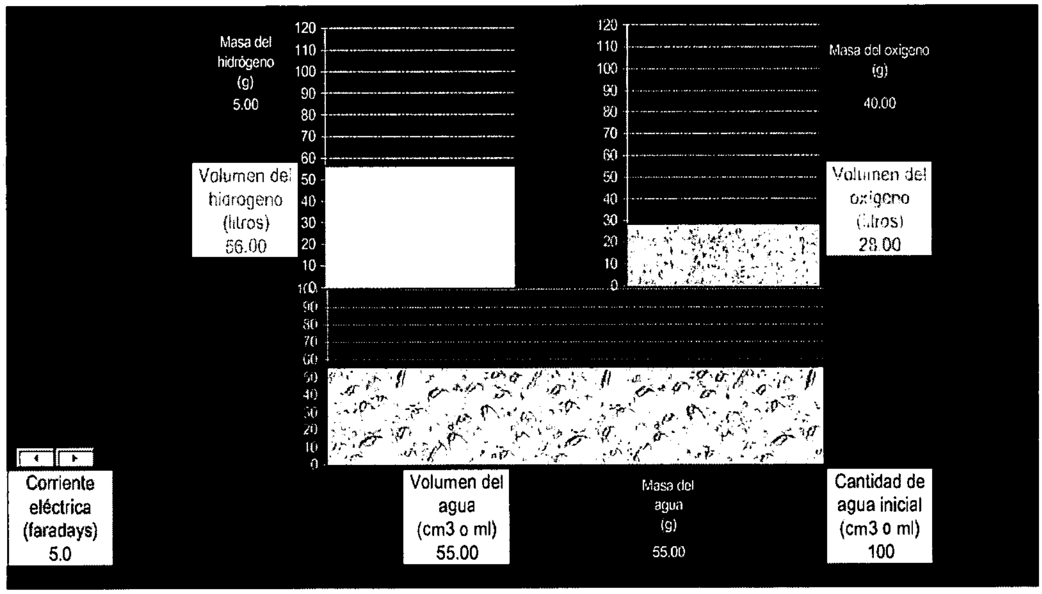
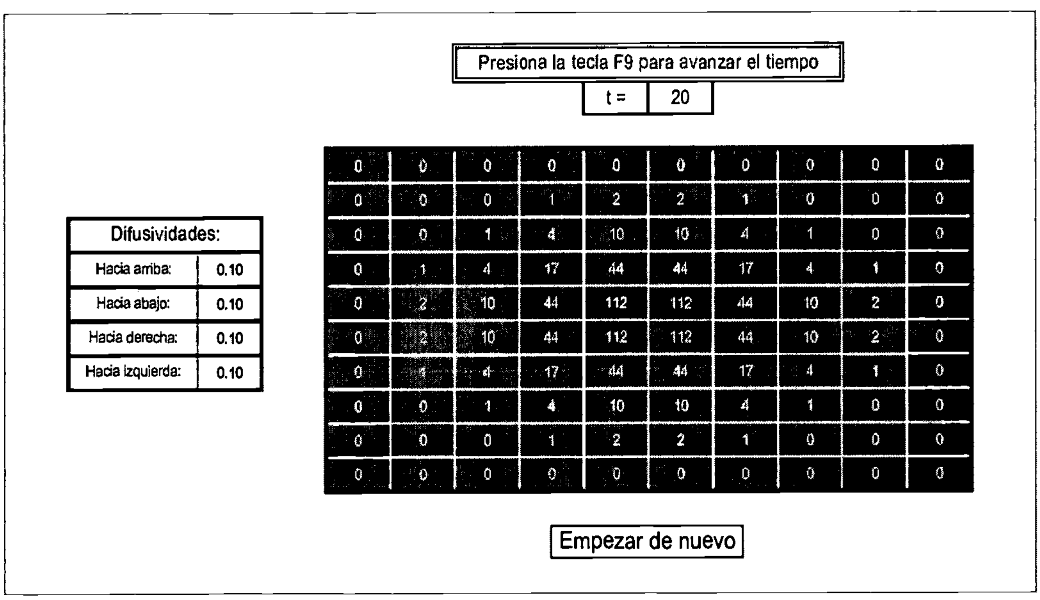


Figure 2: Spreadsheet modeling the process of electrolysis

Figure 3 shows a spreadsheet containing a simulation of diffusion in two dimensions (for the biology course). In it, we can start with any quantity of particles in each of the 100 cells and by pressing the F9 key repeatedly, we can observe the particles diffusing through the cells. On the left side of the screen, the diffusive constants in each of the four directions can be changed.


Presiona la tecla F9 para avanzar el tiempo

t = 20

Difusividades:	
Hacia arriba:	0.10
Hacia abajo:	0.10
Hacia derecha:	0.10
Hacia izquierda:	0.10

0	0	0	0	0	0	0	0	0	0
0	0	0	1	2	2	1	0	0	0
0	0	1	4	10	10	4	1	0	0
0	1	4	17	44	44	17	4	1	0
0	2	10	44	112	112	44	10	2	0
0	2	10	44	112	112	44	10	2	0
0	1	4	17	44	44	17	4	1	0
0	0	1	4	10	10	4	1	0	0
0	0	0	1	2	2	1	0	0	0
0	0	0	0	0	0	0	0	0	0

Empezar de nuevo

Figure 3: Spreadsheet modeling two-dimensional diffusion

Figure 4 shows a spreadsheet containing a mathematical model of two competing species (for the biology course). Each specie has a number of parameters that can be change through controls. The dynamic movement of the graphs allows the students to visualize the effect produced.

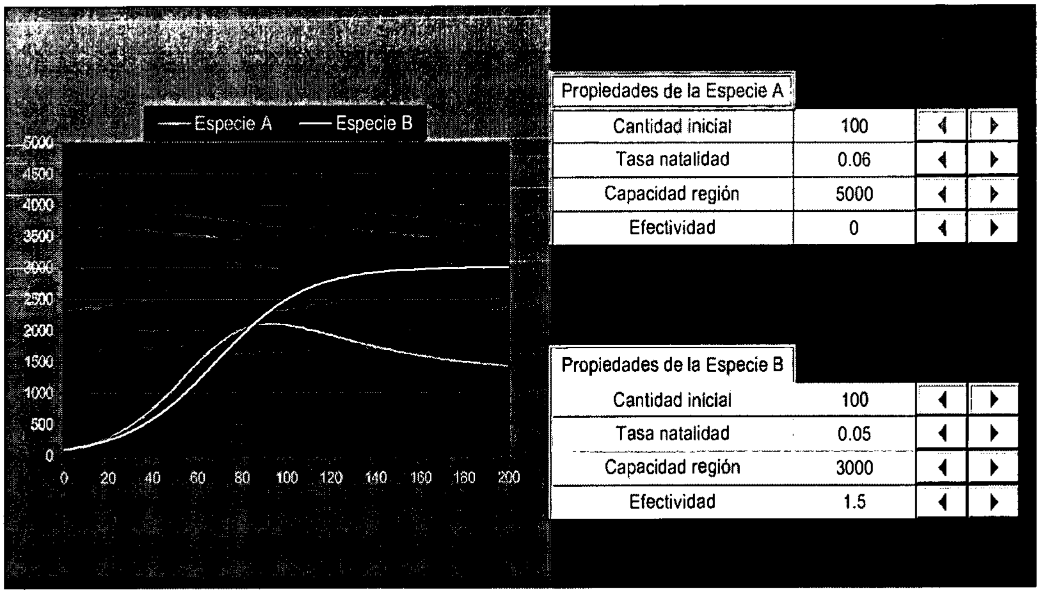


Figure 4: Spreadsheet modeling two competing species

Other spreadsheets for biology model populations in different ways, genetics, epidemics, nutritional data, etcetera.

Figure 7 shows a spreadsheet containing a simulation of radioactivity (for the physics course). Pressing the F9 key repeatedly, we can observe the atoms being disintegrated. The half-life of the material can be chosen and data can be obtained as a function of time.

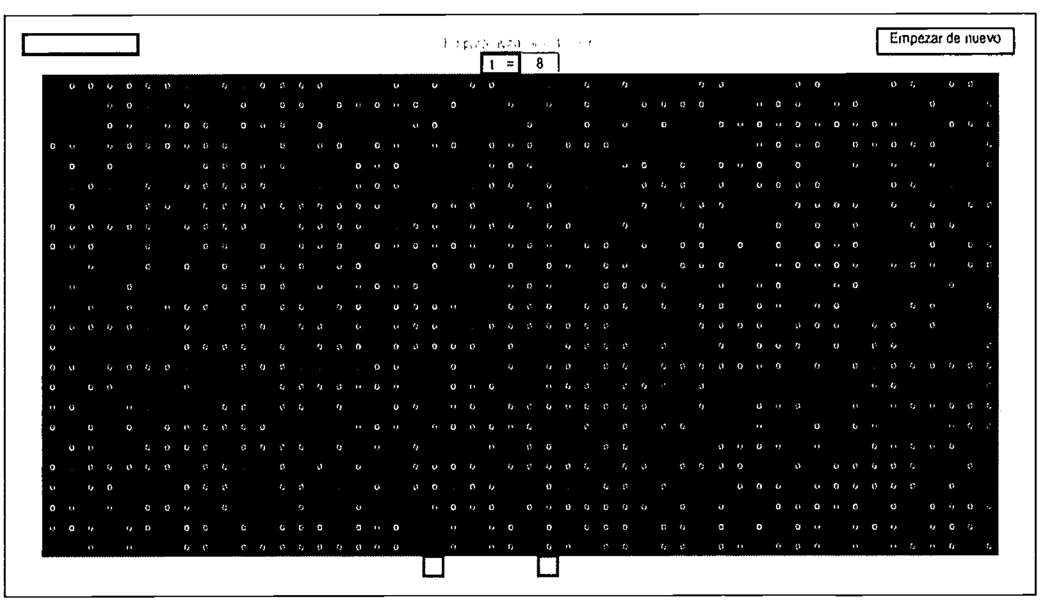


Figure 7: Spreadsheet modeling radioactivity

Other spreadsheets for physics model heat conduction, free fall or with air resistance, circuits, etcetera.

Pedagogical Model

The pedagogical model for this project was described in a previous article (Mochon 2000). Here we will mention only its main components:

- ✓ The work of the students is directed through worksheets to "discover" important ideas in the sciences.
- ✓ The students become the most important elements in the classroom, through active participation and reflection.
- ✓ Communication is crucial in the learning process of the student. Thus, the work is done in groups.
- ✓ The teacher in the classroom has the role of guiding the students to discovery and orchestrating the discussions.

As can be seen, the design of the worksheets is as important as how they are used. Our previous experience shows that the teacher is a very important component in this model. He should encourage the discussion between the students during and after the activity is done.

Conclusions

We have seen once again that the use of controls in spreadsheets has great potential to support the teaching in science, where mathematical models with dynamic graphs can give a visual image of the situation involved.
Although this has to be confirmed further by the classroom results, there is already data supporting the idea that an approach of quantifying the sciences through models, tables and graphs can be useful to improve the understanding of the concepts and ideas.
Finally we should stress that computational tools where the students act independently have a lower chance of success than those supported by worksheets that guide the students through the "right path" to discover relevant ideas. Also, an appropriate pedagogical model is needed.

References

Mellar, H., Bliss, Boohan, Ogborn and Tompsett (1994). *Learning with Artificial Worlds*, The Falmer Press, London and Washington D.C.

Mochon, S (2000). Using Controls to Construct Dynamic Spreadsheets for Teaching Math and Physics: the Design of Interfaces and Worksheets, *Proceedings of MSET2000,* San Diego, CA.

Sutherland, R., Rojano, T., Mochon, S., Jinich, E. and Molyneux, S. (1996). Mathematical Modelling in the Sciences Through the Eyes of Marina and Adam, *Proceedings of PME-20*, Vol. 4, 291-297, Valencia, Spain.

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Revolution in Hand: Handheld Computers in the Science Classroom

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Abstract: Hand held devices, such as Palm Pilots, have the potential to revolutionize the science classroom. These small, inexpensive devices make it possible for science teachers to grade students' laboratory and group projects in real time. A team of science teachers and university educators will discuss what they have learned about these devices and their effectiveness as tool for learning and instruction.

Introduction

A Personal Digital Assistant (PDA) or handheld computer is a small hand held computer with built in applications such as word processing, spreadsheet, personal organizers, and calculators. Grade book and disciplinary programs expand the usefulness of the devices for busy educators. With a shift from teacher-centered to student-centered classroom environments, PDAs may play an important role in enhancing teaching and learning experiences.

Literature Review

While research on PDAs is in its infancy, it is useful to examine the literature relating to the use of laptops and PDAs in schools, as they relate to portability and ease of use. Of particular interest is the documented shift from teacher-centered to student-centered classroom environments in laptop schools (Stevenson, 1998; Rockman, 1998). Increases in both cooperative learning and project-based instruction were documented by Rockman (1998).

Pownell and Butler (2000) identified ways that PDAs can benefit educators. Pownell and Butler argued that PDAs are only effective when they support how teachers work and use information in their classrooms. Their web site, ***The Online Educator's Palm Web Site***, identifies four differences between PDA/handheld computers and desktop computers. One difference relates to portability and size. While laptops are smaller and more portable than stationary computers, PDAs are small enough to be carried in a pocket or a student's backpack. Like laptops, PDAs offer teachers and students portability (Bell, et al, no date; Byers, 1991; Concord Consortium, 2000) and on-the-fly note taking. They are also useful as field journals or in traditional lab settings (Berlanger, May 2000; Cooke, no date; Trotter, October 27, 1999). Accessibility is another area of comparison between laptops and PDAs. Handheld devices are considerably cheaper to purchase and to operate than laptops (Belanger, May 2000). Trotter (October 27, 1999) calls them "equity computers" because of their low cost and ease of use. A third category of comparison is mobility. Teachers are not restricted to a stationary computer and can access and retrieve information anywhere, anytime, including in the field or on fieldtrips to museums or historic places (His & Manus, no date). The fourth area of comparison relates to the adaptability of PDAs. PDAs can change the way educators use technology and the way they access information, particularly information on the Internet. (Pownell & Butler, 2000).

While research on the effectiveness of PDAs in educational settings is sparse, relatively few K-12 schools have had PDAs in place long enough to generate longitudinal studies of their instructional impact. Several groups are actively researching PDAs' classroom effectiveness. Among these groups is the Multimedia Portables for Teacher's Pilot in the United Kingdom. This project put 1,138 high-specification portable computers in the hands of practicing teachers in a range of schools. The program reported high levels of motivation and self-reliance (Fisher, 1999). The program concluded that the PDAs were flexible and adaptable and successful in providing a context for teacher professionalism to flourish (Fisher, 1999).

The Kentucky Migrant Technology Project, a division of the Ohio Valley Educational Cooperative, piloted a PDA program at Eminence Independent Schools in Eminence, Kentucky in 1999. One teacher and a group of eighth graders participated in the program. Preliminary findings included less teacher time spent photocopying tests and other papers and more efficient instructional time. Not only did the teacher use the PDA to beam tests and electronic texts to students' PDAs, but also the students used the devices as journals and as personal organizers. The PDAs' spreadsheet programs and the device calculators were used as well. Conclusions from the first year suggest PDAs are effective tools in the hands of teachers (Lifestyle Passport, 2000). The project is also piloting an online course using the devices, with course materials available for online download. Once downloaded to the desktop computer, the course can be beamed to an instructor's and the students' PDAs.

Other research efforts using PDAs are underway. The National Classroom Project (NCP) at the University of Mississippi (Cooke, no date) supports the use of PDAs as portable labs. One objective of the project is to test whether classroom sets of PDAs can be effective when wheeled from classroom to classroom. NCP literature suggests that PDAs will assist teachers in measuring student progress even as it allows them to conduct individualized re-mediation. Another group examining the effectiveness of the PDA in an educational setting is the Concord Consortium. Research conducted with second and fifth grades found that while both groups were comfortable with the technology, older students used the devices more effectively (Staudt, October 1999). Both groups "easily moved between note taking and data collection" (p. 1). The devices gave students "opportunities to connect questions and investigations to the data a real time setting that enhances "systematic investigations, critical thinking and cooperation" (Staudt, October 1999, p. 1). Additional research suggests that PDAs facilitate group work, the immediate analysis of data particularly during laboratory exercises or when conducting scientific investigations in the field rather than in the classroom (Belanger, May 2000).

Overview of the Study

The main objective of this study was to determine the feasibility of implementing the personal handheld devices for instructional use in the middle school science classroom. Three science teachers in a local middle school participated in the pilot program. They were selected for participation based on how they envisioned using the devices in their classrooms. The researcher used an interest inventory that allowed teachers to explain their vision of how the PDAs would assist their instructional purposes. Teaching experience varied from less than one year to 19 years. Technological comfort levels, as self-report on the pre-survey, ranged from a lack of comfort to very comfortable.

Discussion

Like laptops, PDAs may not be for every teacher. The ability to write lesson plans to incorporate the PDA may be beyond those teachers who continue to struggle with the integration of desktops and laptops into their classrooms. Yet without this integration, PDAs continue to function effectively as personal organizers. Indeed, it was popular with teachers who did not like using other forms of technology in their classrooms. Even with the reduced costs of PDAs, costs for many school districts will remain an issue. The cost of purchasing the devices, software, and providing adequate training may deter districts from these devices. However, what is certain is that these devices have a lower start up and maintenance costs when compared to laptops and desktop computers. It remains to be seen what additional research will reveal about the long-term impact of PDAs on effective teaching.

References

Belanger, Y. (May 2000). Laptop Computers in the K-12 Classroom. Eric Digest. Retrieved October 10, 2000 from the World Wide Web: http://www.notebooksystems.com/link.asp?Site=http://ericir.syr.edu/ithome/digests/EDO-IR-2000-05.html

Bell, V., Bonem C., & Hutchinson, M. (no date). The use of Palmtops in education. Retrieved October 14, 2000 from the World Wide Web: http://www.cee.hw.ac.uk/~mjh/msc_hci/school-pda.html

Byers, J. W. (1991). A Computer in Your Lap.1991 Principal; v71 n2 p14-15 Nov 1991.

Carter, M.W. (1998). A Portable Paradox? ***Laptop*** Computers and Outdoor Learning. Journal of Experiential Education; v21 n1 p14-21 May-Jun 1998 **ERIC_NO:** EJ572405

Concord Consortium. (2000). Curriculum Ideas: Handheld computer suggestions. Retrieved October 14, 2000 from the World Wide Web: http://probesight.concord.org/curriculum/suggestions-handheld.htm

Desmarais, Norman. Innovations Affecting Us: Technology to Learn Anytime Anywhere. Against the Grain; v9 n4 p84,91 Sep 1997. 1997.

Fisher, T. (1999). A New Professionalism? Teacher Use of Multimedia Portable Computers with Internet Capability. In: SITE 99: Society for Information Technology & Teacher Education International Conference (10th, San Antonio, TX, February 28-March 4, 1999); see IR 019 584. **ERIC_NO:** ED432268

Hsi, S. & Manus, J. (no date). Educational Use of Palm Computers in a Standalone Environment. Retrieved October 14, 2000 from the World Wide Web: http://www.stanford.edu/~jmanus/edhand/

McNally, L & Etchison, C. (October 2000). Strategies of Successful Technology Integrators: Part 1 Streamlining Classroom Management. Learning and Leading with Technology, 28.

Cooke, R. (no date). National Classroom Project. Retrieved October 14, 2000 from the World Wide Web: http://www.chairpc.cs.olemiss.edu/windowsce/

Newman, Michelle G.; And Others. The Use of Hand-Held Computers as an Adjunct to Cognitive-Behavior Therapy. Computers in Human Behavior; v12 n1 p135-43 Spring 1996. 1996

Peterson, L. (1999). Transforming the Daily Life of the Classroom: The District Six ***Laptop*** Project. Paper presented at the Annual Meeting of the American Educational Research Association (Montreal, Quebec, Canada, April 19-23, 1999). **ERIC_NO:** ED437028

Pownell, D. & Bailey, G. B. (2000). The next small thing: Handheld computing for educational leaders. Learning and Leading with Technology.

Rockman, et. al. (1998). Powerful tools for schooling: Second year study of the laptop program.

Staudt, C. (October, 1999). Probing untested ground: Young students learn to use handheld computers. Retrieved October 14, 2000 from the World Wide Web: http://www.concord.org/library/1999fall/untested-ground.html

Stevenson, K. R. (1999, April). Learning by laptop. School Administrator, 56(4), 18-21.

Lifestyle Passport. (Fall 2000). The Paperless Classroom: A Kentucky teacher trades three-ring binders for Personal Digital Assistants. Retrieved October 11, 2000 from the World Wide Web:
http://www.microsoft.com/presspass/lifestyles/2000/aug00/paperless_class1.asp

Trotter, A. (October 27, 1999). Palm computing moving from the workplace to the classroom. Education Week. Retrieved September 26, 2000 from the World Wide Web: http://www.edweek.

Wishengrad, Ruth. End of the Printed Line? TECHNOS; v7 n4 p31-33 Win 1998.

Mining for Problem-solving Styles in a Virtual World

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Abstract: The Geology Explorer provides a multi-modal virtual environment that implements an educational game for teaching principles of geology. The game is a networked, multi-player, simulation-based, educational environment that illustrates our role-based pedagogical approach. This takes the form of a synthetic, virtual world (Planet Oit) where students are given an authentic experience and the means and equipment to explore a planet as a geologist would. Each student's experience includes elements of exploration of a spatially-oriented, virtual, world; practical, field oriented, expedition planning and decision making; and scientific problem solving (i.e. a "hands on" approach to the scientific method). Students assume a role and learn about real science by exploring in a goal-directed way and by competing with themselves and with other players.

In this paper, data are reported from a 1999 study, in which students enrolled in a freshman-level Physical Geology course explored the planet for credit. These data were collected in two forms: 1) a survey of student perceptions, positive and negative; and 2) a data mining analysis of student histories which reveals apparent categories of student problem-solving style. Planet Oit can be visited at http://oit.cs.ndsu.nodak.edu/

Introduction

The Geology Explorer (Saini-Eidukat, Schwert & Slator 1999; Schwert, Slator & Saini-Eidukat 1999) is a virtual world where learners assume the role of geologists on an expedition to explore a mythical planet: Planet Oit, which is designed to replicate the physical environments of Earth (and in the same orbit, but directly opposite the Sun). Learners participate in field-oriented expedition planning, sample collection, and "hands on" scientific problem solving.

To play the game, students are transported to the planet's surface and acquire a standard set of field instruments. They are issued an electronic logbook to record their findings and, most importantly, are assigned a sequence of exploratory goals. The students make their field observations, conduct small experiments, take note of the environment, and generally act like geologists as they work towards their goal. A scoring system has been developed, so that students can compete with each other and with themselves.

The Geology Explorer is being developed as a synthetic environment using the freely available Xerox PARC LambdaMOO (Curtis 1997; Bruckman, 1997), which is an environment for creating text-based virtual worlds, to simulate a portion of Planet Oit. Students armed with tools and instruments created as LambdaMOO objects land on the planet to undertake an exploration exercise. They are given an authentic geologic goal, e.g., to locate and report the position of potentially valuable mineral deposits. Accomplishing each of these goals entails mastering several geologic concepts and procedures, and demonstrates student mastery of the material. The first module involves mineral exploration, where students are expected to plan an expedition, locate mineral deposits, and survive the somewhat hostile virtual environment in order to report on it (future modules on hydrology, metamorphic facies, etc. are underway). The first version of the Geology Explorer is text-based; (Slator, Schwert, & Saini-Eidukat 1999); a graphical interface was launched in Fall, 2000.

Planet Oit is designed to emulate the geologic features and processes of Earth. The first version is based on a realistic planetary design, consisting of a single, super-continent composed of roughly 50 locations (Figure 1), arranged so as to be both diverse and coherent. A variety of Earth-like environments, ranging from tropical coastlines to volcanic calderas to glaciated peaks, allows for multiple geologic terrains to be explored. A museum of rocks and minerals is available at the landing site for use as a standard reference collection. Coordination of navigation on the planet is made possible by using directions relative to Earth-like geographic poles (North, South, etc.).

Implemented, as well, are almost 40 scientific instruments and geologic tools (streak plate, acid bottle, magnet, etc.), nearly 100 different rocks and minerals, and over 200 boulders, veins, and outcrops. In the text-based version, students use a command language, which allows for navigation, communication, and scientific investigation while on the planet. Command verbs dictate the student's application of instruments ("streak," "scratch," "hit," etc.) and senses ("view," "taste," "touch," etc.). Students can communicate, and therefore work, with one another through verbal commands. An on-line "user card" listing all these commands and functions is available at: http://oit.cs.ndsu.nodak.edu/oit/usercard.html.

Once the layout and artifacts of Planet Oit were implemented, the rules of the game were imposed over top. After being transported to the planet's surface, students are automatically assigned an initial exploratory goal and can acquire whatever equipment they wish. The goals are intended to motivate the students into viewing their surroundings with a critical eye, as a geologist would. Goals are assigned from a principled set, so as to leverage the role-based elements of the game by gradually leading students to more difficult and interesting goals.

In order for a student to achieve a goal (and therefore earn points), they must address a multitude of tasks identical to those faced daily by field geologists. These include the selection and use of proper field tools, navigation across the planet to the correct region, and interpretation of the tests applied to the problem. As each goal is satisfactorily completed, the student is automatically assigned new goals requiring progressively higher levels of expertise and decision-making. Through this practical application of the scientific method, students learn how to think, act, and react as geologists (see Duffy & Jonassen 1992). This is a particular strength. Student progress is tracked in terms of goals achieved -- and students have a self-paced, anytime/anywhere learning experience.

Classroom Context

Physical Geology at North Dakota State University is a large-enrollment (400+ students in one large lecture section), 3 semester hour course. Aside from lecture, the course content is augmented by slides, a set of course lecture templates, a textbook, and a web resource site that includes self-quizzes, photographs, course news, and links to related resources. Testing is by multiple-choice exams, with students submitting their results on optical scan sheets. Nearly 100% of the students enroll in the course to complete either general education science requirements or specific course requirements within their majors. Because the class is so large in enrollment, it demonstrates the obvious impracticality of field-training each student to think and behave as a scientist, and as a geologist.

In the Fall semester of both 1998 and 1999, the Geology Explorer was incorporated into the Physical Geology curriculum. Data were gathered with a view toward 1) answering several questions about student use of technology and 2) student perceptions of, and satisfaction with, the Planet Oit simulation using an on-line evaluation questionnaire.

The primary goal was to investigate the effect on the student experience with Physical Geology as consequence of introducing the Geology Explorer prototype as a supplementary resource to classroom instruction for a non-major introductory course. To do this, we implemented tracking routines on Planet Oit in order to get statistics for time-on-task, correlations for computer literacy and attitudes towards technology, effect on final grade. We anticipated that these data would lead to a classification by learning style.

The Student Experience

In the Fall, 1999, 81 students completed a Geology Explorer assignment, scoring the required 500 points, and then completed an on-line follow-up evaluation form. This form is web-based and requires identification information (e.g. name, student ID number, and e-mail address), and is composed of 35 questions about the Planet Oit experience (the full form is on-line at http://oit.cs.ndsu.nodak.edu/~mooadmin/cgi-bin/oitform.html).

In the post-test evaluation, 82.8% of the students said they somewhat agreed or strongly agreed they had learned something from the game, and only five students (5.4%) disagreed or strongly disagreed that they had learned something. At the same time, only 9.7% somewhat or strongly disliked the concept of game, and 62.4% thought they might like to play the game again. Meanwhile, the students perceived the game to be at an appropriate level of difficulty, with only 8.6% describing the game as much too complex, and 0 students believing it was much too simple.

For the 81 students who completed the assignment and the post-test evaluation, the average actual time on task was 3.47 hours with a range from 0.83 hours to 8.04 hours (while the average estimated time on task was 5.2 hours with a range from 1 to 12.5 hours). Of this group, 11 (13.6%), underestimated time spent on the planet, 12 (14.8%), overestimated their time on task by 25% or more, and 58 (71.6%), accurately estimated the time they spent on the planet.

Learning Style

Through the course of the experiment, and by interacting with students both off- and on-line, we came to believe that identifiable learning and problem-solving styles were being employed by the students. Some students appeared to take an analytical approach: frequently referencing the on-line help, conducting sequences of experiments, and making diagnoses leading to their scoring points in a deliberate fashion. Other students seemed to take a pattern-matching approach: exploring far and wide in search of outcrops that seemed to match the description of what they were looking for, and then scoring points with relatively few experiments. There was also a small but noticeable group taking a straight "brute force" approach, simply visiting location after location and identifying everything there, one after another, as their goal, eventually succeeding after many tries. One monument to this approach was a student in 1998 who made 1,244 guesses on the way toward obtaining just five correct answers.

To investigate the nature of the apparent trends, an analysis was conducted using logging data to count the number of "reports" (i.e. guesses), the number of locations visited, and the number of experiments conducted (e.g. hit, scratch, streak, etc.), for the same 81 students who had completed the game and the evaluation survey in 1999. These data are summarized in Table 1.

	Reports	**Moves**	**Experiments**
average	42.6	139.2	73.8
st. dev	38.2	83.1	63.2
min	5	19	0
max	238	518	301

Table 1: Student Reports, Moves, and Experiments in 1999

Using these values for average and standard deviation, we developed a classification of behaviors by looking for combinations of either much higher or much lower than average activities in terms of reports, moves, or experiments, or combinations of these. These data are summarized in Table 2. There are a total of 24 clusters, each marked with a code, which represent the three significant categories.

The values in Table 2 indicate that a wide range of approaches are supported by the Geology Explorer, a testament to the user-centered and user-controlled nature of the simulation. Further, almost half of the students can be classified as consistently efficient, not only economizing on their problem-solving effort, but doing so across all three dimensions.

Meanwhile, over half were above normal in one or more dimension, with 17 making excessive reports (code "R," the "brute force" approach); 19 making excessive movements around the planet (code "M," the pattern matching approach), and 22 making more than the normal number of experiments (code "E"). Note that three students were excessive on all three dimensions, and only two students were within 1/2 standard deviation on all three.

Consistently normal or below normal activity		Consistently normal or above normal activity		Mixed problem-solving activity	
rme	10	-ME	5	-Me	4
r-e	8	--E	4	rM-	2
r--	5	R-E	4	r-E	2
-m-	5	R--	3	RmE	2
-me	4	RME	3	---	2
--e	4	RM-	3	Rm-	1
rm-	4	-M-	2	-mE	1
		rmE	1		
		R-e	1		
		Rme	1		
Total (49.4%)	**40**	**Total (29.6%)**	**24**	**Total (21.0%)**	**17**

Table 2: Learning / Problem-Solving Styles

Note: R = many reports; r = few reports; M = many moves; m = few moves;
E = many experiments; e = few experiments.
Example: "-Me" means normal reporting, many moves, below normal experiments (where normal is within one-half standard deviation from the mean).

Discussion

We can only speculate, at this point, what these data mean. We would seem to be seeing a great deal of apparent variability in student style which could point to basic differences, or which might simply be a function of pre-conceived notions on the part of the students as to how interactive software games usually work. That is, a certain number of students might be tempted to "game" the system -- i.e. devote their energies toward learning to "beat the game" rather than learning the geological content the game is meant to convey.

Gaming the system in more-or-less constant concern in efforts of this type and a problem that we, as designers, must be constantly vigilant against. However, it must be recognized these issues are not strictly confined to computing media. Students are resourceful, and there is a long history of anecdotal accounts of students, for example, "cracking the code" of lab samples in order to pass a test. Anyone who has taught laboratory sections for any length of time has similar stories on this theme.

We can make only preliminary claims, at this stage, to a definitive classification of student problem-solving categories. For example, above normal "M" in Table 2, indicating movement and exploration more than 1/2 standard deviation above the mean, might not directly indicate the "pattern matching" strategy mentioned above, but it could simply indicate a high degree of curiosity in some students. Alternatively, it could mean (modesty forbids our promoting this alternative), that our virtual environment is so exciting and filled with wonders that students are exceedingly engaged and feel compelled to see everything they can (19 students were coded "M," we note, over 23% of the total).

By the same token, 22 students were "excessive," if that's the right word, in terms of code "E," for experimentation in Table 2. This is hard to criticize on any level, as experimentation is, in one sense, what we hope to teach. Perhaps these students were repeating experiments because our logging procedures were too inaccessible and they re-did experiments rather than refer to their logbooks. If so, this is a failing of the software that we must try to address.

Lastly, we find that 17 students made excessive reports. This was the indicator that led us to this data-mining investigation in the first place: the intuition that some students (in these data, 21%) were taking a "brute force" approach to their assigned goals. Is this supported? We suspect so. But there are many open questions, the primary of which is how to encourage these students (if we're right in this supposition), to be more analytical in their approach. One aspect we would like to track in the future is the effect of our software tutors in terms of steering the gamers, and the truly overwhelmed, towards more deliberative strategies.

References

Bruckman, A. (1997). Finding One's Own in Cyberspace. In C. Haynes & J.R. Holmevik, (Eds.), *High Wired: On the Design, Use, and Theory of Educational MOOs).* Ann Arbor: University of Michigan Press.

Curtis, P. (1997). Not Just a Game: How LambdaMOO Came to Exist and What It Did to Get Back at Me. in Cynthia Haynes and Jan Rune Holmevik, Editors: *High Wired: On the Design, Use, and Theory of Educational MOOs.* Ann Arbor: University of Michigan Press.

Duffy, T.M., & Jonassen, D.H. (1992). Constructivism: new implications for instructional technology. In Duffy and Jonassen (eds.), *Constructivism and the Technology of Instruction.* Hillsdale: Lawrence Erlbaum.

Saini-Eidukat, B., Schwert, D., & Slator, B.M. (1999). Designing, Building, and Assessing a Virtual World for Science Education. *Proceedings of the 14th International Conference on Computers and Their Applications (CATA-99)*, April 7-9, Cancun.

Schwert, D.P., Slator, B.M., & Saini-Eidukat, B. (1999). A virtual world for earth science education in secondary and post-secondary environments: The Geology Explorer. *International Conference on Mathematics/Science Education & Technology (M/SET-99),* March 1-4, San Antonio, TX.

Slator, B.M., Schwert, D.P., & Saini-Eidukat, B. (1999). Phased Development of a Multi-Modal Virtual Educational World. *Proceedings of the International Conference on Computers and Advanced Technology in Education (CATE'99)*, Cherry Hill, NJ, May 6-8.

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Integrating Mathematics, Science, and Technology Education Goals: An Interdisciplinary Approach

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Abstract: Reform documents in mathematics, science, and technology increasingly call for meaningful integration of technology in K-12 classrooms. Simultaneously, schools are being held more and more accountable for increased content at lower grades by both the reform documents and the popular press. Middle school models call for more focus on the student as independent learners and less focus on specific "school-based disciplines" or classes. One approach to addressing these concerns is through interdisciplinary units. In this paper, an interdisciplinary middle school unit on weather is briefly described as a model that addresses the multiple concerns related to (1) meaningful integration of technology, (2) increased accountability, and (3) less focus on historically independent mathematics, science, and technology classes.

Mathematics, science, and technology educators include the use of technology as a common goal in their most recently developed standards. The National Council of Teachers of Mathematics *Principles and Standards for School Mathematics* (NCTM, 2000) suggests a framework for the types of technology-based activities and content that should be taught. Similarly, the National Research Council's *National Science Education Standards* include suggestions for science education reform in technology-based content and professional development. Finally, the *Standards for Technological Literacy: Content for the Study of Technology* (ITEA, 2000), administered through the International Technology Education Association and funded by the National Science Foundation and the National Aeronautics and Space Administration, identifies the development of technological literacy as the major goal for technology education. A technologically literate citizenry has the ability to "use, manage, assess, and understand technology" (p.7). It is only by inspecting and integrating technology-based activities that include mathematics, science, and technology education goals will a technological literate society be possible.

In addition to this change, these same organizations assert that a more in-depth study of each discipline's content at earlier and earlier grades. This is especially true in the middle grades. To address these issues, the National Middle School Association calls for more focus on the student as an independent learner, developmentally appropriate teaching, and a more integrated approach to teaching and learning in general. One approach to addressing these concerns is through interdisciplinary units. This paper will discuss (1) the need for interdisciplinary teaching, (2) how interdisciplinary planning, teaching, and learning can occur between the mathematics, science, and technology disciplines via technology-based interdisciplinary unit, and (3) other content themes for interdisciplinary development.

The Need for Common Goals and Integrated Assessments

Mathematics

The National Council of Teachers of Mathematics *Principles and Standards for School Mathematics* (NCTM, 2000) Technology Principle states 'technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning" (p. 24). In particular, "when technological tools are available, students can focus on decision making, reflections, reasoning and problem solving." (p. 24) While "technology is not a panacea for teaching computational strategies, teachers should use technology to enhance their students' learning opportunities by selecting or creating mathematical tasks that take advantage of what technology can do efficiently and well – graphing, visualizing and computing." (pp. 25 – 26) Calculators, databases and spreadsheets provide opportunities for these types of experiences to occur.

The *Principles and Standards for School Mathematics* additionally suggest in each of its process standards (Problem Solving, Reasoning and Proof, Communication, Connections and Representation) that "solving problems that arise in mathematics and in other contexts" (p. 52) are crucial to students better understanding their world. More specifically, "school mathematics experiences at all levels should include opportunities to learn about mathematics by working on problems arising in contexts outside of mathematics." (pp. 65 – 66) Thus, creating a method of demonstrating that "the link between mathematics and science is not only through content but also through process." (p. 66)

Science

According to the American Association for the Advancement of Science (AAAS, 1993) scientifically literate people should understand the interdependence of science, mathematics, and technology. Science instruction should include mathematics and technology as tools for observing, thinking, experimenting, and validating. This merger of mathematics and technology into scientific inquiry holds promise for a scientifically literate society. Technology is one way of defining the human experience. Paleontologists use the technology of tool making as one of the chief indicators of emerging human culture. Technology allows us to interact, shape, or more fully understand our environment. The distinction between technology and science blurs as technology becomes more sophisticated. Modern scientific research requires computers for data collection, analysis (statistics), and display. Technologies shape science as they develop, providing motivation and direction for theory building. For example, knowledge of subatomic particles increases with the expanding technology to control collisions between smaller, faster particles and to detect smaller particles as a result of these controlled collisions.

The *National Science Education Standards* grew from the work of the AAAS and several other groups dedicated to the improvement of science instruction. As with mathematics, it is our belief that rich technology- based instruction is integral in nurturing the development of students as active science inquirers. The science and technology standards " establish connections between the natural and designed worlds and provide students with opportunities to develop decision making abilities (NRC, 1996, p. 106)." Using databases, spreadsheets and calculators will assist students with their developing scientific inquiry skills.

Technology Education

The International Technology Education Association *Standards for Technological Literacy: Content for the Study of Technology* (ITEA, 2000), states "technology is created, managed, and used by societies and individuals, according to their goals and values" (ITEA, 2000, p. 7). It has the potential to improve the human situation or damage it. Technology has the potential to save or destroy lives. "The promise of the future lies not in technology alone, but in people's ability to use, manage, assess and understand it" (ITEA, 2000, p. 7). The major goal of Technology Education is to develop a "technologically literate" citizenry. A technologically literate citizenry has the ability to "use, manage, assess, and understand technology" (ITEA, 2000, p. 7). In order to be technologically literate one must understand that technology has consequences. These consequences or "impacts" affect individuals, society, and the environment (ITEA, 2000).

In order to gain technological literacy and minimize the negative impacts of technology students must gain an understanding of "the universals of technology." (ITEA, 2000, p. 10) These include the knowledge, processes and contexts of technology (ITEA, 2000). The development of technological literacy goes hand in hand with the development of both scientific and mathematical literacy. Technologists use math and science, scientists use math and technology, and mathematicians use science and technology. Together these three disciplines have moved society toward new horizons. A technologically literate society will help the scientists and technologists of the future make wise decisions for the benefit of all.

Planning an Interdisciplinary Mathematics, Science and Technology Unit

Individually and in common, these mathematics, science and technology reform documents describe a classroom environment where students are involved in hands-on manipulations that subsequently lead to minds-on engagement. Technology is used because it increases learner's ability to interact with and learn from their environment. Interdisciplinary units are a mechanism for integrating hands-on, multi-discipline, technology-based activities. Mauer (1994) describes four methods of developing interdisciplinary units: correlated, multidisciplinary, interdisciplinary, and integrated day. In a correlated unit, teachers apply the same scope and sequence to their respective courses but make minor adjustments in the time the different elements are taught (p. 3). A multidisciplinary approach consists of designing a course whose purpose is to integrate the content area of different disciplines into a single course of study based on the study of specific themes (p. 4). An interdisciplinary approach centers on organizing curriculum around broad themes which by their design must contain most subject areas (p. 4). An integrated day approach uses the entire school day as an integrated learning experience (not subject based) (p. 4). Regardless of the approach implemented, all true interdisciplinary units have a "curriculum organized around broad themes which by their design must contain most subject areas" (p. 4).

Effective interdisciplinary units incorporate eight characteristics (Erb & Doda, 1989; Mauer, 1994). While each of these characteristics (Figure 1) is expected in all classrooms, when taken as a whole, these characteristics describe and multi-layered approach to teaching and learning, where diversity in the daily routine is valued.

1. A wide variety of instructional objectives (Bloom)
2. Important Theme
3. Balanced Activities (teacher-centered and student-centered)
4. A Wide Variety of Student Learning Activities (hands-on, lecture, technology, etc.)
5. An exciting culminating activity
6. Develops new skills
7. Applies/develops same skills across disciplines
8. Motivating

Figure 1 Characteristics of Effective Interdisciplinary Units

The development of an interdisciplinary unit is a five-step process (Figure 2) (Erb &Doda, 1989). The net result of this process is a unit that begins with a central theme and is refined through more and more specific goals and objectives so that ultimately a variety of subject-specific activities reinforce all objectives and the common theme.

1. Central Theme
2. Instructional Goals (Broad)
3. Content Objectives (Math, Science, etc.)
4. Student learning activities
5. Implementation Plan

Figure 2 Era & Doda's Five Step Planning Model

An Interdisciplinary, Internet-Based, Middle School Unit

The authors have selected the central theme of weather to demonstrate how an interdisciplinary, Internet-based, middle school unit addresses the variety of concerns previously described. A typical unit on weather includes the broad science topics of hydrology (the water cycle) and meteorology (the atmosphere, weather phenomena and their effect, and factors that cause weather). The science processes of describing, recognizing, investigating, interpreting, and forecasting are explicitly stated. Further, the concepts of relationship, composition, structure, effect, and interaction are foci as well. Implicitly, students are to measure weather phenomena; analyze, interpret, and display the data; and diagram the relationships inherent in the study of weather. Mathematics processes that support the learning of weather include, collecting and organizing data along with reading, interpreting, comparing, and analyzing data. Specific technology-based problem-solving skills include the use of scientific calculators and computer skills to solve problems, to discover patterns and sequences, to investigate situations and draw conclusions along with the use of computer software and applications to research, investigate, and analyze data using charts, tables, graphs, or other presentation forms.

Several years ago a unit of this sort would have been restricted to local measurements with locally purchased—or even locally constructed—instrumentation with TV weather reports used to supplement student data gathering. The World Wide Web (WWW) has dramatically changed the potential of this learning experience. Today, a well-constructed unit would be expected to include additional data not previously accessible. Two broad instructional goals that would encompass these additional features would be: (1) collect and use weather data to visualize weather phenomena, including local and Internet sources; and (2) collect and use weather data to make weather-related decisions, including local and Internet sources.

The Georgia Quality Core Curriculum (Georgia QCC found on-line at http://www.glc.k12.ga.us/qstd-int/homepg.htm) was developed to specify the broad competencies for all students in Georgia public schools from kindergarten through high school. Competencies are organized by subject matter and grade. The national standards in mathematics, science, and technology education—along with other resources—were used to frame the development of the Georgia QCCs. The following eighth-grade Georgia QCCs were utilized to develop the interdisciplinary mathematics, science and technology education weather unit.

Science

16. Describes the water cycle and its relationship to the movement of surface and subsurface water.
18. Describes the composition and structure of Earth's atmosphere.
19. Recognizes and investigates weather phenomena and their effect on the Earth's surface. Interprets weather maps and make forecasts.
20. Describes atmospheric factors which interact to cause weather: heat energy, air pressure, winds, and moisture.

Math

3. Uses scientific calculator and computer skills to solve problems, to discover patterns and sequences, to investigate situations and draw conclusions.
4. Uses computer software and applications to research, investigate, and analyze data using charts, tables, graphs, or other presentation forms.
46. Collects and organizes data, determines appropriate method and scale to display data, and constructs frequency distributions; bar, line and circle graphs; tables and charts; line plots, stem-and-leaf plots, box-and-whisker plots, and scatter plots.
47. Reads, interprets, compares, and analyzes data in frequency distributions, diagrams, charts, tables, and graphs (bar, line, circle, stacked bar, double line, and multiple bar), and makes predications or conclusions based on this data.

Exploratory Technology (Grades 6-8)

6. Utilizes tools, materials, and processes to solve technical problems involving the application of science, mathematics, and inventiveness.
9. Solves a given problem using the inductive and deductive processes of the scientific method.

In general, all ten of the Georgia QCCs under Exploratory Technology support the learning of mathematics and science as integral parts of society. Specifically, two standards explicitly point out the interrelatedness of technology, mathematics, and science. The first includes the use of tools, materials, and processes to solve technical problems involving the application of science, mathematics, and inventiveness. Hands-on, minds-on science is built upon individuals observing and manipulating their environment, typically utilizing tools, materials and processes. These observations lead to inferences and meaningful learning takes place. A simple visit to any manipulative-based mathematics classroom will show how the use of materials and tools support cognitive processes in concept development.

Just as mathematics and science consider problem-solving a "foundational skill," technology educators include the idea of inductive and deductive problem-solving as essential. This manifest itself in a study of the tools, materials, and processes of science and mathematics contained in the previous standard. Typical topics of study within a weather unit might range from the history of weather measurement tools to the instruments used today from a simple rain gauge to Doppler radar. Also inherent in this standard are the effects on individual include decisions about dress or activities, effects on society include early warning for tornadoes, and mans effects on the environment -- which might include weather phenomena related to impacts of specific technology such as CFC-free air-conditioning.

A Brief Look at the Structure of a Weather Unit

The major advantage of any interdisciplinary unit -- and this weather unit in particular -- is the broader understanding inherent when the somewhat artificial boundaries of school-based subjects are rejected in favor of complete conceptual development. Five multi-day "projects" drive the study of weather. Projects are listed below with specific limited examples of WWW sites that make each project more student-directed.

(1) set-up their own weather station that monitors local weather,
    a. Description of surface weather observation techniques - http://www.nemas.net/edu/observations/index.htm
    b. An extremely large selection of weather dot com sites - http://www.weather.....com/
    c. Miami Museum of Science - Weather Tools - http://www.miamisci.org/hurricane/weathertools.html
(2) explore the history of weather measurement tools,
    a. Weather Ref Desk - http://www.refdesk.com/weath1.html
    b. The Weather Vane Home Page - http://www.denninger.com/
(3) explore the water cycle utilizing data taken at their local weather station and weather sites,
    a. The Weather Channel - http://www.weather.com
    b. CNN Weather http://www.cnn.com/WEATHER/
(4) determine what weather instruments are being used today to forecast weather, and
    a. The Weather Channel - http://www.weather.com
    b. CNN Weather http://www.cnn.com/WEATHER/
(5) analyze data using the visualization power of spreadsheets.
    a. Sources of real data include the National Oceanographic & Atmospheric Administration - http://www.noaa.gov , specifically found via the NOAA's National Geophysical Data Center (NGDC) - http://www.ngdc.noaa.gov/ngdc/ngdcsociety.html (NOTE: Data is available through multiple sources at this site, http://www.ngdc.noaa.gov/paleo/pubs/mann1998/frames.htm contains six centuries of global climatic data that could be analyzed by students, as an example.)
    b. Visualizing weather related phenomena - http://covis.atmos.uiuc.edu/covis/visualizer/surface.html

Additional Topics

It is important to note that not all individual concepts or objectives lend themselves to fully interdisciplinary units. However, teachers and students who are familiar and competent with interdisciplinary units will naturally be able to *integrate* other skills into any topic. A brief list of topics that are suitable for interdisciplinary units in the middle school follow.

1. Using Machines, simple to complex
2. Using energy
3. Using matter
4. Electronics
5. Structures, natural to manmade
6. Aerospace
7. Force and motion
8. Changes over time
9. New technologies, lasers to fiber optics
10. What things are made of, atoms to molecules to ecosystems

In conclusion, the authors believe that interdisciplinary middle school units hold special promise when attempting to simultaneously address the multiple concerns related to (1) meaningful integration of technology, (2) increased accountability, and (3) less focus on historical math, science, and technology classes that are expressed in the reform documents for mathematics, science, and technology education's. Especially when these concerns are multiplied by the concerns inherent in the middle school reform movement.

References

American Association for the Advancement of Science (AAAS). (1990). Science for all Americans: Project 2061. New York: Oxford University Press.

American Association for the Advancement of Science (AAAS). (1993). Benchmarks of science literacy: Project 2061. New York: Oxford University Press.

Erb, T.O. & Doda, N.M. (1989). Team organization: Promise – practices and possibilities. Washington, D.C.: NEA.

International Technology Education Association (ITEA) (2000). Standards for Technological Literacy: Content for the Study of Technology. Reston, Virginia: Author. [also available on-line at http://www.iteawww.org//TAA/TAA.html]

National Council of Teachers of Mathematics (2000). Principles and Standards for School Mathematics. Reston, VA: Author.

National Research Council (NRC). (1996). National Science Education Standards. Washington DC: National Academy Press.

Mauer, R. E. (1994). Designing interdisciplinary curriculum in middle, junior high, and high schools. Needham Heights, MA: Allyn & Bacon.

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The Design of Instructional Technology to Help Students Connect Phenomena to Scientific Principles

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Abstract: When technology is used to support student inquiry, learners can develop mental models that are initially based upon their intuitive knowledge of the phenomena. Technology can support this collaborative development by giving them the opportunity to visualize the connections between their experiences with phenomena and the corresponding abstractions (e.g., mathematical equations) for a particular scientific principle. This visualization process is optimized when they interact with resources that provide the visual images and the corresponding verbal rules (i.e., heuristics) that scientists use to solve scientific problems. This process is especially effective when the level of abstraction is intermediate between the concrete instances of a phenomenon and the higher order abstractions that represent it. The author recommends that pre-service and in-service science education programs use technology to help students truly understand the connections between phenomena and the underlying scientific principles.

This paper describes how instructional technology can be designed to help students make meaningful connections between phenomena and scientific principles. Conversely, traditional science instruction separates the study of phenomena—in the laboratory—from the study of the underlying scientific principles—in the lecture room. Three types of technology can help students build procedural-to-conceptual bridges across this large curricular gap: (1) *microcomputer-based laboratory* (MBL) experiments give them the opportunity to predict, observe, and explore the effects of experimental parameters (e.g., pH, etc.) upon the outcome (i.e., the dependent variable); (2) *computer-simulated experiments* (CSE) allow extension of MBL learning opportunities to include a wider range of phenomena; and (3) *multimedia learning modules* (MLM) can help them apply scientific principles by practicing their problem-solving skills within a real world context. These three technologies can provide the scaffolded support that students need to design experiments and to discover scientific principles.

Visualization of Phenomena and MBL Experiments

MBL experiments have been shown to be one of the most effective types of technology used in teaching science topics (Berger et al. 94). An MBL is a system that couples a data-gathering device to a microcomputer. The microcomputer records the incoming information from a sensor (e.g. pH probe), and then organizes it into a recognizable pattern (e.g., a graph). MBL experiments can help students simultaneously visualize a phenomenon and its graphical representation (Nakhleh & Krajcik 93, Suits 00). Students need these visual experiences because scientists use visual imagery (Mathewson 99) as mental tools when they attempt to understand and solve complex problems. Technology can shift instruction away from the primacy of verbal thinking and towards the integration of visual and verbal thinking (Collins 91). Students can use it to connect multiple representations of phenomena and to enhance their understanding of principles (Kozma & Russell 97). The goal should be to help them construct meaning through the use of manipulatives, visualizations, and internalizations, which enhance mental pictures and lead to further abstractions (e.g., mathematical equations). Thus, with the support of MBL technology, students can enhance their conceptual knowledge (Nakhleh & Krajcik 93). Overall, MBL experiments can help them organize their observations of phenomena (concrete level) into a coherent set of interrelated principles (abstract level).

Intermediate Level of Abstractions and Interactive CSE

An interactive CSE can fully engage the decision-making processes of students while extending the range of phenomena that can be explored. CSE's use models of scientific phenomena and data from real experiments to allow students to determine the experimental conditions and hence to design experiments. Upon running the experiment, they receive feedback about the experimental outcome. If the outcome does not meet their expectations, they can change the experimental conditions and rerun the experiment. In addition, an interactive CSE enables the student to create idealized simplifications for scientific systems and to transform abstractions into concrete manipulative representations (White 93). This transformation allows them to see dynamic representations of phenomena that are connected to more abstract representations. Thus, they can relate and apply their formal knowledge to their everyday situations (White 93). This "intuitive knowledge" is a flexible and generative type of knowledge (diSessa 00) that could be used as the building blocks to construct a conceptual network of knowledge.

The instructional design of interactive CSE's is most effective when represented at an intermediate level of abstraction (ILA) (White 93). These ILA's enable students to interpret the model's behavior in terms of simple conceptual and process abstractions. They derive these abstractions from their everyday experiences. Instructional design decisions should begin with a model at a low level of complexity and then help students use causal reasoning to visualize a simple mechanism for their model. Other design decisions should make learning (White 93): (1) *understandable and meaningful* by building on intuitive notions of causality and mechanism; (2) *transferrable* by allowing the mapping of ILA's to different real world situations; and (3) *linkable* because their models can link different levels of abstraction (e.g., iconic and symbolic) and different perspectives (e.g., microscopic and macroscopic). These designs should feature a "vast repository of capabilities that we can tap" so that designers "have a much easier time building learning environments that capitalize on that competence (p. 98, diSessa 00)."

Scaffolded Student Knowledge and MLM's

Interactive MLM's can be designed to give students practice at solving problems in an enriched learning environment that allows visual experiences within a real-world context. Students often work quantitative problem solving exercises without understanding the underlying principles for those exercises. In addition, the feedback they receive is often delayed or uninspiring. Conversely, an MLM can show a movie of an expanding automobile air bag (Suits & Courville 99) as the "real-world feedback" that students receive based upon their calculated quantity of solid sodium azide (via the gas law equations) needed to properly inflate the bag. These enriched "drill and practice" problems can increase both student interest and "on task" attention to the problem-solving process. Initially students are given full support (e.g., feedback, help, and cues) so they can attain a particular level of competence; however, this support is faded so they can extend and apply their problem-solving skills.

References

Berger, C. F., Lu, C. R., Belzer, S. J., & Voss, B. E. (1994). Research on the uses of technology in science education. In D.L. Gabel (Ed.), *Handbook of research on science teaching and learning* (pp. 466-490).

Collins, A. (1991). The role of computer technology in restructuring schools. *Phi Delta Kappan, 73,* 28-36.

diSessa, A.A. (2000). *Changing minds: Computers, learning, and literacy*. Cambridge, MA: MIT Press.

Kozma, R.B., & Russell, J. (1997). Multimedia and understanding: Expert and novice responses to different representations of chemical phenomena. *Journal of Research in Science Teaching, 34* (9), 949-968.

Mathewson, J.H. (1999). Visual-spatial thinking: An aspect of science overlooked by educators. *Science Education*, *83,* 33-54.

Nakhleh, M.B., & Krajcik, J.S. (1993). A protocol analysis of the influence of technology on students' actions, verbal commentary, and thought processes during the performance of acid-base titrations. *Journal of Research in Science Teaching, 30* (9), 1149-68.

Suits, J. P. (2000, February). The effectiveness of a computer-interfaced experiment in helping students understand chemical phenomenon. *Mathematics/Science Education & Technology,* Association for the Advancement of Computing in Education, 438-443.

Suits, J.P. & Courville, A.A. (1999, February). Design of interactive multimedia modules to enhance visualization in chemistry courses. *Mathematics/Science Education & Technology*, Association for the Advancement of Computing in Education, 531-536.

White, B.Y. (1993). Intermediate causal models: A missing link for successful science education? In R. Glaser (Ed.) *Advances in Instructional Psychology,* Vol. 4 (pp. 177-252). Hillsdale, NJ: Erlbaum.

Life and Death of the Lymphocytes a Didactic-Pedagogic Game for teaching Immunogenetics

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Abstract Individuals are potentially capable of generating antibodies to all antigenic stimuli. Aminoacid sequencing has revealed a curious and unique fact among proteins, a high diversity (variable) amino-terminal region, responsible for antigen recognition associated to a relatively constant carboxi-terminal region responsible for biological functions. As the presence or absence of immunoglobulins during maturation will determine the fate of the lymphocyte we elaborated this game which follows some rules of Role-Playing Games. Genetic rearrangement, lymphocyte differentiation and repertoire selection are present in the game and were topics of our immunology course where students had most difficulty. Their first reaction in doing this activity was of disbelief, they were reluctant in starting and presented childish reactions, but as they did, they asked the questions we expected during classes. The game is used, with success; in continued-education programs for high-school teachers where Molecular Biology, Genetics and Immunology are the themes. This type of activity renders learning a more pleasant process.

Introduction

All individuals are potentially capable of generating antibodies to any antigenic stimuli. The antibody is a glycoprotein composed of four polypeptide chains, two light and two heavy chains, kept together by sulphate bridges forming a three-dimensional "Y" shaped structure called monomer. Each chain contains a series of repeated homologous units, each with approximately 110 amino acid residues, which fold independently into a common globular structure, called domain. The heavy chain has twice the molecular weight of the light chain, presenting four domains while the light has only two. Within a monomer, the chains are paired, each pair composed by one light and one heavy chain and chains with the same weight are identical to each other. Immunoglobulins (Ig) can also be presented in a polymeric form, joined by another glycoprotein, the J chain, synthesised by the same cell. The most common polymeric forms are the dimmers and pentammers, although other intermediary multiples exist.

Amino acid sequencing analysis of the Ig has revealed a curious and unique fact among the proteins - a high diversity at the amino-terminal region of the chains associated to a relatively constant carboxi-terminal region. The amino-terminal region, of both chains, called the variable region, is responsible for antigen recognition. The carboxi-terminal end, the constant region, is responsible for the biological functions of the Ig's - interaction with the organism's structures such as cells and enzymatic cascades. Having in mind that Igs are present on the membrane of B-lymphocytes as clonal receptors and that the presence or absence of these receptors, during maturation, will determine their fate (life or death), we explored the programmatic content of our basic Immunology course with the game **"LIFE and DEATH of the Lymphocytes"** which we here propose.

Genetic rearrangement, lymphocyte differentiation and repertoire selection, are the topics of the course present in the game. The game permits the comprehension of probabilities of cell survival and therefore of the repertoire selection and is based on probability calculus and combinatory analysis and follows some of the rules of Role-Playing Games (RPG), where each player participates as an actor. Before the presentation of the rules of the GAME we will make some considerations on the concepts of Ig isotypes and idiotypes. And next we will approach the problem of the generation of Ig diversity and some considerations on ontogeny of these cells.

ISOTYPES - The carboxi-terminal region, although denominated constant region, presents 5 different variants for the heavy chains and two for the light chains. The heavy chains are called *mu, delta, gamma, epsilon* and *alpha* while the light chains are called *kappa* and *lambda*. The variations of the heavy chains determine the classes or isotypes of the Igs giving rise to the Ig classification: IgM, IgD, IgG, IgE and IgA, respectively. Technological progress has permitted further classifications, and some isotypes are subdivided and are designated by their corresponding symbol to which a number is added, for example IgA1, IgA2. Any heavy chain can be associated to a Kappa or lambda light chain.

IDIOTYPES - The idiotype, which corresponds to the variable region, is related to the individual variation of each Ig molecule, that is to say, to the capacity that each one has in interacting to a different set of antigens. The association of any one of the estimated 10^{14} different idiotypes to a constant region in the same molecule rendered an interesting genetic problem formulated by Dreyer and Bennet, for the first time, in 1965:

"...The paradox results of the observation that one extremity of the chain behaves as if it was the product of an only gene while the other as if it was the product of thousands of genes..." (Tonegawa, 1983)

What type of genetic duplication would have happened during evolution that produced mutations only at one of the extremities? To solve this paradox Dreyer and Bennet proposed that the genetic material that codes the variable extremity of the polypeptide chain would combine, during the B lymphocyte differentiation, with the gene segment that codes the constant region. This visionary hypothesis came to be proven, two decades later, with the classic work of S. Tonegawa and collaborators, which rendered them a Nobel Prize in Medicine (Tonegawa, 1983)

GENERATION OF DIVERSITY - Although the V region diversity is calculated as being approximately 10^{14} idiotypes, sequence variability is not evenly distributed. Within the variable region there are 3 segments of higher variability designated hypervariable regions flanked by regions of lower variability denominated framework regions. During the process of molecular folding the hypervariable segments are joined and are the segments that will have direct contact with the antigen.

A cluster of multiple gene segments called V_H, D, J_H and C_H for the heavy chains, and V_κ, J_κ and C_κ for the kappa chain and V_λ, $J_\lambda$and C_λ for the lambda chain codes each chain. Each one of these three gene clusters is located on a different chromosome. Of all gene segments used to encode the variable region, the V segments participate encoding the largest number of amino acids. According to the degree of homology these gene segments are grouped in families, both in the human and mouse system. Each species presents a number of different families.

The recombination diversity is possible because of the number of germline V, D and J segments in the heavy chain and V and J segments in the light chain. The fact that the heavy chain presents an extra group of gene segments, the D segments permits a greater variability compared to the light chain. Assuming that these gene segments are rearranged in a completely random mode (which is not true), and that there are no restrictions in the rearrangements (what is, also, not true) it is possible to generate 10^7 different variable regions. This potential repertoire can still be increased by a series of molecular events during the rearrangement process, such as nucleotide deletion, by exonucleases, and nucleotide addition by the enzyme Deoxinucleotidil Terminal Transferase (TdT).

As the absolute number of segments of each region varies between species and have not been determined we will use figures frequently found in the literature and depicted in our game. Let us see:

Considering the rearrangements of the heavy chains

200 (segments V_H) x 10 (segments D) x12 (segments J_H) = 200 x 10 x 12 = $2{,}4\text{x}10^4$ possibilities

Considering the rearranges of the light kappa chain

200 (segments V_κ) x 12 (segments J_κ) =200 x 10 =$2.4 \text{ x } 10^3$ possibilities

Considering that heavy and light chain recombination are independent events the combination of the heavy chain possibilities with the light chain possibilities

$2{,}4\text{x}10^4$ (heavy chain) x $2\text{x}10^3$ (light chain) = $(2{,}4 \text{ x}10^4) \text{ x } (2{,}4 \text{ x } 10^3) = 5{,}76 \text{ x}10^7$

Each V, D and J segment is flanked by a rearrangement signal, a special sequence which consists of three parts: a highly conserved heptammer, a non-conserved spacer sequence either 12 or 23 nucleotides long and a relatively conserved nonammer. The spacers of the V_K, J_λ e D genes have 12 base pairs, while the spacers of the V_λ, J_K V_H, e J_H genes have 23 bp. A striking feature of the spacers is that the lengths correspond either to one or two turns of the DNA double helix. The relation of 12 and 23 bp in the spacers has to be respected, so that the recombinase, can fit in the small and large groves of the DNA.

As soon as two segments have been joined by the recombinase, the endonuclease, acts on the double strand DNA. While the endonuclease cuts the DNA at the corresponding position at the beginning of the heptamers, the recombinase maintains the cut extremities juxtaposed. If the cut ends are bordering perfectly, ligase acts and makes the final repair of the DNA and the recombinase can detach. The intervening segment that was cut is lost and is degraded. However, the cut extremities are not always juxtaposed. When this occurs it is necessary to repair the DNA in order to become functional. The enzyme that repairs the DNA that is being maintained united by the recombinase is TdT. This enzyme inserts nucleotides *de novo* at the 3' end of the junctional regions, without the need of a complementary DNA strand. After this, polimerase, a DNA repair enzyme, which now has a template to guide the addition of the new nucleotides, adds them starting from the 5' terminal, allowing the ligase to complete the final repair of the double strand and recombinase may detach. These N inserts are only seen at the joining sites of the heavy chains. The apparent absence of this type of repair of the light chains is explained by the absence of this enzyme in the later developmental stages of the cell, when the recombination of the light chains happens.

These processes of addition and removal of nucleotides explains the presence of sequences that are not found in the germ line gene segments as in the third hyper-variable region of the Ig which does not exist in the germinal sequence. It is generated randomly by the V_H/D and D/J_H junctions. The D gene segments are Open Reading Frame codons permitting nucleotid insertions or deletions that are not multiples of three, as any of the 3 reading frames are allowed.

It is calculated that the diversity generated by the enzymatic activity has the same order of greatness of the diversity generated by gene segment recombination. This means that for each possible gene combination, for example, $V_{10}D_2J_3$ there may exist 10^7 variations. Let us see how. Considering the random insert of 1 or 2 nucleotides a general change of the molecule due to alteration of the reading frame; 3 nucleotides the addition of 1 amino acid. Considering that 20 amino acids exist 1 amino acid insert x 20 = 20 differences while a 6 amino acid insert (20^6) will lead to 6.4 x 10^7 different molecules.

ONTOGENY OF THE LYMPHOCYTES - During onotgeny, gene rearrangements occur in a pre-determined order. The first cluster to rearrange is the heavy chain gene segments and within it the D/J rearrangement occurs first. Then finally the VDJ segment is rearranged to the constant region. At this point the first polypeptide chain can be produced and exported to the cell membrane. If a productive rearrangement has occurred and the membrane protein receives a stimulus a series of events will be triggered simultaneously; allelic exclusion of the other heavy chain gene cluster and the rearrangement of the first light chain gene clusters. If not then the second allele is rearranged. Now at this point, after the rearrangement of the second allele, if the cell has not produced a functional heavy chain it dies of apoptosis. On the other hand if a productive rearrangement has occurred and the protein is stimulated on the cell membrane the light chain is rearranged. The cell has 4 chances to produce a light chain 2 in the kappa gene cluster and 2 with the lambda gene cluster. The first to produce a productive rearrangement will induce an allelic exclusion event in order not to further rearrange genes. In summary there should only be one productive rearrangement for the light and one for the heavy chain. As soon as the cell has a full antigen receptor it leaves the bone marrow to populate the secondary lymphnods.

The Game - The life and death of the lymphocytes

After the lectures where we approached the themes "Lymphocyte receptors: from genes to proteins" and "Aspects of the ontogeny of Lymphocytes." We presented, to the students, the game we here propose. which consists of steps where we simulate the developmental stages of a lymphocyte. To determine the several options of each stage we propose to use dices. There are at least two possible ways of playing the game in order to demonstrate the lymphocyte development: **Individually** - each student follows the rules simultaneously. After 15 rounds each player compares the results obtained by the rest of the group. **In groups** - make groups of 4 or 5 students, each player waits his/her turn to play and the group accompanies the evolution of the ontogeny of every lymphocyte (each student).

Material necessary for the game

4 RPG dices (20, 12, 10 and 4 faces, one of each) called D20, D12, D10 and D 4, Scissors (representing the exonucleases), Glue (representing the repair enzymes), models of each DNA strand, rules and Game tableau

Observations

1. Before the beginning of the game each player will have to construct the strands of the heavy chain germ line DNA simulated in paper. To play with the light chain as well an adaptation will have to be done removing the D

segments (cyan) and substituting the heavy chain gene segments (green) to the kappa segment (due to lack of space we have not included them here. When all players have their DNA's prepared the game may begin

2. Although, in our model, we represent the five constant region gene segments of the Igs, the rules of the game don't contemplate the class switch, because it would imply in a much more complex and too long a game, which would turn it into a very tiring one. We are now elaborating a game that contemplates the interactions of the lymphocytes involved during the immunological activity.
3. For the light chains we only include one of the light chain gene clusters, there is a second group of gene segments located on a third chromosome. In other words we could still have another two chances to survive, if it were the case. Again we could continue but, to simplify the game, this rearrangement is not included.
4. It would be very complicated to include all the molecular details of the recombination in this model. When the students prepare the model of the simplified DNA strand, it already measures approximately 2 meters. To insert the details of the rearrangement signals (leader sequence, palindromic segments, spacers, etc.) these strands would be at least four times as long rendering them unworkable.

Results using this game with Students of the School of Medicine at UFF

Before we elaborated the game these were the topics in the programmatic activities of our regular immunology course where the students had most problems in learning. Their first reaction in doing this type of activity is of disbelief. They are reluctant in starting the activities, giggle and present other childish reactions but as they start to go through the steps of the game they start asking the questions we would expect during classes.

We have used the game, with great success, to work with high school teachers in continued education programs where Molecular Biology, Genetics and Immunology are the central themes. Using this type of activity renders the learning process a more pleasant one. This game can also serve as the starting point for other events where the generation of biological diversity occurs, not only at the cellular level but, also, of the organism or even of populations

The game

This game is a model of the steps (in summary) that occur during the ontogeny of lymphocytes. It is not intended to be exhaustive but a didactic model in order to make it easier to understand the lymphocyte development. The instructions of the game were planned for the B Lymphocyte but they can be applied for the T lymphocyte once they have been adapted taking into account the distinctiveness of these cells.

Rules of the game

We will consider that each participant is a lymphocyte progenitor cell committed to the development of a B cell. To survive, the indispensable condition is to have a clonal receptor on the plasma membrane. To play and try to survive, everybody will have to repeat the steps described below.

Before starting the game it is necessary to prepare a model of the DNA that you inherited from your parents. For this, get the sheets that contain the light and heavy chain strands, cut the strands and where indicated glue the ends in order to simulate the strands of germ line DNA (enlarge the models supplied here).

Have at hand the dices, scissors, glue and a pencil to accomplish the next stages and the tableau to write down the result of each stage, permitting the final analysis of the events (as a suggestion add more line to permit 15 rounds)

Let's start

1. The game starts with the recombination of the heavy chain of the B cell receptor (BCR). To know which allele will be used first used toss any dice

   PAIR the maternal allele will be used. **ODD** the paternal allele will be used
2. Toss the D12 dice (representing the "J" segments) and D10 (representing the "D" segments) to know which DJ combination you will have.
3. Join the selected gene segments, obtained with the dice, by making a loop in your DNA and then cut out the intervening segments and make the repair of your strand. For example, if you obtained with the dice the segments D1 and J 3; you will cut and drop everything that is in this interval in order to put D1 nest to J3.
4. Now roll your D20 and D10 dice to know what segment "V" you will have. The number obtained with the D20 represents the first two numbers, and D10, the last (i.e., D20=17 and D10=3, the chosen "V" segment is 173).

5. Make a loop in your DNA strand to join the chosen "V" segment to the "D/J" already rearranged segment. Cut out the intervening DNA and make the repair. To have a functional gene you will still need another rearrangement step (stage 8). But before let's see if your rearrangements are functional ones.
6. Throw any dice.
   ODD - means that your enzymes united the several segments in an appropriate way.
   PAIR - means that some repair error has occurred and that the enzyme TdT, entered in action inserting 1 to 12 nucleotides in one of the junctions.
7. To know how many nucleotides were inserted throw your D12, and, to know in which junction, roll any other dice.
   ODD - junction D/J **PAIR** - junction V/D
8. And finally, to know which nucleotides were inserted use your D4, attribute a number for each of the four nucleotides and determine the sequence your TdT will provide as a template for polymerase to repair the DNA **1 - A** (Adenine); **2 - C** (Cytosine); **3** - G (Guanine); 4 - T (Thymine) **Don't forget to write these results on your tableau**
9. A new, non-random, rearrangement occurs at this point. Join your rearranged VDJ segment to the $\mu\delta$ segment of the constant chain. Make a loop in your DNA to join the respective segments and perform the repair.
   Let us see if your enzymes accomplished the repair appropriately producing a functional gene. Play any dice.
   FIRST ALLELE
   PAIR - means that your rearrangements were accomplished in an appropriate way; therefore, you (the lymphocyte) can now transcribe and translate your membrane protein. Proceed to stage 10
   ODD - means that an error happened in your rearrangements. Therefore, in order to survive, you will have to repeat the steps from 1 through 9 using this time your second allele for the heavy chain.
   OBS - If you didn't prepare two DNA strands and have already understood the mechanisms of rearrangement and repair of your germ line DNA, just play with the tableau from here on.
   SECOND ALLELE
   ODD - you die because you have already used both alleles and didn't produce a heavy chain. Without it you won't have the clonal receptor, without which, the lymphocyte doesn't survive.
   PAIR -, you now can proceed for the stage 10.
10. Having produced a heavy chain and expressing it on the cellular membrane associated to the pseudo light chain you have to receive a stimulus from the environment to continue surviving. To know if you continue to live, throw your D12.
   FIRST ALLELE
   Numbers 1 - 4 you have to repeat steps 1-10, for insufficient stimulus;
   Numbers 5 - 12 you survive, therefore these stimuli are adequate. Go to stage 11.
   SECOND ALLELE
   Numbers 1 - 4 you die, for insufficient stimulus;
   Numbers 5 - 12 you survive, therefore these stimuli are adequate. Go to stage 11.
11. Since you are a survivor, now you will have to rearrange your light chain, because without it you won't have the complete BCR. For this throw your D10 (representing the segments "J") and then your D20 and D10 (representing the "V" gene segments) to know what VJ combination you will have.
12. Make a loop in your DNA and cut out the intervening sequences to join the respective gene segments obtained in the dice and make the repair.
13. Make a new loop now to join the rearranged VJ segments with the constant region of the light chain. Cut out and repair your DNA to join the gene segments.
14. Play any dice -
   FIRST ALLELE
   ODD - means that an error occurred in your recombination. Therefore to survive, you will have to repeat the steps from 10 to 14, using this time your second allele for the light chain.
   PAIR - means that your recombination was accomplished in an appropriate way; therefore, you the lymphocyte can now transcribe and translate your membrane protein. Proceed to stage 15.
   SECOND ALLELE
   ODD - you die, once you have already used both alleles for the light chain and didn't produce a functional gene, without which you won't have clonal receptor and, therefore, you (the lymphocyte) will not survive.
   PAIR - you now can proceed for the stage 15.
15. Having completed all rearrangements, both heavy and light chains, in a functional way, you (the lymphocyte) can now express your complete clonal receptor (BCR) and leave of the bone marrow and migrate to any secondary lymphoid tissue. You are winner!
16. To conclude, let's see how many survived. And what are the differences.

Tableau for the game

Instructions

1. Write down the chosen allele in which the first recombination will occur, then the chosen **V, D, J** segments determined by the dice on the corresponding line
2. If an ERROR occurred indicate at which rearrangement point and how many nucleotides were inserted by TdT.
3. In the column Final Result write down which cells leave the bone marrow and for those who die at which stage this occurred
4. To be able to study the populations of cells produced by the bone marrow let's put together your results and those of the rest of the group or class. Now let's analyze
   - Which is the survival rate?
   - Among the survivals how many used the same gene segments?
   - Among these, how many did not need to repair the DNA at the recombination sites?
   - How many repaired the DNA? The number of nucleotides was the same? And at the same recombination site? Are the same aminoacids be inserted?

Cell	Allele	V	TdT	D	TdT	J		Allele	V	J		final Result
1	M							M				
	P							P				
2	M							M				
	P							P				
3	M							M				
	P							P				
4	M							M				
	P							P				
5	M							M				
	P							P				

Use this plate as original for enlarging and photocopying

Glue the next segment here

V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17	V18	V19	V20	V21	V22	V23	V24	V25	

Glue the next segment here

V26	V27	V28	V29	V30	V31	V32	V33	V34	V35	V36	V37	V38	V39	V40	V41	V42	V43	V44	V45	V46	V47	V48	V49	V50	

Glue the next segment here

V51	V52	V53	V54	V55	V56	V57	V58	V59	V60	V61	V62	V63	V64	V65	V66	V67	V68	V69	V70	V71	V72	V73	V74	V75	

Glue the next segment here

V76	V77	V78	V79	V80	V81	V82	V83	V84	V85	V86	V87	V88	V89	V90	V91	V92	V93	V94	V95	V96	V97	V98	V99	V100	

Glue the next segment here

V101	V102	V103	V104	V105	V106	V107	V108	V109	V110	V111	V112	V113	V114	V115	V116	V117	V118	V119	V120	V121	V122	V123	V124	V125	

Glue the next segment here

V126	V127	V128	V129	V130	V131	V132	V133	V134	V135	V136	V137	V138	V139	V140	V141	V142	V143	V144	V145	V146	V147	V148	V149	V150	

Glue the next segment here

V151	V152	V153	V154	V155	V156	V157	V158	V159	V160	V161	V162	V163	V164	V165	V166	V167	V168	V169	V170	V171	V172	V173	V174	V175	

Glue the next segment here

V176	V177	V178	V179	V180	V181	V182	V183	V184	V185	V186	V187	V188	V189	V190	V191	V192	V193	V194	V195	V196	V197	V198	V199	V200	

Glue the next segment here

D1	D2	D3	D4	D5	D6	D7	D8	D9	D10		J1	J2	J3	J4	J5	J6	J7	J8	J9	J10	J11	J12		

Glue the next segment here

CHμ1	CHμ2	CHμ2	CHμ2	CHδ1	CHδ2	CHδ3	CHδ4		CHγ1	CHγ2	CHγ3	CHγ4	

Glue the next segment here

CHε1	CHε2	CHε3	CHε4		CHα1	CHα2	CHα4	CHα4	

Model of the gene segments of the heavy chain

Bibliography

Klein, J (1990) *Immunology* Blackwell Scientific Publications, Inc.

Janeway,C., Trvares,P. Capra,J.D. Walport,M.J. (1999) *Immunobiology: The Immune System in Health and Disease* Garland Pub

Tonegawa,S. (1983) Somatic generation of antibody diversity. *Nature*, 302, 575-581

SIMULATION

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Though recognized as a legitimate and positive aspect of teaching and learning, simulations continue to be rarely used by authors for the 2001 SITE annual. Perhaps the wide variation in defining "simulation" in education has contributed to the dearth of studies. The range in availability of hardware, courseware, and software in international locations where many of these investigations were done certainly has contributed to the variation in sophistication of data treatment. Additionally, though the global economy and international testing have moved countries closer in terms of educational goals, differences in educational philosophies have certainly contributed to the issues addressed and undertaken by this year's contributors. These findings were cited in the 2000 SITE annual and continue to be evident by the lack of submissions in this area.

With only three submissions, the variety of definition is again seen as a strength of this technology driven teaching strategy . The way educators have chosen to define and then implement technology in the classrooms of their districts and countries is as varied as the geographic locations of the schools. Regardless of the complexity or simplicity of the technology available or the cognitive entry level of the personnel proposed for using the innovation, readers can certainly find a situation or discipline that mirrors their own. Reports of technology use for teacher-preparation as well as use with the P-12 students also increase variation.

The Papers

Dwyer and Lopez studied the effectiveness of simulations in learning cycles lessons for middle school students engaged in environmental studies. The Harper & Hedberg CD, *Exploring the Nardoo*, was used to enhance student performance. Upper elementary and middle school students served as a population for the study. Results of pre-instructional and post-instructional mapping showed a richer variety of concepts and increased linkage of concepts in environmental studies when simulations were included in the instructional plan.

Sarapuu and Pedaste used a simulation, *Hiking Across Estonia*, (http://sunsite.ee/tour/) developed in the Science Didactics Department at the University of Tartu, to develop students' higher order thinking skills. Problem-solving and decision making were especially emphasized in the field of environmental studies. Students were assigned to hiking groups after pilot studies were run to determine the most effective simulation process. The virtual hikes in five different communities with seven different environmental problems in each community were the problems of each group. Students were able to click to links of information providing help in addressing the each of the problems. During the hikes, students also came across other problems such as the lack of food and the necessity of determining if plants encountered in a community were safe to eat. Themes of the hikes were connected to the themes present in the State Curriculum of Estonia. Another essential feature of the simulation was developing students' communication skills in the small groups of the hiking group. Interviews before and after the virtual hikes and observations during the simulations were a part of the evaluation of the activity. Results of the study resulted in several editing changes in the design of the communities and the problems in them. However, results did suggest that the simulation program enhanced higher order thinking skills of the students, especially in the area of the ability to analyze texts and graphs.

Strang and Clark developed a Window-based simulation to assist teachers-in-training with preparation of lesson plans. LPII was designed to lead students through a decision-making process in creating lesson plans for a specific type of student. Activities appropriate for the assigned student are entered into the simulation. The final step of the simulation involves students to evaluate the effectiveness of the plan for each student. Several weeks after the initial simulation, a debriefing phase is held. This process is helpful in offering students opportunity to hone lesson planning skills with a built-in evaluative phase that improves the process.

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Simulations in the Learning Cycle: A Case Study Involving "Exploring the Nardoo"

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Abstract: This study of involved students using simulation software in all phases of the learning cycle. Middle school students used a CD-based simulation program, Exploring the Nardoo, which first provided preinstructional and exploratory activities to elicit and challenge students' alternative conceptions. Having set the context for formal instruction, simulations then were used in the invention phase of the learning cycle to help students learn new concepts. The simulations were used again to apply newly learned concepts in different contexts in the expansion phase of the learning cycle. In this study, middle school science students were observed using the simulations as they engaged in learning cycle lessons on environmental systems. The students were tested for their understanding of the concepts before and after completing the learning cycle lessons. Interviews also were made of the students and their instructor.

This study involved students using simulation software in all phases of the learning cycle. Research on the use of simulations in science education has shown that the simulations can be used effectively in preinstructional (Hargrave & Kenton, 2000; Gokhale, 1996) and exploratory activities (De Jong & van Joolingen, 1998). Preinstructional and exploratory activities elicit and challenge students' alternative conceptions. Having set the context for formal instruction, simulations then can be used to learn new concepts in the invention phase of the learning cycle. With the specific guidance in simulations such as Exploring the Nardoo (Harper, n. d.; Harper & Hedberg, 1996), students perform better (Lee, 1999). Simulations can be used again to apply newly learned concepts in different contexts in the expansion phase of the learning cycle.

In this study, 16 upper elementary and 17 middle school science students were observed using the simulations as they engaged in learning cycle lessons on environmental systems. The students were tested for their understanding of the concepts before and after completing the learning cycle lesson. Interviews also were made of the students and their instructor. Data collected included videotape transcripts, teacher journal, student field logs, student concept maps, student and teacher interviews, and products of student activities.

The use of simulations in all phases of learning cycles was shown to be an effective strategy for learning. The teacher was better able to bridge student understanding between print materials and real-world experiences. Results of pre-instructional and post-instructional concept mapping showed a richer variety of concepts and increased linkages among those concepts. This case study thus provides an example of the effective use of simulations in learning cycle lessons for middle school students engaged in environmental studies.

References

De Jong, T., & van Joolingen, W. R. (1998). Scientific discovery learning with computer simulations of conceptual domains. *Review of Educational Research, 68*(2), 179-201.

Gokhale, A. A. (1996). Effectiveness of computer simulation for enhancing higher order thinking. *Journal of Industrial Teacher Education, 33*(4), 36-46. Available: http://scholar.lib.vt.edu/ejournals/JITE/v33n4/jite-v33n4.gokhale.html

Hargrave, C. P., & Kenton, J. M. (2000). Preinstructional simulations: Implications for science classroom teaching. *Journal of Computers in Mathematics and Science Teaching, 19*(1), 47-58.

Harper, B. (n. d.) Creating motivating interactive learning environments: A constructivist view. Available: http://www.curtin.edu.au/conference/ASCILITE97/papers/Harper/Harper.html

Harper, B., & Hedberg, J. (1996). Using cognitive tools in interactive multimedia. Available: http://www.itu.arts.usyd.edu.au/AUC:c4/Harper.html

Lee, J. (1999). Effectiveness of computer-based instructional simulation: A meta analysis. *International Journal of Instructional Media, 26*(1), 71-85.

A Pilot Study of the Web-based Environmental Simulation

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Abstract: Nine groups of students (total 36) from three different schools participated in a three-week pilot study and passed five virtual communities of the web-based simulation "Hiking Across Estonia". The members of hiking teams had to solve 35 different educational tasks. The analyses of students' answers in the pre- and post-tests and also in the semi-structured group interviews proved the program to be applicable for developing students' environmental problem solving and decision-making abilities. Students demonstrated the improvement of their skills in analyzing texts, drawings and graphs of the subtasks. Moreover, the participation in the virtual hike promoted students' involvement in cooperative learning and it also increased their interest in environmental problems.

Introduction

Web-based simulation, where the authentic surrounding is transferred into virtual environment, provides learners with strong support by a variety of sources of information and rich capabilities of multimedia. Computer-based learning applications as the cognitive tools can engage learners in higher order thinking and learning providing opportunities for the acquired knowledge to be generalized to new and alternative problem spaces and contexts (Oliver & Herrington, 2000). Problem-based activity unfolds the process of learning through the application of knowledge and skills to the solution of real-world problems, often in the contexts of real practice (Bligh, 1995). Most commonly it is based on experiences and empirical findings where students learn from problem-orientated tasks rather than fact-orientated ones. Another frequently reported finding concerned with the application of problem-based learning is related to promoting students' motivation and developing their critical thinking (Sage & Torp, 1997).

Promoting learning through problem-based activity provides considerable scope for designers of the web-based learning environment. Several approaches from cognitive theory can be used while designing web instructional pages (see Harper et al., 2000; Leflore, 2000). An essential feature issued from the appropriate guidelines is the authenticity of learning process. This could be achieved by appointing three seminal concepts: credibility, complexity, and ownership (Harper et al., 2000). All these concepts were taken into account in designing a simulation program "Hiking Across Estonia".

Simulation Program

A web-based situational environmental simulation "Hiking Across Estonia" (*http://sunsite.ee/tour/*) has been programmed in the Science Didactics Department at the University of Tartu. Several features of Java and Perl have been used to make the simulation more authentic and affective.

It is proposed that groups consisting of 3-6 students might form hiking teams and participate in the virtual hike. They have to pass five different communities: heath forest, meadowland, grove, waterside meadow and bog. All the communities are provided with informational windows of supplementary texts and illustrations of about 193 species of plants, mushrooms and animals. The information presented introduces the most common and interesting living objects of Estonian nature, but it also serves as a source material for solving the educational tasks. There are seven different environmental tasks in each community (totally 35) to be solved during the virtual hike. All the tasks are presented and can be solved on the web pages. Immediately after answering the questions and solving the problems students get feedback about their results – they have opportunities to get to know correct answers and their own mistakes. A certain number of points are awarded for each task. It enables to organize competitions between hiking teams.

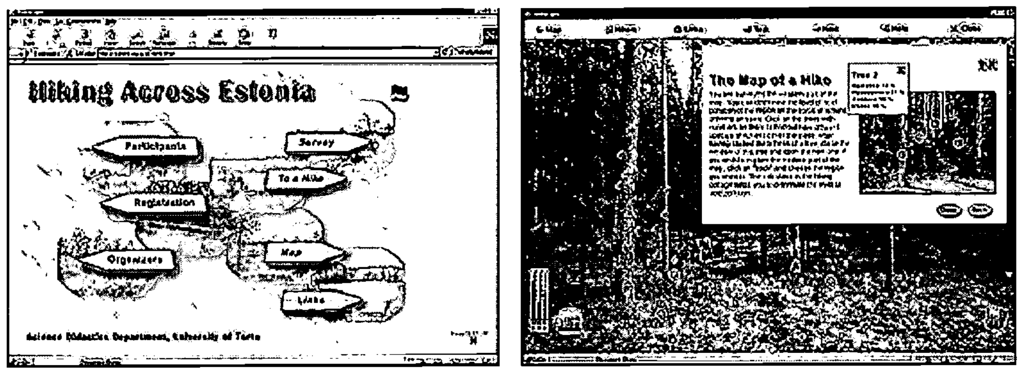

Figure 1: The front page of the simulation program (on the left) and a general view of the first community – heath forest – with an open window of environmental problem-solving task (on the right).

The participants have to meet another problem during the hike – they have to find edible food from different sources. Each team may take along a certain amount of food from the virtual home at the beginning of the simulation, but afterwards the hikers must find it from the communities: they have to decide if the species of plants and mushrooms available in the simulation are edible or poisonous. All the activities of the participants on the web pages including their answers are saved in the server and can be analyzed by the organizers of the virtual hike.

The goal of the program is to develop students' environmental literacy towards promoting higher order thinking skills, especially their problem-solving and decision-making abilities. The main target group of the simulation "Hiking Across Estonia" is suggested to be students of the upper basic and high school.

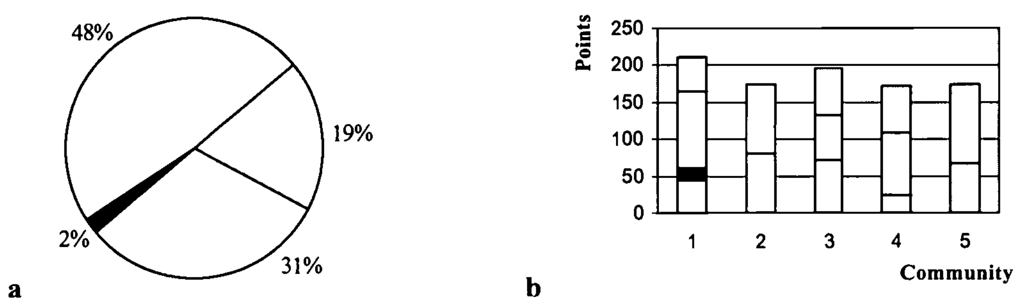

Figure 2: The distribution of percentages of total score between environmental tasks presented in the simulation program based on the knowledge and comprehension of facts (□), application (■), analysis (□) and synthesis (□) (a). The distribution of points between environmental tasks based on the knowledge and comprehension of facts (□), application (■), analysis (□) and synthesis (□) presented in five different communities (b).

At first, the participants of the hike have to examine the virtual community provided with extra information on several aspects of it and after that, open a new window with an educational task related to the respective community. Next, they must find additional information for solving the task. The information is usually available on the web pages of the simulation program itself or on the web sites listed on the links page. In some cases the necessary environmental facts must be looked up in different books.

Educational tasks have been composed on the basis of themes of school biology, environmental study and health education related to the themes of curricula of Estonia and other developed countries. It insures, that the questions and problems of the simulation are not only connected with Estonian local problems but might be understandable and applicable by students of other countries as well.

Students have to analyze texts, drawings and graphs for solving the environmental tasks presented in virtual communities. They can get up to 31% of the total score of 925 points on the basis of knowledge and comprehension different facts in simple questions. About 2% of the score is related to the students' ability of application of the information and 67% of points in certain problem-solving tasks can be achieved by analyzing and synthesizing presented materials and making decisions (Fig. 2.).

Another aim of the simulation program is related to developing students' cooperative involvement in groupwork, but it should also promote their interest in environmental problems.

Pilot Study

Nine hiking teams participated in a three-week pilot study. The main objective of the study was to carry out a formative evaluation of the simulation program and to clarify the applicability of it by the students of different age. The research design of the pilot study is shower in the figure 3.

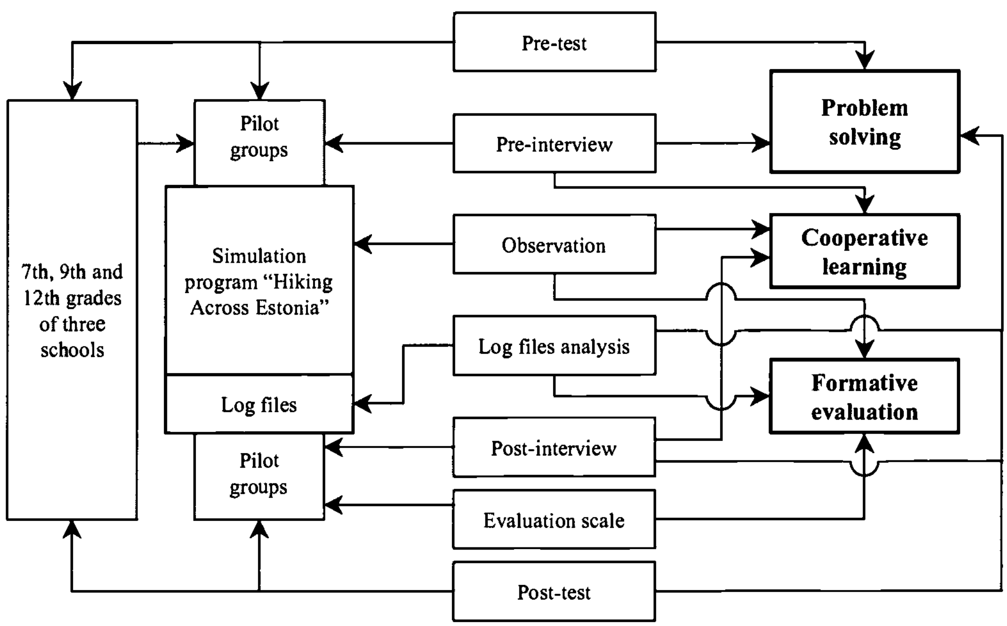

Figure 3: The research design of the pilot study.

At first a pre-test questionnaire consisting of six environmental tasks was composed. The questions presented in the test had been previously pre-tested to ensure internal validity of the latter both among the students of upper basic and high school. Three classes – the 7th (aged 13-14), 9th (aged 14-15) and 12th grade (aged 17-18) – were chosen from three different schools (9 classes with 235 students in total). All the students in these classes had to solve the tasks and fill in the pre-test. According to the results of their answers a group of students with average score was clarified from each class. Next, four volunteers from each group were asked to form hiking teams. As a result of it, nine teams were selected. During a three-week period they passed all the virtual communities and solved the tasks presented on the web pages. Soon after the hiking teams had finished the simulation program, a post-test was asked to be filled in by the participants.

This consisted of similar questions as the pre-test. The answers in pre- and post-tests were statistically analyzed to evaluate the applicability of the program for developing students' problem-solving ability and, particularly, promoting their skills in analyzing texts, drawings and graphs.

Three observers made notes about teams' embarrassments in the application of the program, students' impressions and also their cooperative learning abilities. It gave the information for the formative evaluation of the program and allowed to evaluate the students' progress towards cooperative involvement.

The members of hiking teams were interviewed before and after the virtual hike. A semi-structured group interview was used to clarify students' development as to collaborative work in the problem solving process. The activity of the hiking teams was being observed during the entire virtual trip. The results of nine students' groups in solving the educational tasks in each community were carefully analyzed on the basis of log files of the server. It allowed estimating students' progress towards environmental problem-solving process and the applicability of the program by the students of different age.

A lightly modified Evaluation Scale of educational web sites (Sarapuu & Adojaan, 1998) consisting of 43 questions was presented to a group of expert teachers. The scale consists of three parts: the composition of the site, pedagogical aspects and curriculum-related aspects. A selected number of the questions from the Evaluation Scale were asked to be answered by the members of the hiking teams as well. The students' questionnaire mainly comprised the composition of the site, users' impressions and some curriculum-related aspects. Their answers gave feedback for the formative evaluation of the simulation program.

Findings

The simulation program appeared to be applicable for both basic and high school students. It became evident that only two problem-solving tasks were too complicated – no any team was able to solve them completely. These tasks were simplified and the appropriate corrections were made in the simulation program. Some other improvements in the simulation program "Hiking Across Estonia" were undertaken as a result of the formative evaluation. The majority of corrections concerned texts. A small number of suggestions were about the quality of illustrations. In some cases the text of help files was revised to be more understandable for younger students (aged 13-14).

The teams achieved 60% of total 925 points in average. Each team from the 7th grade got about 48% of total points of the problem-solving tasks, the 9th grade – 45%, and the 12th grade 65% in average. The log fail analysis allowed estimating a significant progress of the problem solving tasks towards the virtual communities (Fig. 4).

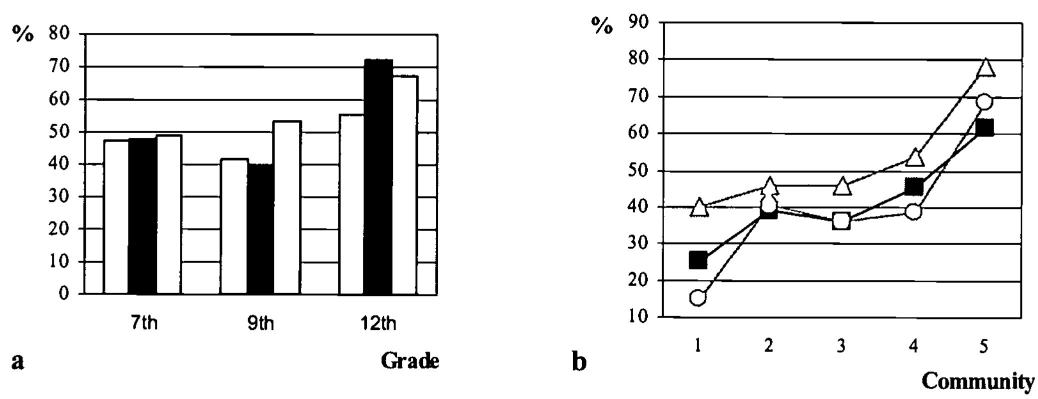

Figure 4: The average percentages of results of three teams from the 7th, 9th and 12th grade in problem-solving tasks of the simulation program (a). The progress of the 7th (■), 9th (○) and 12th (△) grade teams towards environmental problem-solving process in five different virtual communities (b).

This finding was also supported by the comparison of the students' answers in the pre- and post-tests. A significant difference ($p<0.05$) was found in the results of the problem-solving tasks in the post-test between the students of the hiking teams and those who belonged to the control group (Fig. 5a). Furthermore, their ability to analyze texts, drawings and graphs was also under investigation. Students' answers demonstrated a statistically significant progress towards analyzing abilities ($p<0.05$, in all the cases). The best results ($p=0.02$) were obtained in promoting the 7th grade students' ability to analyze graphs.

The analysis of semi-structured group interviews revealed a remarkable promoting cooperative activity among the members of the hiking teams. The records of the observers demonstrated that this was due to the development of students' communication skills and their higher motivation.

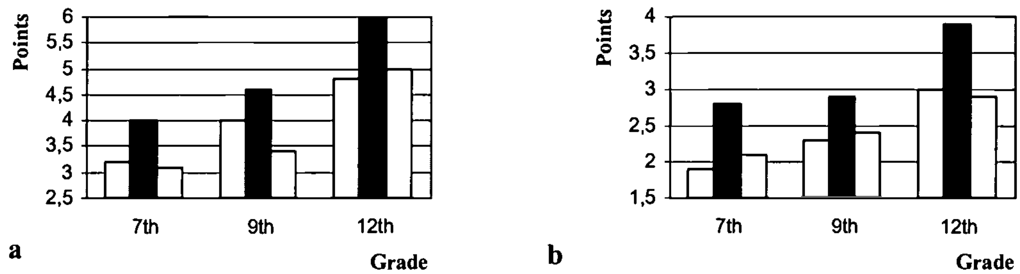

Figure 5: The average results of the 7th, 9th and 12th grade teams in problem-solving tasks presented in the pre-test (□) and post-test (■) compared with the results of the control groups achieved in answering the post-test (□) (a). The average results of the same groups on the basis of the students' ability to analyze the graphs (b).

Conclusions

The web-based simulation "Hiking Across Estonia" is supplied with both environmental simple fact-orientated and complex problem-orientated tasks. The member of hiking teams who participated in the pilot study demonstrated the applicability of the simulation program in promoting students' motivation and their progress towards the problem-solving activity. Authentic complex tasks provided learners with the opportunity of multiple roles and perspectives to be realizable by their collaborative construction of solutions. It encouraged learners to detect and evaluate relevant information, but also to analyze texts, drawings and graphs of the sub-tasks.

As a result of authentic activities the participants of the virtual hike revealed learning outcomes, which could be successfully applicable beyond the simulation program and environmental problems presented on the web pages. The promotion of students' skills to analyze and evaluate texts, drawings and graphs should be relevant in solving most real-life problems. The latter will be under investigation in a quantitative study of the participants of the interschool competition that will be held in the spring-term of 2001.

References

Bligh, J. (1995). Problem-Based Learning in Medicine: An Introduction. *Post-Graduate Medical Journal*, 71, 323-326.

Harper, B., Squires, D., McDougall, A. (2000) Constructivist Simulations: A New Design Paradigm. *Journal of Educational Multimedia and Hypermedia*, 9 (2), 115-130.

Harper, B., Hedberg, J., Corderoy, R., & Wright,(2000). R. Employing Cognitive Tools within Interactive Multimedia Application. Computers as cognitive tools: The next generation. Mahwah, NJ: Lawrence Erlbaum.

Leflore, D. Theory Supporting Design Guidelines for Web-based Instruction. *Instructional and cognitive impacts of web-based education*. London: Idea Group, 102-117.

Oliver, R. & Cowan, E. (2000). Using Situated Learning as a Design Strategy for Web-based Learning. *Instructional and cognitive impacts of web-based education*. London: Idea Group, 178-191.

Sage S. & Torp L. (1997). What does it take to become a teacher of problem-based learning? *Journal of Staff Development*, 18, 32-36.

Sarapuu T. & Adojaan K. (1998). Evaluation Scale of Educational Web Sites. *World Conference of the WWW, Internet & Intranet*. AACE, Orlando, 798-804.

The LPII Simulation: A Lesson-planning Tool for Preservice Teachers

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Abstract: This paper describes the key features of the LPII, a Visual Basic simulation that is designed to help preservice teachers to gain insights in planning effective lessons for both motivated and unmotivated students. The tool's four-step decision-making sequence will be outlined and the post-participation debriefing phase will be discussed. Finally, initial field testing results will be presented, and projected future applications will be suggested.

Introduction

As summarized by Strang (1997), over the past two decades Curry simulations have helped preservice teachers to translate their pedagogical knowledge about teaching into realistic, enactive experiences. This paper describes the latest version of a Windows-based simulation, a tool that is designed to help our teachers-in-training to gain insights in planning effective lessons for both motivated and unmotivated students. The LPII simulation, administered via a Visual Basic software program, can be customized to address content areas including language arts, science, math, and social studies and also to address academic levels including elementary, middle school, and high school. It is intended to be used as a laboratory component in an introductory methods or theory course in teacher education. In initial applications during the fall of 2000, its administration has consisted of a participation phase followed by a debriefing phase.

The Planning Phase

Collaborating in groups of two or three, preservice teachers complete the lesson-planning simulation via mouse and keyboard actions. After entering an ID number and name registration, each teacher group begins a four-step decision-making sequence. At any point during this planning process the participants are no more than several key clicks away from reviewing and/or changing previous decision entries.

Defining the Students

The first step in the planning phase builds on a paper-and pencil task introduced prior to the LPII simulation. During this task, group members collectively complete the Learning Pattern Assessment questionnaire (Golay, 1982) for two hypothetical students--one motivated, the other unmotivated. In discussing how to rate each of the students on the 40 items, the group develops a common impression of how these students differ. The group members complete their definitions during the first part of the simulation by deciding upon a grade level and genders for the two hypothetical students.

Defining Lesson Content

The second step involves three decisions that determine the content that the two hypothetical students will work with during the lesson. After deciding whether the lesson subject will be language arts, social science, mathematics, or science, one of three lesson subject areas is identified via the selection of a State of Virginia Standard of Learning (SOL) goal (Virginia Department of Education, 1999). Finally, one of three lesson goals linked to the SOL is selected.

Defining Lesson Activity

The third and most comprehensive step in the stimulation entails the creation of a lesson for each of the previously defined students. This process evolves from first determining the number of activities that will comprise each lesson to answering questions that address five facets of each activity. These questions ask (1) what the student will do, (2) with whom the student will work, (3) what learning aids will be used, (4) what type of thinking will be encouraged, and (5) how long this activity will last. Navigation through these decisions is completely nonlinear; any decisions can be changed via a single mouse click, and attention can immediately be shifted from one student lesson plan to the other. Finally, in contrast to its predecessors, the LPII simulation expands from a "point and click" experience to one in which participants can author their own options and can also construct notes to document and/or to explain their ongoing decision-making process. Figure 1 depicts the option window that participants work with in making the five types of activity decisions for the motivated and unmotivated students.

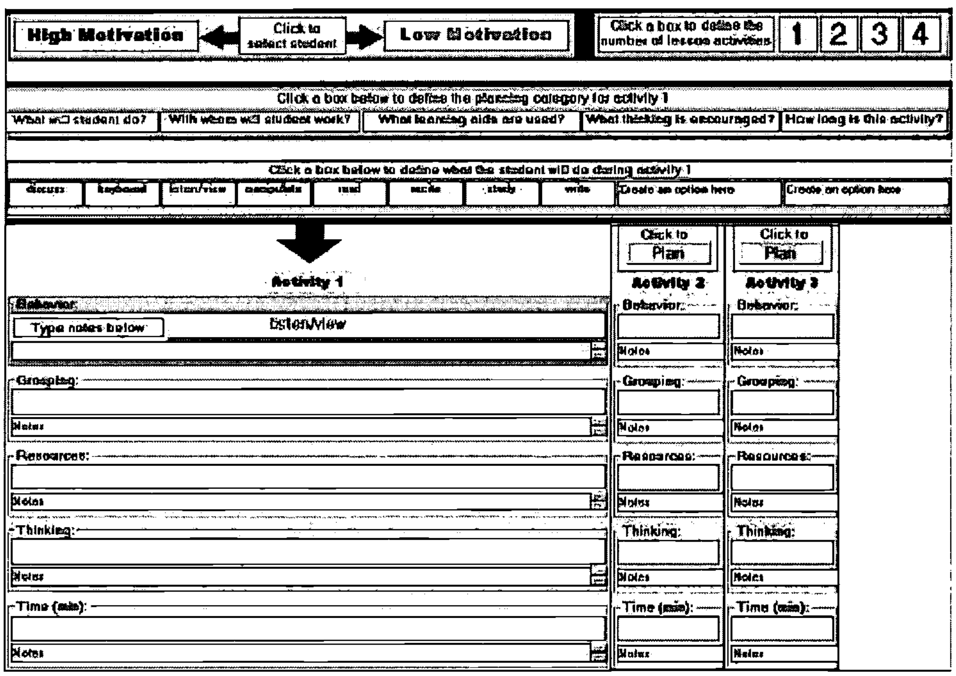

Figure 1: Option window for recording lesson activity decisions

Defining the Evaluation of Lesson Effectiveness

The fourth step in the LPII simulation offers a decision-making dimension not included in its predecessors—a dimension that allows participants to decide how they will evaluate the effectiveness of their planning for each student. Similar to lesson creation, opportunities are provided to tap program-defined options, to create new options, and to record personal notes.

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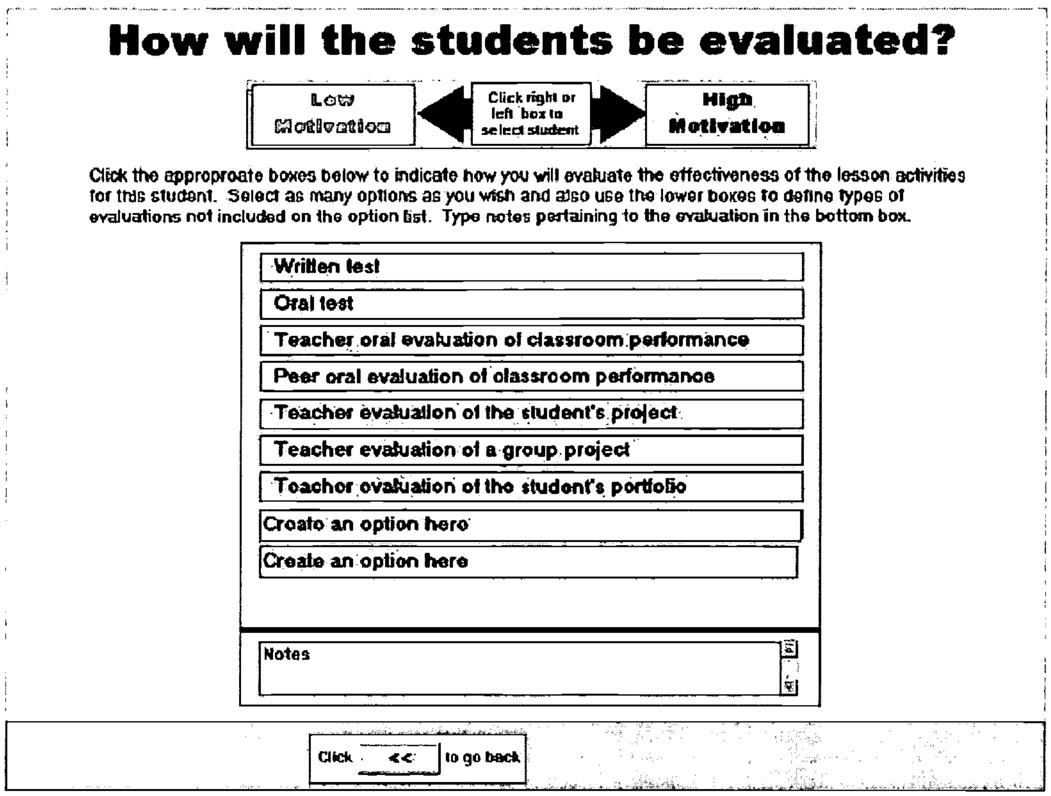

Figure 2: Option window for recording student evaluation decisions

The Debriefing Phase

Several weeks after completing the LPII simulation, participants congregate in small groups to discuss their lesson plans. This process is facilitated through the use of several printed reports that clearly depict for each collaborating group (1) the navigational path followed during the simulation, (2) the contents of the lesson plans for each of the students, and (3) a set of numerical values for key navigation and decision measures. A series of computer-projected graphical displays also allows participants to compare their navigation and decision scores with class averages or with averages generated from data collected from experienced teachers. The goals of this session are first to present these teachers-in-training with clear pictures of their lesson planning, then to stimulate them to comparison of these pictures with those of their cohort and those of an experienced teacher cohort. The preservice teachers are also encouraged to share and to discuss their plans with their colleagues beyond the debriefing session. Again, on their own initiative, participants can obtain from the Curry School Library individual lesson planning profiles of experienced teachers representing the three grade levels and the various subject areas. As the LPII simulation evolves into a vehicle that increasingly offers the opportunity for personal expression, we anticipate that its use as a satellite laboratory component in courses will be replaced by its integration into the mainstream of classroom activity.

Initial Results and Future Plans

After successfully field testing the LPII with several cohorts of experienced teachers enrolled in off-grounds education courses during the summer of 2000, the simulation was included as a laboratory component in a learning and development course that all Curry preservice teachers completed early in their professional program. Fifty-four groups of from two to three students each were constructed from the pool of 136 participants. Group assignment was based on matching two the students' anticipated teaching goals grade level (elementary, middle, or high school), and subject (language arts, social sciences, mathematics, or science.

Preliminary data analysis has focused on two major areas: (1) the reliability of the software, and (2) participant-rated usability of the learning tool. Regarding reliability, there were no software crashes or data losses during any of the 54 group sessions. Regarding usability, group participant ratings, obtained from a paper-and-pencil survey immediately following the completion of the lesson-planning simulation, revealed that 96% of groups found the software easy to use.

Several other ratings obtained from the post-participation survey provide additional insights as to how the simulation will be employed in the future. First, 98% of the groups believed that working together as a group on the lesson-planning task was more beneficial than working alone would have been. Second, 98% of the groups concluded that they would benefit if they had the opportunity to compare their lesson-planning decisions with those generated by groups of experienced teachers. Additional findings that address the decision-making strategies of participant groups will be drawn from two feedback instruments that map the decision path followed during the planning and the decision outcomes that define the resulting lesson. Of particular interest will be the individualized decision options and notes that the participants generate as they complete the planning task.

As findings on the newly developed simulation unfold, it is becoming increasingly clear that this tool's use as a stand-alone laboratory task needs to be rethought. With its evolving open structure, the simulation can easily be integrated into methods coursework and can even function as a diagnostic tool.

References

Golay, K. (1982). *Learning patterns and temperament styles: A systematic guide to maximizing student achievement*. Fullterton: Manas-systems.

Strang, H.R. (1997). The use of Curry teaching simulations in professional training. *Computers in the Schools*, *13*(3), 135-145.

Virginia Department of Education (1999). Standards of Learning resources: Instruction, assessment, and training. http://www.pen.k12.va.us/VDOE/Instruction/sol.html.

SOCIAL STUDIES

Section Editor:
Cameron White, *University of Houston*

Integrating technology meaningfully in social studies remains a major issue in education. Nevertheless, the papers in the social studies section represent varied, creative, thoughtful and meaningful applications of technology for powerful social studies teaching and learning. Each of the papers provide a type of case study model and ideas for meaningfully integrating technology in social studies. The papers also are broad representations allowing for adaptation a various levels.

Teacher's Guide to the Holocaust by Barron, Calandra, and Kemker offers an overview regarding an invaluable website developed resource for teaching the Holocaust. The papers is thorough in describing and analyzing the process for developing the project as well as the actual components of the site. The paper also provides an excellent case study and model for like projects.

The paper by Beal, *Preparing a Virtual Field Trip* focuses on constructivist approaches to technology integration such as meaningful and real world applications. The paper suggests that developing virtual field trips are engaging projects for teachers and students. Specific themes include community, service learning, and character building.

The paper by Coverdale on *...Technology-rich Quest Projects* uses the thematic strand for social studies as suggested by the National Council for the Social Studies. AsiaQuest is used as the case study and model for an analysis of integrating technology, quest projects, and the NCSS themes. The paper also addresses specific issues regarding the definition, rationale, and goals of social studies.

StarFestival by Heistad and Miyagawa describes a multimedia project on the themes of diversity and cultural identity. The package is personalized by using one person as the case study focus for individual identity and development . The goal is to allow students to engage in self discovery of personal identity and worth.

McClelland's paper, entitled *Web-based Delivery of a Generic Research Methods Module* offers a modle of a web-supported teaching and learning project. The paper describes the module and research associated with determining its effectiveness. A variety of issues related to web-based teaching and learning are analyzed including attitudes, learning styles, adaptation, and future projects.

Multimedia Resource File by McCoy, Miller, and Bender describes a project that is intended as a practical application resource for technology and content integration in teaching and learning. Specific components described include internet applications, analyzing effective resources, and products. This paper provides an example of the potential of the internet for powerful social studies teaching and learning.

The final paper in the section by Pye entitled *Are Middle School Social Studies Teachers in a Technological Quandary* focuses on important issues in the integration of technology in middle school social studies. The paper looks at the concept of middle school education and technology as a tool to enhance teaching and learning. The case study describes and analyzes the application of technology in sample middle school social studies classroom in Missouri.

In conclusion, these papers provide critical insight regarding the successful integration of technology in social education at various levels. The case study and model approach used by the authors provide opportunities for interested parties to adapt the ideas in meeting individual needs. The integration of technology in social studies education has made great strides as is evidenced in these papers. We still have a great distance to travel however.

Teacher's Guide to the Holocaust: An Extensive Online Resource for Teachers

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Abstract: The Teacher's Guide to the Holocaust is a large, instructional website with over 7,000 HTML pages. It was designed and developed by graduate students in the Instructional Technology program and the staff of the Florida Center for Instructional Technology, College of Education, at the University of South Florida. The program was designed to provide an overview of the Holocaust through text, original source documents, graphics, photographs, art, movies, and music.

The primary audience of the Teacher's Guide to the Holocaust is preservice and inservice teachers. The site allows them to view the Holocaust through three different "lenses"--Timeline, People, and the Arts. Additional resources are provided in the Student Activities and Teacher Resources sections. Now in its 4th year, the site receives over two million hits per month from educators and students all over the world. This paper provides background information on the evolution of the project, design considerations, and development issues.

Introduction

The Holocaust remains one of the most effective and extensively documented subjects for an examination of basic humanitarian issues; it provides a window into the understanding of the complex elements of human behavior. Through a study of the Holocaust, students and teachers alike can develop an understanding of the ramifications of prejudice and racism, and they can begin to gain insight into the meaning of responsibility for both individual and community actions.

In 1994, Florida became the first state to enact a law requiring instruction in the history of the Holocaust (Brogan, 1997). The law was championed by, among others, Stephen Spielberg, director of Schindler's List. The text of the law reads:

> The history of the Holocaust (1933-1945), the systematic, planned annihilation of European Jews and other groups by Nazi Germany, a watershed event in the history of humanity, to be taught in a manner that leads to an investigation of human behavior, an understanding of the ramification of prejudice, racism, and stereotyping, and an examination of what it means to be a responsible and respectful person, for the purposes of encouraging tolerance of diversity in a pluralistic society and for nurturing and protecting democratic values and institutions.
>
> The Holocaust Education Bill (SB 660)

Although the law mandated Holocaust education, very few of Florida's teachers were adequately prepared to teach this sensitive subject. To help meet the need for teacher preparation and curriculum resources, the Florida Center for Instructional Technology, along with the Instructional Technology program in the College of Education at the University of South Florida, created the online resource, *A Teacher's Guide to the Holocaust* (http://fcit.usf.edu/holocaust).

The *Teacher's Guide* is designed to provide an overview of the Holocaust through text, original source documents, graphics, photographs, art, movies, and music. This website allows preservice and inservice teachers to view the Holocaust through three different "lenses"--Timeline, People, and The Arts. Additional resources are provided in the Student Activities and Teacher Resources sections.

The primary goal of the website has been to provide a "starting point" for Holocaust resources, research, and education for teachers. The site provides over 1,000 photographs, hundreds of source documents, numerous panoramas of concentration camps, traditional Jewish music, annotated bibliographies, blackline handouts, maps, and other materials. All of these resources can be used in classrooms for instructional purposes.

A secondary goal of the website has been to serve as a basis for research studies related to preservice teachers' knowledge and attitudes of Holocaust. Several research studies are underway to assess their preparation to teach topics related to tolerance and prejudice.

Design

The initial design for the *Teacher's Guide to the Holocaust* was created in 1995 by graduate students in an Advanced Design course. The graduate students spent several weeks determining the appropriate content areas and the optimal structure for the site. Existing websites were examined, and alternative instructional strategies were explored. The final composition of the *Teacher's Guide to the Holocaust* presents an overview of the Holocaust from three different perspectives: Timeline, People, and The Arts. The website also includes sections related to Classroom Activities and Teacher Resources.

The *Timeline* section presents the story of the Holocaust chronologically along a detailed timeline of history. This section focuses on the rise of the Nazi party, Hitler's final solution, the rescue and liberation of Nazi death camps, the Nuremberg trials, and the aftermath. Topics are supported with over 1,200 photographs of the war in Europe and copies of transcripts and documents from the Nuremberg Trials and other historical events. This section is designed to serve as a concise point of reference for teachers.

The *People* section exhibits the behaviorist categories of people in time of war. In this section, the focus is not only on victims, but also on bystanders, perpetrators, collaborators, resisters, rescuers, liberators, survivors, and children. *People* also celebrates the resisters and rescuers of the Holocaust, with a special dedication to the Righteous Gentiles who placed their lives in danger to save Jewish people. The Survivor section personalizes the Holocaust by including links to numerous first-hand stories of survivors.

The *Arts* section demonstrates that despite the Nazi's attempts at dehumanization, victims and survivors of the Holocaust held onto the parts of themselves that made them most human. This section contains a gallery of the Arts—music, literature, and visual arts. In *Music*, teachers and students have the ability to hear traditional Jewish music and songs written during the Holocaust in both the camps and ghettos. *Literature* includes the works of playwrights -- materials that teachers are able to incorporate into their study of the Holocaust. The *Visual Arts* section contains the works of David Olere, an artist who survived the Holocaust, as well as other art created by victims of the Holocaust.

The *Teacher Resources* section provides teachers with a wealth of reference materials, including the following (see Figure 1):

Bibliographies:	General and specialized bibliographies of Holocaust works for students and teachers.
Documents:	Primary source materials related to the Holocaust.
Galleries:	Over 1,250 Holocaust photographs, drawings, and paintings grouped into thematic galleries.
Glossary:	Terms related to the Holocaust, including the pronunciation of many foreign words.
Maps:	Maps dealing with events related to World War II.
Movies:	Short QuickTime movies of archival footage and survivor testimony.

Museums:	Descriptions of Holocaust museums and resource centers in Florida and elsewhere.
Music:	A collection of music files appropriate to a study of the Holocaust.
Plays:	An annotated list of educational plays with a Holocaust theme --access to full scripts of selected plays.
Quizzes:	Interactive quizzes for each of the Timeline and People sub-sections.
Software:	An annotated list of educational software appropriate to a study of the Holocaust.
Videography:	An annotated list of films and videos about the Holocaust.
VR Movies:	Forty virtual reality panorama movies of concentration camps and other Holocaust-related sites.
Web Sites:	Links to relevant Holocaust-related Web sites.

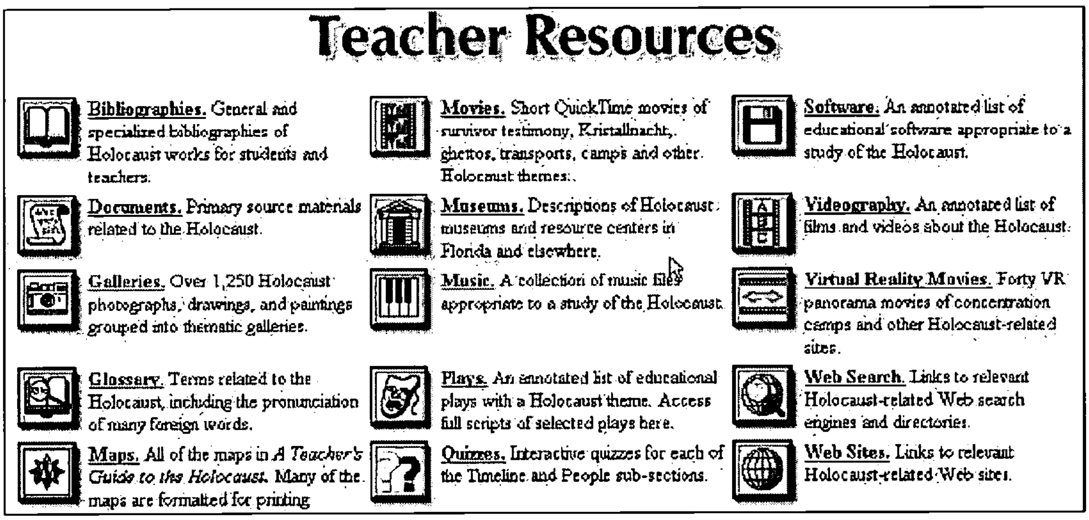


Figure 1. Teacher Resource Section

The *Classroom Activities* section presents a series of lesson plans, targeted glossaries, quizzes, and integrated units that can be used across the disciplines. Each lesson describes the learning objective, appropriate grade level, materials needed, and procedure. This section also contains a "Submit an Activity" area, where teachers can send their own lesson plans or submit suggestions for revisions of the lessons plans in the database.

Development

The program was developed to run with low-end browsers (version 2.0 and above) on either Macintosh or PC computers. For ease of navigation, an image-map was placed at the top and bottom of each page. These image-maps and the Site Map (which is accessible from every page) facilitate the movement from one section to another (see Figure 2). An Index is also available for easy access to relevant topics.

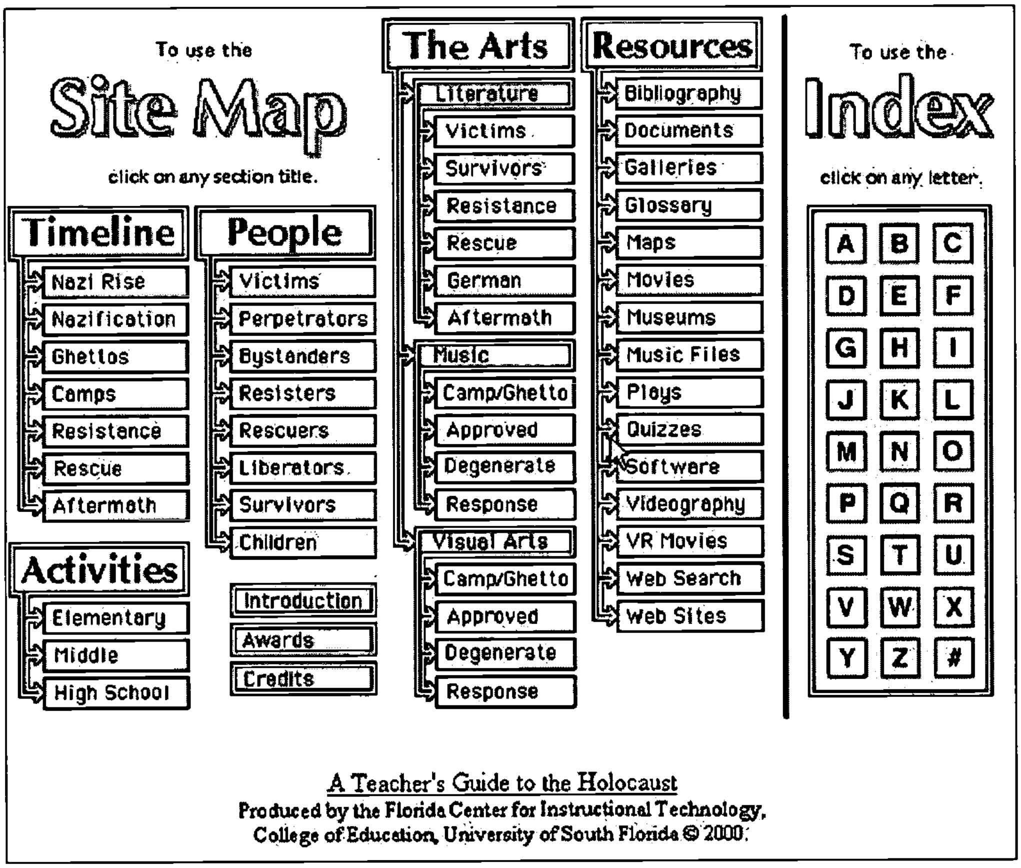


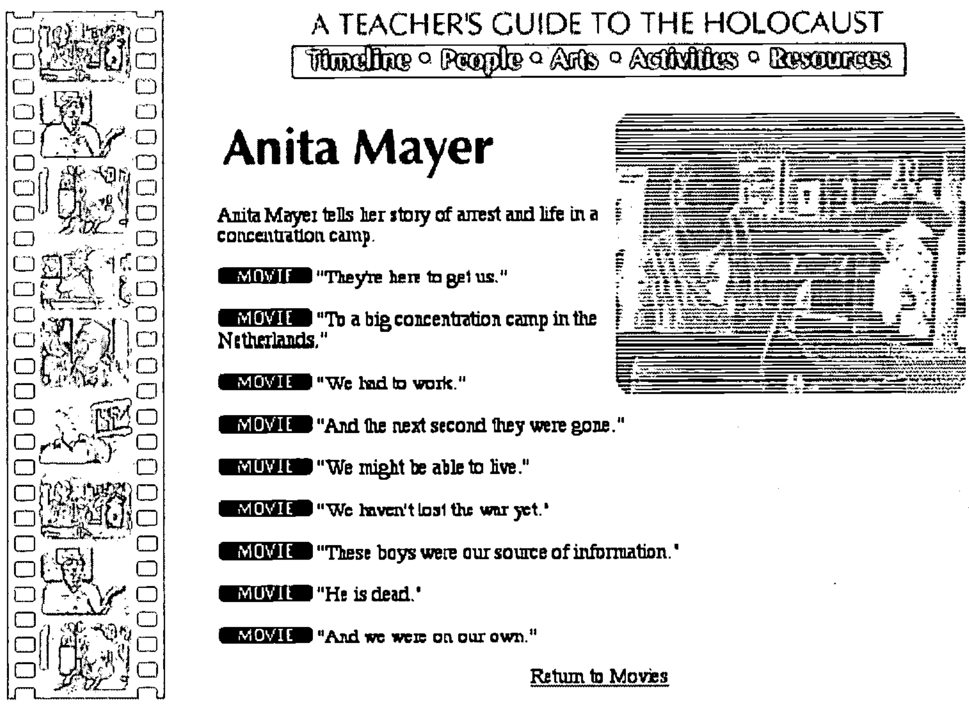
Figure 2. Site Map

Several techniques were used to create the vast array of resources available on the site. For example, in order to provide immediate, client-side feedback and a mild level of interactivity, the Quizzes were created using Macromedia CourseBuilder. The software allowed items to be created using a variety of formats including, radio buttons, check boxes, drag-and-drop and more. Feedback was provided in the form of pop-up dialogue boxes with comments such as, "Good job," or "Try again." In some circumstances, feedback was provided in the form of correct answers. All questions were multiple-choice and their content was created and validated by a team of Holocaust and measurement experts working on *The Teachers' Guide*.

All of the movie and sound files were created in QuickTime because it allows for delivery of both audio and video files over the Web and on CD-ROM. QuickTime is a universal plug-in for multimedia in Web browsers. Multimedia that is created in QuickTime will perform equally as well on Windows and Macintosh computers.

The paper manuscripts of the music were accessed from the public domain at the university library. A musician was then hired from our university to create the music on a MIDI keyboard. The MIDI file was then saved as a QuickTime file.

The Holocaust survivor movie files were originally recorded on an analog video camera at the Tampa Bay Holocaust Museum. Permission was granted from each of the survivors. The VHS videotapes were then transferred to a digital video camera, allowing the movies to be edited on a computer. Each one of the videos was then reduced to short one-minute clips. Finally, we compressed the movies to reasonable file sizes for use over the web.



Virtual Reality movies, which are a series of individual photographs combined together to create a 180 to 360 degree panoramic effect, were created for use with the Holocaust web site. Photographs were taken at actual Holocaust related sites and stitched together using Adobe Photoshop to clean image quality and VR Authoring Studio to stitch and export the panoramic image. This process involves bringing a seamless transition from one photograph to the next. From an educational perspective, the VR movie allows for the usage of virtual field trips in the classroom environment.

Dissemination

The primary vehicle for distribution of the project is the Web. The Florida Center for Instructional Technology maintains a Windows NT web server at USF. File management and maintenance are monitored closely, and revisions and updates can be done on a routine basis. The website currently receives over two million hits per month, and links to it have been established from hundreds of websites throughout the United States, Europe, the Middle East, and other parts of the world.

Although delivery through the Web is optimal in many circumstances, there were sufficient reasons to create a version of the program for delivery on CD-ROM. One of the major restraints of Web delivery is that not all teachers have access to the Web. Therefore, a CD-ROM-based version was created and distributed to every school in the state of Florida.

The analysis, design, development, and dissemination of a large-scale instructional project such as the *Teacher's Guide to the Holocaust* is a major undertaking. Version One was disseminated in 1997; Version Two in 1999; and Version Three in 2000. With each subsequent version, additional photographs, content, and other resources have been added to the site. In addition to the new and updated releases on the Web (for the worldwide audience), 5,000 copies on CD (of each version) have been distributed to Florida schools.

Research

In order to pilot test the effectiveness of the website, and to determine the amount of factual knowledge preservice teachers have of historical events surrounding the Holocaust, two research instruments have been created. One instrument assesses the factual knowledge related to the Holocaust. The second instrument is an attitudinal survey that was designed to measure the subjects' attitudes towards traditionally marginalized groups. An initial study was conducted in the Spring of 2000 with 200 preservice teachers (Calandra, Fitzpatrick, Barron, 2000). Follow-up studies are scheduled for the Fall and Spring of this academic year. Answers to important questions such as the depth of knowledge related to the Holocaust and correlations between knowledge and attitudes can impact the design of teacher education and the design of future versions of the *Teacher's Guide to the Holocaust.*

Response

The response to *A Teacher's Guide to the Holocaust* has been overwhelming. Over two million hits are registered on the site each month. E-mail messages related to the site arrive daily from educators and students all over the world. Students often send questions about the Holocaust as they are working on their homework; teachers send appreciation notes and ideas for enhancement of the site. Based on the e-mail messages, educators are especially grateful for the concise information, the hundreds of photographs, and the access to the source documents. The music section, maps, lesson plans, and the virtual reality movies of the concentration camps are also features that teachers find especially useful.

The *Teacher's Guide to the Holocaust* has received major recognition from well respected Holocaust sites. The Cybrary of the Holocaust links to the project with these words:

> Amazing...simply amazing. Student activities, timeline, links, and much more. "A Teacher's Guide to the Holocaust" offers an overview of the people and events of the Holocaust. Extensive teacher resources are included (http://remember.org/educate.htm).

The website has also received dozens of awards. The online *Encyclopedia Britannica* has listed it among the "Web's Best Sites" with the following citation:

> Carefully designed with an extensive collection of materials, this guide provides an excellent resource not only for teachers and students but for anyone who wants to learn about the Holocaust.

Continuous updates and revisions are underway. Holocaust educators and historians throughout the world continue to contribute to the resources and information in the *Teacher's Guide to the Holocaust.* Through the generosity and collaboration of these Holocaust experts, this site will continue to grow and offer a major resource for Holocaust education.

References

Brogan, F. (1997, November 13). Commissioner Brogan Unveils New CD-ROM, 'A Teacher's Guide to the Holocaust. Florida Department of Education, Tallahassee, FL.

Calandra, B, Fitzpatrick, J, & Barron, A. (2000). A Holocaust website: Effects on preservice teachers' factual knowledge and attitudes toward traditionally marginalized groups. Paper presented at the annual meeting of the Florida Educational Resource Association. Tallahassee, FL.

Preparing a Virtual Field Trip to Teach Value of Community and Sense of Place

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Abstract: This research paper discusses the value of engaging preservice teachers in the development of a virtual field trip. Research in psychology, sociology and education suggests the importance of engaging both teachers and students in activities that promote the development of a sense of place. Taking a field trip of the community provides students with a sense of belonging and support and gives the community a better idea about school activities. Virtual field trips may be use pre-, post- or in place of an actual field trip. During the actual field trip, students use digital cameras to record historic sites and later use *HyperStudio* to prepare the virtual field trip. Preservice teachers experience the field trip and prepare the virtual tour so they may know the power of this activity in building community connections and a greater sense of place.

A great deal is expected of preservice teachers today, not the least of which is proficiency in technology skills. Building a virtual field trip is one way that our teachers become familiar with technology that is easy to use and to teach to their students. Wrapped into the virtual field trip is additional value in the form of its ability to foster a sense of community and place.

Sense of place is not what it was years ago. We are a much more mobile society. This often means that there is no extended family to provide the support families need. Children may be reared by single parents or in homes where both parents work and are unable to spend a great deal of time nurturing their children. Family circumstances affect parenting skills, relationships, and may even endanger a family's survival. Teachers are all too familiar with the effects of lack of family support.

For many children our classrooms become a sanctuary that bolsters them up and prepares them to meet the world. Rather than serving as just a safe haven, we should be helping them explore, contribute and make their mark on their immediate world. As teachers, we tend to see adolescents in our arena. Sometimes we forget that they are already part of a much larger circle. James Garbarino, a proponent of the ecology of adolescent development, explains that youth evolve in interrelated environments (Garbarino, 1985). The four areas most closely connected to them are home, peers, school and community. Adolescents develop based on their experiences and these areas are their reality. The nature and number of connections among these areas determine how fully developed and supported a person is in her life. A strong connection to the community can serve as an anchor and give a student a solid support base on which to rely. For an adolescent in the throes of an identity search, a sense of place can provide a feeling of well being and give the student the freedom to grow by taking risks that they might not have otherwise attempted.

Teachers, too, need the sense of place that knowing and interacting with the community provides. They can better know the culture from which their students come if they know the cultural heritage of the different areas of the city. Studying the city helps one know its needs and opportunities that exist for your class to engage in community service (Arnold & Beal, 1995). Finally, it enables the community to know what is going on in the schools. We cannot expect unqualified support if we do not show them the worth of our students and our programs.

For the past five years preservice undergraduate teacher education students have been part of the Great Raleigh Trolley Adventure. They take a two hour guided tour of the city, complete with stories about historic sites and peoples that have been gleaned from original source documents (Beal, 1992). Some of the tales are taken from private family diaries and newspaper accounts. Throughout the tour students use digital cameras to record each of the memorable stops. One hundred and fifty preservice teachers have taken the tour and follow-up discussions and questionnaires indicate a much stronger sense of community and place and a greater commitment to doing the same thing with the students they will teach.

Students return to the university, select the site they wish to further research and prepare a fact sheet on their site. Next, they must consider the audience for the virtual field trip and prepare their text accordingly. Students are taught *HyperStudio* and each prepares a card or cards with the digital image and text box. Some students are more sophisticated and can add audio, animation or quiz items that give immediate feedback. One student is usually responsible for the title card and another the city map, which is highlighted with the sites to be studied. Buttons are added to connect each of the student=s cards into one stack. Those using the virtual field trip can select a specific site on the map and be taken to the student=s card, which has an image and description of the site.

Preservice teachers can use the virtual field trip activity as a research hook before they take their own students on a field trip. It is useful after the trip as a follow-up and means of assessing what was learned or can be used in place of a field trip if the funding for off campus learning experiences is limited. Most schools have a computer, *HyperStudio* and a digital camera. If a digital camera is not available, a regular one can be used. Regular film can be developed and put on a disk or trip pictures may be scanned to a disk.

Virtual field trips work on many different levels. Service learning: When students are taking the real-life field trip they learn about their community and its needs. The community does the same. This information often leads to teacher or student suggested service learning projects to help the community. Virtual trips can be put on the web and shared with the community. Technology skills development: Students learn how to use the digital camera to record historic sites and later practice their computer skills by using *HyperStudio* to combine the digital images with text boxes and build the virtual field trip stack. Empowering: Trolley-told stories presented in the form of dramatic narrative show that history, often thought dry and boring, can be exciting. Students are empowered and see themselves as the Keepers of the History. Social studies takes on a whole new meaning. Students are eager to preserve and retell the stories to family and friends. Sense of Place: Students become invested in the community and see themselves as leaders in training. They make contributions that are recognized and valued and they feel confident in taking on a larger role as a community helper. Above all, they belong and have another arena in which to be successful and supported.

By using the virtual field trip activity, preservice teachers experience what they will help their own students feel someday, a growing sense of appreciation for their community and a stronger sense of place. The Raleigh Trolley has been used at all levels -- preservice teachers, community leaders, regular classroom teachers and middle school children. Most have followed the tour with the virtual field trip activity. Some have individually prepared virtual tours of a single site and donated the work to that site for their use. Connecting to the community both in a real and virtual sense has proven to be an experience students rate as memorable and the one thing they report they will replicate in their own classroom.

References

Arnold, John, Beal, Candy. (1995). *Service with a Smile: Service Learning Projects in North Carolina Middle Level Schools.* Raleigh, North Carolina: North Carolina Middle School Association.

Beal, Candy. (1992). *Raleigh: The First 200 Years.* Raleigh, North Carolina: Martini Press.

Garbarino, James, (Ed.). (1985) *Adolescent Development, An Ecological Perspective.* Columbus, Ohio: Charles Merrill Publishing Company.

Weaving a Collective Text: A Cooperative Experience

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Abstract: This paper is a report on the experiences of a post-graduate multisciplinary team of students attending the Cognitive Ecology and the Technologies of Intelligence Course and
their Lecturer, while working in a collective text construction and using a collaborative writing tool named The EquiText. It presents the analysis of the text construction as an end of semester extra-class asynchronous work, based on Varela's observer notion in the cognitive ecology field and in Maturana's concepts of organization and structure. At the same time the group was testing their own 'conivence' environment in this tool, which had recently been available for local use.

Introduction: The Choice Of The Threads

This work is the result from the learning experience of a group of post-graduate students at the Universidade Federal do Rio Grande do Sul in the construction of a collective text, using a software of collective authorship, the EquiText. Concepts of Maturana (1999), as organization and structure, in addition to the Varela's observer ontology notion, provide the basic theoretical support for this analysis. These concepts are also shared to a certain extent with other researchers interested in the study of the construction of the ecology of knowledge and its relation with the new technologies of the intelligence, like Pierre Lévy (1993), Gregory Bateson (1991), Francisco Varela (1997), Félix Guattari (1993), and others.

An observer as any human being, when operating in the language with other human beings, participates with them in the constitution of a domain of coordinated actions as a domain of distinctions and in this way he/she can generate descriptions and descriptions of descriptions. The relations between the components that define a compound unity as a simple unity of a certain type, constitute its *organization*. Thus, the organization of a compound unity constitutes its class identity, conserving itself as a whole of invariable relations. The components and the relations between the components which constitute a particular compound unity as a compound unity of a particular type, constitute its *structure*. The relations that constitute the organization of a compound unity takes place as a subgroup of these relations which takes place in its structure. The structure includes more relations than those which define an organization. For this reason, the conservation of the organization does not imply the conservation of the structure. The structural transformations may come from the changing in the characteristics of the components of the compound unity or by the changing in the relations, that may produce itself in an episodic or recurrent way (Maturana, 1999).

Mazzochi (2000) mentions several sites and environments of collective constructions in the area of arts. In the area of collective construction of texts we can mention, for instance, the RCT (Remote Collaboration Tool), which represents a multidisciplinar effort to improve the interaction quality among students and among students and instructors in foreign language courses at the University of California in Davis, since 1997. (Walters, 2000)

Thus, building a text with several hands, from distinct points and different times, on a certain theme, and using a special tool to develop such a task, can be a positive, constructive, and enjoyable experience. If the team of participants are sufficiently motivated and predisposed to share their individual ideas with the whole group - on an specific theme - for the sake of constructing a significant and discursive text in a cooperative and/or collaborative mode in its lay-out.

A Virtual Environment: The Weaver's Loom

The virtual environment used to catalyze the creation of this "coexistence space", the EquiText, (Fig. 1), was first developed by a multidisciplinary group of students attending the Tele-Education Course at the Post-Graduate Program in Computer Sciences in Education (PGIE), at the Federal University of Rio Grande do Sul (UFRGS), in Porto Alegre, RS, Brazil.

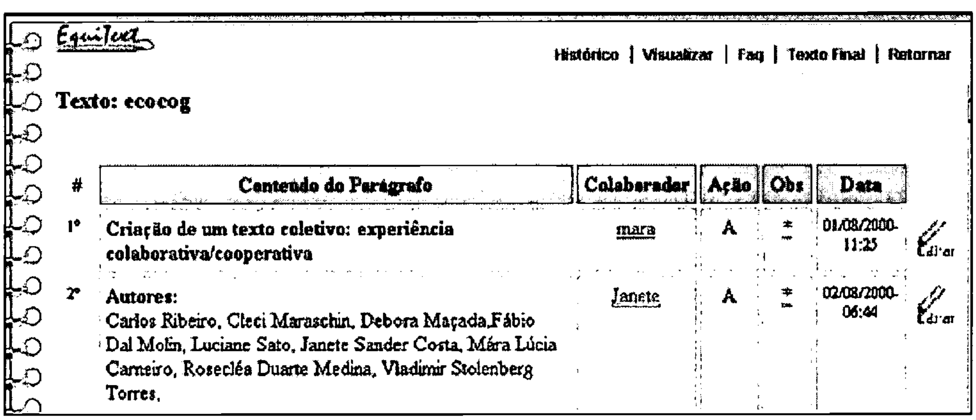

Figure 1 - The Equitext screen edition

The EquiText is the fruitful result of a study-project which constituted the extension course on "Tools and Techniques of Groupware". It was first designed during the 'Tele-Education' Course of the PGIE Program at UFRGS, during the second semester of 1999. It was then launched as a group contribution to the mentioned project, which initially aimed at qualifying teachers and educators to the new distance education standards set out by the Brazilian Government. The description and analysis of the results of this project and the first version of the EquiText can be find in (Rizzi et al. 2000a and 2000b).

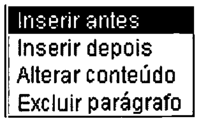

Figure 2 - Edition tool

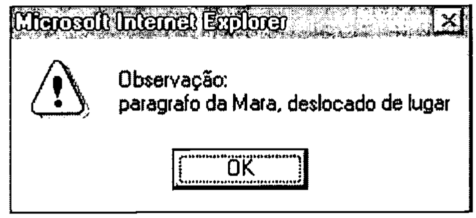

Figure 3 - Sample of a comment text

This tool has then been conceived to give support to the production of collaborative and/or cooperative texts, and it was based on the 'paragraph' concept. This conception facilitates the display of the individual written contributions, allowing the inclusion, alteration, creation of new paragraphs, as well as the exclusion of any existing paragraph unfit to the text in progress - an important move to guarantee the coherence of the text as a significant whole (Fig.2). Besides, it also allows the inclusion of comments, as exemplified in (Fig.3), which constitute short texts in attachment.

According to Lévy, "the word 'text', in its etymology, contains the old feminine technique of weaving. It is perhaps the fact of this knitting of verbs and names through which we tried to retain the meaning, to be designated by an almost textile term, be not a coincidence". (Lévy 1999)

The paragraph concept adopted in the EquiText considers a title of a text in construction as well as one sole line as individual and identified paragraphs with a number in sequence, beginning with the number 1. That numbering is altered dynamically, according to the "movement" of the participation of its team-members.

The Experience: Weaving the Threads

The group of students who participated in the elaboration of this text-experience and in this analysis is constituted by the lecturer of the course in "Cognitive Ecology and Technologies of the Intelligence" and her students - the authors of this paper - all linked to the Post-Graduate Programs of Social and Institutional Psychology and Computer Sciences in Education at the Federal University of Rio Grande do Sul (UFRGS).

We, the authors, come from different backgrounds, such as Psychology, Mathematics, Languages, Biology, Computer Sciences, Engineering, among others, transforming this collective text writing activity a coexistence space in the 'alterity'. It is understood here that the experience of a collective writing is not constituted of a mere representation of ideas and that it follows a pre-conceived organization. It rather constitutes an updated recreation to each written interaction.

The experience under analysis had been accomplished in approximately two weeks. During this period, the group underwent two main processes: first, they were getting acquainted with the environment - by using the EquiText properly while discussing how to start the proposed task; second, the very few ones who dared to start writing their collaborations in the EquiText, by constructing their new paragraphs subject to alteration or substitution moves, not only triggered off important reflections upon the task in process but also motivated the other participants to go on in the collective text creation.

Thus, during the writing process, the text had been built resembling at times a patchwork quilt or a mere registration of ideas still not well connected. Knots were given others untied, as if an assembling of a knitting of ideas was in its way while the writing operating process took place, releasing the text which covers and illustrates the present analysis. It is important to mention that this text is one of the possible actualizations of the several roads which were opened up in the virtuality of the writings registered in the EquiText domains. We could have produced other texts if any other potential version had been actualized.

The use of a virtual environment echoed differently in the team members. The participations were of different intensities, having at every moment the observer's glance modified, pointing out this come and go of several points of view. The testing and the discovery of the environment itself, the experimentation of unusual ways of interaction, the coupling to that other kind of authorship, all these aspects made it possible to create and recreate in this new coexistence space.

Despite the fact that this environment had not been conceived to promote personal interactions in real time, an interesting experience happened during the construction of this text. In the exact moment that the students Rose and Janete elaborated the initial paragraphs in the EquiText, the student Luciane made her contributions to the text. And such actions could be visualized in the screen, at the very movement of the occurrence of the collaborative act.

Technically, this event could be read as a deficiency of the environment, since this tool does not foresee and/or control the access competition. If this fact could generate confusion in some users, who may get surprised with a text in the screen different from that one just edited, in others, new sensations were actually felt while witnessing this irrecognition of the text in motion. That characteristic reveals the asynchronous aspect of the authorship action in the text: participants, of distant points, in different machines, cooperating collectively in the EquiText environment, in that very moment.

Another interesting fact was the oddity in relation to the entire joint of ideas placed in the text. Some participants manifested their disagreement with certain ideas and arguments. This fact proposed an instigating reflection: a collective text does not necessarily express the integrity of each author's suppositions; it may well occur a concomitant recognition/irrecognition of the text being produced. As being different from an individual text, where this process can happen in the *a posteriori*, it seemed to us that in a collective text that partial domain of the directions and connections of ideas, which may release this irrecognition feeling, is already present in the movements of the proper writing.

While this collective experience was taking its course, we could accompany the happening of different writing positions and styles, with different discourse levels. For the very programming of the environment the operation existed in the text itself, through the inclusion and exclusion actions, alteration of paragraphs and inclusion of comments on the text that has been created. In a meta-writing level, the movement of the auto-organization of this group, where critical comments and of positioning were done ON the text; the very textual texture in action could be seen as an important component towards a construction of a hypertext.

The active participation of those involved in the 'weaving of the text' promoted significant structural alterations up to the last moment when it embodied its current form, displayed in the EquiText under the function "Final Text". It did not lose its inner organization as a good written text, though.

Thus, what may we consider for an analysis of a collaborative text production in which the individual " I " or the several individual " I " give place to another " I ", this time collective? Facing this new idea of a 'cyborguian' being , the following inquiries still strike us:

- Could the individual knowledge be really disturbed by a collective mind, to the point that the individuality takes place in a multiple territory?
- Could this text written in a collaborative way be considered a product of a collective mind?

These questions reveal some evidence that the insertion of technological tools in learning environments bring about disturbances both in singular and collective levels. The interesting aspect in this experience with the EquiText is that the theoretical reflection takes place in the same happening of the collective writing. There is no anteriority of the ideas as they materialize themselves in the act of the reflexive writing when they happen to be inserted, altered, substituted or even excluded from the paragraphs in progress.

As we examine the organization of a collectively written text, where the collaboration of one participant may affect or unchain the collaboration of the other (s), we observe that there is an open, dynamic structure, virtually transformable, that works according to the flavor of the movement of the participants' thoughts. The team members get involved in finding a way to participate in accordance to their thinking, though collaboratively enough to be able to co-build a new knowledge - more enlarged and significant. It is the social cooperation, accomplished in its own activity by means of the latest technological tools, in conjunction with the old and battered verbal signs - exactly one of the more significant distinctive aspects of the human species. And associated with the use of the individuals psychological tools, it constitutes the natural phenomenon that modifies its reality.

In this sense, it can be thought then in terms of the texture concept or in a heterogeneous net of senses that is constituted in its own accomplishment, where each author has already inbuilt his/her own net:

" As each one of us was several, he/she was already a lot of people. We used everything that approximated us, the closest and more distant... Not to get to the point that it is not said 'I' anymore, but to the point in that no longer he/she has any importance to say or not to say ' I'. We are not the same ones any longer. Each one will recognize his/her " I ". We were helped, aspirated, multiplied ". (Deleuze & Guattari, 1995).

But, after all, which text is not collective? Are we not all participants of a polymorphic net of ecological ideas, in which each of us can only know who we are from the notion of who are we not? We are the text.

" The text is placed in movement, taken in a flow, vetorized, metamorphic. It is thus closer of the very movement of the thought, or of the image that we make of him today. The text always subsists, but the page gets hidden. The page, that is, the Latin pagus, the field, the territory located within the white of the margins, cultivated of lines and sowed by the author of letters, characters. The page, still heavy of the mesopotamic clay, always adhering to the earth of the neolithic, this very old page, hides itself slowly under the high informational surface, its disconnected signs will rejoint the numeric (digital) wave. Everything happens as if the numberization (digitalization) would establish a type of an immense semantic plan, accessible all over the place, for which each one could contribute to produce, to bend diversely, to retake, to modify, to refold ..." (LEVY, 1993).

We are a collective of brains that are a collective of neurones in interaction. In this simultaneous and heterogeneous writing a kind of refolding of the text takes place, where ideas of authors formerly distant become close and because of this closeness they become irrecognized. A topological sequential, where the ideas are clamped without necessarily producing a logical sequency.

Some Considerations: After all, What Did We Weave?

To what conclusions did we arrive with this work of co-authoring in a team and at distance, using a tool - the EquiText - exactly build for that purpose? In spite of the initial adaptation in the utilization of the EquiText, and of the inherent challenges of a collaborative writing, the accomplished results satisfied the expectations, or even overcame them, regarding the construction of a text " with several hands and brains ".

Our experience configured in an existence spot, propitiating action and reflection, and to a certain extent allowing us our own transformation as well as the entire group in this coexistence episode. In this way, the EquiText domain provided resources not only for the collective construction of a text, but also for its (re) construction. In this way, its construction in a theory-practice congruence makes it possible to discuss how the coupling of the cognitive systems to the technologies can transform the manners of thinking individually and collectively.

Nevertheless, some questions continue instigating us and provoking other reflections:

- that the recognition of the knowledge built in a shared way can, ultimately, result in a larger knowledge, where the minor portions of knowledge, here seen as individual, partial, may actually aid to the constitution of the major consensual knowledge of the group;
- that new kinds of experiments may result from cognitive group productions where the participation of a larger number of people have the privilege to cooperate in the construction of science;
- that a collaborative experience of text elaboration by several people via the EquiText - a favorable environment for such an experience - where what one writes may become the substratum to what the other(s) want(s) to express, even if some part(s) previously registered is/are lost, can be an important moment of reflection over the property of knowledge, an issue on its validation after the scientific world.

From what was previously exposed, it results clear that we find ourselves in a domain where a lot of questions are left for further and deeper discussions. From what has been discussed so far, based on the 'cognitive ecology' notion of Bateson & Guattari and Maturana's concept of the 'ontology of the observer', we may already dare to insert a bridge here to link the sciences, in order to create a textual/theoretical territory, where the concepts are woven and an organization becomes a mutant structure. In other words, it is no longer possible to think in a subject-author interaction without thinking in the collective.

The notion of individual authorship is then illusory in the intertextuality process, the same as the illustrations embroidered in a rug: they give us an illusion of being separated, but if we observe them more closely, they are mere colored parts of an immense texture. And so is the text, so is the subjectivity, so are WE.

References

Bateson, G. (1991). *Pasos hacia una ecologia de la mente*. Buenos Aires: Editorial Planeta.

Deleuze, G. & Guattari, F. (1995). *Mil Platôs: capitalismo e esquizofrenia*. Rio de Janeiro: Editora 34.

Guattari, F. (1993). *As três ecologias*. Campinas: Papirus.

Lévy, P. (1993). *As tecnologias da inteligência*. Rio de Janeiro: Editora 34.

Maraschin, C. (2000a). *Tecnologias e Exercício da Função Autor*. **Anais...** VII Seminário Internacional de Alfabetização e Educação Científica. Ijui: Ed. UNIJUI.

Maturana, H. (1999). *Transformación en la convivencia*. Santiago: Domen Ediciones.

Mazzochi, N. (2000). A Revolução Digital e a Net-Art. In: Dulcimira Capisani. Arte e Educação no Mundo Digital. Mato Grosso do Sul: Editora da UFMS.

Rizzi, C. B. et al. (2000a). *EquiText: a helping tool in the elaboration of collaborative texts*. Annals... San Diego: Conference Site 2000.

____________. (2000b). *Escrita colaborativa via Web - o EquiText*. Annals ...Habana: 7o. Congreso Internacional de Informatica en Educacion.

Varella, F., Thompson, E. & Rosch, E. (1997). *De Cuerpo Presente: Las ciencias cognitivas y la experiencia humana"*. Barcelona: Editorial Gedisa.

Walters, R.F. et al. *RC (Remote Collaboration. (2000). A Tool for Multimedia, Multilingual Collaboration*. http://escher.cs.ucdavis.edu/papers/RC2000.htm.

Developing an Understanding of the Social Studies Through Technology-rich Quest Projects

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Abstract: One of the difficulties of teaching and learning in K-12 social studies classrooms is the "fuzziness" of the discipline. What do we mean by social studies? The *Curriculum Standards for Social Studies: Expectations of Excellence* (NCSS 1994) provide a detailed framework for describing the curricular foci of the social studies by dividing the social studies into ten thematic organizational units. These themes are further delineated by performance standards for the early grades, middle grades, and high school. This paper is a qualitative document analysis of a technology-rich, interdisciplinary curriculum produced by Classroom Connect, a major producer of technology education products. This analysis focuses on the social studies themes present in one specific Quest project: AsiaQuest.

Introduction

Social studies is regarded as a major school subject and is taught in K-12 schools nationwide (NCSS 1994). However, because social studies is multidisciplinary and interdisciplinary, it is often difficult to define. The National Council for the Social Studies (NCSS) defines social studies as follows:

> Social studies is the integrated study of the social sciences and humanities to promote civic competence. Within the school program, social studies provides coordinated, systematic study drawing upon such disciplines as anthropology, archaeology, economics, geography, history, law, philosophy, political science, psychology, religion, and sociology, as well as appropriate content from the humanities, mathematics, and natural sciences. The primary purpose of social studies is to help young people develop the ability to make informed and reasoned decisions for the public good as citizens of a culturally diverse, democratic society in an interdependent world.

Thousands of K-12 students worldwide participate in Classroom Connect Quest projects each semester. How does the curriculum content contained in the technology-rich projects correlate with the social studies themes and the performance expectations established by the NCSS? The purpose of this paper is to provide an overview of the AsiaQuest project and a correlation of the AsiaQuest content to the NCSS themes.

Classroom Connect Quest projects are Internet-based projects that promote active, inquiry-based learning in K-12 classrooms. Teachers subscribe to Classroom Connect and receive an extensive curriculum guide, a user id, and a password. A different Quest project is offered each semester and each Quest follows the same curricular format. Other Quest topics have included MayaQuest, AfricaQuest, GalapagosQuest, JapanQuest, AmericaQuest, and AustraliaQuest. In the spring 2001 semester, the Quest team will revisit MayaQuest. In each Quest, participants communicate with a team of scientists and explorers traveling the designated Quest region via bicycle.

Each Quest provides an inquiry question that focuses all participants' inquiries. AsiaQuest explores Venice, Italy to Beijing, China. However, there is much controversy surrounding the historical account of Polo's journey and thus AsiaQuest poses this question: "Did Marco Polo really go to China?" In Polo's writings, he fails to mention or describe many elements of Chinese culture: tea, chopsticks, Chinese calligraphy, and the Great Wall (Classroom Connect 1999). In her book *Did Marco Polo Go to China?,* Frances Wood (1996) provides extensive evidence that questions Polo's presence in China. Particularly perplexing is how Polo could have not described the Great Wall in his writings. The first to raise the issue formerly was the secretary to Lord Macartney, the first British ambassador to China:

> The first European who published any account of that empire, Marco Polo, has made, however, no mention of the wall; tho as he travelled over land to the capital of China, it is presumed he must have passed through it from Tartary in some spot where the wall now stands. From such silence some doubts have arisen...whether the wall was really in existence in the thirteen century (Wood 1996, p. 99).

This quote is interesting because it mentions Polo's failure to describe the wall but also suggests that perhaps the Great Wall didn't exist in the thirteenth century. However, Wood (1996) counters this possibility with evidence from her research into the wall's construction and its material composition at various points in history. Wood states:

> My feeling is that even without serious wall-building or wall-repairing efforts, there would have been much of the tamped earth wall surviving in the thirteenth century and that it would have been very difficult to have traveled into China from the West without noticing it; thus the omission of the Wall in the *Description of the World* is telling (Wood 1996, p. 101).

In researching Polo's travels, students have a chance to debunk the historical account of Polo's travels or confirm Polo's adventures based on evidence found by the Quest team in China and in documents provided in the Quest project and other resources.

The scope of this paper does not allow a detailed correlation of AsiaQuest content to all ten NCSS themes nor can the analysis extend across the full K-12 curriculum. Thus, selected NCSS themes in the *middle* grades will be analyzed. In the section below, each table will list the NCSS theme, selected performance expectations, and where those expectations correlate to AsiaQuest activities in the curriculum guide. Performance expectations indicate what students should know and be able to do in relation to the larger theme.

Theme 1 – Culture

Social studies programs should include experiences that provide for the study of *culture and cultural diversity* so that the learner can:

NCSS Performance Expectation	AsiaQuest Activity	Page
A. compare similarities and differences in the ways groups, societies, and cultures meet human needs and concerns.	Background Cultural Exchange	50 116
B. explain how information and experiences may be interpreted by people from diverse cultural perspectives and frames of reference.	Dan's Dilemma Create a Quilt	65 116
C. explain and give examples of how language, literature, the arts, architecture, other artifacts, traditions, beliefs, values, and behaviors contribute to the development and transmission of culture.	Myths & Legends Chinese Poetry	65 115

Table 1 – Culture

Theme 2 – Time, Continuity, & Change

Social studies programs should include experiences that provide for the study of *the way human beings view themselves in and over time*, so the learner can:

NCSS Performance Expectation	AsiaQuest Activity	Page
A. demonstrate an understanding that different scholars may describe the same event or situation in different ways but must provide reasons or evidence for their views.	Culture Shock History Mystery	68 69

B. identify and use key concepts such as chronology, causality, change, conflict, and complexity to explain, analyze, and show connections among patterns of historical change and continuity.	History Mystery	69
E. develop critical sensitivities such as empathy and skepticism regarding attitudes, values, and behaviors of people in different historical contexts.	Kid Profile Culture Shock Silk Road Lifestyles	67 78 116

Table 2 – Time, Continuity, & Change

Theme 3 – People, Places, & Environments

Social studies programs should include experiences that provide for the study *of people, places, and environments*, so the learner can:

NCSS Performance Expectation	AsiaQuest Activity	Page
A. elaborate mental maps of locales, regions, and the world that demonstrate understanding of relative location, direction, size, and shape.	Silk Road Map Geography Graphing	7 112 114
B. create, interpret, use, and distinguish various representations of the earth, such as maps, globes, and photographs.	Board Game New Silk Road	115 115
I. describe ways that historical events have been influenced by, and have influenced, physical and human geographic factors in local, regional, national, and global settings.	Debate Asian Culture	112 113

Table 3 – People, Places, & Environments

Theme 9 – Global Connections

Social studies programs should include experiences that provide for the study of *global connections and interdependence*, so the learner can:

NCSS Performance Expectation	AsiaQuest Activity	Page
A. describe instances in which language, art, music, belief systems, and other cultural elements can facilitate global understanding or cause misunderstanding.	Cultural Exchange Chinese Poetry	116 115
B. analyze examples of conflict, cooperation, and interdependence among groups, societies, and nations.	Transportation Asian Culture History Mystery	114 113 109
G. identify and describe the roles of international and multinational organizations.	Culture Shock Kid Profile Myths & Legends	104 107 95

Table 4 – Global Connections

The NCSS themes and performance expectations above are correlated to specific AsiaQuest activities. Many of these activities recur from week-to-week. For example, Dan's Dilemma provides a different inquiry Dilemma each week. In the section below, the weekly themes are correlated to specific inquiry questions.

Discussion

The performance expectations in the NCSS standards "should enable students to exhibit knowledge, skills, scholarly perspectives, and commitments to American democratic ideals (NCSS 1994, p. 14). Using the standards to frame social studies curricula leads to *powerful* social studies. "Social studies teaching and learning are powerful when they are meaningful, integrative, value-based, challenging, and active (NCSS 1994, p. 162). In the analysis below, AsiaQuest's powerful curricular activities and themes are described.

AsiaQuest Themes and Inquiry Questions

AsiaQuest Themes	Description
Wk 1 – Unity & Diversity	This week focuses on studying aspects of China's population. What factors unify the Chinese population? What are the distinguishing characteristics of this culturally diverse population? What strategies have the people of China developed to help them live and work in harmony, and what tensions threaten this harmony?
Wk 2 – Stability & Change	This week focuses on time, continuity, and change. How can China modernize and improve life without losing the traditions, culture, and spirit that are unique to its population, and without threatening China's rich biodiversity?
Wk 3 – Cooperation & Conflict	China has experienced many forms of government over the centuries. Chinese society remains a unique blend of ancient principles and modern ideals. How do the people and ideologies work together in China? Are there tensions among them?
Wk 4 – Conservation & Waste	China's economic boom of the last decade has come with the costs of pollution, deforestation, desertification, and endangered species. What is China doing to address energy and food needs, as well as its ever-expanding population?
Wk 5 – Solutions & Resolutions	AsiaQuest focused on the mystery of Marco Polo's travels. The study of China forces us to think about our own lives, and reflect on what we have learned and what is yet to learn.

Table 5 – Themes & Inquiry Questions (summarized from Classroom Connect 1999)

Table 5 above summarizes AsiaQuest's themes and a description of inquiry questions that may guide students' research. Implementation of AsiaQuest allows teachers to attend to all themes, or focus on specific themes in more detail.

AsiaQuest Activities

Interactivity: Middle level teachers and students can experience several levels of interactivity including utilizing an extensive, web-based library of resources. The AsiaQuest site allows students to submit and review original artwork, communicate with other students using the Student Message Board, and email the Quest experts and expedition team to suggest travel and exploration routes. Viewing scholarly research and inquiry as an interactive process is one of the hallmarks of Classroom Connect Quests.

History Mystery: When researching a particular issue or subject, scientists and historians often accumulate more information than they need (Classroom Connect 1999). How do they determine which information is relevant? Have students solve today's History Mystery by using the Quest Library to conduct research. Have students report their findings to the class.

Dan's Dilemma: Read today's Dan's Dilemma. Have groups of students practice the art of diplomacy by work together to reach a compromise on diverse issues. Use evidence to support positions and to amend positions.

AsiaQuest in Students' Real World

One of the most powerful aspects of Quest projects involves making connections between the concepts and issues examined in the Quest and how those same issues relate to students' real world environments. The AsiaQuest themes described in this paper are just as relevant to students in their local community as to the Quest itself, and thus make the Quest a powerful social studies experience. For example, a people's history and culture, human influence on the environment, consumption and preservation of resources, human conflict and cooperation, and historically-based questions and mysteries about the local community all help students conceptualize AsiaQuest issues by situating the issues locally.

Conclusion

This paper provided a qualitative document analysis of the Internet-based AsiaQuest project. Although the analysis focused on activities for the middle grades, the Quest is appropriate at some level for all students in grades K-12.

The analysis correlated selected themes from the National Council for the Social Studies standards to specific AsiaQuest activities. The analysis also highlighted the role of technology in bringing interactivity to students' research and inquiry. The high-tech, collaborative nature of AsiaQuest is best described by the AsiaQuest team leader:

> Did Marco Polo ever go to China? With the help of the Internet, a remote satellite dish, and the brainpower of a million or so online participants, we hope to find the answer (Classroom Connect 1999, p. 44).

References

Classroom Connect. 1999. *AsiaQuest curriculum guide*. El Segundo, CA: Author.

National Council for the Social Studies. 1994. *Curriculum standards for social studies: Expectations of excellence*. Washington D.C.: Author.

Wood, F. 1996. *Did Marco Polo go to China*? Boulder, CO: Westview Press.

StarFestival: A Multilinear Approach to Cultural Identity

Kari Heistad, StarFestival, USA; Shigeru Miyagawa, MIT, USA

StarFestival is a multimedia K-12 educational package developed at the Massachusetts Institute of Technology that engages students and their teachers in the issues of diversity and cultural identity. It is based on the personal narrative of its developer, Shigeru Miyagawa, who returned to Japan after a 30 year absence, to answer his own personal question of Who Am I? StarFestival engages the students in answering their own questions of Who am I? Where did I come from? and Where do I fit in?

Already adopted officially by the Boston Public School district for use in K-5, this program aids teachers in developing skills and knowledge that helps them to address issues of cultural identity in the classroom with confidence. The CD-ROM introduces teachers to a multi-linear narrative, which encourages student-directed learning by making it possible to incorporate the student's own personal quest for identity and acceptance. By encouraging the students' natural curiosity and interest in relating the program s personal narrative to their own lives, the StarFestival curriculum facilitates the weaving of the threads of common experience between students and the teacher as the class explores their cultural identities and family backgrounds.

The StarFestival curriculum centers on the CD-ROM, *StarFestival...a return to Japan*, which was awarded Best of Show at the MacWorld Exposition. The CD-ROM is accompanied by 14 books and workbooks. These situate the technology-enabled curriculum within the technology context of today's schools. These resources also tie the entire K-12 curriculum to the National Social Studies Standards. As Dr. Michael Hartoonian, co-author of the National Social Studies Standards, notes:

> "*The StarFestival CD-ROM and Curriculum make a dynamic connection between the complexities of content, as envisioned by the national standards, and students' engagements with meaningful and authentic narratives and intellectual mysteries.*" Michael Hartoonian, Co-author of the National Social Studies Standards, Former President of The National Council for the Social Studies and Professor, University of Minnesota

The StarFestival CD-ROM is the personal narrative of "the Professor," Shigeru Miyagawa, who left Japan when he was ten years old, then returns to his homeland to find his roots. He takes with him the hi-tech Personal Digital Assistant (PDA). As the CD-ROM opens, the user finds the PDA damaged in the street. Using an electronic field trip format, the user is able to trace the journey of the Professor to the far away land. The voice of the Professor is played by Mr. George Takei, "Mr. Sulu" of Star Trek. The authenticity of the material, and its personal nature, draws the students in to identity with the Professor, and encourages them to explore their own cultural identity while learning about modern Japan.

StarFestival has been developed over an eight-year period in Shigeru Miyagawa's laboratory for technology and education at MIT. The design for these technology-based aspects of StarFestival are based on research carried out at MIT over the past 15 years, including at the Media Lab, which was the source of some of the key members of the StarFestival development team. The development of the StarFestival package was supported by the National Endowment for the Humanities and the U.S.

Department of Education, as well as Canon and NEC. The overall cost of the project was approximately $3 million.

Along with the CD-ROM, there is a web site, http://sfn.mit.edu, which provides a cutting-edge, broadband interactive TV experience on the web based on some of the content from the CD-ROM. Taken together, the StarFestival package allows teachers and students to acquire skills in some of the most important areas of technology, including use of CD-ROM, web, email, and some web authoring. The StarFestival package is now available from StarFestival Inc. A detailed description of the product line is found at: www.starfestival.com.

Pilot tested by over 100 teachers across the USA, the program has received rave reviews from educators and students alike.

The curriculum surprises you by producing work and projects that just blow you away. Those are the magical moments in teaching that all teachers live for. I was able to experience that excitement with the StarFestival curriculum. The curriculum allowed the students to be the teachers. They put their talents to work and created incredible projects and presentations. Not only did we learn more about Japan, but also we learned more about each other and ourselves. Scott Clark, Educator

StarFestival is able to draw upon the skills and experiences of the teacher, to blend this with a creative use of technology and insights into the issue of cultural identity to create a program that is empowering to both the teacher and the students. It creates an environment of inclusion and exploration that brings forth the issues of cultural identity which is engaging and educational.

Using Presidential Candidate Web Sites for K-12 Lessons

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Abstract: The Bush and Gore web sites offer much in the way of resources for lessons in political science. This paper reviews the information available through these web sites. Then, these resources are tied directly to state standards to demonstrate how these resources can be used to meet benchmarks.

Introduction

This year's election proved to be perhaps the most exciting election in our nation's history. Political science teachers across the country are rejoicing at the fact that many of their students, current and former, finally understand the Electoral College and the intricate workings of the U.S. republic. As if 24-hour coverage and near total media attention on politics were not enough, this year has also given civics teachers another resource for information regarding the presidential election process and the issues on which the candidates ran. The World Wide Web emerged has a tool for presidential candidates.

During the 1976 election, my teacher asked my classmates and I to visit the campaign headquarters for Governor Carter and President Ford in our hometown. We returned to class with bumper stickers, buttons, and even the occasional T-shirt. These artifacts become important resources for our lessons regarding the American political process. With the World Wide Web, teachers and students can now visit the candidates' campaign headquarters and come away with much more than buttons and bumper stickers.

The Bush and Gore web sites offer much in the way of resources for lessons in political science. This paper will review the information available through these web sites. Then, these resources will be tied directly to state standards to demonstrate how these resources can be used to meet benchmarks.

Issues and Multimedia

Both Bush and Gore used web sites during the 2000 presidential campaign. This is a relatively new technique for presidential campaigns given that the World Wide Web was in its infancy during the last presidential race in 1996. Web sites allowed the candidates to present detailed stands on issues such as gun control, abortion, the economy, and defense. For each issue, the candidates published a web page that provided a detailed overview of their respective stands. For instance, Bush's page for education included 1,561 words worth of detail summarizing his principles of reform, reform proposals, and his record on education in Texas (Bush-Cheney 2000, Inc., 2000, November). It also included links to 12 position papers and four speeches. Gore's education page provided similar details (Gore/Lieberman, 2000, November 28). His page included 1,191 words of detail summarizing his positions on standards & accountability and investing more in public schools.

In addition to issue papers, these web sites also provided links to speeches, schedules of upcoming events, means for supporting the candidates, and means for contacting the candidates via e-mail. Many of the speeches are available in text, audio, and even video formats. These multimedia files are formatted for the most commonly used streaming programs and players for the files are available for downloading from both sites.

For the most part, these pages are designed for an adult audience although the vast majority of the content is certainly designed for a general audience. As with any web site, teachers must first fully explore the site to determine if the content is appropriate for their students.

"Just for Kids" and the "Youth Zone"

Early on in the presidential race, Gore saw the need for a youth oriented section of his web site. *His Just for Kids* section included a crossword puzzle, a short quiz about Al Gore and his family, and a sort of treasure hunt where children are asked to look for a picture of Gore's dog, Daisy, which was hidden somewhere in the web site. Although Gore's child oriented pages had little in the way of content related to the presidential race, they did offer some fun activities related to the campaign (Just for Kids, 2000, November 28).

Later in the race, Bush decided to add a *Youth Zone* to his web site. These pages offered a considerable amount of content and lesson oriented material related to the process of electing a president. For instance, the first option in the *Youth Zone* was a description of the presidential election process related to a baseball game (Youth Zone, 2000, November 28). This description used baseball as an analogy to understanding both the primaries and elections. Not to be outdone by Gore's dog, Bush also includes the history of his cat within these pages. The *Youth Zone* included a streaming media file of Texas First Lady Laura Bush reading a childrens book, *Officer Buckle and Gloria.* Most importantly, the *Youth Zone* offered a collection of external links including an Electoral College calculator and links to government related web sites for kids. My favorite was the Kid's Secret Zone at the Central Intelligence Agency.

Meeting the Standards and Benchmarks

More and more states are moving toward at least some standardization of curriculum accompanied by a corresponding set of exams for each grade level. To meet these standards, teachers develop lesson plans that directly address the specifics outlined by the state. For instance, Michigan has a complete set of K-12 Draft Standards and Benchmarks for all major content areas (Content Standards and Working Draft Benchmarks, 2000, November 28).

One of Michigan's standards requires students be able to explain local, state, and federal governments and how power is exercised within those frameworks. A specific benchmark from that standard requires that middle school students be able to "Evaluate information and arguments from various sources in order to evaluate candidates for public office" (SOC.III.4.MS.1). As part of a lesson plan used to meet this benchmark, students could visit a presidential candidate's web page, read the various issue papers, and then write a report that contrasts the candidates' views on specifics.

Web pages offer the ability to visit the campaign headquarters of each presidential candidate without leaving the classroom. Furthermore, students come away more than buttons and bumper stickers. They leave with detailed information regarding how each candidate proposes to govern. In a year with an exciting election, it only seems proper that educational opportunities are more exciting than ever.

References

Bush/Cheney 2000. (2000, November 28). Austin, TX: Bush-Cheney 2000, Inc. Retrieved November 28, 2000 from World Wide Web: http://www.georgewbush.com

Youth Zone. (2000, November 28). Austin TX: Bush-Cheney 2000, Inc. Retrieved November 28, 2000, from the World Wide Web: http://www.georgewbush.com/youth/index.html

Just for Kids. (2000, November 28). Nashville, TN: Gore/Lieberman 2000, Inc. Retrieved November 28, 2000 from World Wide Web: http://www.algore.com/kids/

Gore/Lieberman 2000. (2000, November). Nashville, TN: Gore/Lieberman 2000, Inc. Retrieved November 28, 2000 from World Wide Web: http://www.algore.com

Content standards and working draft benchmarks. (2000, November 28). Lansing, MI: Michigan Department of Education. Retrieved November 28, 2000 from World Wide Web: http://cdp.mde.state.mi.us/MCF/ContentStandards/

How is technology using in SS methods courses?

Frequency report.

Philosophy statement….leads us to the framework

Technology and teacher education framework.

Three levels:

For each level. We define and explain with SS examples and present frequency.

Level 3 – Teacher Educator

A Level 3 use of technology might involve a presentation by a *teacher educator* in a methods class. The technology in this instance could consist of several video examples of real classroom teachers teaching high school students about the Pythagorean theorem, using different instructional models (e.g., one teacher using direct instruction, a second using group work with concrete models, and a third using software). Such an approach would typically involve students in analyzing, critiquing, and contrasting the various instructional methods

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Level 2 – Teacher

An illustration of a Level 2 use might consist of a teacher educator preparing *teachers* to appropriately incorporate a movie about the Pythagoreans and demonstrate web-based interactive proofs of the Pythagorean theorem to enrich their teaching of the topic. Such enhancements add context and meaningful visual support to the theorem and its applications.

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Level 1 – K-12 Student

An example of a Level 1 use could entail a teacher educator preparing teachers to guide their K-12 *students* to use dynamic geometry software (e.g., the Geometers Sketchpad) to investigate right triangles and their properties to develop the theorem in ways not possible with pencil and paper. Such an approach typically engages students in construction and exploration of figures. Students make conjectures based on observations of dynamic manipulations and measurements and verify their conjectures.

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45
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Cross-tabs
k-12 teaching experience
elem, middle, secondary
majority of students

Technology and Social Studies Teacher Education – Results from a National Survey

Cheryl Mason, Univ. of Virginia, USA
Michael Berson, Univ. of South Florida, USA
Walter Heinecke, Univ. of Virginia, USA

The beliefs and practices of College and University Faculty Members (CUFA) of the National Council for the Social Studies Social technology integration into teacher education were investigated using a questionnaire. This presentation will present the survey results and highlight methods of integrating technology into social studies methods courses.

The beliefs and practices of College and University Faculty Members (CUFA) of the National Council for the Social Studies Social technology integration into teacher education were investigated using a questionnaire. Analysis of the responses indicates use of technology in instruction remains low, and faculty remained undecided as to their philosophy of education. Computer training has had little impact on faculties, who have learned most things on their own except for html and multimedia programs, which most had never learned. Faculty reported being confidence in their personal use of technology as well as confidence in their use of technology resources in education. The exception to this was the use of videoconferencing and the use of spreadsheets and databases. The presenters of this session will present the survey results and highlight methods of integrating technology into social studies methods courses.

Methods

We analyzed the data from the Likert-type format by descriptive statistics (i.e. means, standard deviations, percentages, and frequencies) and by *t* tests. Short-item responses were analyzed by descriptive statistics. Data from the open-ended questions were subjected to a content analysis procedure. Responses were analyzed as whole-item units, and designated a code based on the theme they represented.

Computer use

Philosophy is important in that it is related to how often faculty use technology. Computer use is higher among those who believed in providing students with technology-related instruction. The mean computer use for these respondents is 35.06 (SD = 8.6), whereas the mean for those who believe in providing students with technology skills was 31.6 (SD = 9.8). Those who believed in neither philosophy had a mean of 27.7 (SD = 8.6), which is much lower than the others. Those who believe in providing students with technology-integrated instruction were more likely to rate their general use of technology as 'intensive' (n = 17), whereas those who believe in providing students with technology skills were more likely to select 'occasional' (n = 18).

Computer use by faculty in instruction is on the medium to low side. A little more than two in five (42%) respondents claim to use computers occasionally in instruction. One in five (19.8%) used computers throughout the semester, although not every class session, and only one in seventeen (6.2%) used computers every class session. When Social Studies faculty do use technology, it is to prepare lesson plans or communicate with others via email. Videoconferencing, spreadsheets, databases and technology tools are hardly used. Faculty report that their pre-service students use technology in a similar fashion. *Table 1* shows the percentage of those who reported on their own and their student's use of technology 'thoroughly' or 'every' class session. It is arranged in descending order. There is no difference in how often professors, associate professors, assistant professors and instructors use computers.

Confidence

Taken together, faculty report being confident in their use of technology. Seven in ten (69.8%) respondents agreed or strongly agreed that they were confident using computers in many settings whereas one in three (27.1%) did not feel confident.
Faculty report that they have the greatest confidence in using email and the Internet to support individual or small group work. These were also the technologies that were used the most. More than half of faculty report being confident in incorporating the WWW and email in instruction, using computers in many settings, choosing effective instructional software/technology tools, teaching search strategies for use on Internet and CD-ROMs, implementing resources to support SS teacher education, teaching students to prepare lesson plans that access information via networks and modems, teaching students to select and use technology appropriate to task, teaching students to prepare lesson plans that use electronic encyclopedias and catalog, developing computer based presentations for use in instruction, teaching students to prepare lesson plans incorporating word processors, spreadsheets and databases in instruction, and working with K-12 teachers to integrate technology in local schools.

Only preparing word-processed lesson plans, communicating via email, and accessing information from the web were actually used with any frequency. There is also much reported confidence but have the greatest lack of confidence in videoconferencing. Faculty have very low confidence in preparing student's to use spreadsheets and databases, and to use videoconferencing. Faculty who believe in providing students with technology-integrated instruction (n = 4) were far less likely than those focusing on technology-skills (n = 16) to strongly disagree that they were confident using spreadsheets and databases. No other measure of confidence in the use of technology had such a large spread when philosophy is looked at.

Web-based Delivery of a Generic Research Methods Module (for Social Sciences): The Graduate and Post-Graduate Experience.

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Abstract: One educational development approach at Liverpool John Moores University (JMU) from its Business School (LBS) is that of supported web-based learning systems to complement traditional teaching. This paper focuses on recent work at LBS concerning a Masters module, which progressively developed since 1998. The module is web-based and provides a teaching, learning and support environment for academic staff and students. It is flexible in that it is variably credit rated and can be studied in full-time, part-time and distance modes. The approach used in the delivery of the module has facilitated the examination of module/programme support development possibilities on the web from academic, quality and commercial perspectives as well as the cybernetic and evolutionary nature of learning. A feedback model is developed here to inform development of a support web-site. An exploration of student attitudes and perceptions to the technology, factors related to the learning strategies adopted by students and student learning styles were used to inform an over-pinning LBS strategy of a web supported teaching and learning environment, coupled with an innovative longitudinal support mechanism for learners.

INTRODUCTION

Throughout the late 1980's towards the middle 1990's educational technology developments in the UK developed from Open Learning (text based), through to Computer Assisted Learning (CAL), which included software and hypertext on CD-ROM and file servers. This can be collectively referred to as Resource Based Flexible Learning (McClelland 1996). Traditionally one might argue that this concept considers learning to be student centred as opposed to tutor centred, where learners provide their own routes through a learning domain negotiating a set of learning events. This maximises flexibility for the learner in the way learning occurs. However, pedagogically it may not be appropriate to provide a learner with total unconstrained flexibility in a RBFL environment. This has been put concisely by (Boot & Hodgson 1990) in their discussion on constraining open learning:

"A definition [of open learning] revolves around a notion of freedom from constraints on the learning process... such constraints are grouped as administrative (time, duration, cost, etc.) and educational (objectives, methods, sequencing, entry qualifications, assessment, etc.)...The removal of all constraints would ...leave us with no educational provision at all. The issue then is less one of openness and more one of the extent to which formal educational provision has bounded learning."

Interest about the learning environment and the personal attributes of the learners continue to concern developers of learning environments, especially where RBFL is an issue. In the early 1990's this was particularly the case for those with interests in the resource of computer assisted learning (CAL), because the utility of CAL was sometimes a point of debate about how it could contribute to understanding, as we observe it, in a currently limited state of development. More generally, arguments about how learning environments could constrain learners in the way that they learn, or free them to explore, were seen to be as much about socio-culture and paradigms, as about pedagogy. The identification of constraints and degrees of learner freedom is something that is a concern of architects of learning environments (for example, groups of course tutors). In the mid to late 1990's studies (McClelland 1994 and McClelland & Yolles 1997), concerning CAL, demonstrated that constraints derived from a learning domain paradigm provide for that environment a set of learning "truths" that will determine overall learning strategy. It is this paradigm that will act as the set of macroscopic constraints for learners. Different paradigms operate in different levels of system, from courses; to course programmes.

Most learning theory centres on the work of (Kolb 1974 & 1984) but it is feasible to look further afield by examining learning environments as though they are systems, and move slightly away from the traditional language of learning theory. This research aims to report a systemic approach towards modelling learners and learning environments based on the ideas that derive from theories of viable systems, exposed by cybernetic learning environments (McClelland & Yolles 1997). In this case viable means able to maintain a separate (fully or partly autonomous) existence. Viable systems therefore participate in the development of their own futures through self. The idea of viable inquiry systems was identified in order to explore the nature of methodology in its relation to method, in particular with regard to the impact of the learner on the situation being inquired into. In parallel the idea of Viable Learning Systems can be developed. These can be seen as learning systems that include cybernetic learning strategy and learning style as well as approach to study (deep, surface, reproducing learning) and where change in these can be explained through ideas from the concepts of self-organisation and evolutionary theory.

APPROACH TO DELIVERY

With current developments in technology and learning supports for modules and programmes and with the rapidly changing means by which students access information, a strategy exists within LBS to develop web-sites for undergraduate, postgraduate and professional students studying modules. The strategy uses a design and template developed by (Laws 1998) which is learner friendly (to students) and addresses some of the constraints placed upon learners, such as time of study, place of study, interaction with a tutor and availability of scarce resources. Also it is design friendly (to academics), being accessible for authoring purposes in the universities campus wide information system structure. The results of a follow up study on one module, developed to the Laws template are reported here. The Research Methods module, code BUSAEM303 (see http://cwis.livjm.ac.uk/bus/busrmccl/aem303) has a web-site developed by (McClelland 1998).

This paper presents some perceptions,and attitude observations of students and staff concerning use of the web-site. In addition an evaluation of the cost benefits, pedagogical appropriateness and effectiveness as a support in developing students as researchers, is also made.

The web-site for the module contains the following supports:

Learning supports:
Course outline and recommended texts; A copy of the module assessment, with links and supports; Staff profile/contact details, an e-mail link; Links to other web-sites (learning & research and international); Notice board; Sources of Information and a Research glossary

Activity based supports:
Fifteen topic areas with hypertext links to: Lecture notes; Lecture presentations; Workshop/Case questions; Individual learning resources; Articles on-line.

The module can be 12 credits, 15 credits or 20 credits in size (120, 150 and 200 learning hours respectively) supported through 10 or 15 one-hour lectures and 10 or 15 two-hour problem based learning tutorials/workshops. The module is assessed by producing a research proposal for a Masters level dissertation (size of assessment related to credit rating).

LEARNER PERCEPTIONS OF THE WEB-SITE

Liverpool Business School has undertaken several studies involving students that have used the web-site template for a range of modules see (McClelland 2000a & 2000b). As part of the overall studies of web-based learning in LBS a questionnaire was developed and used as a vehicle to gauge student perceptions and qualitative information, in order to refine the design and content of subsequent sites.

A modified version of the above questionnaire was administered to a cohort of students studying the Research Methods module in semester one of the 2000/01 academic year. Of the eighteen students on the cohort twelve were full-time students on a one-year programme in European Studies and six were part-time students on a two-year programme in Leisure and Tourism Management. Some preliminary findings, as extracts, are evaluated here as contributions to developing the web-site.

In addition to the questionnaire students completed a learning styles inventory adapted from Kolb and McCarthy (Kolb 1984). The inventory is designed to explore the way people prefer to learn by indicating statements that refer to their learning predispositions. Scores are obtained and from these dominant learning abilities can be deduced. These fall into four main groupings; *Abstract Conceptualisation* (AC), *Active Experimentation* (AC), *Concrete Experience* (CE) and *Reflective Observation* (RO).

As well as being part of this research, learning style theory is included as an input to the philosophy of research on the Research Methods module [1].

Pairings of learning predispositions enables participants to be located in learning style quadrants. So, for example, if dominant learning abilities are *AC* and *AE* the student would be a *Converger* (practical application of ideas). *CE* and *RO* would indicate a *Diverger* (imaginative ability). *AC* and *RO* would indicate an *Assimilator* (ability to create theoretical models). *CE* and *AE* would indicate an *Accommodator* your greatest strength lying in doing things, in carrying out plans and experiments and involving oneself in new experiences.

Student accessibility to the site and guidance given about the site were not factors in the amount of time they spent using the sites. The cohort also indicated that necessary information provided on the sites did not suffer from problems of clarity. A series of questions presented surrounding frequency of use of the sites showed no effects from the *gender; age;* and *current degree mean mark* .

It was observed from findings that there were no differences for either of the variables *gender* or *international category of student* when tested against perceptions of *ease of use of the site, clarity of design of the site, the responsibility or restriction of self-directed nature of learning* and the *student agreement on provision of administrative support.* These observations were made using independent t-tests ($p > 0.05$).

However, when the variable *Programme* (European Studies and Tourism and Leisure Management) was tested against each of the above perception variables, no differences were observed with one exception, students on the Masters in European Studies were between Responsible and Neither responsible or restricted for self-directed learning (mean 2.17) rather than students on the Masters in Tourism and Leisure Management who were between Very responsible and Responsible (mean 1.5). Theses observations were made using an Independent t-test ($p > 0.05$), the latter difference was supported using the same test ($p < 0.05$).

The same set of perception variables were tested against the variable *student learning styles* and the variable *age groups* (21 < 24, 24 < 27, 27 < 30, > 30). No effects were observed based on *learning styles* or *age*. These observations were made using One-Way Analysis of Variance ($p > 0.05$).

Other observations included student perceptions on the importance of focused web-site supports, which included: *Other web-sites to visit*; *Other web-sites to visit (international); Learning Supports*; *Lecture slides; Sources of Information* and *Glossary of terms.*

No differences were observed with supports tested against the variable *mode of study* (Full-time, Part-time) with one exception, *Other web-sites to visit (International)*, where part-time students perceived the facility between neutral and not very important (mean 3.17) rather than full-time who were between Very important and Important (mean 1.92). The observations were made using an independent t-test ($p > 0.05$), the latter difference was supported using the same test (p

[1] Lectures on the Research Methods module involves the discussion that a predisposition to particular learning styles have implications for philosophies that researchers may adopt.

< 0.05).

No effects were observed with supports when tested against *student learning styles* with one exception, *Other web-sites to visit*, where students exhibiting the style of *Diverger* perceived the facility as of differing importance than students who exhibited styles of *Accommodator*, *Assimilator* and *Converger*. The observations were made using a One-Way Analysis of Variance ($p > 0.05$), the latter difference was supported using the same test ($p < 0.05$).

Extensions of these studies will ultimately allow learning strategy to be related to student learning styles and approaches to study. The model proposed here incorporates observations to support design and content developments for the module.

In terms of the cost benefits, the module has resulted in savings of approximately £4 - 5000 per delivery on resource items such as photocopying handouts and staff time per module, whilst students perceive increases in quality and support.

CONCLUSION: MEETING CHANGING NEEDS

The stated aims of the module are to plan and design research linked to certain research philosophies. The assessment for the module is to produce a Research Plan and Proposal for Masters Dissertation.

Three paradoxes are observed here:

1. The link between the aims and assessment for the module. The assessment does not focus on the learners' ability to directly undertake research, rather, the focus is on the learners' ability to plan and design research linked to certain research philosophies.
2. The teaching of the module. Due to the generic nature of this module and the diversity of student backgrounds, teaching challenges arise concerning the depth and breadth of analytical approaches to be delivered in contact sessions, the subject matter taught and the prior knowledge that is assumed from learners.
3. The relationship between the needs of students and research support for learners. This highlights that clearly there is a need for learners to use supports after the learning outcomes have been met for the module, in order to support to their actual research beyond the module.

In developing the module and the approach to delivery the above factors were incorporated as well as the following: The generic requirements for Masters level study; A range of team curriculum design inputs; Feedback from previous cohorts of LBS students using web-based supports. As the supports for the Research module are web-based, many of the above concerns are being addressed through the design platform. The web-site contains cases and links to both qualitative and quantitative articles, there are links to lower level undergraduate modules covering research methods and related disciplines, as well as on-line support materials. All supports are chosen for related content and are regularly updated; there are facilities to explore analytical disciplines and research approaches in depth (as well as breadth), in order to fully inform and support learners as they develop in research.

Access to the web facility is unconstrained It is regularly updated (in terms of lecture material, links and versions of analysis tools). There are also email links for tutor consultation.

The architect of learner supports and the learner derive benefit through the tailored design of the web-site, based on learner feedback, having supports available outside of the constraints of time and place and from the facility of both subject depth and breadth beyond the lifetime of the module. This model is used to foster a medium of a more holistic multi-faceted approach to developing students as researchers.

REFERENCES

McClelland, R.J. (1996) The Virtual Business School: What does it all mean for UK Business Schools as we enter the next millennium? Conference: Innovative Practices in Business Education, EDINEB, Orlando, Florida, USA 4 - 7 December 1996

Boot, R.L. & Hodgson,V.E., (1990), Open Learning: Meaning and Experience.Contained in Beyond Distance Teaching - Towards Open Learning. Ed. Hodgson et al. Open University Press.

McClelland, R.J. (1994) Teaching and Learning Styles: A Model for the Management of Business Interdisciplinary Subjects in the University Sector. Conference on Challenging the Learning Experience of Management, Bolton Business School , 20 - 22 November 1994.

McClelland, R.J., Yolles, M.I. (1997) The Cybernetics of Learning Environments cti-afm 8th Annual Conference 8 April 1997

Kolb, D.A., et al, (1974). Organisational Psychology: An Experiential Approach. Englewood Cliffs, New Jersey. Prentice-Hall.

Kolb, D.A. (1984), Experiential Learning. Experience as the Source of Learning and Development. Englewood Cliffs New Jersey, Prentice Hall.

Laws (1998) Course Content and Distribution, Web Based Learning Seminar, LJMU, 27 April 1998

McClelland, R.J. (2000a) Campus Wide Information Systems: An integration development for H.E. in Information Systems - Research, Teaching and Practice McGraw-Hill pp 664 - 667 ISBN 007 7097556

McClelland, R.J. (2000b) Digital Teaching, Learning and Program Supports: An Examination of Developments for Students in Higher Education in Euromicro 2000, Proceedings of the 26th EUROMICRO Conference pp 43 - 47 ISSN 1089-6503

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Multimedia Resource File: A Practical Project for Preservice Teachers

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Abstract: The Multimedia Resource File Project is used to allow students to practice and demonstrate integration of advanced technology and content skills in planning and organizing an instructional resource for high school teaching. The student will develop advanced skills in searching the web, evaluating and selecting resources, dealing with copyright issues, organizing resources, and producing a CD product.

Introduction

The National Educational Technology Standards (ISTE, 2000) consist of six general areas: (I.)Technology Operations and Concepts; (II.)Planning and Designing Learning Environments and Experiences; (III.)Teaching, Learning, and the Curriculum; (IV.)Assessment and Evaluation; (V.) Productivity and Professional Practice; and (VI.) Social, Ethical, Legal, and Human Issues. In a preservice teacher education program, there is a need for major projects that allow students to show proficiency in these areas. The following project, the Multimedia Resource File, includes experiences in all six of the goal areas. Once students have completed this project, they should easily be able to implement it in a high school setting. Thus, in planning and implementing this one major project the preservice teacher can address all six of the NETS goals. This may be a part of the Methods course, or a Technology course. Or it may be a departmental capstone requirement that is not a part of either course, but uses elements from both.

Assignment

In consultation with an advisor, the student selects a general topic as the subject of the project. The topics that will be demonstrated are "The Civil Rights Movement," and "The Vietnam War." Both of these topics provide a rich context for multimedia resources because they are fairly recent and primary sources are available.

The student then conducts an exhaustive Internet search for resources related to the topic. These may include text, graphics, audio (speeches, protest songs), video (news broadcasts), or links to webpages. Each resource is carefully evaluated and included only if it is judged to be of value to a high school teacher. A critical part of the project is that the student obtains permission to use all copyrighted material. The resources are then arranged by subtopics, indexed clearly, and burned to CD.

The objective of the project is not to plan a lesson or unit, but to collect resources that may be used in future lessons that may involve PowerPoint or WebPages or other media. The student will develop advanced skills in searching the web, evaluating and selecting resources, dealing with copyright issues, organizing resources, and producing a CD product.

Assignment: Multimedia Resource File

Objective: Student will design and produce a Multimedia Resource File, which utilizes expertise in technology and in content to locate and select appropriate resources for a topic in the high school curriculum. The project will involve advanced Internet searching and evaluation of resources, including copyright permissions. It will also involve advanced technology skills in organizing and producing a data CD, as well as advanced content expertise is selecting and planning instruction.

Activities:

1. Select a topic from your content area's high school curriculum. Discuss topic with instructor.
2. Conduct an extensive Internet search for multimedia resources (text, graphics, audio (speeches, protest songs), video (news broadcasts), or links to webpages) that may be helpful in teaching that topic.
3. Obtain copyright permission for EACH resource.
4. Organize the file. Discuss outline with instructor.
5. Arrange resources in folders and subfolders. Create an html document that serves as an index, and includes links to resources either on the CD and to webpages on the Internet.
6. Burn the CD.
7. Include a self-evaluation, using the rubric below.

Scoring Rubric: (10=A, 8-9=B, 6-7=C, 5 or less=F)

- **Content** (5 points possible)
  - 5 points: Topic is appropriate for high school course. The topic is completely covered and a wide variety of types of resources are included. Resources are well organized. Copyright permissions are included.
  - 4 points. Topic is appropriate. Topic is well covered and a variety of resources are included. Resources are well organized and copyright permissions are included.
  - 3 points: Topic is appropriate. Topic is covered and some variety of resources are included. Resources are organized and copyright permissions are included.
  - 2 points: Topic is appropriate. Topic has weak areas and variety of resources is limited. Problems with organization. Some copyright permissions are not included.
  - 1 point: Topic is appropriate. Topic has many weak areas, and resources are limited in number and in variety. Organization is poor. Copyright permissions are not included.

- **Technical** (5 points possible)
  - 5 points: CD runs without error. Html table of contents includes outline and links to resources on the CD as well as links to Internet pages. All resources display without error.
  - 4 points: CD runs without error. Html table of contents links are without error. Most resources display without error.
  - 3 points: CD runs. Html table of contents has some errors. Most resources display without error.
  - 2 points: CD runs. Html table of contents has many errors. Many resources have errors.
  - 1 point: CD runs. Table of contents is missing or does not work.

International Society for Technology in Education. (2000). National Educational Technology Standards (NETS) and Performance Indicators for Teachers. Eugene, OR: Author.

The increase in the use of computer-based instruction in education and the proliferation of middle schools occurred concurrently in the 1980's. Computer-based instruction was viewed as a new learning tool, which could facilitate a variety of new teaching strategies for educators to employ in the classroom. The formation of middle level education was seen as an attempt to establish meaningful learning for the segment of schooling that encompasses early adolescence at the stage of life between the ages of ten and fifteen (National Middle School Association, 1995). The symbiotic relationship and development of these two educational entities commenced in the 1980's and continues at the moment. The purpose of this study was to determine the frequency and the nature of applications of computer-based instruction in the middle school social studies classrooms in the state of Missouri.

SPECIAL NEEDS

Section Editor:
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I recently read an article about a school for special students. Spending for these students was two to four times the average for students attending 'regular' schools in that state. The school was operated as a residential school and the students had access to many programs that the students in less funded schools did not. The test scores for these special students were, for the most part, outstanding. The state was very proud of this school for special students. However, the school, which was to be one of several in the state, was very expensive to run and maintain. The state therefore decided that this school for special students would be the only one of its type that would be funded. How is it that this one school for special students received such funding and such attention? It turns out that the school is the Illinois Math and Science Academy and these special gifted students were selected after a very rigorous admissions process.

No one denies that students who can do well in math and science (or music or art) should be penalized for their abilities. Quite the contrary, these students should be encouraged to excel through their talents. But what about the students who have been placed in 'special education' classes. Are these students, too, not special?

Each state provides guidelines as to how students who fall within their definitions of 'special education' should be assisted. However, these guidelines are often bureaucratic in tone (as is generally required when developing guidelines). The articles in this section of the Technology and Teacher Education Annual provide a varied and humanizing look at both the students and the educators who work in the area of special education. As you will see, the money is often not there. The teachers are making remarkable innovative and important uses of technology. As you read through these articles, remember that these are special teachers and researchers working with special students in special circumstances. Remind yourself that we are lucky to have such special people working with us.

Preparing Teachers To Use Assistive Technology In Inclusive Settings

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"Abstract"
With the passage of special legislation for the education of children with disabilities, educators are required to provide services to children with disabilities and consider the appropriateness of new technologies as a tool or intervention. This article considers what teacher educators can do to familiarize their preservice teachers with options in assistive technology and prepare them to work with assistive technology. Preservice teachers need minimum competencies in technology and assistive technology. Teacher educators by providing three-prong instruction may play an important role in awakening in each prospective teacher the desire and ability to be the conduit for using assistive technology to develop the potential of each student with special needs.

The Education for All Handicapped Children Act (PL94-142) was passed in 1975 to address the needs of students with disabilities. It was renamed The Individuals With Disabilities Education Act (IDEA) in 1990 and was reauthorized and amended in 1986, 1990, and 1997. Special Education programs in all states are required to fulfill the mandates of this federal legislation or face the loss of funding to local districts. IDEA requires that students with special needs be educated in the Least Restrictive Environment (LRE). Although students with special needs may be placed in self-contained classrooms, the vast majority of them are included in the regular classrooms. Inclusion refers to the placement of children with special needs in age-appropriate settings in which their needs are addressed by the regular education teachers as well as special educators.

With the passage of IDEA Amendments of 1997, Public Law 105-17 educators are required to consider the appropriateness of new technologies as a tool or intervention for every student with an Individualized Educational Programs (IEP). An increasing number of students are being prescribed assistive technology. Assistive technology can help children compensate for their disabilities, focus on their abilities, and reach their full potential. If this trend continues, an increasing number of regular education teachers and special education teachers will need to have knowledge of and experience with assistive technology.

This article considers what teacher educators can do to familiarize their preservice teachers with current options in assistive technology and prepare them to work with assistive technology. Preservice teachers need minimum competencies in technology and assistive technology. Teacher educators can provide three-prong instruction. First, preservice education programs should include an exploration of the variety of challenges students may have. Second. training should also provide familiarity with the laws and terms associate with assistive technology. Third, preservice teachers should have hands-on experience with assistive technology hardware and software. All teachers need these three kinds of information in order to assess the educational challenges and learning differences of each student and to provide assistive technology devices and services.

Section 602 of the Ammendments of IDEA (1997) define the terms "assistive technology device" and ve technology service". The term "assistive technology device" means any item, piece of equipment , or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disability. Assistive devices allow children with special needs to access technology in the most efficient way. Educators need to be familiar with a variety of alternate keyboards, become familiar with QWERTY (standard) keyboard, sample touch screens, trackballs and adaptive devices for students with physical disabilities. Familiarity with assistive listening devices and Braille options may be necessary as well. Examples of assistive technology devices include: adapted track ball, digital camera, IntelliKeys MIDI creator, scanner, switches, touch screens and specialized software. The term "assistive technology service" means any service that directly assists an individual with a disability in the selection, acquisition, or use of an assistive technology device. Such services include the evaluation of the needs of children, providing for the acquisition of asssitive technology, selecting designing, customizing, adapting, and repairing assistive technology.

Regarding the first prong, preservice teachers can learn about special needs children from the literature and from field experiences in a variety of setting that service special needs children. The instruction can be integrated into curriculum courses or taught in separate courses designed specifically to address inclusion and assistive technology. For example, instructors teaching in the curriculum areas of language, reading and literature can consider how to identify students with language-based learning disabilities and how to use assistive technology as an intervention for these children. Instructors can consider assistive technology devices that help children who have difficulty decoding or comprehending text, writing, organizing, evaluating, remembering or generally getting their thoughts in written form onto paper. **L D OnLine** is a website that provides an interactive guide to learning disabilities for parents, teachers, and children (http://www.ldonline.org/).

Regarding the second prong, review of the laws that support assistive technology can be conducted. Preservice teachers can use the Internet to identify current law cases and discover more about agencies that provide services to children with special needs. Laws which should be considered are IDEA, Section 504 of the Rehabilitation Act (Rehab Act) 1973, Americans with Disabilities Act (ADA) 1990, and the Telecommunications Act of 1996. Some helpful web sites for national information include (a) *Center for IT Accommodation (CITA)*: Provides information on legislation and policies on information systems accessibility - http://www.itpolicy.gsa.gov/cita/index.htm (b) *The National Center to Improve Practice (NCIP)*: NCIPnet focuses on special education and technology and augmentative communication- http://www2.edc.org/NCIP/ (c) Office Of Special Education And Rehabilitative Services-United States Department Of Education: Provides an overview of schools' responsibilities toward ensuring that technology is accessible, and a listing of resources in the Federal government to assist schools- http://www.ed.gov/offices/OSERS/whatsnew/whatsnew.html. Individual states are also likely to have agencies and websites.

Regarding the third prong, preservice teachers need to be familiar with hardware and software that can assist in the inclusion of students with disabilities into the regular classroom as well as make the computer accessible to students with disabilities. They should have hands-on experience with hardware and software that support a variety of curriculum areas. For example, there is software that supports the writing process through the use of features such as auditory feedback, word prediction and organizational strategies offer a variety of applications for the classroom. Reading software may provide reading and cognitive learning strategy support through auditory feedback, enhanced visual display and customization to meet specific student needs. These include optical character recognition systems, e-text, and timesaving resources. Math software may provide organizational support, auditory feedback and additional problem solving options. Two helpful websites include **ABLEDATA:** A national database of information on more than 17,000 products that are currently available for people with disabilities- http://www.abledata.com/ and **The Alliance for Technology Access (ATA):** Provides location information for the Alliance for Technology Access regional centers. The Alliance assists individuals with disabilities access technology, mainly through computer resources- http://www.ataccess.org/

Assistive technology requires clear planning to benefit the students involved. Preservice teachers need to have a clear understanding of the reason why it is being incorporated into the education of children with disabilities or the technology becomes just another add-on. Preservice teachers need to develop an awareness that many possibilities for assistive technology exist within an inclusion class environment . . The teacher educator may play an important role in awakening in each preservice teacher the ability to be the conduit for using assistive technology to develop the potential of each student with special needs.

Academic Achievement Problems: Developing Curriculum Based Software to Help Low Achievers

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Abstract: Low achieving children (LA) usually need a very individualized instruction. Teachers rarely can give them this kind of instruction because they have too many children in the classroom. Computer technology may be extremely helpful for those students. However, the lack of contact between developers and school teachers leads to several problems: lack of motivation, cognitive confusion, and teachers' resistance. If computer technology has to help LA, the instructional software must be based on the school curriculum. From our own experience in developing curriculum based software we can underline several guidelines. We took the curriculum materials as the base for the software we were going to develop. Teachers told us what specific contents they were going to teach, and these contents were the ones the software included. The curriculum based software we have developed proved to be useful to teach LA the selected academic contents and strategies.

Introduction

Low achieving children usually need a very individualized instruction to reach the average academic level of their classroom group (Bornas, Servera, & Llabrés 1997). Teachers, however, rarely can give them this kind of instruction because they have too many children in the classroom. Although some help is provided for disabled children (e.g. blind or developmentally retarded), by the school administration, low achievers (LA) remain underattended (Wong 1996). In fact, they often do not cause big problems to their teachers nor to the school. However, repeated failures lead them to a growing academic delay or décalage, and many of them will not finish their primary studies.

Computer technology may be extremely helpful for those students, mainly because the computer can repeat the same instructional content as many times as the student needs to master it (Burt & Ryan 1997; Torgesen & Barker 1995). Hundreds of different addition exercises, for example, can be easily presented to the student when he or she needs to master this arithmetic operation. Hundreds of pages can be shown to let the student read and to improve his or her reading skills. However, a serious problem comes up at this point: having computers in the classroom does not help LA unless an appropriate software is installed on them (Bender & Bender 1996). The quantity and the variety of the software contents are important but much more important is the coherence between its teaching style ant the teaching style of the regular teacher and the school.

Instructional software is often independent of the school curriculum.

Most developers are not in contact with the specific school where the software will be used, and they make use of general, non-specific curricular or educational trends to select the software contents, to set the learning sequences, to program what feedback the user will get as a result of his or her actions on the computer, the global interactivity level between software and children, and so on, thus configuring an educational "style" for the software they are creating. The lack of contact between developers and school teachers leads to several problems. Firstly, children may wonder why they need to do the programmed tasks if these are not the ones they usually do with his or her teacher. Students can think that doing these tasks has no sense in order to learn what high achievers already learned, say reading fluently or dividing. In addition, if the computer tasks are too repetitive they can bore the student and lead him or her to avoid them. The lack of motivation can be the final result in both cases (Lewis 1998).

Secondly, since the teaching style of their teachers may be absolutely different from the educational "style" of the software, children can show cognitive confusion and they can have some trouble to learn specific concepts or strategies. It does not matter how some things are taught they will be learned by all the students (e.g. the names of the basic colors). Other things, however, have to be taught the same way to make sure that LA learn them. For example, there are several ways to teach how to subtract 17 from 20. Probably, high achievers will have no problem to learn two or more subtracting strategies simultaneously, but LA may get confused if they are taught a different subtracting strategy before they master the first one. On the other hand, however, if a specific strategy is not learned by the student then he or she has to be given the opportunity to learn another strategy to solve the same task.

Thirdly, teachers may be reluctant to use the software if (a) the software contents are not the ones they would have chosen, (b) the software instructional style is not coherent with their own teaching style, and (c) the software may cause motivational or cognitive problems to their students.

Guidelines for Developing Curriculum Based Software

If computer technology has to help LA, the instructional software must be based on the school curriculum. Therefore, software developers have to be in contact with the school and the teachers. Furthermore, instructional sofware developers need some knowledge about curriculum related aspects (what a curriculum is, why it is important, how teachers use it, and so on) to understand the teachers demands when they are planing to use computer technology in the classroom.

From our own experience in developing curriculum based software (an experimental study will be presented at the SITE2001 Conference) we can underline several guidelines that, in our opinion, have to be taken into consideration. The software we are referring to was designed to help third grade LA students to improve their performance in reading comprehension and math.

Firstly, the LA students were selected not only because of their poor performance on the evaluation tests that we administered them but also because their teachers considered them as LA. This is to say that the opinion of the teachers was an essential criteria during the students selection process. In fact, some students who performed lower than the average on the standard tests were not considered LA by their teachers, and viceversa, some average performing students were selected since their teachers considered them as LA. The knowledge a teacher has about his or her sutudents can't be replaced by the knowledge we get when we administer them an academic performance test.

Secondly we looked at the books and other curriculum materials that students were using regularly in the school, and we took them as the base for the software we were going to develop. For example, we bought a book of the same publisher and the same level than the one the students used to improve their reading skills in the classroom. The reading software exercises and the classroom reading exercises were quite similar. This was not only true for the sofware contents but also for the learning strategies the software was designed to teach.

Thirdly, teachers told us what specific contents they were going to teach during the next two months, and these contents were the ones the software included. Therefore, while LA sutudents used the computer software they learned the same contents than the other students did. In addition, although the software was not strictly linear, the learning sequence through the curriculum contents was also very similar.

Finally, it is worth to say that the sofware was not only based on the teachers knowledge nor on the shool curriculum. To develop the software we made use of the psychological and educational knowledge about (a) low achieving students and their cognitive problems, (b) learning strategies and metacognition, and (c) effective teaching strategies. In other words, the shool teachers and the school curriculum must be considered carefully to develop curriculum based software, but developers need knowledge about the learning and teaching processes.

Conclusion

The curriculum based software we have developed proved to be useful to teach LA the selected academic contents and strategies, although at the end of the computer using period LA performance was still lower than performance of high achievers. In addition, beyond the performance results we would like to underline that LA students really liked the software and they were well motivated to use the computers. Teachers got very involved in the research process since they participated from the beginning, when LA students were selected, along the whole development process: contents, strategies, feedback and reinforcement, evaluation, etc.

References

Bender, R. L., & Bender, W. N. (1996). *Computer-assisted instruction for students at risk for ADHD, mild disabilities, or academic problems*. Needham Heights, MA: Allyn & Bacon.

Bornas, X., Servera, M., & Llabrés, J. (1997). Preventing impulsivity in the classroom: how computers can help teachers. *Computers in the Schools, 13*(1/2), 27-40.

Burt, K. L., & Ryan, C. L. (1997). An investigation of the effects of medication and the use of computerized feedback in task performance of AD/HD children. *Issues in Special Education & Rehabilitation, 12*(1), 56-70.

Lewis, R. B. (1998). Assistive technology and learning disabilities : Today's realities and tomorrow's promises. *Journal of Learning Disabilities, 31*, 16-26.

Torgesen, J. K., & Barker, T. A. (1995). Computers as aids in the prevention and remediation of reading disabilities. *Learning Disability Quarterly, 18*, 76-87.

Wong, B. Y. L. (1996). *The ABCs of Learning Disabilities*. San Diego, CA: Academic Press.

The Need for Assistive Technology in Educational Technology

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Abstract: This paper will address definitions, services, levels of technology and application of assistive technology concepts as they relates to education. An overview of the NCATE and ISTE guidelines concerning assistive technology, and the current elements of the graduate educational degrees concerning assistive technology is provided. Federal legislation concerns the application of assistive technology in an educational setting and its possible impact on educational technologists. A model is proposed for a course concerning assistive technology and universal design to better prepare instructional technology graduates to enhance the performance of students with disabilities and design educational material for increased accessibility. This session is intended for educators in instructional technology and exceptional education programs.

Disabilities rights leaders have said that the application of technology will be the equalizer of the 21st century (Flippo, Inge & Barcus 1995). Through the use of assistive technology (AT) devices, many students can decrease their isolation and become an important part of a regular classroom, their least restrictive environment. Assistive technology is a basic tool in the educational process for any individual who may be experiencing a disability. Technology that is used as tool in education is the basic definition of educational technology.

This paper will address assistive technology and services, overview the current assistive technology elements of graduate educational technology degrees, and present a model for including assistive technology to better prepare instructional technologists to participate and enhance the performance of students with disabilities.

What is Assistive Technology?

The Technology-Related Assistance for Individual with Disabilities Act of 1998 (PL 100-407) gave us the first legal definition of assistive technology devices and services. An assistive technology device was defined as: any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities. An assistive technology service was described as: any service that directly assists an individual with a disability in selection, acquisition or use of an assistive technology service.

What are the Levels of Assistive Technology Use?

In considering assistive technology, you must consider the environment, the individual, and the characteristics and levels of the technology (Gitlow 2000). Assistive technology may be classified as high, middle or low tech. The concept of a high technology device usually includes items that require computers, electronics or microchips to perform some function. Low technology usually does not require an outside power source. An example of high technology is a computer. The application of technology could range from having a computer read a book (high tech) to printing out material in a larger font to a student using a magnifying glass (low tech) to read material.

Along with considering the level of the technology, consider the levels of how the necessary assistive technology item will be applied. The levels in applying the assistive technology solution include whether the item is personally, developmentally, or instructionally necessary (Judd-Wall 1999). The personally necessary level is concerned with assistive technology devices that are used by an individual student, such as a pair of color blind glasses to enable a learner to more effectively interact with his/her environment. Developmentally necessary devices may be shared among individuals. These devices help meet an educational need based on a developmental delay, which ideally would be improved, eliminating the need for the item in an individual's future. Lastly, instructionally necessary devices are those which modify the instructional process at a course or grade level, and do not need to be moved with the user as he or she progresses to the next level in education.

What is Educational Technology?

Educational or instructional technology can be hard to define. At its simplest it can be the application of technology in teaching or education, but many feel that it is much more than that. Perhaps the most encompassing definition is from University of North Carolina Media Services (1997) which states that: "Educational technology is the application of research, learning theory, emergent technologies, and child and adult psychology to solving instructional and performance problems." The Presidential Commission on Instructional Technology highlighted four areas in which educational technologists perform: 1) design of instruction, 2) production of instructional products and services, 3) management of instruction, and 4) evaluation of instruction.

Assistive Technology in the Graduate Educational Technology Program

The National Council for Accreditation of Teacher Education (NCATE) accreditation in association with the International Society for Technology in Education (ISTE) requires that assistive technology be addressed within such higher education programs as educational computing and technology leadership. The guidelines and standards for those programs state that a graduate of such a program should "demonstrate awareness of resources for adaptive assistive devices for students with special needs" and be able to "identify and classify adaptive assistive hardware and software for students and teachers with special needs and locate sources to assist in procurement and implementation" (NCATE 1999).

However, assistive technology is, for the most part, only discussed as a small component of technology integration classes or is thought of as being part of the "special education" section. There exists the need for the addition of a course devoted to the application of assistive technologies, awareness of the possible limitations of users, and universal design in a graduate educational or instructional technology program.

A review was conducted of instructional and educational technology programs within the colleges of education across Florida's state university system. According to their published programs of study, none of the state colleges of education was offering a course specifying assistive technology in its title or available description. A similar limited review was conducted of universities nationwide that offered graduate programs in educational or instructional technology. From this survey, it was found that less than twenty percent of the colleges that offered an educational technology degree provide courses focusing on assistive technology.

Impact on Instructional Technologists

As part of the federal Individuals with Disabilities Act IDEA amendments of 1997 and 1999, statements now require assistive technology devices and services to be considered on an individualized basis and become a part of the individual education plan (IEP) if the child needs them to benefit from his educational program. The individualized education program (IEP) is a written statement for a child with a disability that is developed, reviewed, and revised at the child's school. The IEP's occur each year for every child with a disability and they are developed by members of the IEP team including parents, teachers, special education teachers, administration and others. Section 508 of the Rehabilitation Act Amendments of 1998 is the most extensive new law with wide ranging effects. This ruling requires that all US federal agencies make their information technology accessible to their employees and customers with disabilities. The law gives federal employees and members of the public the right to sue if the government agency does not provide comparable access to the information and data available to people without disabilities. Section 508 applies to Web sites that are produced for government agencies. All state agencies that receive federal funds under the Assistive Technology Act of 1998 are also required to comply with Section 508 requirements. Schools seeking to comply with legal requirements regarding students with disabilities need faculty with knowledge of assistive technology applications. Based on NCATE accreditation requirements, it would be reasonable for a school administrator or other official to expect that an educational or instructional technology graduate from an NCATE accredited program would be able to effectively contribute to a student's IEP team. These expectations would include that such a graduate be able to make effective judgments and recommendations concerning assistive technology and universal access.

Assistive Technology Course Development

With the rapidly aging population of the United States, there is also a growing need for assistive technology and universal design. To receive federal funding organizations must be IDEA and Section 508 compliant. There exists a need to provide instruction on assistive technologies and methodology to make technology products such as computer programs and web pages handicapped accessible.

Instructional and educational technology specialists require more extensive experience and education concerning assistive technology than they currently receive. Instructional/Educational Technology graduate programs should devote a course to the presentation of the basic concepts and applications of assistive technology. This course could be offered as a requirement in the current university master's instructional technology program and as an elective in its master's of education or exceptional education programs. The NCATE and ISTE standards state that for initial certification, a teacher should "demonstrate awareness of resources for adaptive assistive devices for students with special needs." These standards would be well met by such a course. The technologies and strategies presented in a course concerning the application of assistive technology would also address many of the other NCATE guidelines associated with specialty programs such as educational computing and technology leadership.

An assistive technology course could be designed as an introductory or survey course in the application of technology as assistive and adaptive devices, software and strategies. This course could present strategies for students who are physically or mentally impaired, and may be in a mainstreamed situation. The purpose of the course material would be to teach about the use of technologies to overcome handicaps and improve functionality. Course topics could include: basics of assistive technology; legal/ethical issues associated with assistive technology; assistive technology and the individual education plan (IEP); levels of assistive technology; technology adaptations; Windows and Macintosh built-in accessibility tools; text-to-speech and speech-to-text; universal design and the internet; English as a second language, and physical and learning disabilities. An additional facet of such a course should also be designing web-based information to be universally accessible, covering such topics as making web pages more accessible and designing multimedia to overcome user handicaps. The assessments and activities of the course should include hands-on experiences with assistive technologies. Activities should be designed to include visitations to schools or labs to see assistive technology being used, the application and use of text-to-speech and speech-to-text programs, experiences with adaptive switches and toys, and even experimentation with environmental control hardware and software

During discussions and interviews with inservice teachers, counselors, physical therapists, parents, and assistive technology organizations, a need for training and education in the area of assistive technologies was identified. Through continuing discussions, some basic areas of need in assistive technology education were identified. Visitations were conducted at the Assistive Technology Educational Network (ATEN), Florida Diagnostic Learning Resources (FDLRS) and Florida Instructional Materials (FIMSE) labs. The goal of the visitations was to learn about the state of the art and the programs being offered, and to understand the components of the AT community. Additional research continued through conducting a literature survey in the field, observing at schools and labs, and studying current Exceptional Student Education (ESE) and Instructional Technology (IT) programs offered at universities. In order to begin to fill the need that was perceived, a course outline was developed and components were taught at daylong hands-on workshops designed to introduce instructional technologists and teachers to assistive technology. From these preliminary discussions with professionals in the assistive technology community, it was found that an assistive technology course would be appreciated and that course delivery through distance learning would be preferred. Many of the potential students expressing interest in such a course were unable to travel to a university. As an educational technology program course, it would have an added benefit as a recertification course for ESE professionals and general education teachers.

After an initial course outline was developed, members of parent support organizations such as the Statewide Advocacy Network on Disabilities (STAND), university professionals in special education, assistive technology state organizations such as Florida Diagnostic and Learning Resources System (FDLRS) and Assistive Technology Education Network (ATEN), future students in exceptional education, and other instructional technology professionals were asked to provide feedback on the course design, goals, topics and assessments. All were extremely pleased with the idea of the material becoming available for instructional technologists, exceptional student education (ESE) and general education educators. In its current form, the AT course "Technologies for Special Populations" (see appendix) is designed as an introductory course in the application of technology as assistive and adaptive devices in education. The course itself should model effective design practices. For example web pages will be designed for universal access and course materials and multimedia will be developed to be handicapped accessible. Because of its online delivery, the course serves as a model of information presented through an assistive medium.

Learning Strategies

The Technologies for Special Populations course stresses hands-on experiences with various assistive technology approaches and devices. One of the main course goals is designing methods for a student to have actual experiences with the technology going beyond readings and looking at images about the technology. Students are expected to purchase, train, and use voice input systems, install and use an environmental control system, purchase and use a voice repeater, and use speaking software and hardware devices. Student interactions with assistive technologies fall into five areas. Students interact in an online forum, they have field experiences, and they complete technology projects, in addition to using standard materials such as tests and papers.

One of the strategies used in the Technologies for Special Populations course is the forum. Students participate for themselves and also analyze what other students have done and provide feedback to their classmates' thoughts. Forum topics include case studies that students use in experimenting with, suggesting and explaining assistive technologies. Further forum topics encourage students to discuss and evaluate the impact that the assistive technologies have on them while they use various devices and programs such as environmental control, voice input, and text-to-speech.

Students will be required to observe the use of assistive technology as part of their field experiences. Students are asked to observe a student who uses assistive technology devices, or investigate and visit an assistive technology demonstration lab. Using an assistive technology device checklist and observation form, students would observe assistive technologies being used and then contribute in an online exchange concerning their observations.

Currently projects are being designed to give students additional experiences with assistive technology in evaluation, adaptation, and creation of assistive technology devices. Students evaluate web sites for universal access, compare various assistive technology software products, compare assistive technology hardware tools, and even complete an evaluation of a student related to the use of a specific assistive technology. Students will use software to create a communication board that augments communication within a specific class or function. Additional support is being sought for the creation of a supplemental traveling assistive technology box. Sent through the standard mail system, this box would provide students access to the more expensive technologies including touch screens, alternative keyboard inputs, talk boxes, close captioning devices, and more.

References

Defining Educational Technology (1997). Media Services, University of North Carolina, Charlotte. Online at http://www.uncc.edu/lis/media/edtech.html.

Educational Computing and Technology Leadership Standards (2000) *NCATE Guidelines for Educational Computing and Technology Leadership.* Online at :http://www.ncate.org/.

Flippo, K.F., Inge, K.J., & Barcus, J.M. (1995). *Assistive Technology: A resource for school, work, and community.* Baltimore, MD: Paul H Brookes.

Galvin, J., & Scherer, M.J. (1996). *Evaluating, selecting, and using appropriate assistive technology.* Gaithersburg, MD: Aspen.

Gitlow, L. (2000). *Assistive Technology.* Online at: http://www.ume.maine.edu/cci/FACTSFC/articles/assistec.html.

Individuals with Disabilities Education Act, 1992. (P.L. 101-476).

International Society for Technology in Education (2000). *Teacher Technology Standards.* Online at http://www.iste.org/.

Judd-Wall, J.(accessed September 1999). *Necessary categorizations.* Online at: http://www.atcn.ocps.k12.fl.us/links.html.

Stoller, L. C. (1998). *Low-Tech Assistive Devices: A handbook for the school setting.* 1998. Therapro Inc. Publishers

Technology-Related Assistance for Individuals with Disabilities Act, 1988. (PL 100-407).

Technology-Related Assistance for Individuals with Disabilities Act Amendments, 1994. (P.L. 103-218).

Rehabilitation Act Amendments of 1998, Section 508

Appendix: Syllabus for Technologies for Special Populations (an introduction to assistive educational technology)

Course Description: This course is designed to be an introductory survey course in the application of technology as assistive and adaptive devices and strategies for special population students, ESOL, learning, physically or mentally impaired, and are in a mainstreamed versus a profound situation. The basic concept of the course material is to learn about and use technologies to overcome handicaps and improve functionality. The course will be focusing mostly on integrating technology/computer based applications and adaptations. Course topics include built in adaptations: Windows/Mac, legal issues, ethical issues, Individualized Education Plan (IEP), support agencies, English as a Second Language learners (ESOL), Exceptional Student Education (ESE), learning disability, environmental control, vision assistance, physical impairments, motion impairment, voice control, voice input, Text-to-Speech/Speech-to-Text, technology adaptive strategies: study, outline, concept mapping, toy adaptation, and universal access/design.

Topic Outline:
Introduction to assistive technology; Legal issues and the IEP; ESOL as a special population; Toys, Switches, and other adaptations; Windows & Mac built-in Accessibility tools; Text to Speech & Speech to Text; The Internet; Mobility and Physical Impairments; Hearing and Vision; Learning Disabled

Required course materials:
Internet Access, Speech to Text program, Environmental control materials & program, Voice recorder or 4-frame talker and Internet access. Texts for the class are *The Internet: an inclusive magnet for teaching all students* published by World Institute on Disability and *Learning to Read in the Digital Age* by Anne Meyer and David Rose

Assessments

Information/Research Paper:
The paper should have a focus on integrating and/or implementation of assistive technology in a school setting. What does this mean to education? How does it change the role of teachers, students and schools? How is the nature of technology changing instruction? How does change itself change what we do as teachers? This paper should examine issues, societal trends, and their effect on education. The final topic for the paper must be approved by the instructor. Paper should be three to four pages, in APA style, pay attention to format, spelling, and grammar.

Projects:
Evaluations - Using the guidelines, rubrics and forms from the website, review and provide recommendations concerning the appropriateness of use in the following areas: 1. Web site evaluation for handicap access; 2. Software evaluation; 3. Hardware evaluation and;4. Ability evaluation
Field/Experimental Experiences - 1. Assistive hearing; 2. DVD experience; 3. Voice input/control; 4. Memo minder and; 5. Environmental control
Activities - 1. IEPs - TREE software: Use software in the process of creating an individualized education plan that incorporates assistive technology; 2.Create a communication board: Design and produce a one-page document to act as a communication board specific to subject area and grade level. The board should provide words and icons that are representative of speech necessary for discussion/communication for a class in that area; 3. Concept mapping: Using concept map software as a learning tool, develop an application for studying and learning.

Other Assessments - 1.Quiz on legal/support/IEP; 2. Forum discussions; 3. Case studies and; 4. Site experience/observation (assistive technology in a classroom or demonstration lab)

During the early part of the course, you should arrange to visit a class and observe a student using assistive technology devices. The class can be self-contained or mainstreamed. Use the assistive technology device checklist and then provide a summary of your finding concerning the student. You should make mention of how the student and teacher feels concerning the technology. If you would prefer not to visit a class or am unable to make sufficient contacts to be able to do so, the following are acceptable alternatives to classroom observations:

Visit an ATEN lab
Attend a ATEN workshop
Attend a FDLRS (or equivalent) meeting or workshop
Visit a FDLRS (or equivalent) lab displaying assistive devices

Evaluation: Course grades are based on quizzes, activities, projects and lab assignments.

Target Learners: Current and future educators, instructional technologists, and anyone interested in learning about assistive technology for the school setting. This course may be applied to recertification at all grades and subject areas.

Forming Personnel, Creating Culture. Participative System for Preparing Content Providers for Homepages Addressed to People with Special Needs.

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Abstract: Our work is developing a homepage, content providers for and with people with special needs in a continuously evolving, participatory system. Our purposes are: qualifying technicians in Special Education, building, feeding and managing a site in the Web; developing a culture of the computer usage as a mediator of communication. We took into account the following directives: being flexible, modular, so that, new participants may always be integrated; looking for accessibility resources both for the production of the homepage and the qualification of the work team; decentralizing the production of the homepage form and content, and keeping a permanent channel for guidance of the participants; associating the qualification's content with its use in making the homepage; guaranteeing the work team's autonomy in keeping and improving the homepage. A preliminary graphic proposal is online to be analyzed and criticized to reach a better visual and sound promotion of the hypertext components.

Introduction

Our challenge is to develop a homepage for and with people with special needs. That means a collective work, continuously evolving, to create a participative system for preparing content providers for homepages addressed to people with special needs, as requested by the "Diretoria de Educação Especial" (Bureau of Special Education) of the "Secretaria de Educação do Estado de Pernambuco" (Department of Education of Pernambuco State).

To carry out that conception with the most positive results in number of accesses, and able to become an institutional undertaking out of the groups of participants' sphere of management, some directives have been suggested and implemented, making up a system of production. Such system of production is the project main body, and has as principle the idea of collective production of a homepage that works organically connected to the political-pedagogical conceptions of the requesting Bureau, so as to assure a real acquisition of this instrument of work through developing conceptions and basic competence for the homepage future maintenance by the work team members.

Together with technicians and support educators, the work team defined the purposes:

1. To build a homepage addressed to people with special needs.
2. To qualify technicians in Special Education, for building, feeding and managing a site in the World Wide Web;
3. To develop a culture of the computer usage as a mediator of communication.

In order to put our work in practice we have regular meetings. This is the way we work for defining the target clients, the themes to compound the site, their nomenclature and hierarchy, have been developed, carried on through assigned tasks, discussions, records, researches on the Web, and qualification in concepts applied to the homepage production. On the [Table 1] we give an example on how the people involved in the project share the tasks.

Stages	**Personnel Engaged**		
	Work Group	***Consultants***	***Technicians in Informatics***
1 Conceptual design	Defining client Surveying needs Defining institutional representation	Supplying subsidies Systematizing.	
2 Contents	Defining Collecting Mapping	Supplying subsidies Systematizing Mapping	Mounting Digitizing
3 Graphic Design	Following up Appraising		Implementing
4 Animation / Updating	Following up Implementing	Assisting	Casual Action

Table 1: Division of working tasks among personal

Indeed, it has been established a process which does not end with the conclusion of the making of the homepage. An executive plan corresponding with the circumstances and characteristics of the group, the target public and even the requesting Bureau has been developed, taking into account the following directives:

a) To be flexible, modular, so that, new participants may always be integrated;

b) To look for accessibility resources both for the production of the homepage and the qualification of the work team;

c) To decentralize the production of the homepage form and content, and keep permanents channel for guidance of the participants;

d) To associate the qualification's content with its use in making the homepage, so as to invert the equation of outer, closed production into an inner, open one;

e) To guarantee the work team's autonomy in keeping and improving the homepage.

A process of qualification has been established, of which the practical result is the homepage development, which has been divided into six moments. Those moments consider the formalization of three component contents: 1) Web conceptions. 2) Formal Design and hypermedia, and 3) Computer and software usage. In the graphic Design and hypermedia case, the qualification has been only preliminary.

The members of the working team participate in all steps of the homepage construction.

Besides qualifying people with the necessary technical requirements to create and manage their own homepage, an important outcome is the feeling of command developed by the team, that may be understood from the methodology of work that has been built, as follows:

Definition of a methodology of work: collectively building this instrument, through researches, meetings, discussions, studies, use of computers.

Break of some paradigms: the knowledge of Informatics, seen before as a basic requirement for making a homepage, has been acquired little by little, in exchanges in the group, and according as the page contents and their form of organization are dimensioned.

Some discoveries: the challenge and the value of a collective construction, the possibility of approaching the school to other segments of society, the feeling of responsibility before that product that is the group's creation, the decentralization in the management of a homepage, the acquisition of knowledge of projects, laws, entities and professionals of the area.

After organizing the site into topics from a vertical list, the group of participants built a model of organizational hierarchy [see Figure 1], in which the information could be linked through association, allowing, in a later stage, to incorporate, remove, fuse or separate the group of information, in a hierarchy discussed and defined by themselves.

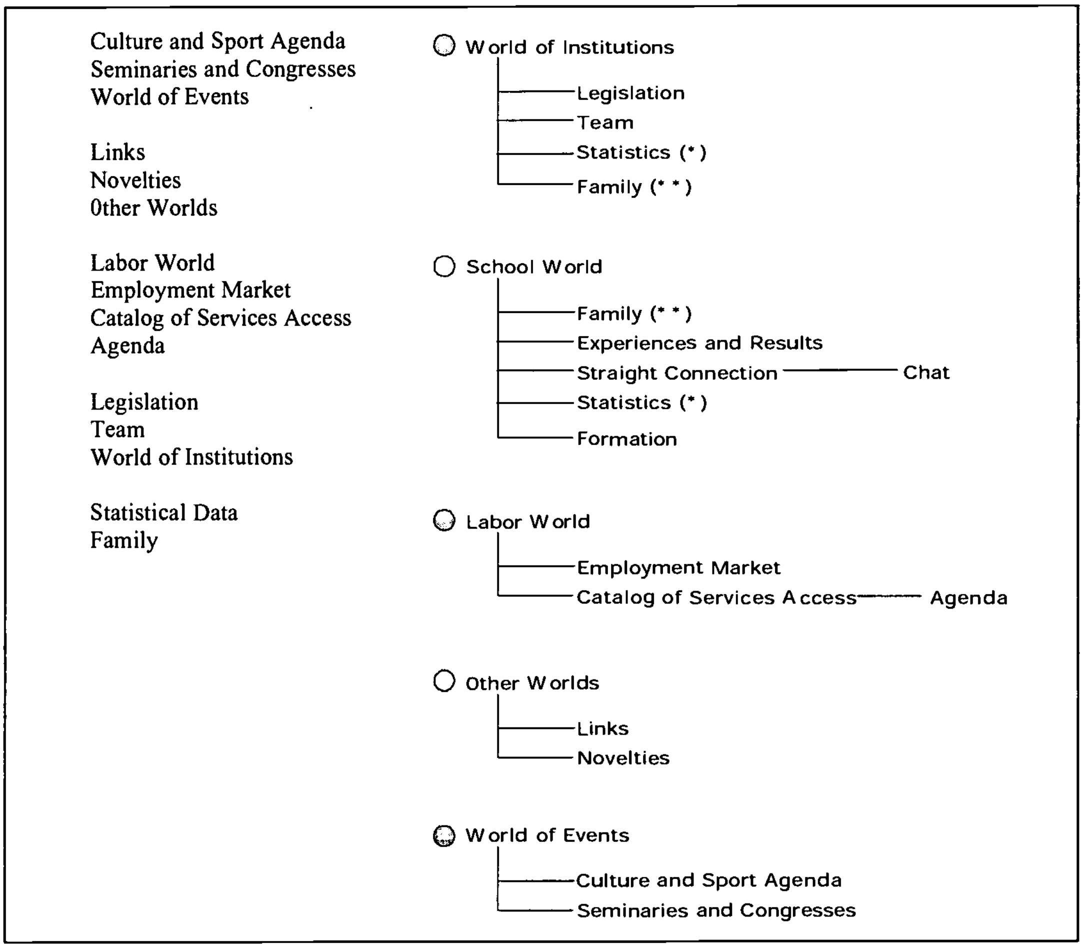

Figure 1: Organizational Structure

The result was a substantially different division, yet keeping the characteristics of a hypertextual organization.

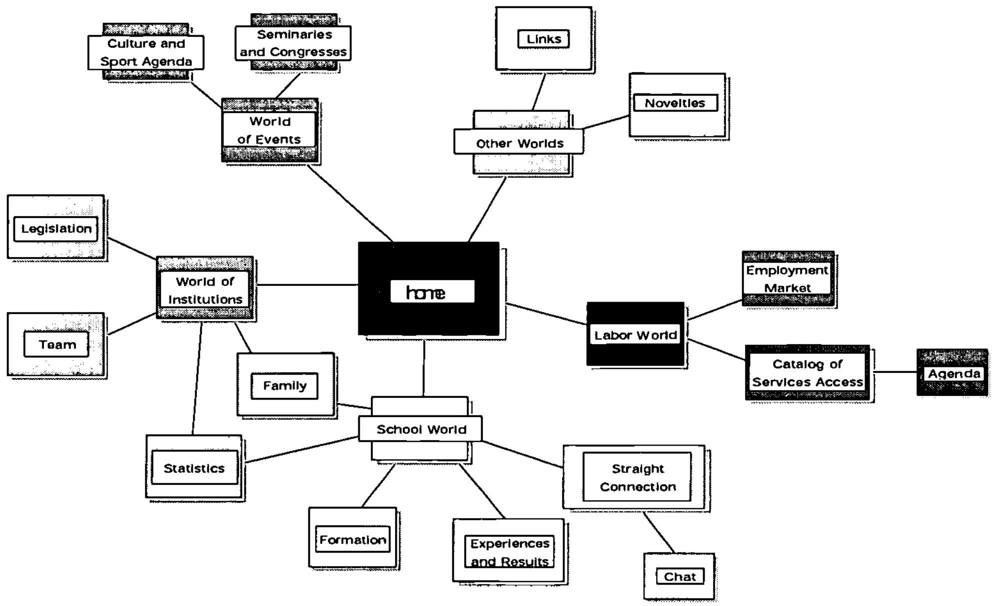

Figure 2: Site Structure

At present the participants have initiated their activities of exchanging e-mails, as well as collecting information to fill the page. A preliminary graphic proposal has been presented, with a purpose equivalent to that of the hierarchy proposal: to encourage the participants to develop their own interface. The model presented has been analyzed and criticized. Now, a work is in progress for a better visual and sound promotion of the hypertext components [Figure 3].

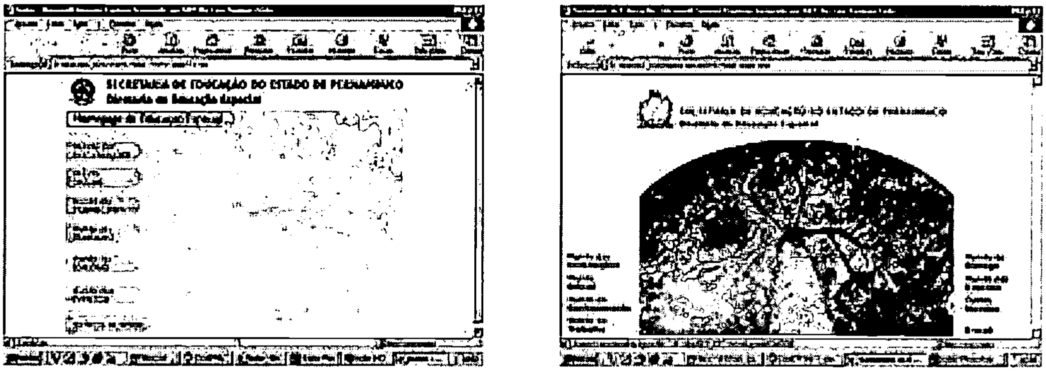

Figure 3: Visual changes at the homepage.

At the same time, the participants began to define a system of propagating the information: each participant will become a potential trainer of other groups.

That model proposes that interrelated associations be formed to feed not only the homepage, but also to provide content for other sites, and to continue to encourage the creation of a culture of computers' usage as mediator of communication both of people with special needs and of those who work with them.

Homepage is hypertext, representing the possibility of rapid examination of the content, of non-linear and selective access to the text, of segmentation of knowledge into modules, and of multiple connections with innumerable other hypertexts. It represents "one of the futures of the writing and reading" (Levy, 1993, p.19).

Communication will be neither the message, nor the sender, nor the receiver, but the hypertext, which "is like an ecological reserve, the ever movable system of the senses' relation that the precedent ones keep" (Levy, 1993, p.73). It is from that perspective that a new culture of communication is being created to whom is in need of special resources to get into communication.

0ur role is to make people literate in Informatics, in the "Freirian" sense of the term (Jurema and 0'Rourke, 1997), so assuring a real appropriation of those changes, through the development of concepts and basic competence for the future maintenance of the homepage by the participants of the working team.

References

Jurema, A. and M. O'Rourke (1997). *An international approach to devolping Information Technology (IT) literacy in schools based on critical consciousness*. CSCL'97 The Second International Conference on Computer Support for Collaborative Learning, University of Toronto, Canada.

Lévy, P. (1993). *As tecnologias da inteligência. O futuro do pensamento na era da informática* Editora 34.

PREPARATION OF EDUCATORS TO PROVIDE EFFECTIVE COMPUTER-BASED ASSISTIVE TECHNOLOGY ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES

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Abstract: As students with disabilities are mainstreamed into general education settings, teachers need to be knowledgeable about appropriate accommodations, formats, and strategies, as well as accessibility issues. Often educators feel overwhelmed by the need to develop and deliver individually effective instructional materials for students with diverse abilities. This is particularly true in light of the current emphasis upon computer-based assistive technology as well as the need to make the Internet accessible as a learning tool for students with disabilities. There are no specific training competencies for general educators relative to assistive technology or Internet accessibility for students who require accommodations. Based on the emerging literature in this area, a qualitative study was conducted to determine the experiences and needs of teachers in this domain. A series of open-ended questions were used in an interview format. A subsequent analysis of transcribed interviews yielded patterns of teacher responses that will be discussed in terms of implications for training.

BACKGROUND

Traditionally, teachers working with students who had disabilities utilized various instructional methods to enhance student learning as well as formats that included large print or audio cassette versions of print materials for individuals with impaired vision or augmentative hearing devices for individuals with hearing impairment. However in the past five years, many of the accommodations that are necessary for students with disabilities include sophisticated computer-based assistive technology. Furthermore, teachers who utilize the Internet for class assignments must develop strategies to make this complex learning tool accessible across students who may have very different learning abilities.

THE CONTEMPORARY CHALLENGE OF COMPUTER-BASED ASSISTIVE TECHNOLOGY

Today, teachers working with students who have disabilities must expand their repertoireof accommodation formats, strategies, and accessibility issues relative to (a) computer-based assistive technology and (b) the use of the Internet as an instructional tool. Some examples of computer-based assistive technology materials for students with various abilities and disabilities include visual signals in addition to auditory signals, "Close View" screen enlargement programs, voice recognition systems for voice access to computers, adaptive software programs (including word prediction programs for word processing with limited key strokes), specialized keyboards (on-screen keyboards, large keyboards for individuals with limited motor control, or miniature keyboards for individuals with motor impairment), alternative input devices (joysticks and trackballs), and alternative output devices such as large-text or Braille printers (Lisiecki, 1999; Menlove & Hammond, 1998). For students with learning disabilities, assistive technology accommodations may consist of reading machines, word processors, and other educational software that can compensate for reading, mathematics, writing, and spelling difficulties (Bryant, Bryant & Raskind, 1998). Finally, issues of Web accessibility for students with various disabilities remains a challenge for most classroom teachers.

TEACHER TRAINING NEEDS

A teacher's ability, training, and attitude regarding computer-based assistive technology and Web access are major contributors to a student's success. Given the emphasis upon mainstreaming of students with disabilities into general education classrooms coupled with the shortage of special educators for support and consultation, general education teachers are in need of training to support access for all of their students. Based on the emerging literature on the subject of computer-based technology and Web accessibility, a qualitative study was conducted to determine the needs and experiences of preservice and inservice general education teachers in these areas. A series of open-ended interview and survey questions were developed. Undergraduate teacher education students as well as licensed teachers and teacher education faculty responded to the questions. Questions focused upon individual attitudes, knowledge, and skills regarding assistive technology and Internet accessibility. Audiotaped interviews were transcribed and analyzed in order to develop a taxonomy of emerging patterns of practitioner experiences and training needs.

RESULTS AND IMPLICATIONS

The emerging results of this project can be broadly categorized into teachers' attitudes about special education, teachers' attitudes about technology, teachers' lack of confidence in terms of their knowledge base regarding computer-assisted accommodations, a lack of funding and resources to implement appropriate computer-based accommodations, and overall unfamiliarity with the issue of Internet accessibility for students with disabilities. As reported by McGregor & Pachuski (1996), as well as Persichitte, Caffarella & Tharp (1999), teachers in general are very concerned about the rapid pace of development of education technology coupled with new applications of classroom instruction. This concern is amplified by the reports of the teachers in this study who work with students who have disabilities. One of the on-going goals of this study, and of this presentation, will be to expand the implications of teacher attitudes and experiences into a discussion of the specific core competencies (as initially addressed by Lahm and Nickels, 1999) that would be necessary for general education as well as special education teacher training programs.

REFERENCES

Bryant, D.P., Bryant, B.R., & Raskind, M.H. (1998). Using assistive technology to enhance the skills of students with learning disabilities. *Intervention in School and Clinic*, 34(1), 53-58).

Lahm, E. A. & Nickels, B.L. (1999). What do you know? Assistive technology competencies for special educators. *Teaching Exceptional Children*, 32(1), 56-63.

Lisiecki, C. (1999). Adaptive technology equipment. *Computers in Libraries*, 19(6), 18-22.

McGregor, G., & Pachuski, P. (1996). Assistive technology in schools: Are teachers ready, able and supported? *Journal of Special Education Technology*, 13, 4-15.

Persichitte, K.A., Caffarella, E., & Tharp, P. (1999). Technology integration in teacher preparation: A qualitative research study. *Journal of Technology and Teacher Education*, 7(3), 402-425.

Website 101: Creating Annotated Special Education Bibliotherapy with Children's and Young Adults Books

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Abstract: The purpose of this project is to share the steps involved in creating and designing a specialized web site for viewers who either work with children and young adults who have special needs or those who have special needs. The web site will allow the viewers to apply the principles of bibliotherapy. Bibliotherapy is defined as healing through books, reading books to help solve and better understand personal problems, and/or mutual sharing of literature in order to structure interaction between a facilitator and a participant. The web site, designed to be interactive, becomes the facilitator and the viewers become the active participants. For example, people may log on and write reflections about their feelings toward the book listed on the web site. Participation in bibliotherapeutic intervention allows participants to hyperlink with other viewers, and therefore, make connections that encourage active problem solving related to special needs.

Project Description

The authors discovered that there is no an interactive web site on bibliotherapy that utilizes current children's and young adult books. This paper describes a project designed to help participants select books whose topics relate to the problems of people with special needs. Since the web site is interactive, participants can read a recommended selection and post their written responses to an interactive bulletin board. Initial categories were chosen based on special needs frequently reported in the literature (see Table 1), with the understanding that other categories would be added at a later date, including death and dying, less common disabilities, etc.

1LT Leo Brennan, an undergraduate in Multimedia Design at Cameron University, assisted with the creation of an interactive web site containing links to each of these special needs. These web design features were taken into consideration: background, color, imaging (animation and graphics), FAQs, links to other sites on the Internet (authors' homepages, other reviews, etc.), WebCT format, accessibility, server issues (file transfer, testing, publicizing and maintaining the site), sound clips, format for book reviews, alternative text, alignment, embedded tables. Publishers were contacted and asked to submit books that fit the specific categories presented in the following table.

Table 1

Special Needs Categories Included in Bibliotherapy Web Site

Abuse	ADHD (Attention Deficit Hyperactivity Disorder)	Autism	Behavior Disorders
Chemical Dependancy	Communication Disorders	Dysgraphia	Dyslexia
Emotional Disturbance	Fetal Alcohol Syndrome	General and Multiple Disorders	Gifted and Talented
Hearing Disabilities	Learning Disabilities (spelling, math, reading, writing)	Mental Retardation	OHI (Other Health Impaired)
Physical Disabilities	TBI (Traumatic Brain Injury)	Vision Disorders	To be developed

Table 1: Bibliotherapy special needs books

Outcomes

Current books were identified that speak to specific special needs. Certain books were chosen repeatedly, which is indicative of the bibliotherapeutic value and literacy merit. In addition, this study also reflects the level of interest of the participants, which is considered one indication of personal need. An innovative web site has been created for use by people (professionals, librarians, empathetic readers, victims and their families) that provides healing through books.

Literature References

Books are for talking, too: A scourcebook for using children's literature in speech and language remediation. (1990). Tucson, AZ: Communication Skill Builders, 1990.

Campbell, L. A. (1999). *Storybooks for tough times.* Golden, CO: Fulcrum.

Carlin, M. F., Laughlin, J. L., and Saniga, R. D. (1991). *Understanding abilities, disabilities, and capabilities: A guide to children's literature.* Englewood, CO: Libraries Unlimited.

Friedberg, J. B. (Ed.). (1992). *Portraying persons with disabilities: An annotated bibliography of nonfiction for children and teenagers* (2nd ed.). New Providence, NJ: R. R. Bowker.

Kaywell, J. F. (Ed.). (1993). *Adolescents at risk: A guide to fiction and nonfiction for young adults, parents, and professionals.* Westport, CT: Greenwood.

Pyles, M. S. (1988). *Death and dying in children's and young people's literature: A survey and bibliography.* Jefferson, NC: McFarland.

Reidarson, N. (no date). *Books for disabled young people: An annotated bibliography.* Hosle, Norway: IBBY Documentation Centre of Books for Disabled Young People, the Norwegian Institute for Special Education.

Robertson, D. (Ed.). (1992). *Portraying persons with disabilities: An annotated bibliography of fiction for children and teenagers.* New Providence, NJ: R. R. Bowker.

Spredemann, S. D. (1992). *Best of Bookfinder: A guide to children's literature about interest and concerns of youth aged 2-18.* Circle Pines, MN: American Guidance Service.

Spredemann, S. D. (1981). *Bookfinder.* Circle Pines, MN: American Guidance Service.

Zvirin, S. (1997). *The best years of their lives: A resource guide for teenagers in crisis* (2nd ed.). Chicago: American Library Association.

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Integrating Technology in Classrooms with Learning Disabled Students: Teachers' Needs and Professional Development Implications

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Abstract : Although technology could have a positive impact on students with learning disabilities, it appears that special education teachers do not use these teaching and learning tools to their full potential. This paper presents the main findings of a survey on special education teachers' use of technology and their needs regarding technology integration. Results from the survey show that although teachers have a favourable opinion on technology, intensive computer use in the classroom remains scarce. Lack of time, insufficient knowledge of the pedagogical uses of technology and lack of information on existing software were identified as the three major hurdles to technology integration. Considering these needs, professional development activities should aim to provide a greater knowledge of the pedagogical strategies suited to use different technologies, develop teachers' skills for technology-based activity planning and give teachers the means to share information on available educational material.

Introduction

Many studies and meta-analysis highlight the benefits of computer applications in an educational setting. Although, as pointed out by Woodward and Rieth (1997), results from such studies are not easy to interpret given the different applications, design characteristics or instructional strategy they may imply, it appears that technology can have a positive effect on learning in different contexts (Sivin-Kachala & Bialo, 1994; Johnson, Cox et Watson, 1994; Hannafin, Hannafin, Hooper, Reiber et Kini, 1996) and on student motivation (Sivin-Kachala & Bialo, 1994; Draude et Brace, 1999).

Technology could even have a greater impact on learning for students with learning disabilities. Sitko and Sitko (1996) concluded from different studies that motivational and affective benefits derived from technology uses are more conspicuous for students with special needs. Furthermore, Bender and Bender

(1996) mentioned that certain computer attributes can help palliate some characteristics of students with learning disabilities. For instance, graphics and sound can help create interest when students show a general lack of interest towards educational material and frequent reinforcement can increase their short attention span. Green (1995), after interviewing teachers known for their extensive experience with computers and students with learning disabilities, concluded that multimedia computer software increases motivation and self-esteem for many learning disabled students and, in some cases, reduced behaviour problems.

Despite these potential benefits, there is little evidence that teachers use these technological tools on a regular basis with learning disabled students. In a report on computer use in special education, Chouinard (1996) stated that access to computers in special education classes in Quebec was limited and that special education teachers did not use technology on a regular basis with their students. Since then, very little research data have been published on the extent and nature of computer use in special education, in Quebec or elsewhere.

Special education teachers seem to use only a few of the technological tools available. Prinz and Boger-Mehal (1999) stated that the use of technology within special education classrooms is often limited to rote practices using games or to tasks such as word processing and drawing. Based on our field experience, it seems that few classroom experiences allow learning disabled students to engage in long-term projects using technology as a production tool although such projects may have a positive impact on these students. These observations lead us to believe that computers are not used to their full potential in the special education classroom.

This paper relates to a three-year collaborative research project focusing on the integration of technology in classrooms with learning disabled students and the effects of this integration on student motivation, self esteem and social abilities. The project was conducted in various schools from three distinct Quebec school boards. The main objectives of the project were as follows:

- To assess teacher use of technology in classrooms with learning disabled students and identify their needs in regard to technology integration;
- To develop, in collaboration with teachers, instructional activities where students carry out a project using technological tools;
- To assess the impact of technology integration on student motivation, self-esteem and social abilities.

This paper focuses on the first two objectives, since the impact assessment is not yet completed. After highlighting the principal uses of the computer in the classroom, it will describe teachers' needs in regard to technology integration. Then, it will make some recommendations for inservice teacher professional development, taking into account some of the survey results related to computer uses and teachers' needs. It also presents a model for classroom projects engaging learning disabled students in long-term activities.

Method

202 teachers from different Quebec schools working with elementary and high school students with learning disabilities or behaviour problems were asked to complete a questionnaire focusing mainly on their use of technology both inside and outside the classroom, on their attitude toward technology and on the obstacles and their needs regarding technology integration in their own classroom. Some data were also collected on teacher characteristics, experience with technology and computer access in the school. The 42 item questionnaire used a mix of Likert scale type and open-ended questions.

Interviews conducted with 43 of these teachers supplied in-depth information on the obstacles to technology integration and on the measures that could help teachers attain this integration. Interviews were conducted using a semi-structured approach.

In the second year of the project, nine elementary and high school teachers were selected to experience in their classroom different long-term projects integrating computer activities. Projects were planned jointly by research team and teachers.

Main Results

Results from the survey showed that computers are available to nearly all teachers and that more than 80% of teachers used the computer for personal and professional use outside the classroom. Teachers' attitude toward computers are also very positive, as 89% of teachers consider that technology is useful for teaching and learning and 81% of them think it should be used in the classroom. Most of them (78%) also consider that technology has a positive impact on student learning.

Despite the relative accessibility of the computer and teachers' favourable opinion toward technology, actual use in the classrooms is not very extensive: 25% of teachers don't use the computer in the classroom and no more than 29% of them use it more than two hours a week with their students. Furthermore, when computers are used in the classroom, it is usually for word processor, educational software or Internet use. These applications are the only ones used on a regular basis by more than 20% of teachers.

In order to better understand the discrepancy between teachers' positive attitude towards technology and their relatively limited use of the computer in the classroom, it is logical to investigate the obstacles identified by teachers as the main hurdles to technology integration in the classroom. Lack of time, insufficient knowledge of the pedagogical uses of technology and lack of information on existing software were identified as the three major obstacles to technology integration. A majority of teachers are satisfied with the quality of the hardware available (82%) and the technical support supplied in the school. On the other hand, 47% of teachers are not satisfied with the pedagogical support they receive to integrate technology. More than half of the teachers (55%) consider that they don't get enough information on technology relating to educational applications.

The training needs expressed by most teachers focused on the strategies to implement in order to use technology in a sound pedagogical manner. The teachers identified greater needs relating to the pedagogical aspects than the technical aspects. Over 90% of teachers consider that training on appropriate teaching strategies for technology-based classroom activities would be useful. Access to computers or suitability of the available computers did not seem to be a major obstacle for most teachers although some mentioned that they would like to have more computers in their classroom.

These results are in agreement with the opinion of Cuban (1993) who argues that logistical difficulties or lack of funds form only a partial explanation of a deeper problem related to the underuse of technology in schools. A discrepancy between sound pedagogical use of technology and core visions of teaching represent also an important issue in technology integration.

Implications of the Study

Taking these results into account, we can suggest ways to meet some of the teachers' needs, in order to facilitate technology integration in the special education classroom. Considering these needs, professional development activities should aim to provide a greater knowledge of the pedagogical strategies suited for different technology uses, develop teachers' skills for technology-based activity planning and give teachers the means to share information on available educational material. The following suggestions could help reach these goals.

- Create networks where teachers can share information and discuss different classroom technology integration experiences.

Since a majority of teachers expressed dissatisfaction toward the information available on technology applications in their school, networks where teachers can exchange information on technology-based activities seems useful. Such networks could facilitate the sharing of experiences and material well suited to the curriculum.

- Focus on the pedagogical strategies needed when using technology rather than on more technical aspects. As pointed out in our study, teachers' needs and concerns are closely related to pedagogical aspects. Consequently, teacher education programs and training should focus on the strategies to implement in technology-based activities. Proposing models for classroom activities and helping teachers develop their own activity scenarios can contribute in developing competencies in the use of sound pedagogical strategies in computer-based activities.

- Give training on a wide variety of technology uses in special education.
As pinpointed by our study and by other authors such as Prinz & Boger-Mehal (1999), special education teachers only use a few of the technological tools available. As does Bailey (1992), we believe it is necessary to expand the options for computer use in special education in order to empower the teachers to use a wider variety of these tools with their students.

-Prepare teachers to guide their students towards long-term projects.
As shown by our study, few special education teachers engaged their students in long-term project integrating technology. Most often, they proposed short-term activities such as instructional games. Because special education students often learn at a slower rate and have a long history of failure, long-term projects may be more suited to produce significant changes. Furthermore, engaging students in projects where computers are used as a tool to gather information and create their own productions allows the students to perform activities that are more significant.

The projects developed with nine teachers suggests different models for classroom activities engaging students in long-term projects where computers are used as a tool. For example, in one of these models teachers guide students through the following steps:

- Define a goal and topics
As learning disabled students often lack motivation toward classroom activities, it is important to let them participate in the choice of the project and the related topics. The goal should have meaning for the students.

-Get direct experience or expert testimony related to the project
Real life experience or others' testimony appears to be a good way of engaging the students in the project and heightening interest .

-Gather relevant information via electronic sources
By gathering information from different sources, students can widen the scope of their inquiry and improve the quality of the final result. Teacher supervision appears important to help students improve their inquiry strategies and guide them toward relevant materials.

- Create a collective product using electronic tools (journal, multimedia document, database or other)
Learning disabled students can take pride in authoring their own media productions. Technology as a production tool also provides some advantages for students with learning disabilities. As Woodward and Rieth (1997) mentioned, tools such as word processors eliminate the problems associated with poor writing skills encountered by a lot of learning disabled students. When used with relevant learning strategies, the computer can support the planning, writing and revision phases of product execution (MacArthur, 1997). The collective aspect of the project should take into account the strengths and weaknesses of the different students.

-Present their production in and outside the classroom
Learning disabled students' productions are rarely displayed. Assuring a distribution of their work both inside and outside the classroom can contribute to increase their self-esteem and to create a positive effect on others' perceptions.

This model can be illustrated with examples drawn from the experiences carried out during the past two years in different elementary and high school level classrooms.

More information on this project and its results is available (in French only) at the following Website: http://www.uqtr.uquebec.ca/gritas

References

Bailey, J. (1992). Curriculum approaches in special education computing. *Journal of computer-based instruction,* 19, 1-4.

Bender, R.L. & Bender, W.N. (1996). *Computer-assisted instruction for students at risk for ADHD, mild disabilities or academic problems.* Boston: Allyn and Bacon.

Chouinard, J. (1996). Document d'orientation sur le plan d'école et les TIC en adaptation scolaire. Permettre aux élèves de l'adaptation scolaire de s'approprier les nouvelles technologies de l'information et de la communication (TIC). Cemis national en adaptation scolaire. Commission scolaire de Montréal (CSDM).

Cuban, L. (1993). Computers meets classroom: Classroom wins. *Teacher college record*, 95(2), 185-209.

Draude, B. & Brace, S. (1999). Assessing the impact of technology on teaching and learning: student perspectives. Available online: http://www.mtsu.edu/~itconf/proceed99/brace.html

Green, D. W. (1995). The benefits of multimedia computer software for students with disabilities. New York. . Eric Ressources In Education , ED 382 172.

Hannafin, M.J., Hannafin, K.M., Hooper, S.R., Rieber, L.P. & Kini, A.S. (1996). Research on and research with emerging technologies, In David H. Jonassen, *Handbook of research for educational communications and technology.* (pp. 378-402). New York: Macmillan.

Johnson, D. C., Cox, M. J., & Watson, D. M. (1994). Evaluating the impact of IT on pupils' achievements. *Journal of Computer Assisted Learning*, 10, 138-156.

MacArthur, C.A. (1997). Using technology to enhance the writing processes of students with learning disabilities, In Kyle Higgins & Randall Boone (Eds), *Technology for students with learning disabilities*. Austin, Texas: Pro-ed.

Prinz, A.M. & Boger-Mehal, S. (1999). Integrating Technology into the special needs classroom: Are teachers prepared? Proceedings of SITE 99, p. 1569-72.
Available online: http://discovery.coe.uh.edu/downloads/aace/site/1999/SITE99.PDF

Sitko, M. & Sitko, C. (eds). (1996). *Exceptional solutions*. Aylmer, Ontario: Althouse Press.

Sivin-Kachala, J. & Bialo, E.R. (1994). Report on the Effectiveness of Technology in Schools, 1990-1994. Eric Ressources In Education. ED371726

Woodward, J., & Rieth, H. (1997). A historical review of technology research in special-education. *Review of Educational Research,* 67(4), 503-536.

The Integration of Assistive and Adaptive Technologies Into the Preservice and Advanced-Level Courses of Instructional Technology and Special Education

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Abstract: Instructional technology has become a tool that is integral to the preservice teacher educators' bag of tricks; however, the integration of assistive and adaptive technologies into the learning environment to meet the needs of special education learners is sometimes perceived as more cumbersome. The integration of assistive and adaptive technologies into the preservice and advanced-level instructional technology courses is discussed.

Introduction

Personnel preparation may be defined as providing the knowledge and skills related to effective educational and related services based on best practice and changing trends for educators to teach all students (Ryndak & Sirvis, 1999). Utilizing these knowledge and skills to provide a supportive learning environment has become the basis for evaluation of an educator's ability to address the individualized needs of each student. While Special Education faculty assume the role of content experts for the assessment, selection, implementation, and evaluation of assistive and adaptive technologies, Instructional Technology faculty play the role of process experts in "the design, utilization, management and evaluation of the processes and resources for learning" (Seels & Richey, 1994, p. 1).

Instructional Technology

Instructional technology is a tool that preservice teachers must begin to conceptualize throughout focused methods course work. The introductory technology course offered at numerous universities addresses knowledge and skills related to an understanding of instructional technology, theoretical implications, appropriate and successful applications within the learner-centered environment, appropriate integration of technology within lesson plan design and development as well as numerous other instances of instructional application of technology. However, situations occur that may be beyond the experiential scope of presevice teachers. For example, how does a teacher work with a student who has specific learning needs, such as a student receiving special education services? Instructional technology offers the special education learner the opportunity to work alongside other students in an on-level classroom environment. For many preservice teachers, the opportunity for early hands-on experience with assistive/adaptive technologies is not available within the traditional beginning education course work. Rather it occurs in later field experience courses.

Instructional Technology and Special Education

The teaming of Special Education faculty and Instructional Technology faculty provides an innovative formula to address the issue of assistive and adaptive technologies within preservice- and advanced-level courses associated with instructional technology and special education. While Special Education faculty have brought their knowledge of assistive and adaptive technologies to the table, Instructional Technologists have brought their expertise concerning the appropriate and successful integration of technologies into the educational learning environment. In this way, the preservice teacher educators have the opportunity not only to learn about assistive and adaptive technologies, but also to focus upon the integration of such technologies within a supportive learner-centered environment for special education PreK-12 students.

Special Education

Special Education provides technology-embedded course assignments and activities. The technology process activity provides preservice teachers with information needed to complete course assignments related to case study students. Examples of embedded technology include the use of instructional strategies requiring informational websites, e-mail, database searches and electronic libraries. Examples include the preservice teachers' use of technology to: research disability areas; develop a website "Resource Directory of Services" for young children with disabilities and their families; create on the computer original artistic interpretations and schematics; read what family members of students with disabilities say on discussion boards; participate in an interactive video workshop on assistive and adaptive technologies and universal design; visit virtual classrooms using assistive and adaptive technologies; browse vendor websites for assistive and adaptive technologies; download and use sample software programs; complete on-line surveys; create communication boards using Mayer-Johnson Inc. Boardmaker software; and design, develop and present Microsoft PowerPoint presentations,.

Through the use of technology-embedded special education course work, preservice teachers become knowledgeable in the numerous ways technology can be integrated into services for special education students. Technology-embedded course work provides a link between the successful application of technology and the provision of a supportive learner-centered environment for special education students. In this way, the educator not only meets the special needs of each student but also provides the student with an opportunity for success in the general education setting. Instructional technology offers the special education student this opportunity, wherein the learning environment is not only student-centered, but centered upon student success.

Conclusions

Through the integration of assistive and adaptive technologies into the preservice and advanced-level courses of instructional technology and special education, the preservice teacher educators' bag of tricks has expanded. Such powerful tools within a learning environment offer numerous directions through which to reach special education students and to adapt the learning environment to the students' needs. The importance of appropriate, thoughtful and successful integration of technology within a special education environment must be emphasized through out the preservice teacher educators' program of study.

References

Mayer-Johnson Inc. (1997-2000). [software]. Boardmaker. Solana Beach, California.

Microsoft. (2000). [software]. PowerPoint. Redmond, Washington.

Ryndak, D. L., & Sirvis, B. (1999). Advertisements for faculty with expertise in severe or multiple disabilities: Do they reflect initiatives in teacher education and school reform? *Teacher Education and Special Education*, 22, 14-24.

Seels, B. F. & Richey, R. C. (1994). *Instructional technology: The definition and domains of the field.* Washington, DC: Association for Educational Communications and Technology.

Designing Accessible Web Sites for People with Disabilities

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Abstract
In order to make the Worldwide Web accessible to individuals with disabilities and also more accessible for everyone, web developers can follow 14 guidelines provided by the W3C group. This paper summarizes these guidelines and provides suggestions for compliance. Levels of compliance, benefits of compliance, examples of accessible web sites, and an accessible web site template are described.

The Web is a democratic media that is designed to provide information not only anytime and anywhere but also for everyone. For those unfamiliar with accessibility issues pertaining to Web page design, consider that some users may be operating in contexts very different from your own. For example:

- They may not be able to see or hear.
- They may not be to process some types of information (written, visual, auditory) easily or at all.
- They may have limited ability or no ability to move or manipulate a keyboard or a mouse.
- They may have difficulty reading or comprehending text.

Individuals also sometimes use supplementary software programs and devices, called **assistive technologies**, which aid them using technology. Assistive technologies include specialized web browser programs and screen reader programs. Web developers should consider access for individuals with disabilities and their use of assistive technologies during site design. While there are several disabilities to consider, each accessible design choice generally benefits several disability groups at once and the Web community as a whole.
The **W3C group**, a nonprofit organization, has produced a set of fourteen *Web Content Accessibility Guidelines* which are available online (W3C, 2000). A consortium of government agencies and businesses sponsors W3C. Its goal is to increase web accessibility.

Priorities for Accessibility

The W3C guidelines provide general principles for accessible design. Each guideline has a priority level assigned to it based on its impact on accessibility. These priorities are described below:

- Priority 1: Requirements which developers must address

All sites must comply with these requirements or else one or more groups will find it impossible to access information in the document.

- Priority 2: Requirements which developers should address

All sites should satisfy these guidelines. Otherwise, one or more groups will find it difficult or impossible to access information in the document.

- Priority 3: Requirements which developers may address

These are requirements which Web developers may address to improve access to web documents.

Sites that conform to the W3C guidelines may display the image or message shown below as an indication of conformance on their web page:

The W3C Approved Web Site Image

W3C WAI-A WCAG 1.0

This page conforms to W3C's "Web Content Accessibility Guidelines 1.0", available at http://www.w3.org/TR/1999/WAI-WEBCONTENT-19990505, level Double-A.

The level of compliance is indicated as A, AA, or AAA as described below:

- Conformance Level "A": all Priority 1 checkpoints are satisfied,
- Conformance Level "Double-A": all Priority 1 and 2 checkpoints are satisfied,
- Conformance Level "Triple-A": all Priority 1, 2, and 3 checkpoints are satisfied.

Guidelines for Web Accessibility

The W3C Level guidelines are summarized below.

Guideline 1: Provide equivalents to auditory and visual content.

For each graphic image, text content can be presented to the user as text. In order to be useful, the text must convey the same function or purpose as the image. For example, consider a text equivalent for a photographic image of the Earth as seen from outer space. If the purpose of the image is mostly that of decoration, then the text "Photograph of the Earth as seen from outer space" might fulfill the necessary function. If the purpose of the photograph is to illustrate specific information about world geography, then the text equivalent should convey that specific information. If the photograph has been designed to tell the user to select the image (e.g., by clicking on it) for information about the earth, equivalent text would be "Information about the Earth". Thus, if the text conveys the same function or purpose for the user with a disability as the image does for other users, then it can be considered a text equivalent. This is probably the easiest modification that can be made to most Web pages to make them more accessible. Most web authoring programs, such as *Microsoft Front Page*, have a function called *Alternate* that can be used to enter a text description for images when they are placed on a page. When the user moves the cursor over the image, a text equivalent for the image will then appear on the user's screen.

Non-text equivalents of text such as icons, pictures, pre-recorded speech, or a video of a person translating the text into sign language can make documents accessible to people who may have difficulty accessing written text, including many individuals with cognitive disabilities, learning disabilities, and deafness. Non-text equivalents of text can also be helpful to non-readers. An auditory description is an example of a non-text equivalent of visual information. Auditory descriptions of multimedia presentation's visual track benefits people who cannot see the visual information. Audio can be recorded with application programs such as *RealAudio* and added to the web page as an option.

Guideline 2: Don't rely on one color alone.

Ensure that text and graphics are understandable when viewed without color. If color alone is used to convey information, people who cannot differentiate between certain colors and users with devices that have non-color or non-visual displays will not receive the information. When foreground and background colors are too close to the same hue, they may not provide sufficient contrast when viewed using monochrome displays or by people with color deficits.

Guideline 3: Use markup and style sheets properly.

Using html markup improperly hinders accessibility. Misusing html markup for a presentation effect, such as using a table for a page layout or a header to change the font size, makes it difficult for users with specialized software or hardware to understand the organization of the page or to navigate through it. Constructing what looks like a table of data with an HTML PRE element makes it difficult to render a page intelligibly to other devices.

At the other extreme, Web developers should not sacrifice appropriate formatting because a certain browser or assistive technology does not process it correctly. For example, it is appropriate to use the TABLE element in HTML for tabular information even though some older screen readers may not handle side-by-side text correctly.

Guideline 4: Clarify natural language usage.

Use text enhancements, such as boldface and italic, when they facilitate pronunciation or interpretation of abbreviated or foreign text. Developers should also provide expansions of abbreviations and acronyms. Using natural language improves readability of the Web for all people, including those with learning disabilities, cognitive disabilities, or people who are deaf. When abbreviations and natural language changes are not identified, they may be indecipherable when machine-spoken or brailled.

Guideline 5: Create tables that transform gracefully.

Tables should be used for tabular information (data tables) only. Developers should avoid using them to design page layouts. Tables for any use present special problems to users of screen readers. **Screen readers** are software applications commonly used by visually impaired individuals to read the text on a screen aloud so that it can be heard.

Guideline 6: Ensure that pages featuring new technologies transform gracefully

Ensure that pages are accessible even when newer technologies are not supported or are turned off. Although developers are encouraged to use new technologies that solve problems raised by existing technologies, they should know how to make their pages still work for people who choose to turn off features. Ensure that pages require scripts, applets, or other programmatic objects can be turned off or not used. If this is not possible, provide equivalent information on an alternative accessible page.

Guideline 7: Ensure user control of timed content changes.

Ensure that moving, blinking, scrolling, or auto-updating objects, if used, may be paused or stopped. Some people with cognitive or visual disabilities are unable to read moving text quickly enough or at all. Movement can also cause such a distraction that the rest of the page becomes unreadable for people with cognitive disabilities. Screen reader programs are also unable to read moving text.

Guideline 8: Ensure direct accessibility of embedded user interfaces.

Objects embedded in pages, such as applets and scripts, sometimes have their own interface. In these cases, the interface should be accessible to users so that they can be adapted to work with assistive technologies if necessary. If the interface of the embedded object cannot be made accessible, an alternative accessible solution, such as an alternate version of the page, should be provided.

Guideline 9: Design for device independence.

Device-independent access means that the user may interact with the site or document with a preferred input or output device such as a mouse, keyboard, voice, head wand, or other device. If, for example, control of a form can only be activated with a mouse or other pointing device, individuals using voice input, a keyboard or some other non-pointing input device will not be able to use the form.

Guideline 10: Use interim accessibility solutions so that assistive technologies will operate correctly.

New web technologies may not be immediately available to people using assistive devises. For example, older screen readers read lists of consecutive links as one link. Active page elements such as this are therefore difficult or impossible for these users to access. Also, changing the current window or popping up new windows can be very disorienting to users who cannot see that this has happened. This guideline is classified as "interim", meaning that the Web Content Guidelines Working Group considers them to be valid and necessary to Web accessibility as of the publication of the current version of the guidelines. However, the Working Group does not expect this to be necessary in the future, once Web technologies have incorporated anticipated features or capabilities. Until all browsers allow users to turn off spawned windows, developers should not cause pop-ups or other windows to appear or change a current window without informing the user.

Guideline 11: Use W3C technologies and guidelines.

Many formats commonly used on the web such as *PDF, PostScript* and *Shockwave*, require viewing with either plug-ins or stand-alone applications. Often, these formats cannot be viewed or navigated with the assistive technologies in common use. W3C recommends that these document formats be converted to W3C supported markup languages such as HTML, XML, or plain text. When inaccessible technologies must be used, equivalent accessible pages should be provided.

Guideline 12: Provide context and orientation information to help users understand complex pages or elements.

Providing navigation tools and orientation information in pages will maximize accessibility and usability. Not all users can make use of visual clues such as image maps, proportional scroll bars, side-by-side frames, or graphics that guide sighted users of graphical desktop browsers. Orientation information is somewhat like the running head of a book and tells the user where she is in the web site. For example, a web page might include an orientation line in the footer of the page that reads something like *Introduction: page 2 of 6.* This tells the user what part of the web site they are viewing. Simple icons such as a home icon and forward and back arrows also improve the ease of navigation. Grouping page components and providing contextual information about their relationships can be useful for all users. Dividing large blocks of information into more manageable groups where natural and appropriate also aids in understanding page components.

Guideline 13: Provide clear navigation mechanisms.

Providing clear and consistent navigation mechanisms such as orientation information, navigation bars, and site maps, increase the likelihood that a person will find what they are looking for at a site. Clear and consistent navigation mechanisms are important to people with cognitive disabilities or blindness, and benefit all users. Link text should be meaningful enough to make sense when read out of context. For example, using a link such as *Information about version 4.3* instead of *click here* adds to clarity.

Guideline 14: Ensure that documents are clear and simple so they may be more easily understood.

Using clear and simple language promotes effective communication. Access to written information can be difficult for people who have cognitive or learning disabilities. Using clear and simple language also benefits people whose first language differs from your own and those people who communicate primarily in sign language.

More information on these guidelines, including checkpoints and examples of techniques is available from the W3C web site.

Validating Accessibility of Web Sites

A checklist which can be used for evaluating any web site for compliance with these guidelines is available online from W3C. While use of the checklist provides for a human review of web sites, the *Bobby* program provides an automated review of web sites (Center for Applied Special Technology, 2000). Bobby is based on the W3C guidelines. While a Bobby review can provide a good general review of potential problems on any web site, it cannot assure compliance with all guidelines, especially those dealing with readability and navigation. Bobby is a Web-based tool that analyzes Web pages for their accessibility to people with disabilities. The Center for Applied Special Technology (CAST) offers Bobby as a free public service. By entering the URL of a page that you want Bobby to examine and clicking Submit. Bobby will display a report indicating any accessibility and browser compatibility errors found on the page. Bobby will only test one page at a time. If you wish to test an entire site as a batch, use the downloadable version of Bobby. Once all the pages on a site receive a Bobby Approved rating, it is entitled to display the Bobby Approved symbol.

Benefits of Accessible Web Sites

I have had an opportunity to work with faculty from my university's program for training teachers of visually impaired students by assisting them with developing accessible web sites for handicapped individuals. As I learned about designing Web sites for universal accessibility, I came to realize that designing web sites for handicapped individuals not only benefits those with handicaps but just about everyone else as well. For example, use of text equivalents, while benefiting users with disabilities, can also help all users find pages more easily, since search robots use a page's the text when indexing the page. Using good contrast between text and background improves readability for all. Using clear and simple wording improves readability for everyone. Following these guidelines helps improve access and usability of web sites for all, including those with disabilities and those without them. In cases where it is not possible to incorporate all of these guidelines into a page, creating a text based equivalent option is a fairly easy solution. This not only makes the page accessible to many individuals with handicaps; it makes the page readable for those who lack the latest versions of browsers and other web technologies.

For examples of accessible web sites, visit one of the following sites: *The W3C Group, American Council for the Blind, Lighthouse International, National Federation for the Blind,* and *The Texas School for the Blind and Visually Impaired.*

A downloadable Bobby compliant web page template, which can be used by developers, to help them get a head start on designing a more universally acceptable site is available free on the web at the following URL:

http://www.educ.ttu.edu/temp/ada/

This site includes tips to help visually impaired viewers change the appearance of a site with their browser, an alternate text only page, and some useful links.

References

Center for Applied Special Technology, Bobby [Online]. Available http://www.cast.org/bobby/, Nov, 8, 2000.

W3C Group, Web Content Accessibility Guidelines [Online]. Available http://www.w3.org/TR/WAI-WEBCONTENT/, Nov, 7,2000.

Assistive Learning Within a Special Needs Environment

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Abstract: The potential value and importance of assistive and adaptive technologies within the learning environment of special needs students must be emphasized. Students with exceptionalities can be aided through the thoughtful and successful integration of instructionally appropriate technological tools. The potential significance of instructional technologies within a special needs environment is imperative towards the success of the student learners.

Introduction

The reauthorization of IDEA recognizes the potential value and importance of assistive and adaptive technologies for students with exceptionalities. With the recent emphasis and integration of this technology into the mainstream classroom, teacher candidates must become knowledgeable and comfortable with assistive and adaptive technological tools that will aid learners with exceptionalities in the general classroom.

Instructional Technology

The instructional technology available within today's educational environment is becoming available to all levels of the PreK-12 environment at a quickening pace. Because of the diverse needs of students with exceptionalities, teacher candidates need experience with a wide range of assistive/adaptive technologies available to students with exceptionalities. Coursework and field experiences aid in the transition from preservice teacher to inservice teacher with the necessary and sufficient skills to support all learners. The experiences not only benefit teacher candidates but also the students whom they directly work with as well.

As always, instructional technology is just a tool, but a tool that can aid the special needs learner at appropriate points within the learning process. When emphasis is placed upon technology as a mere tool through which learners can access information and create products to display learning, the creativity and inspiration of the learner comes alive. Technology, when integrated into the instructional design of a learning experience, can be a positive influence within a learner's knowledge acquisition and conceptual framework of understanding. Therefore, the careful and thoughtful integration of instructional technology within a learning environment can be a positive influence for the PreK-12 learner.

Assistive and Adaptive Instructional Technologies

Instructional technologies have been integrated within the learning environment for PreK-12 learners with varying success. The emphasis for hardware and software availability is now giving way, as the pendulum swings towards the appropriate and successful integration of instructional technologies into the learning environment. However, we can not ignore the special needs of learners within the classroom environment. Assistive and adaptive technologies offer the technological efforts to not only the general education learners, but also to learners with special needs. First and foremost, we must define what is encompassed within the terms "assistive" or "adaptive" technologies:

> Assistive (or adaptive) technology includes any equipment, software, service, or specialized instructional material that helps disabled persons improve their quality of life and increase their access to education, the workplace, and the community. These devices help people function more independently in nearly all aspects of life, but especially in communication, mobility, learning, and personal care (Pesta, 1994, paragraph 2).

Teacher candidates have available to them numerous types of assistive and adaptive instructional technologies that offer learner-centered, as well as teacher-centered, opportunities to develop basic knowledge of subject matter as well as strive towards higher order thinking skills. During a five-week field experience, teacher candidates select and evaluate various types of assistive/adaptive technology available to the students in their current placement. Candidates thoroughly research various technologies they have access to in the field. Candidates then draw on their research, previous coursework in Special Education and Instructional Technology, and experiences of others to apply what they have learned to the natural teaching environment. Teacher candidates document their understanding of the technology and how it is used with students with exceptionalities via videotape. That is, each candidate presents a brief overview of selected assistive/adaptive technology available in the classroom by describing the technology and its uses. Candidates then demonstrate how the technology is used with the student with an exceptionality within the context of the classroom. The experience provides the opportunity for the teacher candidate to work with the student and the technology together, rather that the technology in isolation.

Candidates and mentor teachers both express value in such opportunities. The videos created by teacher candidates are then shared with their "colleagues. In addition, candidates evaluate the contributions assistive/adaptive technology adds to the quality of life of students with exceptionalities by developing an artistic advertisement of the assistive/adaptive technology available in the classroom. The advertisement reflects the value the technology has on the student's quality of life, the skills that can be learned, and attitude of the child with an exceptionality. Teacher candidates are encouraged to use skills learned in Instructional Technology for all assignments.

Conclusions

The technologies available within today's educational arena have the ability to not only emphasize the strengths of the exceptional learner, but also to further integrate the learner into the general classroom environment. Such opportunities for technology tools must be emphasized within the preservice teacher's coursework to provide a supportive learning environment for all students.

References

Pesta, J. (Summer 1994). Assistive, Adaptive, Amazing Technologies. *TECHNOS Quarterly: For Education and Technology 3 (2).* Retrieved November 20, 2000 from the World Wide Web: http://www.technos.net/journal/volume3/2pesta.htm

Special Educators' Technology Literacy: Identifying the Void

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Abstract: This study was initiated to investigate the technological knowledge and skill level of special education teachers and their use of technologies in self-contained and inclusive classrooms as mandated by public law. The study was conducted in two southeastern Florida school districts and included a sample of 210 teachers with a response rate of 69%. The results of this research will report the usage level of 24 technologies in the classroom and will discuss the correlation between teacher skill level and the use or non-use of computers and other technologies for instruction.

Introduction

Having daily classroom access to a variety of technological tools for special education teachers and students may soon be the norm rather than the exception. It is the hopes of many that technology will be used to improve and enhance the learning environment, but evidence has shown, "Without proper teacher training and motivation, technology can land on a shelf" (Clifford, 1998, p.34). Clifford also believes, like others, in the importance of technology in the contemporary classroom:

> Simply put, its role is too important, and the hardware and software involved are too expensive and valuable to allow this to happen. As technology plans are put in place, staff development must be factored in. At the same time, educators understand that the technology is now a critical component in learning, and that staff development in this area needs to be determined, sustained, varied, calculated, supported and frequently individualized (p. 34).

Teachers of students with high incidence disabilities, educating in both regular and special education elementary classroom settings, will need guidance and assurance that possessing technological skills is consequential in the attainment of personal and career goals for themselves and their students. A professional development plan for all teachers ought to include a significant wealth of computer and other technology training programs based upon a needs assessment that will encourage personal goal attainment in technological proficiencies identified through self evaluation. If teachers are to prepare students to meet the educational and vocational plans our children pursue, then it is imperative that all teachers gain knowledge and skills necessary to acquire and maintain a full range of recognizable competencies in this fast moving technological environment.

Special education teachers are becoming much more visible in regular education classrooms during the transition to the inclusion model that is being adopted by schools as mandated in the public laws. Novice special needs teachers are not unlike the regular education teachers who graduate from NCATE approved teacher preparation programs. They are presumed to have had at least one introductory technology course as well as numerous experiences to see how the integration of technology into the classroom could improve the teaching and learning environment. Unfortunately, during this transitional time, veteran teachers may not have had the same opportunities to acquire basic technology skills essential for today's technological expectations. The intent of this study was to ascertain the current status of the teachers' technological literacy and to identify the utilization or non-utilization of a variety of technological tools in special education programs. The results of this study may contribute helpful information to encourage the preparation of numerous technology workshops and inservice training programs to bring technologies and teachers together, to strengthen the instructional environment in special education classrooms.

Literature Review

The most recent and comprehensive analysis of special education and technology literature published in 1999 "...judged as contributing to the emerging knowledge base on special education technology research and practice," was synthesized by Edyburn, (2000, p. 7). He identified seven topics that dominated the literature: (a) assistive technology; (b) instructional technology; (c) World Wide Web; (d) implementation issues; (e) augmentative communication; (f) teacher training, and (g) accessibility. Teacher training was the focus of only 11 articles identified out of the 144 articles recorded.

Many would agree that teaching with technology in the special education classroom allows for the introduction of multiple instructional methods and modalities that may not be possible without the use of new hardware and software. Numerous research studies have reported the benefits of a diverse and multi-sensory learning environment for learners with disabilities, which also supports the argument that teachers ought to be proficient in the selection and use of computers and other technologies. According to Prinz & Boger-Mehall, (1999), "By using assistive technologies such as multimedia and hypermedia in a lesson, teachers can present information visually, audiologically, and textually" (p. 1570). Improving the technological knowledge and skills of teachers to utilize the variety of technologies would support the multi-sensory theories for instructional purposes and provide additional tools to meet individual goals as set forth by public laws governing education.

Teacher Awareness of Public Laws

There are five public laws that have a profound impact on elementary education in the teaching and learning environments that focus on implications for technology utilization specifically. Well-prepared teachers will be aware of these laws and ought to be able to distinguish the most relevant usage of numerous technological tools that may support individuals' instructional needs. Teacher training in the utilization of both low tech and high tech devices ought to be included in faculty development programs to meet the mandates of these public laws (Cronis & Ellis, 2000).

P.L. 100-407: Technology-Related Assistance for Individuals with Disabilities Act of 1988.
This public law addresses the need for access to technology by individuals with disabilities and their families.

P.L. 101-476: Individuals With Disabilities Education Amendments of 1990.
This public law identifies assistive technology as a specific service to be provided to young children with disabilities, legitimizing technology as an educational tool, and mandating that all students with disabilities be considered for assistive technology as part of their Individual Educational Plans (IEPs).

P.L. 101-336: Americans With Disabilities Act of 1990.
This public law stipulates that classes and educational equipment must be modified to enable participation by students with disabilities.

P.L. 102-119: Individuals With Disabilities Education Act Amendments of 1991.
This public law provides for greater family involvement in early intervention and states that assistive technology devices and services may be part of the Individualized Family Service Plan (IFSP).

P.L. 103-218: Technology-Related Assistance for Individuals With Disabilities Act of 1994.
This public law requires that states develop comprehensive programs of technology-related assistance for all persons with disabilities regardless of age.

Instructional Applications

These laws will benefit only those children with disabilities if our teachers are knowledgeable, trained, and adequately supported in the classroom to use a wide variety of technological tools appropriately. Results from a study that identified the status of assistive technology usage and special education teacher preparedness in northeastern state by McGregor & Pachuski (1996), reported that "In spite of the relatively high self-ratings of technology proficiency, teachers were substantially less satisfied with their ability to use technology in their teaching. Similarly, the largest discrepancies between teachers' ratings of importance and availability of specific technology support involved assistance to set up and program equipment, fiscal resources, and training" (p.13). Our study focused on the identification of the technology needs of teaches and their interest in utilizing numerous technologies in their instruction to provide a more current review of the status of technology use in special education.

The Study

Research Questions

1. How do special education teachers self-rate their technological knowledge and skill level?
2. Given a list of 24 technologies (including hardware & software), do special education teachers use or not use them in their instruction?
3. Is there a correlation between the self-rated knowledge and skill level and the use or non-use of these 24 technologies?
4. What is the special education teachers' level of interest in attending demonstrations or workshops of the 24 technologies?

Participants

The participants in this study were 144 special education elementary teachers assigned in grades P-K to 5 and employed in two school districts in southeastern Florida. School district one had a total student enrollment of approximately 145,000 students and district two had a total student enrollment of 80,000 students. Teachers surveyed included: (a) specialists teaching in varying exceptionalities (cross-categorical) resource classrooms; (b) teachers instructing in self-contained emotional/behavioral disorder classrooms; (c) teachers providing instruction in classrooms implementing inclusion, and (d) teachers serving students in pre-kindergarten special education classrooms.

The mean number of years teaching experience of the respondents was 11.29. Of the 144 participants, 131 or 91% were female, 11 or 7.6% were male. Two teachers did not respond to this question. Thirteen percent of the teachers had assignments in P-K, 26 % of the participants were teaching in grades 1-3, and 29% were assigned in grades 4-5. Additionally, 25 % indicated they taught in other categories: 4% grades 1&2 only; 13% were assigned to grades 2&3 only; and 8% indicated they taught in all grades. Eight percent of the participants did not respond to the grade level teaching assignment question that was asked of the special education teachers.

Instrument Design

The instrument was developed by initially generating a list of important items based upon the researchers' prior experiences developing surveys. Secondly, a draft of instrument was created to elicit information from teachers to determine how well the research questions might be answered. Ten special education teachers reviewed the initial draft and provided feedback and suggestions for improving the questionnaire. The second draft of the instrument was piloted with 18 special education teachers from six elementary schools. The final survey contained 19 items and required approximately fifteen minutes to complete. Quantitative data were collected using the paper and pencil method for completion of the instrument.

Data Collection

After approval from the university as well as the school districts central administration to conduct the study, a letter was sent to elementary school principals in the counties requesting permission to survey the special education teachers. A two week deadline was requested for return of completed surveys. Follow-up phone calls were made after the deadline to increase questionnaire submissions. All questionnaires were returned after eight weeks for data analysis. A total of 210 surveys were distributed and 144 completed surveys were collected for a return rate of 69%.

Data Analysis

The quantitative data from the survey items were analyzed using SPSS for Windows v. 10.0. A Microsoft Excel 2000 speadsheet was designed to improve the reliability and ease of entering and organizing the data from the completed survey.

Results

Addressing the Research Questions

In order to answer the research questions, the participants were first surveyed on whether or not they used 24 different technologies in their instruction. These technologies included: (a) VCR; (b) Laser Disk; (c) Computer; (d) Printer; (e) CD-ROM; (f) Scanner; (g) Camcorder; (h) Digital Camera; (i) Conferencing Camera; (j) Touch Windows; (k) Switches; (l) Power Pad; (m) Intellikeys; (n) Muppet Keyboard; (o) Voice Recognition Software; (p) Word Processing Software; (q) Presentation Software; (r) Desktop Publishing Software; (s) Spreadsheets; (t) Database Software; (u) Electronic Mail; (v) Web Browsers; (w) Educational Games; and (x) Encyclopedias.

The teachers were then asked the frequency with which they believed they would use each of those technologies in their instruction. Finally the participants were surveyed on their level of interest in attending demonstrations or workshops on each of the technologies. This paper only addresses research questions one, two, and three.

Use of Technologies for Instruction

The teachers reported the use and non-use of the 24 technologies in their classrooms in the following manner: (a) VCR 88.4% used, 11.1% not used; (b) Laser Disk 25.5% used, 74.5% not used; (c) Computer 88.4% used, 11.1% not used; (d) Printer 76.1% used, 23.9% not used; (e) CD-ROM 60.6% used, 39.4% not used;

(f) Scanner 12.6% used, 87.4% not used; (g) Camcorder 24.4% used, 75.6% not used; (h) Digital Camera 11.8% used, 88.2% not used; (i) Conferencing Camera 0% used, 100% not used; (j) Touch Windows 16.2% used, 83.8% not used; (k) Switches 8.9% use, 91.1% not used; (l) Power Pad 3.7% used, 96.3% not used; (m) Intellikeys 8.9% use, 91.1% not used; (n) Muppet Keyboard 2.2% used, 97.8% not used; (o) Voice Recognition Software .7% used, 99.3% not used; (p) Word Processing Software 72.1% used, 27.9% not used;

(q) Presentation Software 17.8% used, 82.2% not used; (r) Desktop Publishing Software 35.6% used, 64.4% not used; (s) Spreadsheets 17% used, 83% not used; (t) Database Software 11.9% used, 88.1% not used; (u) Electronic Mail 15.6% used, 84.4% not used; (v) Web Browsers 14.1% used, 85.9% not used; (w) Educational Games 73.5% used, 26.5% not used; and (x) Encyclopedias 37% used, 63% not used.

Regularity of Use of Technology

An Analysis of Variance (ANOVA) procedure was used to compare the mean scores among the four skill level groups identified through the Technology Needs Survey for ESE Teachers, and to determine whether significant differences existed among these four groups in their beliefs of the regularity with which they might use various technologies in their instruction. Analysis of variance, or ANOVA, is a method of testing the null hypothesis that several group means are equal in the population by comparing the sample variance estimated from the group means to that estimated within the groups. This procedure was conducted for each of the 24 technologies included in section four on the survey.

Statistically significant differences were found to exist among the four groups for four of the 24 technologies on the questionnaire including the perceived use of a laser disk player, scanner, camcorder, and digital camera. Table 1 presents an ANOVA summary for the questions pertaining to these four technologies. Once it was determined that differences existed among the means for these four technologies, Tukey's Honestly Significant Difference (Tukey HSD) post-hoc comparison tests were performed to determine which skill level groups among the four differed significantly in their beliefs about which technologies might be useful in their instruction. The Tukey method uses the standardized range statistic to make all of the pairwise comparisons between groups. This method is designed to compute all pairwise comparisons while maintaining the experiment-wise error rate at the pre-established alpha level, in this case 0.05. The four skill level groups of the questionnaire were used as the factor for purposes of this statistical analysis. The questions pertaining to the possible frequency of use of 24 different technologies in instruction served as the dependent list.

Table 1
ANOVA Summary for Technological Needs Survey (Questions 17BUSE, 17FUSE, Q17GUSE and Q17HUSE)

Variable	Source of Variation	SS	df	MS	F	Sig.
Laser Disk (Q17BUSE)	Between Groups	17.61	3	5.870	3.28	.025
	Within Groups	164.88	92	1.792		
	Total	182.49	95			
Scanner (Q17FUSE)	Between Groups	21.62	3	7.21	3.77	.013
	Within Groups	172.30	90	1.92		
	Total	193.93	93			
Camcorder (Q17GUSE)	Between Groups	24.63	3	8.21	5.16	.002
	Within Groups	148.05	93	1.59		
	Total	172.68	96			
Digital Camera (Q17HUSE)	Between Groups	35.98	3	11.99	6.45	.001
	Within Groups	167.29	90	1.86		
	Total	203.28	93			

Questions: How regularly do you believe a laser disk player, a scanner, a camcorder, or a digital camera could be integrated into your instruction?

Statistically significant differences were found among the four skill level groups in their perceived regularity of use in instruction of a laser disk player [F (3, 92) = 3.28, p = .025], a scanner [F (3, 90) = 3.77, p = .013], a camcorder [F (3, 93) = 5.16, p = .002], and a digital camera [F (3, 90) = 6.45, p = .001]. Those participants identifying themselves as beginners responded statistically significantly different in their perceived frequency of use of a laser disk player, a scanner, and a camcorder in their instruction than those participants who identified themselves as being intermediates. No statistically significant differences were found among any other skill level groups with respect to their perceived frequency of use of these first three technologies.

Those participants identifying themselves as beginners responded statistically significantly different in their perceived frequency of use of a digital camera in their instruction than those participants who identified themselves as being intermediates or advanced users. No statistically significant differences were found among any other skill level groups with respect to their perceived regularity of use of a digital camera. In all cases, the beginners responded that they believed they would use these technologies less regularly in their instruction than the intermediates or the advanced users. It is even more interesting to note that those identifying themselves as novice users of technology did not respond significantly different than advanced users in their perceived regularity of use of 24 technologies.

References

Clifford, W. (1998). Updating teachers' technology skills. *Momentum,* 29(3), 34-36.

Cronis, T., & Ellis, D. (2000). Issues facing special educators in the new millennium. *Education,* 20(4), 639-648.

Eyburn, D. (2000). 1999 in review: A synthesis of the special education technology literature. *Journal of Special Education Technology,* 15(1), 7-18.

McGregor, G., & Pachuski P. (1996). Assistive technology in schools: Are teachers ready, able, and supported? *Journal of Special Education Technology*, 13(1), 4-15.

P.L. 100-407: Technology-Related Assistance for Individuals with Disabilities Act of 1988.

P.L. 101-476: Individuals With Disabilities Education Amendments of 1990.

P.L. 101-336: Americans With Disabilities Act of 1990.

P.L. 102-119: Individuals With Disabilities Education Act Amendments of 1991.

P.L. 103-218: Technology-Related Assistance for Individuals With Disabilities Act of 1994.

Prinz, A., & Boger-Mehall, S. (1999). Integrating Technology into the Special Needs Classroom: Are Teachers Prepared? *Proceedings of the Society of Information Technology in Teacher Education*, San Diego, CA. 1569-1572.

TECHNOLOGY DIFFUSION

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Everett Rogers (1995), in his renowned book, *The Diffusion of Innovations*, established a framework that helps us understand the complex process by which new ideas and practices are adopted by individuals and organizations. Simply stated, an innovation presents people with alternative ways of doing things and solving problems. Individuals and organizations must then decide whether to adopt these alternatives and change their practice or reject the innovations in favor of more "tried and true" approaches. Rogers asserts that the "diffusion of innovations is essentially a social process in which subjectively perceived information about a new idea is communicated" (p. xvii). The meaning of an innovation, he explains, "is gradually worked out through a process of social construction" (p. xvii). Under favorable conditions, a "critical mass" of users will eventually adopt the innovation and it becomes an accepted practice. In the absence of supportive conditions, however, many innovations fail to take hold and are abandoned for more established approaches.

This section consists of papers that examine efforts to promote the diffusion of technology in a variety of educational settings. The first six papers are research reports on the adoption and integration of technology in K-12 classrooms. The next four papers address efforts to infuse a technology emphasis throughout university programs. The following four papers provide descriptions of collaborative partnerships between universities and K-12 schools—followed by four reports of professional development models. A group of nine papers then examine the use of Internet-based learning environments. The next two papers focus on issues pertaining to standards for technology use, followed by four papers that give insights into the various facets of technology integration. Finally, the remaining four papers address theoretical issues involved in technology diffusion efforts.

The first set of papers examines the technology diffusion process in K-12 schools. Cavanaugh describes an online technical support database for educators. This resource provides troubleshooting tips, hardware upgrade procedures, multimedia tutorials, and links to additional resources and vendor updates. Gibson examines the effects of providing laptop computers for K-12 students in a rural community. He addresses issues such as the influence of having access to the technology on the learning process and teachers' pedagogy. O'Rourke highlights a key element in the diffusion process in elementary schools—opinion leaders who exert influence on their peers. Implications of her findings are discussed. Rodriquez and McDonald evaluate a Web-based middle school science curriculum and identify factors that are related to effective implementation of the curriculum. Scagnoli and Willging describe efforts to integrate various subject areas via a Web-library. Topp, Doshier and Schlager's paper focuses on the development, implementation, and impact of multidisciplinary, thematic units used within the school curriculum.

The second group of papers reports on efforts to diffuse technology components in university programs. Ferguson and Mahoney discuss issues associated with their PT3 sponsored project for revising their two required preservice technology courses. Brown and Appleman describe the formation of an organization for education students who are interested in instructional design. This group, Students in Multimedia Studies (SIMMS), was created to support people interested in expanding their skills beyond those required for standard instructional design situations. Snelbecker, Slesaransky-Poe, Fitt, Miller and Gallo describe a variety of strategies to infuse technology in a large, urban teacher education program. Cereijo, Mortensen and Holcomb report on distributed learning models used in their Department of Technology and Cognition.

The papers that follow document university/K-12 collaborative partnerships. Kemker, Schullo and Fitzpatrick describe the services provided by the Florida Center for Instructional Technology Preview Center located in the College of Education, at the University of South Florida. The center offers opportunities for K-12 teachers to examine over 3000 software and multimedia titles, hardware devices like Smart Boards and digital cameras, and provides workshops for using the technologies and integrating their use into instruction. Sugar, Parke and Pedersen present details about the development of a collaborative network that supports their university-school partnership. Wilkinson and Nel describe efforts in South Africa in which the Technicon Free State launched its Adopt-a-school program to provide professional development and other technology assistance to a secondary school in need of these services. Wolfe, Ashley, Nancy, Taylor and Wolff tell about a collaborative project in which content and teacher education faculty as well as elementary and secondary teachers redesigned curricula for implementation at their various sites.

The next cluster of papers focuses on models for professional development with technology. Jenks and Strickland describe the implementation and evaluation of a program designed to train technology mentors for rural school districts. The Technology Integration Mentors in Education (TIME) is a "train the trainers" model aimed at diffusing technology throughout a rural western state. Bailie examined data from a survey to see how results from local educators compared with results from a nationally normed survey. One focus of the survey was professional development. Anderson and Starrett describe the process whereby a university's retention, promotion and tenure guidelines were revised to value professional development associated with professors' infusion of educational technology into their university courses. Finally, McCurry explores inservice teacher education through the lens of two theoretical constructs—Rogers' Diffusion of Innovations theory and Vygotsky's constructivist concept of Zone of Proximal Development.

Following is a group of papers that documents the proliferation of learning environments enhanced by the Internet and related technologies. Hsu, Cheng, Chiou and Chen examined the use of the Internet in a High School in Taiwan. Teachers' attitudes and use of the Internet in instruction were compared before and after an intervention by the researchers. Findings indicate Internet use increased after the intervention, and that teachers recognized an increased need for assistance in teaching with the web as they progressed. Donohue and Ison describe how they quickly and easily get teachers to design slide shows and interactive quizzes and construct online curricula using a series of online tools. Gareau discusses how Javascript can be used to develop interactive online applications and Eckert describes a system that allows instructors and students to manipulate the same computer over a network. Pemberton, Tyler-Wood, Cereijo, Rademacher and Mortensen assess the effectiveness of the EnVision System as a tool for monitoring practicum students from a distance for their Educational Diagnostician Program. In a related paper, Pemberton, Cereijo, Tyler-Wood and Mortensen describe further efforts to use distance technologies in this program. Richardson & Felkel tell about their work with Web-based video in a business calculus class and St-Pierre focuses on practical suggestions for building and using Web sites to support teaching. Finally, Maraschin, Smith, Tamusiunas, Costa and Rickes describe a project in Brazil in which a group of teachers used web-based collaborative writing tools in a distance learning seminar.

The next two papers focus on issues related to standards for technology use. Georgi examined similarities between California technology standards and standards developed in the ISTE NETS project. Baines and Belvin looked across a technology standards and content area standards to find areas of overlap. They hope to distill the multiple standards documents into a unified set of standards.

Technology integration is the common theme in the next cluster of papers. Dias examined the relationship between teachers' pedagogical practices and the ways that they integrated technology into their instruction. She found consistency between constructivist teaching methods and instructional uses of technology as a tool to support student learning. In his paper, Foster explored connections between integrating technology into the classroom and teachers' self-efficacy, motivation and the perceived utility of the technology. Baylor and Ritchie identified factors that influenced several issues associated with technology integration (i.e., technology's influence on developing higher order thinking skills and teachers' technological competency).

In her paper, Lim shares a framework for integrating technology in teaching and learning that she believes will guide institutions in adopting innovative educational practice.

The last set of papers all address theoretical issues pertaining to technology diffusion. Duffield, Grundmeier, Stocker and Raymond provide a review of the literature in which they examined the ISTE Essential Conditions for Implementing NETS for Teachers in light of theories of diffusion, innovation, and adoption. Knode and Knode discuss how developments in artificial intelligence are enabling the creation of software-based tutors and teaching assistants. Chen and Thielemann describe how a lack of technology has contributed to the digital divide and suggest ways that teachers can access resources to promote equity. Remidez, Laffey and Musser address another issue—that of open source software development and how it can benefit teacher educators. Finally, Szabo describes what he believes is a major revolution—the information communications technology revolution—and hypothesizes how educators can minimize the shock and turmoil that we are likely to face.

References

Rogers, E. (1995). *The Diffusion of Innovations, 4th Edition.* The Free Press: New York.

A Response to Technology Integration in Teacher Education for Merit, Tenure, and, Promotion

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Abstract: An effort by a committee at Southeast Missouri State University to provide support to faculty infusing technology into their teaching led to the creation of a document that provided suggested guidelines for judging these efforts in merit, tenure, and promotion. This paper describes the guideline document and the efforts that were taken to develop it. This paper also outlines the technology infusion efforts of two faculty involved in training teachers at the university, one in education and one in biology, and describes how they used the document to file for merit recognition.

Teacher education institutions are being asked to respond to the changing career market faced by today's public school students. Predictions for these students indicate that many jobs will require expertise in technology. In 1996, statistics predicted that five of the ten fastest growing jobs would require computer experience (College Planning Network, 1996). As a consequence, businesses are asking the public schools to produce students who are comfortable in the use of technology (USDL, 1991). Parents too, are demanding that their children be trained to use technology as a part of their school program (Trotter, 1997).

In response to these conditions, teacher education institutions are increasingly integrating technology into their teacher training programs in an effort to produce future teachers who are comfortable using technology in their classrooms. Both education faculty and those responsible for the arts and sciences courses that support the training of teachers are being asked to infuse technology into their university courses (NCATE, 1997). Recent research has demonstrated a correlation between the modeling of appropriate use of technology in college courses and the successful training of technology-using teachers (ISTE, 1999). Indeed, professional organizations whose job is to judge college and university teacher education programs for continued certification are now requiring the infusion of technology into teacher preparation courses (NCATE, 1999).

While the infusion of technology into teacher education is now required, the merit, tenure and promotion guidelines of many universities have failed to respond to this requirement. Though technology infusion is expected by professional organizations, many education colleges, while expecting written publications from their faculty, fail to award publication credit to the technology products of their faculty for merit, tenure and promotion (Johnson, Johnson, and Epstein,1998). Facing the choice between traditional requirements for continued employment and using technology, faculty might opt to focus on the former activities over technology infusion efforts in their teacher training courses. These choices can pit the desire of the teacher education administrators to receive positive NCATE approvals that includes technology infusion requirements against the desire of the faculty to succeed in their teaching positions.

Facing this dilemma, Southeast Missouri State University made an effort to reward the infusion of technology into the university and its teacher education program. The effort began with a motion in the Faculty Senate to revise the wording of the Faculty Handbook tenure and promotion guidelines to recognize these efforts. This motion was not successful. In 1999, in order to provide recognition for the technology efforts for those who were using technology while not threatening those who were not infusing technology, the Interim Provost brought together representatives of all of the colleges of the university. This included those colleges involved in the training of teachers, the College of Education and other colleges in the arts and sciences that support teacher education. The task of this committee, the Information Technology Faculty Roles & Rewards Action Team, was to design a document that would act as a series of recommendations to the promotion and tenure-granting committees on campus, acknowledging the technology efforts of those faculty who were infusing it while still maintaining the current language of the tenure and promotion guidelines.

The committee began by researching the rationale for creating the document. Together, they collected university mission statements that focussed on the inclusion of technology within instruction at the university. In addition, the committee felt that a mission statement and charge from the provost was not adequate rationale, that substantiation of these technology efforts with successful student learning was also necessary. To collect this part of the rationale, the literature of learning with technology was researched for its instructional benefits. This information was also included in the document, providing a strong motive for the document's use when making decisions about merit, tenure and promotion. Next the committee collected examples of technology initiatives within the university. These initiatives were compiled and sorted within the three traditional areas of tenure: research, service and teaching, with a description of the interpretation for each area. The resulting document, *Information Technology Faculty Roles & Rewards Action Team Information Technology Promotion, Tenure, and Merit Guidelines* (manuscript in preparation), was then distributed to the Dean's Council where it was accepted. Subsequently, it was distributed to the faculty where it is currently in its first year of use.

Description of Document

The ITFRR Promotion, Tenure, and Merit Guidelines document that was produced by the committee was divided into three parts. The introduction provided the rationale that led to the creation of the document. Included in this part is a synopsis of the mission statement of the university which includes the infusion of technology. Included also is a summary of the benefits of using technology in teaching. Finally, included in this part of the document is a statement that governmental officials and parents want their students to be exposed to appropriate technology in their education program.

The second part of the document is a description of the three areas commonly judged for merit, tenure and promotion. The document describes common faculty technology uses that might fit within each of these three categories. For example, it elaborates on a description of how class Web pages might be included within the teaching category.

The final portion of the document is a listing of the common technology initiatives that faculty engage in and how they might be classified when filling out papers for merit, tenure and promotion. It provides an outline of where these initiatives best fit within the three traditional areas as described in the faculty handbook. The list can then be a guideline for faculty who use technology to develop their papers for merit, tenure, and promotion. It also acts as standards for those faculty who make judgements about merit, tenure and promotion awards. A copy of this document is available on the Internet at http://cstl.semo.edu/itfrr.

Case Study of Biology Faculty

The Department of Biology at Southeast Missouri State University prides itself on being current in educational practices and being a forerunner in acceptance of new techniques and technologies. The faculty member described here was hired into the department in the fall of 1995 as a plant physiologist. During his five years of teaching within the department, his teaching was determined to be very effective based on peer-review, student ratings of instruction, and anecdotal evidence. He also developed a successful research program involving many students. During those five years, he published five peer-reviewed journal articles, obtained a research grant from the US Department of Agriculture, and was in general active within his field as evidenced by attendance and presentations at numerous professional meetings in his area. His record in the area of service included active participation on department, college and university level committees, including two years on Faculty Senate. Also, he became heavily involved in faculty development via his collaborative work with the Center for Scholarship in Teaching and Learning. His use of technology to enhance teaching led to his being chosen to facilitate workshops that provided training in the area of technology to other faculty on campus.

The involvement in faculty development became very heavy as he continued to be involved in the planning and development of the training workshops and continued to facilitate many sessions. This quickly led to his inclusion as a Technology Associate, an advisory committee that advises the center on directions the University should take in the inclusion of instructional technology into teaching and learning at Southeast Missouri State. This heavy commitment to the use of technology led to him being appointed Director of the center at the end of his fourth year at the University, a 3/4 time position leaving him 1/4 time in the Department of Biology. Based on his achievements in Teaching and Scholarship, he was encouraged to go up for promotion and tenure a year early, during his 5th year at the University.

The Department heartily approved his Record of Service in the areas of Teaching and Scholarship with strong evidence of effective teaching and the peer-reviewed publications and outside grant funding leading the way. Interestingly, Service was rated the lowest of the 3 traditional areas. Much of the evidence documented for service related to the faculty member's involvement in faculty development in the area of integration of technology into teaching and learning. This was ironic in light of the Department's stated position on being openly accepting of new technologies and being a fair judge of faculty accomplishments, etc.

The guideline document described had not been released to the campus at the time of the promotion and tenure process described above. However, some of the justification and approach used in the document were included in the record of Service. Nonetheless, it was apparent that the heavy involvement in the integration of technology was not considered with as great a weight as other more traditional pieces of evidence were. It is hard to say what effect the document might have had had it been circulated previous to this process. The document had however been circulated when the described faculty member submitted his merit report for CY 1999; a time frame which included six months of service fulltime in the department and six months as Director of the center. In this case, the heavy involvement in technology was recognized and rewarded. It is hard to say whether the document was responsible for this in any part, but it is likely that it had some impact.

The Department of Biology serves Science Education majors as was well as Secondary Education majors in other fields. The above-described faulty member has taught classes for majors and non-majors both and thereby has taught many students majoring in some form of education. Technology was integrated into many of his courses in the form of PowerPoint presentations, course-enhancing web materials, and even technology-oriented activities in biology. He has even taught a non-majors course completely on-line. Technology has also played a role in his scholarship as he has attended and presented at technology-in-education-oriented meetings and conferences and has recently submitted a book chapter on the creation and maintenance of web sites. The role of technology in service has been described above. Given that education students learn not only by content but also by example, the integration of technology into the classroom is an important aspect of the education received by these students. In order to promote effective use and integration of new technologies, it is important to teach by example. To this end, it is essential that the use of technology by faculty be recognized and rewarded by colleges and universities. The development and use of the guideline document described is one step in moving toward a more just recognition of the use of technology in the classroom by faculty teaching the teachers of tomorrow.

Case Study of Education Faculty

In the College of Education, the document, *Information Technology Faculty Roles & Rewards Action Team Information Technology Promotion, Tenure, and Merit Guidelines* served as a tool for classifying technology infusion activities according to the three traditional areas of merit, tenure, and promotion. One education faculty member's technology activities were spread across the three areas of teaching, research, and service. Using the document as a guide, most of the technology activities of the education faculty member fell into the area of improvement of teaching, followed closely with the area of service. However, the efforts in both of these areas led to technology-infusion activities that fell into the area of research.

The education faculty member taught courses that included instructional methods courses in special education, educational theory courses for regular education graduate students, and instructional technology courses for both regular education and special education. The technology infusion efforts in her education courses included many uses of computer-based technology ranging from simple email assignments to demonstration of sample technology-integrated lessons for her students.

In teaching courses in special education, the education faculty member infused technology by requiring Internet searches in several areas. These searches included such things as searching for information on different disabilities, searching for communication methods to use with diverse parents, and information on different education theoreticians. The students worked in groups and were taught to use chat rooms to enable them to communicate within their groups as they searched for information on their disabilities.

Another introductory course in special education that this faculty member taught was accomplished entirely online. Students in this course were required to communicate using several technology methods. They used a bulletin board to post case study assignments, communicated via email and chat lines for group research papers on different disability areas and used instructor-created Web pages for information. These activities were identified by the guidelines paper as teaching effectiveness efforts.

In teaching educational theory courses, the education faculty member infused the use of email, searching the Internet, educational software demonstration, and production of multimedia projects. In this course, the instructor introduced a variety of cognitive educational theories and the theoreticians who developed them using PowerPoint slides. As a part of the course, the instructor required her students to develop a research paper on one of the cognitive theoreticians and to teach a lesson that reflected that theory and infused technology. The students were taught *Hyperstudio* to do the presentation. To accomplish these projects, the students searched the Internet for information on the theorists and emailed a draft to the instructor. As each of the theories was discussed in class, the instructor demonstrated educational software packages that reflected that particular theory, followed by the student presentation on the theory and their sample lesson that infused technology. All of these technology efforts were identified by the guidelines document as efforts to improve teaching.

Two technology emphasis areas were created by the faculty member for the elementary and secondary programs, one at the undergraduate level and one at the graduate level. In these courses, the education faculty member used many methods of technology infusion. The education faculty member demonstrated technology-infused lessons, using a variety of software packages and relevant Web sites for a variety of subject areas. For each subject area, in addition to the software, she had the students create lessons for their students that used the Internet and then required them to find relevant Web sites to direct their students to use in their lessons. She provided hands-on use of special education technology, even requiring her special education graduate students to make a switch for their students. She used PowerPoint to present methods of making Web sites accessible for people with disabilities and then had students make accessible Web sites. She used email pen pals for her students to keep in touch with students in a K-12 classroom. Students looked up lessons on the Internet and turned them into lessons that were authentic activities using graphing software. Again the guideline document identified these as teaching improvements.

These teaching activities led to other opportunities that the guidelines document placed into the service and research categories. Several of the teachers in the courses that this faculty member taught requested her to come to their schools and provide an in-service for their faculty. She became a regular in-service provider to train their teachers to use the new technology. She served the university on several technology committees, at the departmental level, the college level, and the university level. She was asked to provide several in-services for faculty at each of these levels also.

Research and publication efforts also emanated from the technology activities that this faculty member used in her teaching. She was able to write and serve as primary investigator for several grants that used technology. She was primary investigator for an Eisenhower grant that purchased software for the regular education and special education teachers who participated in the courses she taught. These teachers developed technology-infused activities to prepare their students for state assessments. She was co-investigator and primary investigator for two grants that purchased hardware and software for regular and special education teacher candidates to use in their field experiences. The guideline paper suggested to her that these activities were properly placed into the research category.

Also in the research category, this faculty member provided several peer-reviewed state, regional and national presentations on technology use. She published five peer-reviewed articles about technology use in education, as well as a chapter in a textbook. Each of these activities were identified by the document as research activities.

Thus the guidelines document provided suggestions about the listing of technology infusion activities in this education faculty member's record of service. This education faculty member had technology infusion activities that fell within the categories of the improvement of teaching, service to the region and university, and research activities. These technology infusion efforts allowed this faculty member to achieve the highest level of merit offered by her department in the College of Education.

Conclusion

The *Information Technology Faculty Roles & Rewards Action Team Information Technology Promotion, Tenure, and Merit Guidelines* document was developed to provide guidelines to faculty at Southeast Missouri State University. These guidelines were designed to serve both as recommendations for classifying technology efforts for those faculty infusing technology and as suggestions for those involved in making judgements about these efforts for merit, tenure, and promotion. Future plans for this document include the collection of data from faculty members at Southeast Missouri State University and evaluation of its impact on the merit, promotion and tenure process there.

References

College Planning Network. (1996, October 16). *Back to school: A guide for adults returning to college*. Seattle, WA: Author. Retrieved October 29, 1999 from the World Wide Web: http://www.collegeplan.org/bcksch/bkschool.htm.

International Society for Technology in Education (1999). *Will new teachers be prepared to teach in a digital age?* Santa Monica, CA: Milkin Family Foundation.

Johnson, G., Johnson, R., and Epstein, T. (1999). *Institutional survey of credit for technology related efforts by COE faculty*. Paper presented at he meeting of the Society for Information Technology in Teacher Education, San Antonio, TX.

Task Force on Technology and Teacher Education. (1997). *Technology and the new professional teacher: Preparing for the 21st century classroom (1997)*. Washington, DC: National Council for Accreditation of Teacher Education. Retrieved November 9, 2000 from the World Wide Web: http://www.ncate.org/projects/tech/TECH.HTM.

Trotter, Andrew. (1997). Technology counts: Taking technology's measure. *Education Week on the Web*. Retrieved November 27, 2000 from the World Wide Web: http://www.edweek.com/sreports/tc/tchome97.htm

U.S. Department of Labor (1991). What work requires of schools: A SCANS report for America 2000. Washington, DC: US Department of Labor. Retrieved November 15, 2000 from the World Wide Web: http://wdr.doleta.gov/SCANS/whatwork.

Comparing a Local School District's Teacher Use of Computing With National Survey Results

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Abstract: Funded by the National Science Foundation and the U.S. Department of Education, the Center for Research on Information Technology and Organizations conducted a national survey of schools and teachers entitled, "Teaching, Learning, and
ill discuss a modified local version of this survey administered to a large diverse suburban school district. The purpose of this local survey was to provide a comprehensive needs assessment focusing on the usage patterns and opinions of teachers toward computing. This paper will summarize the local survey results and then go on to compare the local results with the national survey results drawn from selected reports posted on the Internet. An outline of district plans to use the survey results in guiding the implementation of its technology plan will also be presented.

Introduction

In his State of the Union Address in 1996, President Clinton established the goal of technological literacy for all students as the nation prepared for the 21st century (Pepper 1999). Now that we have reached the new millennium, the educational community is still struggling to meet the President's challenge. Numerous surveys have been conducted to determine how schools and teachers are using computers and the Internet to advance learning. For example, surveys conducted by the U.S. Department of Education, the Office of Technology Assessment, the National Center for Education Statistics, and Education Week document the problems teachers face when trying to integrate technology into the curriculum: hardware and software that are out of date, classrooms that are not wired for the Internet, technical support that is not always available, staff development programs that are not adequate, and lack of time required to use technology effectively (Frank 1999, Oldenburg 1999, Pepper 1999).

Teaching, Learning, and Computing

Funded by the National Science Foundation and the U.S. Department of Education, the Center for Research on Information Technology and Organizations conducted a national survey of schools and teachers entitled, "Teaching, Learning, and Computing 1998." More than 4,000 teachers in grades 4 through 12 in over 1,100 schools throughout the country completed the survey questionnaire. The teacher survey posed questions on teaching philosophy, teaching practice in a single class, use of computers, general teaching experiences, and work environment. The analysis investigated the possible relationship between a constructivist philosophy of teaching and computer use. Possible correlates were computer experience, teacher responsibility and experience, educational background, and support for use of technology and constructivist practices. The survey was administered in 1998 and results were posted on the Internet starting in 1999. The availability of national results from such a comprehensive survey provided an excellent opportunity to conduct the survey on a local level and then compare the local results to the national results.

Local District Survey

The New Rochelle School District is a large diverse suburban district with a high school, two middle schools, and seven elementary schools. As is the case with most districts, New Rochelle is held accountable by its Board of Education and the New Rochelle community to develop and implement a comprehensive technology plan. The city of New Rochelle recently passed a technology bond to fund advances in computer technology in the schools, primarily in the form of improvements to the infrastructure. Looking beyond the hardware and wiring additions to their schools, district leaders felt that a comprehensive needs assessment, focusing on the usage patterns and opinions of their teachers toward computing, would be an valuable tool in guiding future technology decisions. One method of gathering data was to survey the teachers in the district to determine their use and level of expertise with technology. To that end, a modified version of the Teaching, Learning, and Computing Survey was developed that drew questions primarily from the sections on use of computers and work environment. The survey also contained other questions, including demographics (such as subjects and grades taught) and general opinions about computing and the Internet. These additional questions were based on a survey conducted by the Texas Center for Educational Technology, entitled "Teachers & Technology: A Snap-Shot Survey." The newly designed survey was distributed in September 1999 to all teachers in the district; participants were instructed to base their responses on their teaching practices during the 1998-1999 school year. After the completed surveys were collected, the data were coded and entered into SPSS for analysis.

Local Survey Results

Responses were received from 270 teachers in the district (a little more than 50%). Demographics revealed that over one quarter of the teachers had been teaching for over twenty years. The survey revealed a moderate indication that younger teachers have a higher level of comfort with computers than their older peers; only13% of the respondents rated themselves at the highest level of computer use. Over 80% of the teachers reported that they needed more time to use computers and the Internet, more training in technology integration, more curricular-based software, computers and Internet access and more technical support. This was a disturbingly high percentage, given the fact that the district had been very diligent in providing computers, staff development opportunities, as well as technical and instructional support to its teachers for many years. Yet, despite these efforts, teachers still appear to feel inadequately prepared when it comes to exploiting the power of computers in the classroom.

Fewer than half of the teachers reported using computers in class. The most popular objectives teachers cited for using computers in class were learning to work independently, mastering skills and remediation; word processing and games for practicing skills were the software most often assigned. It was encouraging to find that a number of teachers have a computer at home and some have Internet access. However, their competencies lie primarily in searching the Internet as opposed to more demanding tasks such as preparing a presentation or a multimedia document. Teachers reported that Internet access was the most valuable technology needed in the classroom.

Only 16% of teachers reported that they discussed computers and software on a regular basis with their colleagues; contact with teachers from other schools was rare. Despite the district's efforts to provide staff support, only 29% of teachers believed that staff development activities were followed by support for implementation, 26% of teachers believe that teachers play an important role in defining staff development activities, and fewer than 20% of teachers report that the Internet and its use were a central topic of discussion. The lack of classroom Internet access and useful curriculum-based software were notable deficiencies. Teachers further reported a lack of instructional (77%) and technical (70%) support.

Comparison to National Results

While some of the preliminary results were encouraging, many of them appeared alarming on the surface. The question to be answered was how they compared to the results of the national survey on Teaching, Learning, and Computing. As mentioned above, the national survey results were posted on the Internet. Two reports, "Internet Use by Teachers: Conditions of Professional Use and Teacher-Directed

Use" and "Teacher and Teacher-Directed Student Use of Computers and Software" and two snapshots, "Technical and Instructional Support for Teachers" and " Professional Development" formed the basis of the comparisons described below. Since the national survey included only teachers from 4-12 grades, results from lower grades in New Rochelle were eliminated from the comparison tests. For the reports that were of particular interest to the New Rochelle School District, local data was analyzed to align as closely as possible with the national data. Not all questions of interest could be compared because in several instances questions had too few responses to formulate a valid comparison.

Internet Use

One of the major areas of concern in the New Rochelle School District is the lack of classroom Internet access, particularly at the middle and high school level. The survey shows that 95% of middle school classrooms and 90% of high school classrooms have no access as compared to 60% and 61% nationally, yet 83% of teachers rated classroom Internet access essential to their teaching. The situation at home appears to be no better, with only 11% of New Rochelle teachers having home access as opposed to 59% of teachers in the national survey. However, it is encouraging that despite their lower access rate, New Rochelle teachers report about the same (email use and posting information) or higher (lesson plans) percentage of use of the Internet.

Computer Use

New Rochelle teachers (45%) lagged behind their national counterparts (71%) in the use of computers in the classroom. One reason for this may be the higher student to computer ratio in the New Rochelle schools. The ideal ratio appears to be about one computer for every four students. Only 6% of New Rochelle teachers reported this low ratio as compared to 13% of national survey teachers. According to the national survey, the average student to classroom computer ratio is 6 to 1, whereas the average in New Rochelle is 12 to 1. It is important to note that most of the computers in the district are currently located in computer labs rather than in classrooms. While important, the number of computers is not as crucial an issue as how teachers are using them. Another area of concern for New Rochelle is that 79% of their elementary school teachers rely heavily on games and drills. A possible explanation is that most New Rochelle teachers report remediation as an important objective for computer use. In fact, 63% of New Rochelle teachers who assign games and drills value remediation as an objective, as compared to 39% nationally. Elementary school teachers in New Rochelle are to be commended for a higher mean number of computer skills (3.7 out of 7) than the national elementary school teachers (2.6 out of 7). Middle school teachers in New Rochelle, however, came in lower (2.6 out of 7) than the national middle school teachers (3.4 out of 7).

Work Environment

New Rochelle can take pride in the fact that twice as many elementary school teachers (61%) report staff development sessions in critical thinking than the national survey teachers (32%). Yet staff development sessions in computer related topics are slightly lower in New Rochelle (21%) than they are nationally (32%). Technical support in New Rochelle appears to be better than in national schools. New Rochelle teachers report that when they need support, it is available over 68% of the time, whereas national teachers report that it is available less than 23% of the time. On the other hand, instructional support in New Rochelle might be improved since it is available only 9% of the time as compared to being available 25% of the time nationally.

Discussion

It appears that the New Rochelle school district has made great strides in providing effective computer use for its teachers and students. The level of technical support that is provided is also commendable by comparison to national survey results. Perhaps the area in which New Rochelle is most deficient in comparison to the national survey is in the number of classroom computers and classroom Internet access, particularly at the middle school and high school levels. There is wide agreement that despite the fact that most students have their own computer when they go to a computer lab, having four or five computers in the classroom significantly increases the number of computer assignments and the number of contact hours a student receives. Moving computers from the labs into the classrooms would be a significant improvement. Of course, wiring costs need to be addressed, especially to provide Internet access in the classrooms. Teachers themselves need more computer access for themselves. As compared to the national survey teachers, very few of them have computers at home to help them prepare lessons for their students. Perhaps purchasing laptop computers that could be assigned to teachers, particularly over the summer, would help to alleviate this problem.

Survey results seem to indicate that the elementary school teachers fare better than the middle and high school teachers in their use of computers in the classroom. Many more of them seem to have classroom computers so they are able to make more frequent assignments. They are also using software that addresses higher order thinking skills, such as simulations, presentation software, and multimedia authoring. It is unfortunate that they are also using games and drill and practice as the overwhelmingly predominant use of computers. This could be attributed to the fact that this is the most readily available resource that they have. Survey results indicate that teachers, particularly middle and high school teachers, could use more training and improve their computer skills.

Conclusion

The district has already begun to address a number of the concerns the survey revealed. The technology bond allowed the district to plan a single network that could be accessed by all schools, providing increased Internet access that was sorely needed. Each third and fourth grade classroom has received four computers, with a fifth computer for the teacher planned in the near future. This influx of computers will reduce the student to computer ratio to 6-1 for the third and fourth grade. They will be phasing out the dual platform of Macs and IBMs to standardize the interface for teachers and students. The New Rochelle School District has recently hired two Technology Information Specialists to work on staff development and curriculum integration in the elementary and secondary schools. Using this survey as baseline data, the district hopes to repeat the survey at the end of the next phase of the technology plan to show evidence of the strides students and teachers have made along the path of technological literacy. It is hoped that the data provided by this survey and comparison analysis will assist them in moving closer toward the goal that President Clinton proposed nearly five years ago to prepare our students with the technology skills mandated by the twenty-first century economy.

References

Becker, Henry J (1999). Internet Use by Teachers: Conditions of Professional Use and Teacher-Directed Student Use. Report #1, Teaching Learning and Computing: 1998 National Survey. University of California, Irvine. http://www.crito.uci.edu/TLC/FINDINGS/internetuse

Becker, Henry J., Jason L. Ravitz & Yan Tien Wong (1999). Teacher and Teacher-Directed Student Use of Computers and Software. Report #3, Teaching Learning and Computing: 1998 National Survey. University of California, Irvine and University of Minnesota. http://www.crito.uci.edu/TLC/FINDINGS/computeruse

Times-Picayune. Sep. 24, 1999.

Oldenburg, Don. "The Teacher-Technology Gap." *The Washington Post*. Feb. 2, 1999

Pepper, Kaye (1999). A Comparison of Attitudes toward Computer Use of Preservice and Inservice Teachers. Mid-South Educational Research Association, Point Clear, AL. (ERIC Document Reproduction Services No. ED 436 525)

Professional Development. Snapshot #6, Teaching Learning and Computing: 1998 National Survey. University of California, Irvine. http://www.crito.uci.edu/TLC/FINDINGS/snapshot6

Technical and Instructional Support for Teachers. Snapshot #4, Teaching Learning and Computing: 1998 National Survey. University of California, Irvine. http://www.crito.uci.edu/TLC/FINDINGS/snapshot4

Rage Towards the Machine: Technology and Standards in 2001

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Abstract: With the burgeoning movement to establish standards, many organizations have developed expectations for what a teacher should know and be able to accomplish through technology. We examined standards from accrediting agencies (NCATE, INTASC, and TEAC), professional organizations (NCTE, NCTM, NCSS, NAME, and ISTE), and state departments of education (Florida, Georgia, Tennessee, and Texas). We discuss and evaluate the standards promulgated through these agents in terms of clarity, complexity, coherence, adaptability, measurability, and desirability. Accordingly, the standards of NCATE, INTASC, TEAC, NCSS, NCTE, and ISTE were found wanting, while the standards of NCTM, NAME, and especially the technology standards being developed by the state of Georgia were more fully articulated, logical, and useful for teachers. In general, the more precise standards were stronger, but they were also more temporal.

Over the past twenty years, billions of dollars have been spent on computers, networks, and training. The E-rate program alone has provided America's schools with more than $3 billion worth of Internet access (Riley 2000). Concomitantly, there has been a surge of interest in national standards. Over the past decade, almost every professional organization even slightly related to teacher education has formulated, promoted, and distributed their own particular set of standards. Every state except Iowa has developed standards in at least some subject areas. Forty-four states have standards in the four core areas -- English, math, science, and social studies. Often the core standards contain explicit expectations for a teacher's technological expertise as it relates to his/her teaching field. For example, in Florida an expectation for a high school language arts teacher is that he/she be able to "select and use a variety of electronic media, such as the Internet, information services, and desktop publishing software programs, to create, revise, retrieve, and verify information" (Sunshine State Standards 2000). Forty-one states require prospective teachers to pass an exam connected to these standards (Education Week 2000).

So many standards, so little time. The array of standards vying for the attention of a teacher can lead as much to confusion as enlightenment. To what extent are the standards compatible? How do they differ? Which standards promote the "highest and best uses" of technology? To answer these questions, we examined a variety of standards as follows:

1) Teacher education accrediting agencies--the National Council for the Accreditation of Teacher Education (NCATE), Teacher Education Accrediting Council, and (although it is not an accrediting agency) Interstate New Teacher Assessment and Support Consortium (INTASC).

2) Professional subject area organizations--the National Council of Teachers of English (NCTE), the National Council of Teachers of Mathematics (NCTM), the National Council on the Social Studies (NCSS), and the National Association for Music Education (NAME).

3) Selected state standards--Texas, Georgia, Tennessee, and Florida.

In the following discussion, we will use italics to emphasize when we are citing a standards document verbatim.

Teacher education accrediting agencies

What is new about NCATE 2000 is the emphasis on candidate performance. Supposedly, no longer will a college of education be able to pass NCATE accreditation by amassing impressive volumes of data on the conceptual framework, faculty accomplishments, and sequence of courses. Instead, NCATE 2000 requires that institutions furnish the accrediting teams with information concerning the performance of candidates in classroom settings. Although technology is not explicitly mentioned in the six broad standards, under *standard I. Candidate Knowledge, Skills, and Dispositions*, there is an indicator called *Pedagogical Content Knowledge.*

The "target behavior" for pedagogical content knowledge is a teacher who *"has an in-depth understanding of subject matter that they plan to teach, allowing them to provide multiple explanations and instructional strategies so that all students learn. They present the content to students in challenging, clear, and compelling ways and integrate technology appropriately"* (NCATE 2000 Standards, p. 4). With regard to the professoriate who teach prospective teachers, under *standard 5. Faculty qualifications, Performance, and Development*, the standards mandate that facilities should allow faculty to *"model the use of technology...to practice its use for instructional purposes."*

TEAC, which was created, in part, as a reaction against the complex, politically-correct gauntlet of NCATE, takes an understandably briefer view. According to TEAC standards, *"special attention should be given to assure the technologies that ease the teacher's work and the student's learning are firmly integrated in the curriculum."* The only other mention of technology in TEAC documentation is that they consider it advantageous if *"graduates have acquired the basic productivity tools."* One assumes that technological tools would be included in the definition of basic productivity.

INTASC, an organization formed to forge a consensus concerning model teacher behaviors across state lines (which could lead to more reciprocity among states), lists ten standards. Technology appears only under principle #4. *"The teacher understands and uses a variety of instructional strategies to encourage students' development of critical thinking, problem solving, and performance skills."* Unlike the similar standard in TEAC, INTASC's "instructional strategies" specify technology: *The teacher knows how to enhance learning through the use of a wide variety of materials as well as human and technological resources (e.g. computers, audio-visual technologies, videotapes and discs, local experts, primary documents and artifacts, texts, reference books, literature, and other print resources.* (INTASC 2000)

The technology standards promulgated by NCATE, TEAC, and INTASC are brief, vague statements that ask that a teacher use technology as part of a kind of instructional toolkit. While such breadth lends itself to adaptability, the technology standards in these accrediting organizations seem neither measurable nor particularly desirable. Technically, a teacher could fulfill each of these standards by flipping the switch on a transparency machine. Nothing wrong with a transparency machine, mind you, but it would seem to exist some distance from "highest and best use." In practice, NCATE and TEAC accrediting teams converse with faculty and students about the availability of computers on campus and peruse syllabi to determine whether or not an institution meets the indeterminate standards in technology.

Professional Organizations

The table below contains expectations for technological competence by organization. The table lists the total number of standards (including supporting standards), the number related to technology, and provides sample, illustrative standards. The professional organizations surveyed include the National Council on Social Studies, National Council of Teachers of English, National Council of Teachers of Mathematics, the National Association for Music Education, and the International Society for Technology in Education.

Organi-zation	Total standards	Number of standards that explicitly mention technology; sample standards
NCSS (K-12)	10	0; The NCSS standards are content-centered. *Standard VIII. Science, Technology, and Society* advocates the study of the history of technology from a variety of perspectives. However, there is no standard directed at using technology in the social studies classroom.
NCTE (K-12)	10	1; *Students use a variety of technological and informational resources (e.g. libraries,*

		databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.
NCTM (has stds. for K-12. We examined grades 9-12)	21 major standards, 67 supporting standards	5 supporting standards; *compute fluently and make reasonable estimates: develop fluency in operations with real numbers, vectors, and matrices, using mental computation or paper-and-pencil calculations for simple cases and technology for more-complicated cases.* *understand and perform transformations such as arithmetically combining, composing, and inverting commonly used functions, using technology to perform such operations on more-complicated symbolic expressions* *write equivalent forms of equations, inequalities, and systems of equations and solve them with fluency—mentally or with paper and pencil in simple cases and using technology in all cases;* *judge the meaning, utility, and reasonableness of the results of symbol manipulations, including those carried out by technology* *for bivariate measurement data, be able to display a scatterplot, describe its shape, and determine regression coefficients, regression equations, and correlation coefficients using technological tools*
NAME (has stds. for K-12. We examined grades 9-12)	26 minimal, 12 desirable	NAME has a specific set of "technology standards for high school" that is separate from its other standards. NAME specifies minimal and desirable levels for each of four areas: *curriculum and scheduling* (9 minimal, 5 desirable), *staffing/equipment* (7 minimal, 4 desirable) , *materials/software* (8 minimal), and *facilities* (2 minimal, 3 desirable). An example of a minimal level under *curriculum and scheduling: "4. Learning experiences in the curriculum include the use of computer-assisted instruction, MIDI sequencing, music notation software, Internet music resources, and electronic musical instruments to help students acquire the knowledge and skills listed in the National Standards."* An example of a desirable level under *curriculum and scheduling: "3. The school offers a specialized course in which students utilize appropriate music technologies in composing and arranging, recording, and producing multimedia."*
ISTE (K-12)	6 major standards, 23 supporting standards	The 6 major categories are: *I. technology operations and concepts; II. planning and designing learning environments and experiences; III. teaching, learning, and the curriculum; IV. assessment and evaluation; V. productivity and professional practice*; and *VI. social, ethical, legal and human issues.* Examples of supporting standards: *IB. demonstrate continual growth in technology knowledge and skills to stay abreast of current and emerging technologies.* *IIIB. use technology to support learner-centered strategies that address the diverse needs of students.* *IVC. Apply multiple methods of evaluation to determine students' appropriate use of technology resources for learning, communication, and productivity.* *VIC. Identify and use technology resources that affirm diversity.*

Table 1: Technology Standards in Selected Professional Organizations

In analyzing the usability of the standards of professional organizations, we were struck by the variance among subject areas. NCSS mentioned NOTHING about the competence of a teacher (let alone her/his prowess in utilizing machines in the classroom) and NCTE boasted a single standard related to technology. On the other hand, both NCTM and NAME set forth expectations that are relatively clear and precise. One could readily discern whether or not a prospective teacher of mathematics could *"display a scatterplot, describe its shape, and determine regression coefficients, regression equations, and correlation coefficients using technological tools"* so that he/she could teach his/her students to do this. Likewise, a music teacher will not be able to fake knowing "*how to use MIDI sequencing, music notation software, Internet music resources, and electronic musical instruments*" if these skills must be taught.

In comparison to the NCTM and NAME standards, the ISTE standards are trendy and ponderous. Would any sane teacher ever decide to go online to "identify and use technology resources that affirm diversity?" Surprisingly, the ISTE standards are warm and fuzzy, obscure, immeasurable standards that do not offer a teacher much in the way of guidance. For example, according to standard VC., a teacher should *"apply technology to increase productivity."* Does that mean a teacher should stop giving essay exams and put everything on SCANTRON?

State Standards for Technology

Florida's Sunshine State Standards include expectations for technology skills by grade level and subject area. In grades 9-12, language arts has 14 standards, math-6, science-4, foreign language-5, social studies-7, the arts-11, and health/physical education-4. Most of the technology skills are implicit rather than explicit. For example, in the language arts, a student should be able to *"synthesize information from multiple sources to draw conclusions"* (Sunshine State Standard LA.A.2.4.8). In math a student should be able to *"analyze real-world data and make predictions of larger populations by applying formulas to calculate measures of central tendency and dispersion using the sample population data, and using appropriate technology, including calculators and computers."*

In addition to subject-area standards, Tennessee has created a set of Instructional Technology Standards for Teacher Education Licensure. Instructional Technology standards are to be *"infused throughout the teacher preparation program."* These 28 standards range from the vague, ISTE-like *"ability to integrate instructional technology into the classroom to facilitate interdisciplinary teaching and learning,"* to the more concrete, *"can load and install programs; create, find and manage files; create and use a database; create and use a spreadsheet; utilize a software presentation package to create presentations for use on a computer technology projection system."*

The Texas Education Agency recently devised a comprehensive K-12 curriculum, called Technology Applications, that focuses on technology skills and the use of computers. Technology Applications specifies a grade level by which a student must attain competence in a certain technological skill. The TEA proposes eight courses in high school: Computer Science I and II, Desktop Publishing, Digital Graphics/Animation, Multimedia, Video Technology, Web Mastering, and Independent Study. In addition to the separate set of courses, technology is to be integrated across courses. However, the details of ensuring that a prospective teacher can use technology effectively have yet to ironed out. Currently, the only requirement for a prospective teacher of English is that he/she *"be able to use several forms of technology without anxiety or fear."* Unfortunately, fearlessness does not always equate to "highest and best use."

In Georgia, a set of Technology Integration Standards have been developed as an accompaniment to the state standards, called the QCCs (Quality Core Curriculum). The Technology Integration Standards were developed along the lines of six competencies: *basic skills, productivity, communication, societal and ethical issues, research,* and *problem solving*. Each of the competency areas lists several expectations. There are 20 standards in all with 83 supporting standards for grade 12. Basic skill, standard 1 is *"Demonstrates the essential skills for understanding, using, and managing technology tools."* Supporting standard 1.1 is *"Demonstrates appropriate and effective uses of operating systems functions (Graphical User Interface)."* Productivity standard 8 is *"Creates documents using most desktop publishing functions."* Supporting standard 8.5 is *"Converts desktop publishing documents into html/web documents."*

Unlike the wide range of expectations expressed in the standards of professional organizations, the standards of these four states are more consistently pro-technology and less prone to "educationese" and hyperbole. It is encouraging that Georgia's draft of the Technology Integration Standards attempts to spell out what is meant by "technology integration." The complex list of standards and supporting standards could be used by organizations such as NCATE or TEAC to determine whether or not a student's performance in the classroom adequately satisfies the technology requirement. Most of Georgia's Technology Integration Standards are clear, attainable, measurable, and sufficiently adaptable.

Conclusions

Individuals who create standards face innumerable pressures and must make hard decisions based upon the best interest of students. The difficulty with formulating standards, and particularly technology standards, is that innovation never rests. As Drucker (1999) notes, "What the new industries and institutions will be, no one can say yet. No one in the 1520s anticipated secular literature, let alone the secular theater. No one in the 1820s anticipated the electric telegraph, or public health, or photography." Creators of standards must feel the impulse to formulate benchmarks that will stand the test of time, irrespective of future developments or technological breakthroughs. NCTE, NCATE, TEAC, and ISTE created broad sets of standards, ran them by innumerable focus groups, and wound up with bland, yet cryptic sets of statements. To be sure, the standards of NCTE, NCATE, TEAC, and ISTE are more akin to proclamations of the particular organization's political leanings than genuine guidance for teachers. The advantage of such mealy-mouthed standards is that teachers may interpret and achieve the standards in innumerable ways. The disadvantage is that they are so broad as to be virtually meaningless.

On the other hand, the standards of NAME, NCTM, and the developing technology standards of Georgia seem more practical, achievable, and desirable. Of course, the specificity of expectations for teachers will require that these organizations revisit and revise their standards as older technologies vanish and new products emerge. To move teachers towards "highest and best of technology," they need to be given advice beyond the edict to "integrate technology into instruction." As we continue to "rage towards the machine," it is useful to keep in mind that nothing lasts forever, most especially standards in technology.

References

Drucker, P. (1999). Beyond the Information Revolution. *Atlantic Monthly*, October, 47-57.

Education Week (2000). Who Should Teach? Available: http://www.edweek.com/sreports/qc00/templates/article.cfm?slug=execsum.htm.

Florida Department of Education (2000). Sunshine State Standards. Available: http://www.firn.edu/doe/cgi-bin/doehome/menu.pl

Georgia Department of Education (2000). Technology Integration Standards. Available: http://techservices.doe.k12.ga.us/edtech/edtechdocuments/Final%20BOE%20Item%20Standards.pdf

INTASC (1992). Model Standards for Beginning Teacher Licensing and Development: A Resource for State Dialogue. Available: http://www.ccsso.org/intascst.html.

International Society for Technology in Education (2000). National Educational Technology Standards for Teachers. Pamphlet.

NCATE (2000), NCATE 2000 Unit Standards. Washington D.C.: NCATE.

NCSS (2000). Social Studies Standards. Available: http://www.socialstudies.org/standards/exec.html

NCTE (2000). NCTE/IRA Standards for the English Language Arts. Pamphlet.

Riley, Richard (2000). Conference on Educational Technology, September 11, 2000, Washington D.C. Available: http://www.ed.gov/Speeches/09-2000/0000911.html

Tennessee Department of Education (2000). Instructional Technology Standards for Teacher Education Licensure. Available: http://www.state.tn.us/education/mteacher.htm

Texas Education Agency (2000). Long range plan for Technology 1996-2010. Available: http://www.tea.state.tx.us/technology/lrpt/

FACTORS INFLUENCING TECHNOLOGY INTEGRATION: A QUANTITATIVE NATIONWIDE STUDY

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Abstract: Based on a comprehensive study of 94 classrooms from four states in different geographic regions of the country, this quantitative study investigated the impact of seven factors related to school technology (planning, leadership, curriculum alignment, professional development, technology use, teacher openness to change, teacher non-school computer use) on five dependent measures in the areas of teacher skill (technology competency and technology integration), teacher morale, and perceived student learning (impact on student content and higher order thinking skills acquisition). Step-wise regression resulted in models to explain each of the five dependent measures. Teacher technology competency was predicted by teacher openness to change. Technology integration was predicted by teacher openness to change and the percentage of technology use with others. Teacher morale was predicted by professional development and constructivist use of technology. Technology impact on content acquisition was predicted by the strength of leadership, teacher openness to change, and negatively influenced by teacher non-school computer use. Technology impact on higher-order thinking skills was predicted by teacher openness to change, the constructivist use of technology, and negatively influenced by percentage of technology use where students work alone.

Over the past decade, many articles have appeared in popular and educational journals providing anecdotal evidence of changes that educational technology can make in schools. Even though other empirical articles have provided quantitative and qualitative evidence of these changes, most schools rarely base their technology decisions on specific published research findings. Instead, school leaders often start by thinking about the intended results that technology should provide within their school environment. Next, these leaders take certain actions regarding the attainment, allocation, use, and support of technology. Consequently, this study was framed along this line, to consider the question "What actions most effectively lead to desired results regarding the integration of technology in schools?" We considered seven factors (planning, leadership, curriculum alignment, professional development, technology use, teacher openness to change, teacher non-school computer use) and five outcomes in the areas of teacher skill (level of teacher technology competency, technology integration), teacher morale, and perceived student learning (impact on content acquisition, impact on higher order thinking skills) which will be described in the next sections. Data was collected through structured interviews with teachers and administrators, teacher surveys, and examination of school technology use plans. The following sections will describe how each variable was operationalized. For a comprehensive literature review of these variables, see Ritchie & Baylor (1999).

Operational Descriptions of Factors

In this study, *technology planning* was operationalized from the *teacher's* perspective to include the teacher's role in creating the technology use plan, his/her familiarity with the published vision, and the belief that the plan considers his/her needs. From the *administrator's* perspective, it was operationalized to include three components: strategic, teaching/learning and operational. In terms of the strategic component, this included the extent to which the plan stated a vision and involved stakeholders, which may be the most important action regarding technology planning (Anderson, 1996). The teaching and learning component of the TUP covered instructional innovation. The operational component of the TUP included technology maintenance and support, the presence of an action plan and timeline, and facility infrastructure, configuration, and funding issues. Also included were the extent to which technology decision are based on the official TUP, the extent to which records are kept regarding the type and number of technology activities, and the extent to which purchase and use of technology has closely followed the details as described in the TUP.

Technology leadership was operationalized from the *teacher's* perspective to include the presence of positive technology-using role models, such as the principal, and the presence of incentives for teacher use of technology. From the *administrator's* perspective, it was operationalized to include the principal's ability and work with the school community to formulate, articulate, and communicate a school's vision (Dede, 1994; Raizen, Sellwood, Todd, & Vickers, 1995; Rhodes, 1994; Sergiovanni, 1995). The principal's use of technology is also included as part of the leadership component since s/he fosters credibility and respect by communicating to the staff via email, demonstrating the use of desktop presentation to the faculty, showing a student how to keep a writer's journal with a word processing program, or describing a technology-enhanced teaching strategy (Maurer & Davidon, 1998). Further, the principal's belief that technology can be integrated into teaching and learning, his/her participation of the principal in school technology training sessions, and the evaluation of faculty and/or school in reaching stated technology goals are also factors. The extent to which the schools' technology knowledge and leadership is shared by a variety of faculty is important given that a successful technology leader shares leadership by empowering other school members (Maurer & Davidson, 1998). Also included in the operational definition were the vision of the technology use plan to promote technology for teaching and learning, and the presence of an action plan and timeline within the technology use plan.

In this study, *curriculum alignment* was operationalized from the *teacher's* perspective to include teacher perception as to whether technology activities are covered through the curriculum documents.

Professional development was operationalized from the *teacher's* perspective to include the applicability of the professional development programs, incentive provided to attend programs, access to technical support, and appropriateness of technology equipment. From the *administrator's* perspective, it was operationalized to include the extent to which the school supports faculty to attend workshops or conferences, the listing of professional development activities in the TUP, and the support of school activities to learn to use technology. The latter is important given that teachers require prolonged exposure to new ideas and skills before classroom behaviors change; specifically, to feel in command of educational technologies and to know when and how to use them, can take five to six years (Brunner, 1992; Elmer-Dewitt, 1991). In addition, the extent to which teachers are responsible to determine in-service technology training topics is an important consideration given that to encourage faculty to embrace the concepts delivered during the workshop, it is important to involve them in the selection of the topic (Rubin, 1989). Given that there are varying abilities and knowledge of faculty in a school, seldom will there be agreement on the need for any one in-service topic; consequently, the best strategy would be to identify multiple topics and then involve only people who have needs in the specified content domain (Picciano, 1998). The presence of incentives for incorporating technology was also considered as part of professional development.

For this study, *technology use* was delineated according to nine subcomponents, each of which were considered separately in the regression models: 1) how often technology was used for preparing for or during classroom instruction; 2) the percentage of time that subject-matter content was the focus of the technology use; 3) the percentage of time that higher order thinking skills (HOTS) were the focus; 4) the percentage of time technology literacy was the focus; 5) the percentage of time technology was used alone by students, responding to questions, 6) the percentage of time technology was used alone by students, creating; 7) the percentage of time technology was used with others; 8) the percentage of constructivist use of technology; and, 9) the perceived success of technology use by teachers.

Based on this research, in this study *teacher openness to change* was operationalized from the *teacher's* perspective to include his/her predisposition for trying new instructional innovations, and the belief that s/he can take risks in teaching. From the *administrator's* perspective, teacher openness to change was operationalized to include whether the technology use plan promotes instructional innovation with technology implementation.

Teacher non-school computer use was operationalized in this study from the *teacher's* perspective to include the number of times technology (e.g., word processing, database, spreadsheet, graphics, multimedia, telecommunications) was used at home for non-school activity.

In the previous sections, we examined the factors that may determine the success of technology in a classroom. But what are the areas that schools want to <u>impact</u>? The dependent measures are explained in the next sections. Note that several of the factors described previously could be considered interchangeably with the desired outcomes (e.g., it could be argued that high teacher morale should be an independent variable that affects the degree of success in using technology). However, the factors were purposely selected to serve as predictors, and the outcome measures as dependent variables.

Description of Dependent Measures

Impact on content acquisition was operationalized from the *teacher's* perspective to include the relative impact/importance of technology in terms of the content acquisition, in other words, the extent to which the use of technology added to the class performance in content acquisition. From the *administrator's* perspective, it was operationalized to include the role of the Technology Use Plan's vision in promoting technology for teaching and learning, and the reflection of the plan in describing the use of technology by students to enhance learning based on current knowledge of cognition.

Impact on HOTS was operationalized from the *teacher's* perspective to include the relative impact/importance of technology in terms of higher order thinking (i.e., thought processes); specifically, the extent to which the use of technology added to the class performance in higher order thinking. From the *administrator's* perspective, it was operationalized to include the role of the technology use plan's vision in promoting technology for teaching and learning, and the reflection of the technology use plan on current knowledge of cognition in describing the use of technology by students.

Given that the integration of technology in education should be have the goal to change the nature of instruction rather than just using technology to perpetuate traditional teaching and learning methods (Hawkins & Collins, 1992), *technology integration* was operationalized from the *teacher's* perspective to include the extent to which the use of technology fits into the overall unit of instruction, whether there are transitions before and after the activity with the rest of instruction, and the extent to which technology use is not a separate activity from other instructional activities.

In this study, *teacher morale* was operationalized from the *teacher's* perspective to include his/her enjoyment of using technology, his/her perception of colleagues' morale regarding technology use, opportunities for collegial sharing of technology ideas and uses, satisfaction with work environment, and extent to which s/he believes that position provides professional growth and is satisfying. From the *administrator's* perspective, it was operationalized to include the extent to which faculty are rewarded for intent to use technology, the promotion of innovation/creativity within the technology use plan, specific plans for teacher technology maintenance and support, and incentives to participate in professional growth and for incorporating technology as stated in the technology use plan.

Teacher technology competency was operationalized to include teacher-perceived confidence in the following areas: using a variety of software programs (e.g., word processing, database/ spreadsheet, email, internet), file management, solving general software or hardware problems, use of terms associated with computers, identifying and explaining basic computer components, operating technology equipment, selecting and implementing appropriate technology to support curriculum, incorporating technology (e.g. telecommunications, word processing, spreadsheets, computer based presentations, email, internet) in instruction, and teaching students to use technology (e.g., graphics, internet, word processing, spreadsheets/databases, electronic encyclopedia, and use of appropriate vocabulary).

Considering all of these factors and outcomes together, the primary research question is as follows: Which combination of factors best predicts each of the five desired outcomes?

Sampling

Through purposive sampling we selected schools that were known to be effective users of technology in four areas of the country. A set of schools was nominated from each of four regions of the country that researchers believed to represent highly technology-integrative schools. From this process, twelve schools were selected: five from California, two from Florida, three from Virginia, and two from the state of Washington. In return for their assistance, the schools were provided with a grant for the purchase of instructional materials and a report of the data collected from the school.

Of the twelve schools, five were urban, four were suburban, and three were in rural settings. The percentage range of white to non-white students ranged from 5% to 95% with the mean percentage of non-white students as 32%. Five of the schools were elementary, five were middle schools, and two were high schools. Once the schools were selected, the principal of the school provided the researchers with list of "classrooms" meeting the three following requirements: 1) the teacher is the primary provider of instruction (not part of a teaching team); 2) the teacher is using technology in his/her teaching; and, 3) the teacher has been teaching the class since at least the prior school year and is intending to teach at the school through the next year. From this list of classrooms, we selected at random ten to twelve classrooms for each school. Following this, the principal asked each of the randomly selected teachers whether they would be willing to participate. If a teacher declined to participate, a replacement from the pool was randomly selected, until there were at least ten participating teachers per school.

The resulting sample included a total of ninety-four teachers and correspondingly ninety-four classrooms from the twelve schools, with the classroom as the unit of study.

Instrumentation

Given that there were no existing instruments that matched the sources of the data with the independent and dependent variables, we developed four new instruments to collect school, classroom, teacher, and administrator information. The four instruments included the following: administrator structured interview, teacher structured interview, technology use plan evaluation, and teacher survey. Each instrument was created to consist primarily of Likert items on a five-point scale. As appropriate, each instrument was evaluated by a panel of experts for content validity, reliability, and usability, as will be described below. Triangulation was an important component to gather data from multiple sources to gain multiple perspectives. Data was collected according to the following schedule: Administrator interview (Spring, Summer), Technology use plan analysis (Spring, Summer), Teacher survey (Fall), and Teacher interviews (Fall). The instruments were implemented by researchers in each of the four geographic regions.

A structured *administrator interview* was conducted and tape recorded with each chief school administrator to gather information regarding the following variables, as shown in Table 1: technology planning, leadership, professional development, and teacher morale. The transcripts of all of the interviews were then analyzed and scored by one researcher. A sample question from the scoring instrument was as follows: "The principal believes technology has the potential to be transparently infused and integrated into the entire spectrum of teaching and learning. (1- strongly disagree; 2-disagree; 3- neutral; 4- agree; and 5-strongly agree)"

A structured *teacher interview* was conducted with each of the 94 teachers to identify the teacher's perception of technology in the classroom regarding the following variables, as shown in Table 1: curriculum alignment, technology use, impact on content acquisition, impact on HOTS, and technology integration. Part of the interview required the teacher to list all activities in the prior school year that involved technology. From this list, three activities were randomly selected to focus upon and were scored according to Likert- scaled items. All researchers in the four geographic areas were trained via video together with detailed structured interview questions, all on a Likert 1-5 scale. The interviewer's guidelines for assessing the level of technology integration for an activity is as follows: "To determine the level of integration of the activity, ask questions such as the following: In a typical day in which this activity was conducted, what would normally be taught right before and right after this activity? How did the activity fit into the unit of instruction? What are transitions like between the different components of the activity with the rest of instruction? Is the activity separate from other instructional activities?" Following the interview questions, the interviewer would then rate the activity according to the following scale: "The technology-related aspects of this activity are integrated into classroom instruction. (1-strongly disagree; 2-disagree; 3-neutral; 4-agree; 5-strongly agree)."

Technology use plans from each of the 12 schools were obtained and evaluated according to how well the plan established a vision for the incorporation and integration of technology by the school's faculty. Analysis of the plan contributed to the following variables, as shown in Table 1: planning, leadership, professional development, teacher openness to change, technology use, integration, content acquisition, HOTS acquisition, and teacher morale. The TUPs were scored by a trained team including one researcher in each of the four geographic areas. Inter-rater reliability was conducted by evaluating sample TUPs until the researchers scores reached a reliability coefficient of .85. At that point the researchers each independently evaluated the technology use plans in their geographic areas. A sample rating question regarding instructional innovation is as follows: "The plan promotes instructional innovation and/or creativity with technology implementation. (1-strongly disagree; 2-disagree; 3-neutral; 4-agree; 5-strongly agree)."

A take-home *teacher survey* was given to each teacher to collect information on the following variables, as shown in Table 1: planning, leadership, professional development, teacher openness to change, teacher non-school computer use, technology use, teacher technology competency, and teacher morale. A sample question regarding teacher morale is as follows: "My teaching position is satisfying. (1-strongly disagree; 2-disagree; 3-neutral; 4-agree; 5-strongly agree)"

Results

Using the four instruments described above (with a combined total of 148 items), data was collected from 94 classrooms. A total of 15 independent variables (technology use was broken down into 9 subcomponents) were considered as predictors for regression models for each of the 5 dependent variables.

Given that nearly all of the items were on a 1-5 Likert scale, a process of aggregation was used to average the scores and provide one score ranging from 1-5 for each classroom, where 1=low and 5=high for a given variable. Aggregation was performed by averaging all related item values so that each variable was reduced to one score per variable per class. For example, Mr. Lang's classroom could be rated 1.24 on technology planning, 2.45 on leadership, 4.56 on curriculum alignment, etc. A strength of this method was that multiple sources of information (via the four instruments) contributed to the overall variable scores. Variables that were not on a 1-5 Likert scale (e.g., the technology use subcomponents) were not aggregated, but entered into the model separately as-is. Descriptive statistics are listed in Table 2.

The primary means for analyzing the data was through step-wise regression analyses to identify what combination (if any) of the independent variable(s) predicted the results of the dependent variables.A statistically significant model of independent variable(s) predicted each of the five dependent variables via a forward step-wise regression.

Technology impact on student content acquisition was predicted by 1) the strength of technology leadership at a school; 2) openness to change; and 3) (negatively influenced by) teacher non-school computer use. (R^2 = .589). All independent variables were entered in a forward stepwise regression model. See Table 3.

Technology impact on higher-order thinking skills was predicted by 1) the degree of teacher openness to change; 2) (negatively influenced by) the amount of technology use by students working individually in situations where they were "creating"; and 3) the level of constructivist modes of technology use (R^2 = .608). All independent variables were entered in a forward stepwise regression model. See Table 4.

Teacher morale was predicted by professional development and constructivist use of technology. (R^2 = .559). All independent variables were entered in a forward stepwise regression model. See Table 5.

Teacher technology competency was predicted by teacher openness to change. (R^2 = .164). All independent variables were entered in a forward stepwise regression model. See Table 6.

Technology integration was predicted by teacher openness to change and technology use with others. (R^2 = .391). All independent variables were entered in a forward stepwise regression model. See Table 7.

Conclusion

The degree of teacher openness to change was repeatedly found to be a critical variable as a predictor in our study. Teachers who are open to change, whether this change is imposed by administrators or as a result of self-exploration, appear to easily adopt technologies to help students learn content and increase their higher-level thinking skills. It also appears that as these teachers incorporate these technologies, their own level of technical competence increases as does their morale. Because this one variable has such an important influence on how well technology and its subsequent influences are embraced in a classroom, administrators and policymakers may wish to encourage further development in this area. Unfortunately, given that it is a personal trait, it is difficult to influence.

Another variable with high predictive influence was the level of technology leadership and support for professional development. It appears that administrators who promote the use of technology, not only in words but also in action, lend credence to a technology culture. Our interview was designed to look beyond administrators who superficially endorse technology, and identify those who actively use, model, and reward teachers who infuse technology into their classroom. The bottom line appears to be that administrators who wish to nurture a technology culture need to figuratively "roll up their sleeves and join in" rather than sitting by the side.

Although we found that administrators contribute to the positive interactions of technology in a school, of greater importance were teacher attributes. Long-range planning for software developers and schools of education should include a vision that nurtures decision-making and development by teachers, rather than implementing systems solely from the level of policymakers. Currently many technology initiatives rely upon policymakers to communicate the value of technology to teachers, instead of involving teachers from the start. By helping teachers find ways to actively infuse technology, investments in time and money will pay off in greater content acquisition and higher-order thinking skills for students and greater teacher competence and morale.

References

Anderson, L. S. (1996). *Technology planning at state, district, and local levels.* ERIC Digest. (ERIC Document Reproduction Service No. ED 393 448)

Brunner, C. (1992). *Integrating technology into the curriculum: Teaching the teachers.* (Bank Street College of Education, Center for Technology in Education No. CTE-TR-25). New York.

Dede, C. J. (1994). Leadership without followers. In G. Kearsley & W. Lynch (Eds.), *Educational technology: Leadership perspectives* (pp. 19-28). Englewood Cliffs, NJ: Educational Technology Publications.

Elmer-Dewitt, P. (1991, May). Education: The revolution that fizzled. *Time* 48-49.

Maurer, M. M., & Davidson, G. S. (1998). *Leadership in instructional technology.* Columbus, OH: Merrill.

Picciano, A. G. (1998). *Educational leadership and planning for technology* (2nd ed.). Upper Saddle River, NJ: Prentice Hall.

Raizen, S. A., Sellwood, P., Todd, R. D., & Vickers, M. (1995). *Technology education in the classroom: Understanding the designed world. San Francisco*: Jossey-Bass Publishers.

Rhodes, D. C. (1994). Sharing the vision: Creating and communicating common goals, and understanding the nature of change in education. In G. Kearsley & W. Lynch (Eds.), *Educational technology: Leadership perspectives* (pp. 29-38). Englewood Cliffs, NJ: Educational Technology Publications.

Ritchie, D. & Baylor, A. L. (1999). What Gets Results? An Analysis of Effective Technology-Integrating Schools. Technical report funded by CompassLearning.

Rubin, L. (1989). Curriculum and staff development. In M. F. Wideen and I. Andrews (Eds.), *Staff development for school improvement* (pp. 170-181). New York: Falmer.

Sergiovanni, T. J. (1995). *The principalship: A reflective practice perspective.* Boston: Allyn and Bacon.

Advanced Technology Opportunities for Education Students: The SIMMS Example

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Abstract: In a department or school of education, how does one set up an environment that acknowledges the importance of developing simple instructional design solutions, while simultaneously offering students opportunities to experiment with cutting-edge technologies? One approach is the creation of an extra-curricular organization that focuses on exploring technological innovations and the development of a supportive atmosphere for people interested in expanding their skills beyond those required for standard instructional design situations. The organization of Students in Multimedia Studies (SIMMS) at Indiana University is one example of this approach; the recent creation of the SIMMS 'be Washington State University is a second example. Both groups face interesting challenges in administration of the organization, and developing and maintaining activities of interest to the membership.

Introduction

Instructional Design program coordinators are often faced with a dilemma. How does one promote an attitude of parsimonious and judicious design and development, following adages like "less is more" and "form must follow function," while at the same time promoting and fostering an atmosphere of enthusiasm for experimenting with new and innovative computing technologies? How does one set up an environment that acknowledges the importance of developing instructional design solutions in the least obtrusive manner, while simultaneously offering students the opportunity to experiment with cutting-edge technologies where "obtrusiveness" may be an acceptable starting point? Schon writes,

> In the varied topography of professional practice, there is a high, hard ground overlooking a swamp. On the high ground, manageable problems defy technical solution. The irony of this situation is that the problems of the high ground tend to be relatively unimportant to individuals or society at large, however great their technical interest may be, while in the swamp lie the problems of greatest human concern. The practitioner must choose. Shall he remain on the high ground where he can solve relatively unimportant problems according to prevailing standards or rigor, or shall he descend to the swamp of important problems and nonrigorous inquiry? (Schon, 1987. p.3)

Indiana University's graduate programs in Instructional Systems Technology and Education, and Washington State University's undergraduate and graduate programs in Education focus on the theory and practice of instructional design and delivery. The programs offer students course work on the history and current practice of instruction in corporate, K-12 and higher education settings, curriculum development and theory, and opportunities to pursue research in these areas. Classes within these programs include basic instruction in innovative technologies and multimedia production. Courses with titles such as "Educational Technology Used in the Schools" and "Instructional Development and Production Process" ensure that upon completion of the program, students will have had some basic training in multimedia production (e.g. making simple web-sites).

A small but significant portion of students involved in these programs would like to find opportunities to go beyond the basics of multimedia production. Currently in vogue is digital multimedia development, (using software to create computer-based experiences with graphics and sound). In other words, they would like to go mucking about in the swamp, to which Schon refers, but using new tools to do it. Responding to this need, Indiana University's Department of Instructional Systems Technology developed an extra-curricular organization that offers students an opportunity to explore multimedia development well beyond the essential requirements of their degree program.

The following sections articulate the types of activities appropriate for developing increased skill in media production and the development; the subsequent dissemination of a student organization designed to explore possibilities in multimedia production; the administrative challenges these organizations face; and concluding remarks.

Developing Media Production Skills

Experienced and competent instructional design (ID) professionals recognize a difference between the instructional design process and the production process (Brown, 1999 p.1). While the instructional design process involves the identification and development of objectives, activities and evaluation protocols in order to promote learning, the production process is a phase within the instructional ~~design~~ development process (Appelman, 2000); it focuses on the creation and design of tangible products identified as necessary to the overall instructional design. Research conducted at Indiana University suggests that incorporating the following activities into an instructional design program helps facilitate students' development of media production skills (Brown, 1999 pp 201-202).

1. Offer a number of production experiences, allowing learning to occur through a set of iterations. This gives students an opportunity to learn from their own mistakes as well as a chance to apply good general practices to a variety of production situations. This should help particularly with the goal of generating increased respect for what should and should not be accomplished given specific materials, time, and skill.

2. Hold critique sessions. These allow students to focus on function and design issues in a formal setting that allows for greater focus on the project itself, de-emphasizing distractions like course grading.

3. Offer opportunities to "Show and tell." Students get to see how others have met specific production challenges and can share ideas on how best to approach similar challenges. There is also a "level element within this activity that is beneficial to those students who may fear that they are not performing up to the standards of their peers as well as students who may mistakenly believe they are more advanced. In order to capitalize on this leveling effect, care must be taken when choosing sample work for show and tell sessions in order to show a reasonable range of products, not just a sampling of the very best or very worst.

These activities can be incorporated into a course of study, if media production courses are offered. What happens, though, when few (or no) advanced media production courses are offered within a program of study? How can students with an interest in advanced media production receive departmental, faculty and peer support?

An Extra-Curricular Solution

Indiana University's Department of Instructional Systems Technology (IST) developed an extra-curricular organization that focuses on exploring technological innovations and the development of a supportive atmosphere for people interested in expanding their skills beyond those required for standard instructional design situations. The organization of Students in Multimedia Studies (SIMMS) at Indiana University has an active membership of students not only from IST, but from other departments and programs around the Bloomington campus as well. SIMMS members meet multiple times during the academic year to share projects individuals and groups on working on or completing; to share information about new or updated media development hardware and software and to socialize with people who share their interest in multimedia production. The recent creation of the SIMMS 'beta chapter' at Washington State University performs the same function in Pullman, Washington. Washington State University has no Instructional Systems Technology programs presently, but it does have a number of students on campus who take an active interest in multimedia development and instructional design.

There is an element of fun to all of this, which can be more easily addressed since SIMMS is an extra-curricular organization. As Landauer writes:

> Here is the hypothesis. We have taken to computers not because they made us more productive, not because they bring us better products or services, but because we like them. Being able to charge my groceries by swishing a card through a machine that automatically debits my bank account is neat. I get a kick out of it. The store manager does too. We are a world of people who like the new, the cute, and the ingenious. (Landauer. 1995. p. 193)

There is nothing wrong with enjoying "the new, the cute and the ingenious," especially if taking some pleasure in this promotes students' keeping a watchful eye on the horizon of technological innovation. It is plausible that even the recipient of this "innovation", the learner, might find this novel form of instruction motivational, engaging, and even fun.

Administrative Challenges

Both SIMMS groups face interesting challenges in administration of the organization, developing and maintaining activities of interest to the membership and bridging the gap between group members who are highly technologically proficient and those who aspire to greater technological proficiency.

At Indiana University (IU), Dr. Appelman of the Instructional Systems Technology Department, initially conceived of the SIMMS organization in 1995 as functioning similarly to the Medieval Craftsmanship Guilds. Just as those early practitioners focused on quality and growth in the execution of their craft, so was SIMMS to focus on quality and professional development with multimedia. Through the submission of a portfolio, students were classified into apprentices, journeymen, and masters of a specific aspect of multimedia such as video, imaging, audio, or graphic design. By delineating such a hierarchy, leadership for each group was made clear, and growth objectives for apprentices and journeymen were targeted at becoming a master within a group.

This rigid structure worked well to create a positive esprit de corps among the students, but the administrative overhead was considerable. Extensive faculty involvement was necessary to set standards, provide support for missing skills, and to keep meetings and workshops happening on a regular basis. Following a couple years of rapid growth, the "charter members" graduated and a decline in membership prompted a redefinition of SIMMS. It was clear that the goal of reaching a mastery level in the hierarchy of SIMMS was not desirable for most students, but what they wanted instead was simply exposure and guidance into new media domains.

The current iteration of the SIMMS organization at IU is almost entirely student run. The IST Department, along with generous alumni, have invested in a high-end digital space called the SIMMS Lab. Equipped with sophisticated Macintosh , PC, SGI, video, scanning, and audio tools, this lab is only accessible by SIMMS members and their trainees (called SIMMlets). Each semester focus groups are formed around leaders within SIMMS who then send out a call to the entire IST body for anyone interested in a particular focus of study. The focii may be 3D modeling, digital video editing, authoring, media research, and in general anything that the IST Department is limited in attending to in depth within its curriculum. A goal for each focus group is to put together a "SIMMinar" for the IST student body that describes what they have learned and discovered. The development of tutorials and job aides are very much encouraged, such that learning curves may be shortened for others that follow in their footsteps.

Finally, it is worth mentioning the view of SIMMS from the standpoint of faculty. At IU, the Alpha chapter of SIMMS provides an avenue for faculty to find resources for projects, both individual and departmental. Countless media elements need to be created for the web and other products, and many of these needs have been met within the SIMMS organization. As the faculty find out that things can happen in both areas of production and research by simply saying "find a SIMMS member and see if you can work something out", the SIMMS organization becomes strengthened. Care should be taken NOT to look at SIMMS as a production unit unless considerable faculty mentorship and funds are available to compensate students. SIMMS members must feel free to follow their own directions for multimedia development since the time commitment is considerable. Imposing pressures of time and faculty rank have proven to cause loss of interest and the sense of experimentation that is at the heart of the SIMMS concept.

At Washington State University (WSU), Dr. Brown of the Department of Teaching & Learning has taken a lead role in contacting other professors around campus to develop interest in a "beta chapter" of SIMMS. Responses from faculty members in a variety of departments, including Fine Arts, Architecture and Management Information Science have expressed interest. Initial meetings with professors and graduate students has indicated there is an enthusiasm for developing and maintaining a SIMMS organization at WSU.

One means of maintaining SIMMS activity is to develop within the organization a network that provides information about professional development opportunities for its members. At WSU, Dr. Brown and Dr. Darcy Miller have received funding from The Arc of Washington to support the development of three "knowledge objects" designed to teach essential concepts. The concepts are to be determined by -service special education teachers; the target learning audience is students with mild mental retardation. In offering significant funding as well as an opportunity to develop a computer-based knowledge object, the SIMMS organization finds a very compelling reason to meet with regularity.

Conclusion

The focus of any education or instructional design program must remain the judicious application of both "soft" and "hard" educational technologies. It is easy for students to get sidetracked by glamorous new technologies that may or may not be used to create effective instruction. However, in stressing the importance of simple technologies that have proven effective, it is possible to create a situation that limits students' abilities to experiment with the new and different.

Offering students opportunities to work with advanced media; to share their efforts with peers and mentors; and to critique each others' work can be accomplished through organized extra-curricular efforts. The SIMMS organization at Indiana University has enjoyed multiple years of success, the nascent beta chapter of SIMMS at Washington State University is enjoying a similar success as the organization begins to coalesce into a working entity of students and faculty from around the campus. Projects like The Arc of Washington knowledge objects initiative help to support the organization by providing both projects to focus upon and funding to complete those projects.

References

Appelman, Robert L. (2000). An iterative development model: agenesis from pedagogical needs. *International Journal of Continuing Engineering Education and Lifelong Learning,* Vol. 10, No. 1

Brown, A.H. (1999). *Strategies for the Delivery of Instructional Design Coursework: Helping Learners Develop a Professional Attitude toward the Production Process.* Indiana University. Doctoral Disseration. UMI Publication Number AAT 9962697

Gagne, R. M. (1985). *The Conditions of Learning and Theory of Instruction.* (4 ed.). Fort Worth: Holt, Rinehart and Winston, Inc.

Landauer, T. K. (1995). *The Trouble with Computers: Usefulness, Usability, and Productivity.* MIT Press

Merrill, M. D. and the ID2 Research Group. (1996). Instructional Transaction Theory: Instructional Design based on Knowledge Objects. *Educational Technology.* 36(3), 30-37.

Rogers, E. M. (1995) *Diffusion of Innovations, 4th Edition.* New York: Free Press

Schon, D. A. (1987). *Educating the Reflective Practitioner.* San Francisco: Jossey-Bass Publishers.

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Online Technical Support Database for Educators #61

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Abstract: As educators depend more on technology, demand has grown for school technical support. Timely, convenient support is needed for schools to most effectively use technology. An online database was developed to provide immediate easy access to technical assistance. Developed for Florida educators, TLC: Tech Links for Classrooms, is a searchable web archive of assistance. TLC offers troubleshooting tips for hardware, software, operating systems and networking; steps for performing hardware upgrades; multimedia tutorials; and access to updates from vendors. Existing web resources were linked from the database and additional materials such as tip sheets and help files were created. Presentations related to using school computer networks, and tools to streamline the work of school technology coordinators were developed. Users may view all resources, or search the database by selecting from a list of six broad categories of resources: hardware, software, networks, general technology information, technology management, or technology training. Keyword searching locates specific topics. Search results list the resources with a link to the full resource, and a link to more detail about the resource. Resources are available as web pages, PDF files, PowerPoint presentations, database files, spreadsheets, word processing files, or multimedia SMIL presentations.

As students and teachers depend more on computers as teaching and learning tools, demand will grow for school technical support. Schools continually deploy additional classroom, lab, and research computer stations to allow greater access to computer resources by students. Not all users and school technology coordinators have skills in troubleshooting, problem-solving, maintaining, or upgrading computers. In order for the computers in schools to be maximally effective, they must be maximally operational. Keeping computer operating well requires access to instructions, hints, and techniques applying to a wide variety of hardware, software, operating systems, and infrastructure.

An effective educational technology technical support resource must have a specific combination of features. It must support the array of legacy and cutting edge technologies in use in schools, and it must be updated to reflect the constant changes in school technology. The technical support service must be available to schools at low cost, preferably in each location where technology is present. The resource must offer rapid access to the knowledge needed to address the situation, and the information must be useful to audiences with a range of technology experience and ability.

Current technical support resources tend to fall into two main categories: niche, vendor or product related information; and information tailored to the systems found in a particular school or district. Neither category constitutes a convenient one-stop clearinghouse for users. The resources are generally distributed as books, CD-ROMS, or web sites. Books and CD-ROMs have the highest cost to the user due to the physical nature of the media, and due to the distribution process the information tends to lag behind the most recent technology in use. Web sites tend to be less expensive to develop and distribute, are very comprehensive, and can be very current, but few address the needs of education.

To begin to address the growing need for educational technology technical support, one of Florida's instructional technology centers created an online database of information designed to provide immediate and easy access to assistance. The center worked with state grant funds to design, develop, and publish a searchable web archive of resources called "TLC: Tech Links for Classrooms." The center collaborated with area school district technology specialists to identify the highest priorities for the types of resources to make available in the database. Priorities included troubleshooting tips for the most commonly used hardware, software, operating systems and networking; steps for performing simple hardware upgrades; multimedia tutorials; and access to updates from vendors.

The next stage in the development of TLC involved creating and gathering the resources for the database. The project staff performed web searches to locate and evaluate existing resources that could be linked from the database. About 100 such web resources were included in the initial database. An evaluation of the selected resources revealed incomplete areas of need, including troubleshooting, hardware upgrading procedures, and tools specific to school technology management. To fill in these gaps of knowledge, the project staff wrote tip sheets and help files as web pages to add to the database. University graduate instructional technology classes agreed to do their semester projects to contribute to the database. The students in the classes, Advanced Multimedia and Advanced Design, teamed up to create multimedia tutorial job aids. The job aids illustrated the steps in hardware installations and upgrades. Two additional university classes in School Networks provided materials to the database. These materials were presentations about procedures and practices related to using school computer networks, and tools to streamline and organize the work of school technology coordinators. Almost 100 additional original database resources were added from these activities.

As the scope and content of the TLC database was developed, the options for placing the information online were evaluated. The web database involved three main decisions: choosing the database application; selecting a server configuration; and selecting a web based user interface. The database options included Filemaker Pro or Microsoft Access databases. The databases could be accessed from a server using FrontPage extensions, a server set up for Filemaker Pro, or a Cold Fusion server. The tools available for writing the user interface for the database were HTML, FrontPage, Macromedia Dreamweaver, Cold Fusion Studio, and Claris Homepage. The skills and interests of the project team led to the selection of an Access database residing on a Cold Fusion server queried from a Dreamweaver web page.

The interface web page was deliberately kept simple, open, and light, with a few clear options. Users may click a button that shows the entire list of resources in alphabetical order by title. Users are able to search the database by selecting from a list of six broad categories of resources: hardware, software, networks, general technology information, technology management, or technology training. Keyword searching was also made available to enable users to search for resources related to specific topics. After launching a search, a new page appears listing the resources in digest form: the title, a short description, a link to the full resource, and a link to more detail about the resource. The full URLs of resources are included to facilitate printing a useful results list. Resources that are not available as web pages are provided in alternative formats such as PDF files, PowerPoint presentations, database files, spreadsheets, word processing files, or multimedia SMIL presentations.

The TLC database has received very favorable responses from educators in its first year of use, and it is subject to regular review and update. The possibility of having work included in the database has been a motivational factor for students in the contributing university courses, and they've appreciated having access to samples of work from previous classes for their own learning. The maintenance of the database includes checking that existing web links are valid and still useful, adding newly discovered web links, adding newly created original university projects, and updating the corresponding project contributors list. The contributors' list shows all project developers and materials developers by name accompanied by the link to their resources.

Modeling and Implementing Effective Technology Practices

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Abstract: Faculty in the department of Technology and Cognition at the University of North Texas have identified several strategies to enhance students' use of technology and students' level of technology proficiency. In our instructional technology classes, future teachers are being introduced to the effective use of old and new technologies to deliver their lessons. In other courses in the department, innovations in the faster delivery of video on the Internet have allowed department faculty to store portions of videotaped class lectures on the department's server and make a sample of these available to prospective students. Thus, students may read about a class and also view a lecture before deciding whether or not to enroll in a course. Distributed learning models being used in the department make use of multiple platforms. One approach the department has developed is a program for the delivery of asynchronous and synchronous class-lecture videos with the use of streaming media and the Internet.

Infusing Technology in Our Teacher Education Courses

Students interested in the technology aspects of being a classroom teacher have several course options available in the College of Education at the University of North Texas. There is an assumption that most students will bring some level of computer proficiency with them into their coursework. For those whose skills are weak an introductory course on computer literacy and basic computer applications (in this, Microsoft Office) is suggested. This course can be taken on-line in an independent study mode supported via technology such as email, on-line testing, and discussion forums. A traditional, on-campus classroom section of this course is also offered for those that require more structure and guided instruction. Outcomes of this course, either distance delivered or the on-campus offering, meet the necessary prerequisites for other courses in the technology sequence. In addition, this course provides many students their first exposure to distance delivered instruction and technology-based instruction.

Instructional Technology

In our Introduction to Instructional Technology classes future teachers are being introduced to the effective use of old and new technologies to deliver their lessons. Within the first weeks of the semester, students are introduced not only to different learning theories and teaching models but also to hands-on modules integrated with each new chapter. These hands-on modules demonstrate real world technology applications and provide the connection to appropriate uses and inclusion of both old and new technologies of instruction. As soon as learning theory is reviewed, the classes concentrate on several book and multimedia modules that overview the system's process (instructional design, etc)... then progress to non projected and projected media elements that are demonstrated and then reinforced via subsequent lab experiences (i.e. a chance to learn how to dry mount, rubber cement, and create non-computer transparencies...) for a taste of the old which is still in use today. But immediately, students are also taught how to create and enhance transparencies with the use of a flat bed scanner, computer, drawing software and a color printer. In order to create these transparencies students exchange the old cardboard frames for the word processor or the power point program, and the scissors and glue for the new cut and paste features found in both programs. Students are taught the basic uses of both software packages and the features that could help them enhance a presentation and a handout. The scanner and features of graphics software are also demonstrated to teach students how to include pictures when the clipart library found in the software is not enough. The use of a digital photo camera provides the students skills at obtaining additional illustrations. In subsequent modules students are given a chance to understand and use digital video cameras and create a "how to" team video, use the Internet for specialized searches, evaluate educational software and web sites given a criteria, create a web page, attend and participate in a hands-on videoconferencing demonstration, learn about filtering software, virus scanning, web based courses and much more. Although each skill is addressed at only an introductory level, students' awareness of all these tools and teaching methods gives our future teachers enough guidance on the use of the tools and inclusion methodology, thereby enhancing and enriching their skills as a teacher. The hands-on approach seeks to prove that, although complex in their inner workings, the tools themselves are easy to use and have a very short learning curve. Familiarity should result in a relaxed understanding and eventual use of technology mated with creative ideas.

Other Technology Courses

Also in the sequence of preservice technology courses is Computers in Education. This course stresses the use of technology in the classroom with an eye toward integration of technology into the curriculum. Students in the course increase their knowledge of technology and its impact on teaching and learning. In addition, topics such as development of student portfolios, evaluating software, creative activities using the Internet by students are investigated. If students follow the entire sequence, they place well on a "Teachers Using Technology" continuum developed by the Technology & Cognition faculty. That is, they demonstrate the skills necessary to meet the standards of ISTE/NCATE.

We also try to offer a diversity of learning systems for our students to use in the acquisition of the course materials. Although we do believe that the sage still needs to be on the stage for some of the class materials, we also strive for interactivity through a variety of delivery systems. Our courses range from standard class schedules that are approximately ½ lecture and ½ lab work... to fully asynchronous, webdelivered sections. Our most popular model (with both teachers and faculty) is a combined class during which the students come to campus 6-8 times a semester for high tech labs, specialty lectures, and teacher-learner/learner-learner interactions. The other 8-10 classes have all materials delivered via the web (both our own server/web sites and a university-based WebCT system). Most testing is web based. We feel that this model gives us opportunities to serve both as 'sage' and as

Delivery of Courses via Distributed Learning Models

In the Department of Technology and Cognition at the University of North Texas, new technologies are being used and tested to deliver class instruction across the Internet. Each program area in the Department maintains a comprehensive Web site (i.e. www.cecs.unt.edu) that provides course syllabi, degree requirements, course objectives, faculty information, etc. Streaming media (discussed later) is used to give prospective students a brief sample of the course before they register. In addition, students get a brief introduction of what taking a course via the Internet may entail. For instance, in order to take advantage of some of the extras on the Web site, they have to download players and plug-ins. This serves as an example of the types of skills necessary to receive a course delivered via streaming media.

WebCT is supported at the university level as a deployment tool for distributed learning. The software is used in several different models of delivery in the department. Some courses only use the on-line testing, email and chat functions. Other courses utilize the entire functionality of WebCT. Most of the distributed learning courses are at the graduate level. As mentioned earlier, several course delivery models have been developed. For instance, several VTEL equipped classrooms are available for traditional, synchronous distribution of two-way audio and video. While optimal for delivery of courses at satellite university locations, the equipment is in high demand resulting in a waiting list for use. Due to this limitation, faculty gravitated towards Internet distribution as an alternative. This has also proven to be problematic as discussed later.

The use of streaming media was an early attraction to faculty delivering instruction via the Internet. As a result, we have developed several models of delivery based on streaming media technology. As an aside, we have found the software solutions offered by Real Networks best meet our requirements.

Course Delivery Models Using Streaming Media

Several models of course delivery via streaming media have been developed with the department. The next section describes those models. As will be seen, some of the models deliver content synchronously and some were designed to deliver content asynchronously. While not the focus of this paper, the creation of streaming media requires some audio and video production hardware in addition to the related software (in our case, Real Producer Plus by Real Networks). We have found this hardware to be inexpensive and readily available. Figure 1 shows a mobile cart developed to record video and audio, convert to streaming media and deliver "live" via the Internet. Files can be stored immediately on a local hard drive or a streaming media server. While a convenience, a high-speed or powerful computer is not a necessity to capture, store and play streaming media.

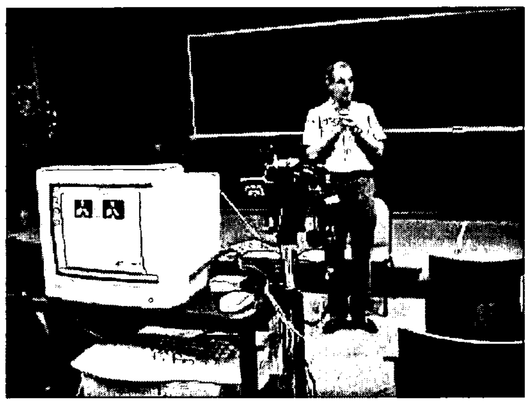

Figure 1 – Portable Streaming Media Production Cart

Streaming Audio

Two graduate level courses have been taught using streaming audio. The instructor lectures to an on-campus section of a course and streams the audio live. Students can listen to the lecture in real time. Viewing web pages as directed enhances the audio portion. This method of instruction requires a microphone, computer with sound card and encoding software. Each lecture is also archived on a server so that students can review it at a later date. This is also a great convenience for those that could not attend the on-campus lecture or "tune in" to the live streaming lecture. The faculty member using this technique has also recorded the live lecture on videotape, converted it to streaming video and archived it for future use.

Live Streaming Audio and Video

This approach uses streaming audio and video to deliver instruction in real time via the Internet. Students access a website and view the live broadcast. Basically, the course content is captured using a video camera and microphone, digitized, converted to streaming media, transferred to a streaming media server and delivered to the end user. There is a very brief lag, measured in seconds, between the time the content is actually created and when the user finally receives it. This approach is the most elaborate implementation from a hardware and software perspective. Typically, the live course content is also archived for later use by students. The advantage to this technique is obvious.

Archive Streaming Media

Faculty members have found that recording course content (audio, video or audio and video) and converting to streaming media for future use is a viable approach to distributed learning. This technique allows for content editing. As is often the case, the first several minutes of a course are devoted to local business, conversation, or other mundane topics. There is little or no benefit to this information for a student not attending the on-campus class. In essence, postproduction editing and archiving creates an efficient module. Using this approach, a faculty member typically has all of their on-campus meetings videotaped. These sessions are then edited for content and prepared for distribution at a later date. This, in essence, is the equivalent of preparing a telecourse. The only difference is the mode of distribution. In lieu of broadcasting each session on a schedule basis, the student accesses the course lectures at their convenience. Faculty using this technique also has to be attentive to updating the content each time it is offered.

Archive Streaming Media with Graphics

One of the advantages of the Real Networks software is the ability to synchronize graphics with the audio or video stream. This technique requires post-production work in order to create and synchronize the graphic elements with the streaming content. Figure 2 shows an example of what the student sees while viewing the archived content. This technique is somewhat time consuming but the effort results in an efficient delivery of the content. Again, editing allows for the removal of any activity that is not directly related to the content of the lecture.

Real Networks refers to this technique as SMIL Technology. Graphics are synchronized with the streaming media using time. For instance, simple code is used to instruct the software to show a graphic so many minutes and seconds into the file.

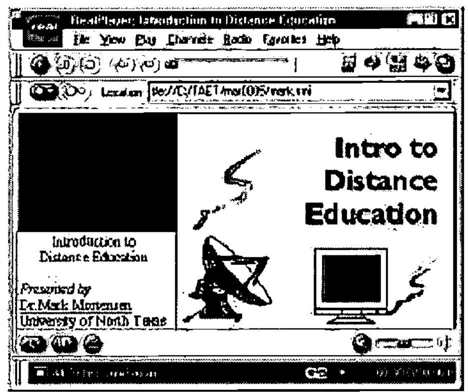

Figure 2 – Sample SMIL screen. Video plays in black box upper left in the frame.

Streaming Audio with 3rd Party Software

Several faculty members have found Screen Watch by Optx (www.Optx.com) to be a unique tool for the delivery of instruction. Screen Watch is a screen capture program similar to Lotus Screen Cam. The Optx product has great advantage because of the large amount of compression applied to the capture resulting in files that easily stream over the Internet. Procedurally, the user narrates his/her on screen activity. The audio portion is recorded and the screen movements, mouse movements, etc. are synchronized to the audio track. This is an ideal platform for teaching computer related topics, how-to's etc. The student can hear the instructor reciting the procedures and see the result of those procedures on screen at the same time. Similar to Real media, this software requires the user to download a browser plug-in in order to view the presentation.

Issues Related to Streaming Media

As can be seen from above, we have extensively used streaming media in various implementations as alternatives to traditional on-campus instruction. Being a high tech, high touch department, students have come to expect technological approaches to course content. There are graduate courses in the creation of digital audio and video and creation of streaming media. Students enrolled in those courses have the advantage of both taking a course in this fashion and learning how to create streaming media and other delivery approaches at the same time. In addition, undergraduate courses using the technology are also in various stages of development. Again, students will learn how to create streaming media while taking courses delivered by streaming media. We feel this represents the highest possible form of modeling technology.

With the advances in streaming technology, a user can view an audio and video clip on the computer within seconds of clicking on its link. The video and/or audio files no longer need to be completely downloaded before viewing can begin. Now only a small portion of the media file is downloaded, buffered into the user's PC RAM. When an approximately 20 second buffer has been created, the streaming media starts playing. The rest of the content is buffered and readied for playing "on the fly."

Buffering speeds are mostly limited by the students' modem or other connection. While the majority of the users may have a 28.8Kb or 56Kb modem, the students with a DSL, T1 or higher connections will experience more continuous viewing. Also, the advent of Sure Stream Technology by Real Networks, allows for the server and student's computer to negotiate what speed to use for playback depending on the highest available bandwidth at connection time. This process is transparent to the student. While offering courseware via the Internet is the biggest advantage of streaming media (whether live or archived), the Internet itself is the biggest disadvantage. Graduate courses in the department are offered in the evenings during peak Internet traffic times. Streaming media requires a large (but not outrageous) amount of bandwidth. Problems have been reported at both ends of the distribution. Students report that streaming media continually pauses and buffers during peak Internet usage times. As a result, an archived file that should play smoothly for perhaps 45 minutes may take over an hour to stream. Another problem also exists at the origination end. In our case, the bandwidth of our connectivity at the university is "maxed out" except between two and 6 am. This builds in a delay before the signal leaves the facility. Oddly enough, most of the bandwidth allocation has been traced to the dorms where students are downloading files from Napster.Com! The magnitude of this phenomenon is great – we have the equivalent of seven T-1's running at full capacity. To circumvent this problem, a faculty member that originates live streaming video each week, has moved to a satellite campus to teach. This location has available bandwidth. In addition, production equipment and a server also were relocated. As a result of problems related to bandwidth, many faculty members have abandoned streaming media. Unfortunately, this reduces the amount of distributed learning courses offered by the department. It also reduces student's exposure to this technology.

Other Approaches to Implementing Technology Delivered Instruction

As mentioned earlier, the "high tech" nature of the faculty in the Department of Technology and Cognition results in many approaches to course delivery. As streaming media proved to be problematic, hybrid approaches have been developed as solutions. For instance, the instructor of a Cognitive Psychology course and an Instructional Design course decided to asynchronously distribute streaming media files via CD-ROM instead of the Internet. This approach provided the same content using streaming media with none of the limitations of the limited bandwidth of the Internet. In addition, on-campus sessions are offered on several weekends for those students that prefer some contact with the instructor or other class members. Web enhanced activities are offered with the help of WebCT software which has proved to be viable for providing online testing, email, chats, download sites, etc. for these course models. This hybrid approach has been well received by students enrolled in those courses.

Since the Internet has posed some problems with distribution, other faculty members have rediscovered multimedia technology as a method of creating distributed learning courseware. One project under development will use multimedia (from CD-ROM) to help preservice special education teachers to understand the concepts of gifted and talented students. The project uses video-based case studies, information pages and web links to create an information source for students. The value of this project is that it will provide an alternative to on-campus instruction.

Synchronous and Asynchronous Class Formats

Web based courses are being offered synchronous and asynchronously. In the synchronous setting, the student attends classes live but in the space independent setting of their own choosing (home, office, library, other) wherever a computer with an Internet browser and Real Player client software is available. Students in this setting can hear and see the lecture, follow the power point slides released by the teacher, and interact with other students through a chat room (see Figure 3). Also, using the chat room the students can ask the teacher questions live during the lecture. Synchronous Web based lectures are recorded and saved in the school's server for later viewing. Students are then given the URL and password of the server to access these and other class materials (syllabus, schedule, assignments, handouts, class slides, bulletin board and email) at a later time.

The asynchronous setting of "attending" classes on the Internet is not only space independent but also time independent. Students from anywhere and at anytime can access the University's server and view any of the pre-recorded classes, saved and labeled by chapter number and topic. After choosing a video clip, students can hear and see the class lecture, and follow the power point slides much like in the synchronous setting, except for two variants. First, and most obviously, there is no one to interact with in the chat room while viewing the lectures. And second, while viewing the video the student can pause, rewind and view over and over any or all of it as needed, using the VCR like controls on the screen (see Figure 3). Also, since the live lectures are recorded in the classroom with the teacher and students present, part of the teacher-student interaction such as questions and anecdotes, can be "experienced" by the students Web viewing the class in synchronous and/or asynchronous mode.

While many advantages and disadvantages maybe cited for the asynchronous class format, two characteristics are indisputable. Asynchronous classes are time and space independent. Students may "attend" classes at any time from anywhere. On the other hand, synchronously delivered courses are live and so students are time dependent. Those students may also benefit from the live interaction with the instructor and other peers as the lecture is taking place. Because Web based courses are the new instructional phenomena, new research is being conducted to determine its effectiveness and new methodology is still being tested to determine adjustments in the pedagogy of such courses. These areas of research have been intriguing to faculty using distributed learning technologies. In addition, graduate students have been exposed to research and research methodologies related to distributed learning.

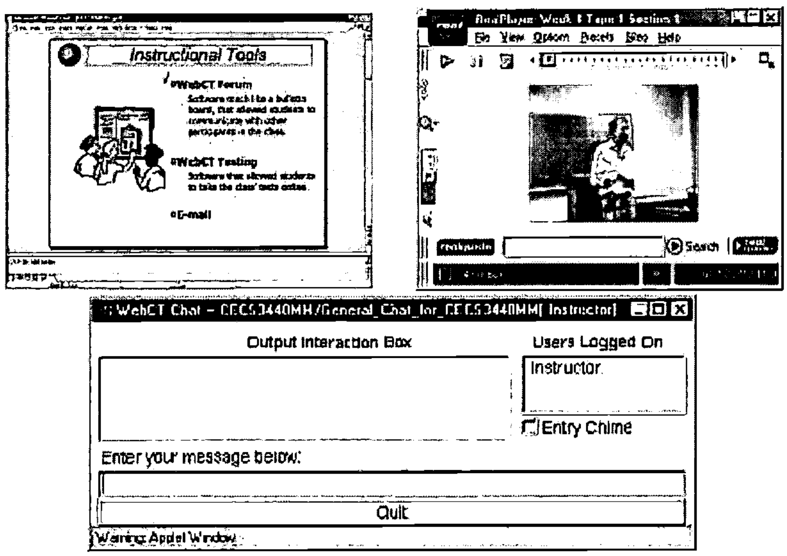

Figure 3 – Synchronous Web based class setting

Conclusion

Presently, studies indicate that students with very busy lives that hold full time jobs, have a family, live over 30 minutes from the university campus, travel in job related assignments and have many commitments, like to "attend" classes in some fashion other than coming to the main campus of the University of North Texas. As is often heard, students say "anything is better than driving to Denton!" Certainly, more research is needed to determine if the virtual classroom, or whatever hybrid approach is used, is as effective as our traditional classrooms.

In the Department of Technology and Cognition not only are teachers being trained to appropriately use technology, but also technology is being tested in new ways in the delivery of these courses. Technological innovations are being introduced and tested from our classrooms' podiums while research is conducted to establish their effectiveness. As long as this continues, faculty will benefit professionally by investigating different distributed learning approaches. Students will certainly benefit by being exposed to the techniques. And new viable ways of instruction may in the very near future allow educational institutions to adapt to the changing life style characteristics of the student population they serve.

Understanding the "Digital Divide" - the increasing technological disparity in America; Implications for Educators

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Abstract: Within the past decade, a growing body of evidence supports the ever-widening technological gap among American school children (U.S. Department of Commerce, 1998). The "Digital Divide," a leading economic and civil rights issue, is defined as the divide between those with access to new technologies and those without. Disparity in computer use can be found among rural, urban and suburban students, with the division drawn upon socio-economic lines. This trend indicates that the "haves" possess increasingly more information and economic opportunity, -nots" are lagging even further behind. Groups that lack access to information resources include: minorities, low-income people, less education people, children of single parents, and residents of rural areas or inner-cities (http://www.ntia.doc.gov/ntiahome/fttn99/contents.html). Since many people do not have knowledge of technology to pass onto their children, schools will serve as the catalyst for preparing America's youth for the age of technology. Data indicate that outside of work, schools are the second most frequent place where people access the Internet, 33% of access is made from schools (http://www.digitaldivide.gov). Since schools are so important for technological education and access, the U.S. Department of Commerce has arranged for additional funds to aid American schools in purchasing technology. These funds are now available for nonprofit educational organizations and public school districts. Educators must recognize the manifestations of the technical inequality as it affects the lives of America's school children and must become aware of initiatives, both federal and private, that will provide the means and methods to narrow this gap. The purpose of this paper is to describe the "Digital Divide" and explain the steps needed to be taken by America's educators to close this gap.

Introduction

Two hundred years ago "The Great Divide" that threatened the destiny of many Americans was the geographical challenge of crossing The Continental Divide. Only by crossing the treacherous Rocky Mountains could the desperate pioneers partake in the economic benefits westward expansion offered. Two centuries later, "The Great Divide" for Americans is no longer geographical, but technological. Many Americans find themselves unable to meet the challenge of the technological demands of the 21st Century and feel left behind. This "Digital Divide" for modern-day Americans divides those with access to new technologies and those without. Data suggest that the "haves" possess increasingly more information -nots" are lagging further behind (http://www.digitaldivide.gov). The "Digital Divide" has become a critical issue for America; one that if left unchecked, threatens to increase economic inequality and sharpen social division. America's educators must recognize the manifestations of this technical inequality as it affects the lives of America's youth and must become aware of initiatives, both federal and private, that will provide the means and methods to narrow this gap.

Federal Initiatives

To determine means for reaching out to people at risk of falling behind in the Information Age, President Clinton called upon both the government and the private sector to support policies and initiatives that will work to bridge the divide. During the "Digital Divide" discussion in President Clinton (2000) stated:

> ... No one has to be bypassed this time around. The choice is in our hands. We can use new technology to extend opportunity to more Americans than ever before; we can truly move more people out of poverty more rapidly than ever before, or we can allow access to new technology to heighten economic inequality and sharpen social division. (http://www.pub.whitehouse.gov/uri-res/I2R?urn:pdi://oma.eop.gov.us/2000/4/18/16.text.1)

During a recent "Digital Divide Summit" Secretary of Commerce William M. Daley introduced a new federally sponsored web site. This web site, digitaldivide.gov was developed by the National Telecommunications and Information Administration of U.S. Department of Commerce (NTIA) to inform American citizens of federal programs designed to close the "Digital Divide" (see Figure 1, Source: http://www.digitaldivide.gov). This web site also provides information on a range of grant and loan programs including private sector educational and funding initiatives.

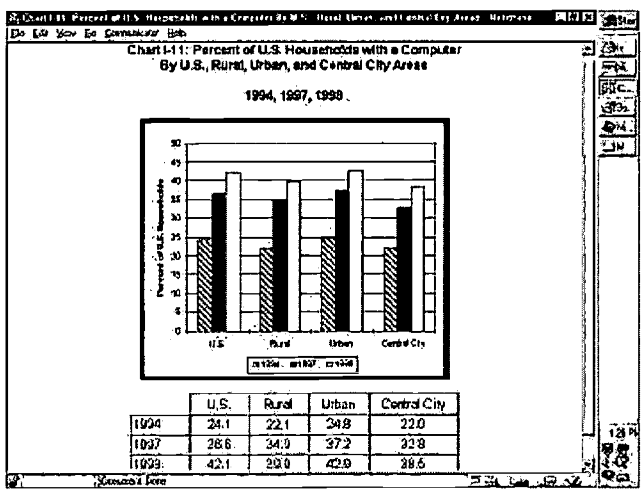


Figure 1: The Digital Divide Homepage

Private Sector / Corporate / Higher Education Initiatives

The public media has tried to raise public awareness of the issues manifested by the "Digital Divide". PBS has aired a series of programs, the Digital Divide Series, that address the "Digital Divide" and how technology affects classroom, gender, race and work issues (http://www.pbs.org/digitaldivide/).

Several universities across the country have formed partnerships with corporations, private educational foundations, and non-profit organizations to seek solutions to the growing problems presented by the "Digital Divide". A recent conference hosted by Delaware State University focused exclusively on how to bridge the "Digital Divide" in spite of growing limitations (http://www.bridgingthedivide.org/). Non-profit organizations such as Alliance for Technology Access have also been formed to make sure small groups, such as children and individuals with disabilities were not left out in the efforts to bridge the "Digital Divide" (http://www.ataccess.org/).

In the campaign for public awareness and support in seeking solutions to the "Digital Divide", corporate level participants play an important role. Many hi-tech companies devote products, service, and grants to give back to the local communities. Specifically, Microsoft and Sun Microsystems have teamed with the Black Family Network in order to host activities such as Black Family Technology Awareness Week. During the meetings, participants sought solutions to the "Digital Divide" dilemma (http://www.blackfamilynet.net/soon/). 3Com, one of the leaders in network technology, has established initiatives to help the nation's public schools bridge the growing "Digital Divide" among urban communities. In July 1999, 3Com, in partnership with The United States Conference of Mayors, created the Urban Challenge program, which is a partnership that rewards forward-thinking cities with $100,000 grants in 3Com systems and services for technology initiatives designed to improve residents' lives (http://www.3com.com/government/urbanchallenge/).

The "Have-nots" of the Digital Divide

America's educators must recognize the technical inequality as it exists in the lives of students both inside and outside of school. This inequality is tied to several important factors in the student's life, the region in which the student resides, available economic resources, family structure, and level of education of family members. According to the NTIA in the U.S. Department of Commerce (1999), the groups that lack access to information resources in the United States are minorities, low-income people, less educated people, children of single-parent households, and residents of rural areas or inner-cities (http://www.ntia.doc.gov/ntiahome/fttn99/contents.html).

One important determinant of computer and Internet use can be linked to a student's region of residence. The following chart (see Figure 2) describes the usage of computers in U.S. households (42.1% overall) by region: rural (39.9%), urban (42.9%) and central city (38% in 1998) (http://www.ntia.doc.gov/ntiahome/fttn99/FTTN_I/Chart-I-11.html).

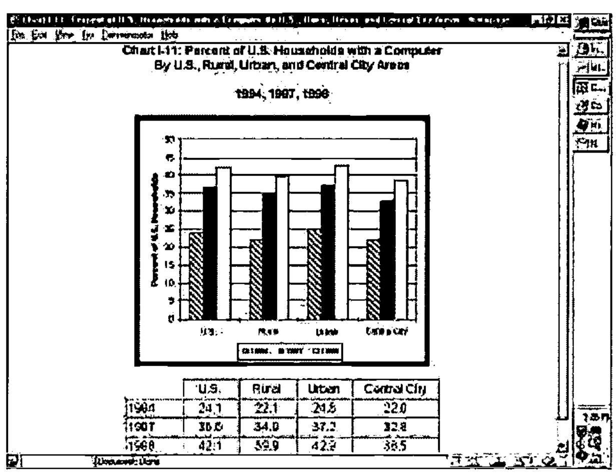


Figure 2: Computer Penetration Rates in different areas

Another important determinant of computer and Internet use can be linked to family income. The U.S. Department of Commerce (see Figure 3) reports that economic advantages in the form of family income increases a student's access and use of computers in schools (http://nces.ed.gov/pubs98/condition98/c9803c03.html).

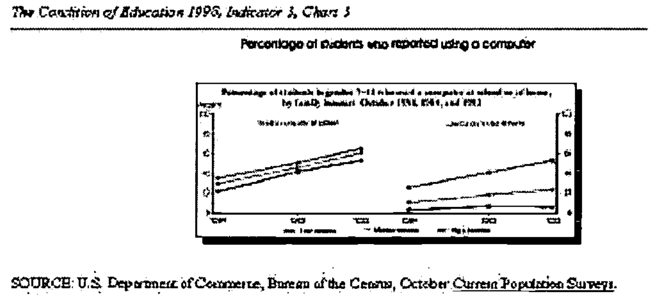


Figure 3: Family income increases a student's access and use of computers in schools

Recent data indicates that the penetration rates of telephone, computers, and Internet among the U. S. households are 94 percent, 42 percent, and 26 percent respectively (see Figure 4). A large discrepancy exists between the 94 percent telephone penetration rate and the 26 percent Internet use penetration rate http://www.ntia.doc.gov/ntiahome/fttn99/FTTN_I/Chart-I-1.html). Most households receive their Internet access through local or national Internet Service Providers (ISP) by paying a flat monthly fee. Figure 4 indicates that in 1998, among the U.S. households with Internet service, 69 percent obtained the connection through national service provides such as American Online or Microsoft Network, 14 percent from local phone companies and local service providers such as PDQ and Flash in the greater Houston area, and 4 percent from long distance companies such as Sprint and AT &T (http://www.ntia.doc.gov/ntiahome/fttn99/InternetUse_II/Chart-II-24ab.html).

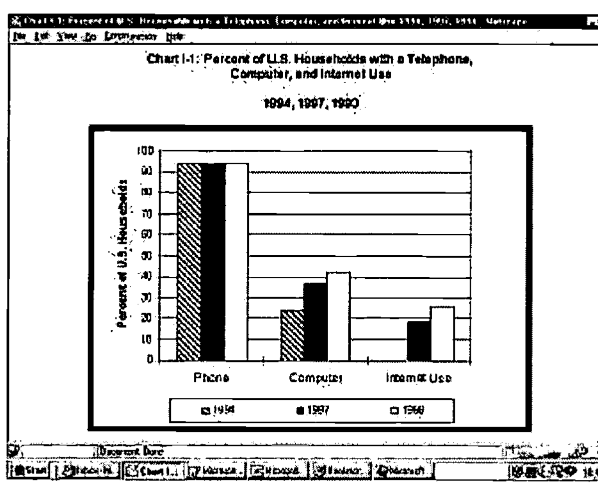
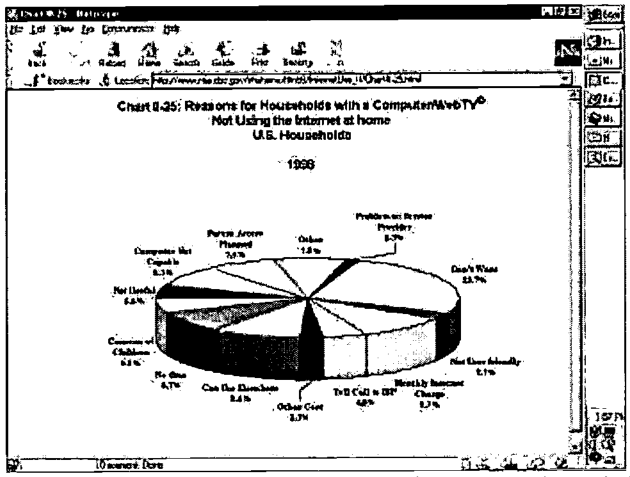


Figure4: Penetration rates of phones, computers, and Internet in US Households

In response to the question of why households with a Computer/Web TV do not use the Internet at home (see Figure 5), 25 percent answered they simply didn't want the service, 9.7 percent answered the monthly Internet Charge was the reason, 9.6 answered they can use other Internet connections available elsewhere, 8.3 percent answered their computers are not capable of the connection, 6 percent answered concern for children was the reason, 4.8 percent didn't want to pay the toll call fee to the ISP, and 2.3 percent didn't want to pay the other cost involved. In total, at least 25 percent of the reasons for not



connecting to the Internet were cost related; yet 7.5 percent of the surveyed population were planning for future Internet access (http://www.ntia.doc.gov/ntiahome/fttn99/InternetUse_II/Chart-II-25.html).

Figure 5: Reasons of households with computer/WebTV not using the Internet at home

Household structure is another important determinant of computer and Internet usage (see Figure 6). While 61.8% of households composed of married couples with children own computers, only 31.7% of female-headed households own a computer. Black families with two parents are nearly four times as likely to have Internet access as single- parent Black households. Married couples with children under 18 exhibit the highest rates of Internet penetration (inside and outside the home Internet access (37.6%) http://www.ntia.doc.gov/ntiahome/fttn99/InternetUse_II/Chart-II-24d.html).

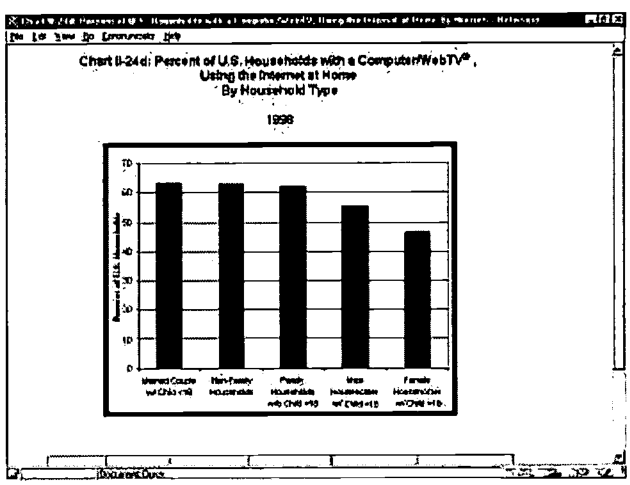


Figure 6: Percents of US households with a computer/WebTV using the Internet at home
by household type

Education level appears to be another important determinant for computer and Internet usage (see Figure 7). Among the U.S. households using the Internet in 1998, 45 percent held a BA or higher degree, 30 percent had some college education, 15 percent had a High School diploma or GED, 6 percent had some high school experience, and 4 percent had only an elementary education (http://www.ntia.doc.gov/ntiahome/fttn99/FTTN_I/Chart-I-25.html).

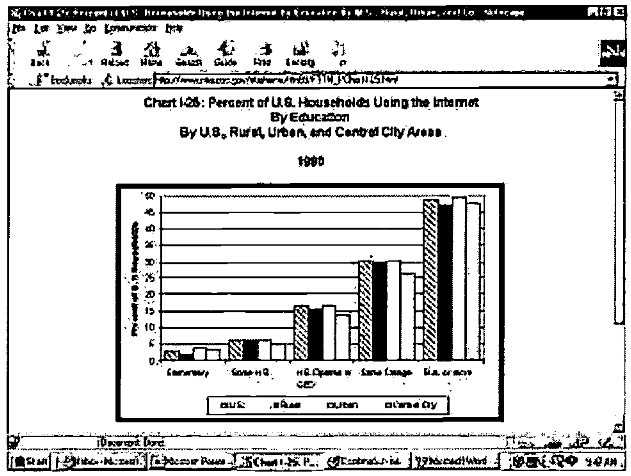
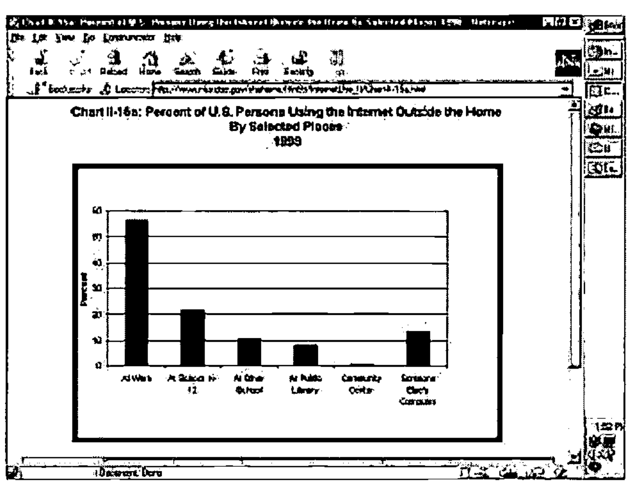


Figure 7: Percent of US households using the Internet by Education

The Importance of School in Closing the Digital Divide

Since many people do not have knowledge of technology to pass onto their children, schools are destined to serve as the catalyst for preparing America's youth for the age of technology. In 1998, in U.S., 35 percent of Hispanic, 27 percent of Black, 20 percent of White, and 19 percent of Asian/Pacific Islanders used the Internet outside the home and gained access at K-12 schools (see Figure 8, source: (http://www.ntia.doc.gov/ntiahome/fttn99/InternetUse_II/Chart-II-15a.html). The data reveal that school is the single most crucial entity for someone who cannot afford to have Internet at home gain access to the Web. Data indicate that outside of work, schools are the second most frequent place where people access the Internet, 33% of access is made from schools (see Figure 9).



Applications of a Best Practice Study: Implications for Technology Integration in the Elementary Classroom

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Abstract: This paper presents the results of a study on four elementary teachers' technology integration practices. Boyatzis' (1998) thematic analysis technique was used to examine interview transcripts, observation notes, and teacher-produced documents for pedagogical practices that accompanied uses of computer technology in these teachers' classrooms. Emergent patterns borne out by the data resulted in a general conclusion that best teaching practices and best technology integration practices go hand-in-hand. Educators should not be overly impressed by the mere use of technology in instruction. They need to be discerning about the pedagogy that accompanies its use.

Introduction

An emerging consensus in the current educational reform effort suggests that teaching methods based on constructivist principles promote learning in a way that teaching-by-telling cannot do. The social aspect of learning by collaboration and an individual's need to explore and experiment are best directed through pedagogies based on constructivist theory. Some of these strategies identified as "best practice" include student-centered instruction, experiential and holistic learning, authentic experiences, reflective exercises, social interactions that scaffold learning, collaborative grouping, problem-oriented activities, and integrated thematic units (Daniels & Bizar, 1998; Zemelman, Daniels, & Hyde, 1998). Many in the field of instructional technology (Grabinger, 1996; Jonassen, Peck, & Wilson, 1999; Wilson & Cole, 1996) also recognize that an instructional context based on these principles has significant implications for uses of technology that promote meaningful learning. As Clark (1983) indicates, "Media are mere vehicles that deliver instruction but do not influence student achievement any more than the truck that delivers our groceries causes changes in our nutrition" (p. 445). It is not the media that influences learning; rather, it is the instructional design utilizing effective teaching strategies that makes an impact. Good teaching combined with appropriate and effective uses of technology makes for a dynamic, rich learning environment.

So, what might you expect from an elementary teacher who is using best practices as they relate to technology integration? From my observations and discussions with four elementary teachers who infuse technology into their instructional practices, it has less to do with the pizzazz of a PowerPoint presentation or graphics whizzing onto a web page and more to do with the lesson design and teaching methods selected when technology is being used (Dias, 2000).

The Study

The study began in the Fall of 1999 and concluded in the Spring of 2000. I used qualitative inquiry since this study sought to provide a "picture" of teachers' technology integration practices as they naturally occurred (Bickman, Rog, & Hedrick, 1998). Using the reputation case selection sampling technique (Miles & Huberman, 1994), 4 elementary teachers from a large metropolitan school district in the Atlanta, Georgia area were chosen. They were identified as "technology integrators." All were female. One taught third grade, another fourth grade, and two taught fifth grade. Two of the four teachers taught in the same elementary school. The participants' teaching experience ranged from 4 to 23 years. Their ages ranged from 34 to 45 years old. Their earned degrees included one Bachelor of Arts and three Master of Education degrees.

The schools in which the teachers worked served between 700 and 1,100 students. The average class size for these four teachers was 24 students. Two teachers had five networked, multimedia classroom computers with Internet access and the other two teachers had only one. A variety of computer-related technologies were available at these schools such as digital cameras, scanners, and various display devices. Each school had a computer lab with a fixed rotation schedule. The schedules varied at each site. Time allotments ranged from 25 minutes to 50 minutes approximately every 6 days.

I gathered data from multiple sources: interviews, participant observations, and documents such as lesson plans and web pages. Each teacher participated in four informal interviews with foci based on Seidman's (1998) interview protocol. Interviews followed observations, except in the case of the initial interview. I observed the teachers for four observations periods ranging in length from 40 minutes to six hours. On several occasions, observation periods continued into a second day depending on the activity that I was observing. Since the purpose of the study was to identify best teaching practices as they related to technology integration, I scheduled observations with the teachers so as to coincide with technology-connected lessons. The teachers provided me with lesson plans reflecting the activities I observed as well as others previously used along with artifacts such as web pages that they had created.

Through inductive analysis, categories, themes, and patterns emerge from the data (Janesick, 1994; Patton, 1990). Boyatzis' (1998) thematic analysis was employed as a means to interpret the data collected. This began as data was first collected and ran throughout the study. Triangulation was evident after a review of observation field notes and documents confirmed the trustworthiness (Lincoln & Guba, 1985) of the interview data.

Results

Emergent patterns borne out by the data resulted in a general conclusion that best teaching practices and best technology integration practices go hand-in-hand. It is sufficient to say that effective teachers adjust instruction to meet the needs of their students. In addition, they typically use a broad repertoire of approaches skillfully (Darling-Hammond, 2000). The participants in this study used a variety of methods while diffusing technology into the curriculum throughout the school year in order to achieve a balance of activities for their students. Their approaches to technology integration helped to foster a supportive classroom climate: one in which students made choices, took responsibility, expressed themselves and their knowledge in a variety of ways, and created a community of learners. The following are five best practices that emerged from my analysis of interview transcripts, observation field notes, and documents.

1. Multidisciplinary and Problem-based Units

Elementary teachers use technology best when it is done in conjunction with multidisciplinary, problem-based units. These units are typically contextualized for the students so as to simulate a problem that they might encounter outside of the school setting. Teachers in this study facilitated only one or two such units a year because of their in-depth and time-intensive nature. For example, one teacher created a stock market unit in which her fifth grade students collaborated with ninth grade students for a six-month look at how the stock market worked. Both classes researched a variety of stocks and used e-mail to exchange information once a week. With the fifth graders acting as stockbrokers and the ninth graders taking the role of investors, students worked in "firms" buying, selling, and trading shares. They computed costs, losses, and gains, prepared stock reports, and created investment portfolios. Using word processing tools, graphing software and Internet tools during this project helped to increase students' understanding and extend the learning environment.

2. The Ends Drive the Means

Teachers who are integrating technology are purposeful when using it. One of the best practices of teaching is focusing on what the students should have learned when the lesson is over. This is true of technology integration. Teachers in this study determined the objectives first and then decided *when* and *if* to use technology to help meet these objectives. In addition, they used technology with their students in a variety of places in the lesson: to introduce material, to extend understanding, to provide additional practice, to enrich learning, to provide closure, and to assess learning. Technology should play different roles in instruction depending on curriculum objectives and lesson design. Teachers who integrate are flexible and not single-minded in their placement of technology within a lesson.

Teachers also realize that the design of the lesson may cause their role to change. Both direct instruction and teacher-as-facilitator were instructional strategies used when integrating technology. Direct instruction was generally used to introduce material, clarify content-based misconceptions, or teach technology skills. Teachers I observed tried to keep these segments short, between 15-30 minutes. They also acted as facilitators of learning while students were engaged in cooperative group work or even during individual assignments. These teachers' end goals for their students help to determine the means needed to reach them.

3. Collaboration and a Community of Learners

I also observed these teachers building a community of learners. The Internet and e-mail make it possible to extend the classroom beyond its four walls. Students can participate in data gathering activities with schools locally and nationally. The third and fourth grade teachers in my study worked side-by-side in the same school and team-taught many units. In a unit focused on regions and the impact of people's needs and wants on the environment, they created surveys to find out the "ecological footprint" of other elementary classrooms in various regions across the United States. They e-mailed their surveys to schools throughout the country. After compiling the data using graphing software, the students constructed different scenarios depicting the potential impact of supply and demand on the environment of these regions.

Adopting "e-pals" was another way several of these teachers expanded their community of learners. One fifth-grade teacher and her class joined nine other classes across the United States for a "Cyber Quilt" project. Using e-mail and "snail mail," the classes exchanged information about themselves including the culture, lifestyles and climate of the area in which they lived along with fabric squares that they felt represented this information. Each class created a quilt with material that students brought in as well as the fabric squares from their e-pals. Through this project, students gained a greater understanding of the power of the Internet and e-mail as communication tools, made new "cyber friends," and considered the similarities and differences between themselves and people living in other parts of the United States.

The community of learners is not just about activities external to the classroom, but also about the teacher being a learner in the process and helping students to recognize each other as experts. Due to the limited number of computers frequently found in classrooms, collaborative activities are a natural fit as an effective instructional method. Problem-based activities or multidisciplinary units provide the perfect context for students to work together. Technology integrators use this best practice to capitalize on students' strengths, develop teamwork skills, and to scaffold learning. For example, groups of three or four students may gather around a computer to use *Inspiration* for a brainstorming session prior to starting on their group project. They also share and divide the work in such a way that all group members have task responsibilities so that each student has some individual time on the computer. While this works best in classrooms with three to five computers, I also saw it work in classrooms with only one.

4. Scaffolding For Understanding

During technology-connected lessons, technology-integrating teachers regularly and systematically scaffold learning for their students. Using this method, the teacher provides the student with some type of assistance to complete a task or learn a concept. Gradually, the "scaffold" is removed until the student is doing this on his or her own. The scaffolding strategies used in conjunction with technology by the elementary teachers in this study included the following: bookmarking websites, providing written directions for computer-related tasks, graphic organizers, note-taking guides to use while gathering information from on-line resources, verbal reminders, and peer tutoring. Pre-selecting appropriate sites allowed the students to begin developing information access skills in a somewhat controlled environment. It helped to eliminate potential problems that can result from inadequate search strategies, misspelled words, or poor keyboarding skills. Graphic organizers guided students as they gathered and recorded data from on-line sources as well as helped them organize ideas prior to using the computer to generate graphs, charts, reports and presentations. Written directions, demonstrations, verbal reminders and peer tutoring all served to assist students as they learned to use technology in the classroom.

5. Using Multiple Hard and Soft Technologies

Another best practice related to integrating technology is the use of multiple hard and soft technologies. These teachers who used technology effectively did not limit integration to a narrow set of technology tools, but rather chose from a variety in relation to their teaching goals. These included soft technologies such as the Internet, e-mail, word processors, graphing programs, databases, cognitive mapping programs and multimedia software. Of these, the availability and versatility of word processing and Internet tools resulted in more frequent use.

They also included hard technologies such as flex-cams, digital camera, scanners, and some type of display device (which is critical to whole class instruction). One of the fifth-grade teachers I observed used the digital camera throughout the year as a way to record the "class history." She and her students used the digital pictures in multi-media presentations that reflected what students had learned from a recent fieldtrip. They imported pictures into classroom newsletters as a way to communicate with parents about special events, and students printed out pictures to use in classroom art projects.

Conclusions

Computers and the Internet are more available now to teachers and students than ever before (Williams, 2000). In a recent study (Smerdon, Cronen, Lanahan, Anderson, & Angeles, 2000), 99% of teachers reported having computer access somewhere in their schools. Of these, approximately half used them for classroom instruction. 84% indicated that they had computers available in their classrooms. Accompanying this trend, is an increasing demand for teachers to make computers an integral part of their instructional activities. They are expected to integrate technology in ways that ensure that their students achieve success in learning, communications, and life skills as well as becoming technology literate in the process. Within the last few years, the International Society for Technology in Education (ISTE) and its partners have developed both the National Educational Technology Standards for Students (2000) and the National Educational Technology Standards for Teachers (2000). These documents clearly indicate expectations for effective computer usage in teaching and learning. Standards, competencies, assessment, and accountability for technology usage are upon us. It is important for school administrators and others in leadership roles to understand what constitutes best practice in technology integration. When administrators evaluate teachers using technology, it is imperative that they know what to look for. They should not be overly impressed by the mere use of technology. They should be discerning about the pedagogy that accompanies its integration. Based upon my research, and that of others, some of the questions that should be addressed when evaluating teachers' effective integration of technology into the school curriculum are the following:

- To what extent does technology bring additional value to multidisciplinary units?
- To what extent is the integration of technology driven by instructional objectives?
- To what extent does technology cut across different events within a unit or lesson?
- To what extent does the teacher adapt flexible roles and teaching/learning strategies in order to maximize learning outcomes through the integration of technology?
- To what extent does the teacher utilize the integration of technology to build a community of learners?
- To what extent does the teacher utilize various scaffolding strategies in order to maximize learning outcomes through the integration of technology?
- To what extent does the teacher utilize multiple hard and soft technologies in order to maximize learning outcomes through the integration of technology?

Computers in the classrooms are here to stay. Already a variety of assessments tools exist that help teachers determine their technical skill level, such as those based on the Mankato Scale (Computer Use Self-Assessment, 2000). There are others that attempt to measure teachers' instructional use of technology (Moersch, 1997). These self-reporting tools are valuable sources of information that can help teachers and administrators plan for staff development. However, as teachers become more proficient at integrating technology into their curriculum, we must begin to move beyond self-assessments. New evaluation models that include looking at pedagogical practices in relation to technology integration are necessary.

References

Boyatzis, R. E. (1998). *Transforming qualitative information: thematic analysis and code development*. Thousand Oaks, CA: Sage Publications.

Clark, R. E. (1983). Reconsidering research on learning from media. *Review of Educational Research, 42*(3), 445-459.

Computer Use Self-Assessment. (2000). Retrieved November 28, 2000, from the World Wide Web: http://www.sonoma.edu/people/cochran/edu484/mankato.html

Daniels, H., & Bizar, M. (1998). *Methods that matter: six structures for best practice classrooms*. York, ME: Stenhouse.

Darling-Hammond, L. (2000). Teacher quality and student achievement: A review of state policy evidence, 8(1). Retrieved November 27, 2000, from the World Wide Web: http://olam.ed.asu.edu/epaa/v8n1

Dias, L. B. (2000). *Best practices of technology integrating teachers: Pictures of practice from four elementary classrooms.* Unpublished Dissertation, Georgia State University, Atlanta.

Grabinger, R. S. (1996). Rich environments for active learning. In D. Jonassen (Ed.), *Handbook of research for educational communications and technology* (pp. 665-692). New York: Simon & Schuster Macmillan.

Janesick, V. J. (1994). The dance of qualitative research design: metaphor, methodolatry, and meaning. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (pp. 209-219). London: Sage Publications.

Jonassen, D. H., Peck, K. L., & Wilson, B. G. (1999). *Learning with technology: a constructivist perspective.* Uppser Saddle River: Merrill.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic Inquiry*. Thousand Oaks, CA: Sage Publications.

Moersch, C. (1997). Computer efficiency: Measuring the instructional use of technology. *Learning and Leading with Technology, 24*, 52-56.

National educational technology standards for students--Connection curriculum and technology (2000). Eugene, OR: ISTE.

National educational technology standards for teachers (2000). Eugene, OR: ISTE.

Patton, M. Q. (1990). *Qualitative evaluation and research methods* (2nd ed.). Thousand Oaks, CA: Sage Publications.

Seidman, I. (1998). *Interviewing as qualitative research* (2nd ed.). New York: Teachers College Press.

Smerdon, B., Cronen, S., Lanahan, L., Anderson, J., & Angeles, J. (2000). *Teachers' tools for the 21st Century: A Report on teachers' use of technology* (NCES2000-102). Washington, D.C.: National Center for Education Statistics.

Williams, C. (2000). *Internet access in U.S. public schools and classrooms* (NCES2000-086). Washington, D.C.: National Center for Education Statistics.

Wilson, B. G., & Cole, P. (1996). Cognitive teaching models. In D. H. Jonassen (Ed.), *Handbook of educational communications and technology* (pp. 601-621). New York: Simon & Schuster Macmillan.

Zemelman, S., Daniels, H., & Hyde, A. (1998). *Best practice: new standards for teaching and learning in America's schools* (2nd ed.). Portsmouth, NH: Heinemann.

Real-time Learning in a Virtual World

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Abstract This paper explores the feasibility of an Internet software known as "iMatrix" to enhance learning opportunities within the virtual environment of the *NatureShift! Linking Learning to Life* web world. The *NatureShift!* project, a US Department of Education Technology Innovation Challenge Grant, seeks to investigate the impact on learning when informal (free-choice) education methods are applied through technology to formal education curriculum. To build an effective technology delivery system, *NatureShift* chose iMatrix, an image and audio database software developed by Surweb (a TICG project), to provide instructional tools for users that allow on-line construction of slide shows, tests, and learning units. By adapting iMatrix tools to its *NatureShift Exploration Model*, an inquiry-based, constructivist learning model, learners gain creative control over their learning environment. They may create digital presentations or instructional media with minimal understanding of the technology. *NatureShift* is evaluating the iMatrix effectiveness in assisting learners to make learning meaningful.

Background

NatureShift! Linking Learning to Life (*NS*) is a five-year Technology Innovation Challenge Grant (TICG) funded through the US Department of Education and awarded in 1997 to the partnership of Dakota Science Center and Grand Forks Public Schools. Two primary objectives of the grant are the creation of an instructional web-based environment that reflects and evaluates the effectiveness of the *NS Exploration Model* as a learning strategy, and incorporation of appropriate and innovative instructional technologies throughout the learning process. In spring 2000, *NatureShift* accepted an offer from Surweb, another TICG project, to join a consortium of projects testing and adopting Surweb's software innovation known as "iMatrix." It was determined that iMatrix software might enhance *NatureShift*'s instructional capabilities, contributing a database to house informational resources and an on-line set of tools for creating custom learning events from those resources. One immediate instructional advantage was clear – iMatrix provided opportunity for users to collect resources from their world and then turn those resources into custom instruction. This advantage meant that a user (learner) could create meaningful learning events by studying information from the world they already understood (Brynes 96, Negroponte 94, Solis 97a, Papert 93) the prime goal of the *NS Exploration Model.* The iMatrix offered a second advantage to users, whether educators or learners – the opportunity to create a complete instructional sequence, including resource, instructional presentation, assessment and context, live on the web in real-time (Bills *et al.* 95). The advantage offered immediacy, feedback, and personalization of instruction, all critical elements of effective learning strategies. The critical and decisive choice was then made to integrate iMatrix tools seamlessly through the *NatureShift* construct rather than establish a standalone iMatrix web site as the consortium envisioned without educational application to member projects. Under this design, iMatrix and *NatureShift* each gained enhanced capability to utilize the powers inherent in the other.

NatureShift! Scope and Innovation

The *NatureShift* grant seeks to impact learning outcomes through integrating informal (free-choice) education approaches into the formal education experience (Sanford & Uyehara 97). In so doing, the grant calls upon innovative technology to aid instructional application and stimulate creative uses of technology throughout the learning environment.

Innovations of the Grant

Innovation 1

The grant developed an educational model, the *NS Exploration Model*, which culls best practices from free-choice education and formal education strategies and applies those strategies to both formal education classrooms and informal education settings. The goal of the model is to stimulate critical thinking and interpret meaning from personal discovery and understanding. The model has four structural elements which, together, are designed to bring the learner to the goal. (1) Engagement – stimulates inquiry and puts the learner in charge of the learning path. (2) A Web Adventure – provides free exploration through a *defined* instructional path and teaches research using new technologies. (3) A Real World Adventure – brings instruction into the learner's world and offers a path for knowledge application and understanding. (4) A *NS* Project – constructs a summative presentation or demonstration of knowledge gained, requiring the learner to interpret the meaning of the principles and/or skills acquired. Solis (Solis 98) explains, "a learning environment requires the development of two components: (a) a guiding philosophy and (b) a system that supports the philosophy in practice." Establishing a supportive system to deliver the *NatureShift* philosophy led to the second grant innovation.

Innovation 2

NatureShift disseminates its model, its curriculum framework, its resources, and its instructional practices through a robust networking system and a web site that uses advanced technologies to construct a learner-centered instructional environment. The *NS* world is a simulated exploration through five cross-disciplinary, integrated microcosms. It engages learners through inquiry and it gives them content for study, investigative methods, and tools for engaging content, critical components for motivating learners in project-based learning approaches (Blumenfeld *et al.* 91).

Innovation 3

Creative partnerships empowered an innovative educational program that linked information resource providers and expertise with schools, universities, and non-formal education providers. An unbroken *learning line* was established that could deliver information from an original source through instructional designers to educators and pre-service teacher training programs and into the hands of learners for construction of knowledge and meaning. The partnerships created a meaningful instructional medium and context for learning so that higher order thinking skills could be stimulated in target learner populations (Solis 97b).

Curriculum and Technology Contributions

Curriculum

NatureShift is unique in its approach to content development. It had opportunity through its partnerships to develop content contributed by first source providers. Grant administrators sought out the primary educational resources necessary for development of *NatureShift*-applicable curriculum. North Dakota is a state challenged by sparse population, rurally isolated communities, and a limited economic base (Sanford & Uyehara 97). One key need that drove development of the grant was the lack of resources for the State's North Dakota Studies curriculum framework. *NS* resource partners were selected for their ability to add substantial resources to the project to meet that need. One of the first findings of the grant was that collection of original source material from partners for creating curriculum turned out to be an effective fuel for firing-up interest in learning, even though those resources were delivered through a virtual medium. Because learners could study information that came from their home environment, they became interested in the content under study -- even when that content was delivered via the web. It was, in fact, critical to student interest that that original material was in the virtual presentation. It had the effect of "making it real" (*NatureShift* Progress Report 2000, Solis 97b). Learners no longer simply investigated the application of knowledge to their world in a Real World Adventure, but they now had the "real thing" available on-line for exploring the curriculum they were learning.

Technology

Midway into the *NatureShift* project, it became clear that a robust technology architecture would be needed which could serve a comprehensive web site to learners. It would need to deliver a highly interactive web environment and offer communication and collaboration tools that would ensure appropriate on-line teaching and learning methods. The elements added to the *NatureShift* web site included a model *NS Exploration* for each of the five modules, on-line pre-post evaluations, knowledge checks with feedback, authentic content delivered engagingly, a functional operation that stimulates inquiry and exploration, plus communication and collaboration technologies to encourage learner interactions. The addition of the iMatrix software brought necessary enhancements to these functions and contributed a new layer of user controls.

iMatrix Contributions

Development of the original iMatrix software was the project of SURWEB (State of Utah Resources WEB), a Technology Innovation Challenge Grant formed by a statewide consortium of public and private agencies, led by Southeaster Education Service Center. The project was intended to address educational opportunities for disenfranchised communities, provide authentic, locally-created resources to enhance educational opportunity for all of Utah's elementary and secondary students, provide quality education resources via technology, build connectivity to access information, and develop curriculum applications for the Internet (Bills *et al.* 95). At the conclusion of the project, the software was turned into a consortium of Challenge Grant web sites and renamed iMatrix.

Capabilities of the Software to Deliver *NatureShift* Objectives

The iMatrix software is structured upon searchable digital *Collections* of images, sounds, movies, and PDF documents that are accessible for the creation of HTML-generated *Media Shows*, *Tests*, and *Learning Segments*. This four-part package of tools is easily learned by teachers and students (Nelson 2000). The power of the user tools to create instructional materials over the web in real-time gave to *NatureShift*, as to other consortium members, the ability to generate an archive of instructional resources which users could manipulate for generating new instructional content. What *NatureShift* recognized was that iMatrix provided several answers that could prove effective for the project. It was a database with a web interface that could house all of *NatureShift*'s partner developed resources. It could make those resources available to school partners and Dakota communities. More importantly, the software functionality matched *NatureShift* instructional strategies for putting interpretation of learning into the hands of learners and giving learners the ability to follow their own lines of inquiry. It also offered *NatureShift* users the option to create summative projects on-line for their *NS Explorations*. What development staff discovered, once they began using iMatrix software, was that, given further development to meld the two webwares,[*] iMatrix could lead to more innovative offerings for both web sites.

Merging Application Powers for Curriculum Development

NatureShift web innovations included the creation of simulation-style learning environments whereby users could enter, watch, interact, listen and explore a specific world of inquiry. iMatrix innovations gave users a web site archive that could be manipulated into instructional products of the user's choice. *NatureShift* staff determined that they could merge the two innovations. By embedding iMatrix tools inside the *NatureShift* world and making them available to *NS Explorers*, it allowed learners to remain in the learning experience and yet have creative power to manipulate it. This tactic offers learners an option for drawing meaning from their *NS Explorations* and a way to prepare an interpretive presentation of what they have learned, without leaving *NatureShift.* iMatrix thereby gains curriculum and/or content focus for its user while NatureShift gains tools for the learner to use with curriculum content. *NatureShift* recreated the design of its web operations to enable iMatrix tools to be used within the *NatureShift* curriculum. This feature meets *NatureShift*'s primary goal of stimulating creative thinking by providing content and giving the learner freedom and power to interpret and formulate meaning from his or her engagement with the content (Pirie & Kieren 92).

NatureShift developers have reviewed the advantages of the merged functions of both web technologies. As a result, curriculum writing teams are now developing coursework for specific curriculum frameworks that can be delivered almost anywhere through this enhanced medium.

Professional Development

Both NatureShift and iMatrix goals include the proven instructional strategy of modeling learning methods when drafting professional development plans. If the merged technologies work well for teaching students, they should work equally well for training educators and professionals. iMatrix is designed for use as a training tool as much as a learning tool. When combined with NatureShift web tools, it functions admirably for demonstrating NatureShift teaching strategies.[†] iMatrix has been used exceptionally well to demonstrate the twin values of instructional *immediacy* and learner interactivity (Montgomery 2000). With only an Internet connection, iMatrix can be accessed and immediately put to use when giving a presentation. It has obligingly provided its tools for uploading pictures in real time during workshops and demonstrated to participants the power of creating an instructional event in real time to a multitude of learners. A Media Show can be created in less than 10 minutes. iMatrix has the unique capability of providing instruction, demonstration, and training at the same time. It is ubiquitously portable, sending its lessons and media shows anywhere there is an Internet connection to receive it.

Conclusions

iMatrix has proven a powerful tool for putting creative power into the hands of learners. In combination with a curriculum- or content-rich site, it gains power exponentially to help learners interact with the objects of learning. Because the same authoring platform[‡] is used by teachers and students, students gain the opportunity to become teachers, thereby demonstrating what they have learned and enhancing their own learning. This ability for users to author instruction matches one of NatureShift's core principles – to give

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[*] Webware – refers to a package of web programming that delivers a "software-like" application over the web.

[†] NatureShift teaching strategies include: (1) "Each one teach one" (i.e., teacher creates lesson in iMatrix from which students create their own lessons for other students, or class presentations); (2) Use of technology to deliver instruction; (3) Personalizing learning inquiry (using digital cameras to gather information, uploading it into iMatrix, presenting it).

[‡] "Authoring platform" refers to a software tool that allows the user to create (author) new software applications. In this case, iMatrix gives users the ability to generate new HTML-based instructional materials.

learners a way to sum up the knowledge they have gained by constructing their own meaning from it. This functionality, however it might be used, will undoubtedly enhance the NatureShift web site by allowing it to grow openly and through unlimited user contributions.

References

Bills, F.L., Johnson, L., Taylor, G., Everett, C., Ison, C. (1995) *State of Utah Resources (SURweb),* U.S. Department of Education Technology Innovation Challenge Grant, Price, Utah.

Blumenfeld, P.C., Soloway, E., Marx, R.W., Krajcik, J.S., Guzdial, M., and Palincsar, A. (1991) Motivating project-based learning: sustaining the doing, supporting the learning. *Educational Psychologist*, 26 (3 & 4), pp369-398.

Byrnes, J.P. (1996) *Cognitive Development and Learning in Instructional Contexts*. Allyn and Bacon. Boston.

Donohue, P.J. and Hardin, T. (2000) *NatureShift! Linking Learning to Life*. U.S. Department of Education Technology Innovation Challenge Grant Progress Report, 2000. Washington, D.C.

Nelson, P. (2000) October NatureShift Report on learning iMatrix for development of a classroom project: *Fish of Lewis and Clark State Park*. Williston High School, Williston, North Dakota. http://imatrix.natureshift.org/Search/MS_Community.asp

Montgomery, L.A. (2000) *The Effects of SURWEB Hypermedia Construction on the Development of Complex Knowledge Structures, Creative Thinking, and Research Process Skills of Utah Sixth Grade Social Studies Students*. Southern Utah University, Cedar City, Utah. http://www.surweb.org/information/whatsnew.asp

Negroponte, N. (1994) Learning by doing: don't dissect the frog, build it. *Wired*, 2 (7).

Papert, S. (1993) *The children's machine, rethinking school in the Age of the Computer*. New York: Basic Books.

Pirie, S. and Kieran, T. (1992). Creating constructivist environments and constructing creative mathematics. *Educational Studies in Mathematics*, 23, 505-528.

Sanford, M.S. and Uyehara, V.Y. (1997) *NatureShift! Linking Learning to Life*, U.S. Department of Education Technology Innovation Challenge Grant, Grand Forks, North Dakota.

Solis, C.R. (1998) The electronic studio and the intranet: network-based learning. In McNeil, S., Price, J.D., Boger-Mehall, S., Robin, B. and Willis, J. [eds.] *Proceedings of SITE 98 - Ninth International Conference of the Society for Information Technology and Teacher Education (SITE)*, 1. Association for the Advancement of Computing in Education. Washington, D.C. http://www.coe.uh.edu/insite/elec_pub/HTML1998/

Solis, C.R. (1997a) Virtual Worlds as constructivist learning tools in a middle school education environment. In B. Khan [ed.] Web Based Instruction. 393-398. Englewood Cliffs, NJ: Educational Technology Publications.

Solis CR (1997b) Teacher Professional Development: Two Case Studies of Curriculum-driven Training. In Price, J.D., Rosa, K., McNeil, S. and Willis, J. [eds.] Technology and Teacher Education Annual, *Proceedings of SITE 97 Eighth International Conference of the Society for Information Technology and Teacher Education (SITE)*. http://www.coe.uh.edu/insite/elec_pub/HTML1997/

The Interactive Classroom

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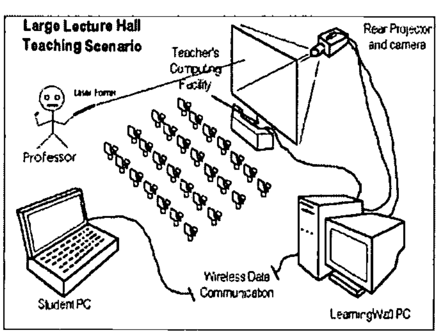
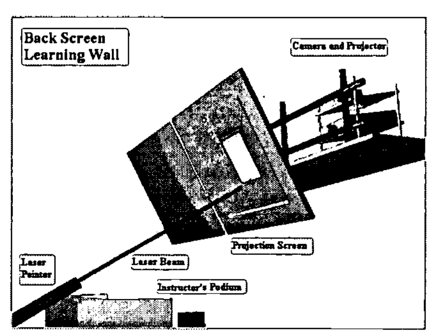
Abstract: Computer programs have been developed that enable students in a classroom to interact with and take control of the computer the instructor is using to present the class material. From their seats students can request to connect their laptop computers over the network to the main computer that is being used to project the course material. Once connected, any student can, at any time, send messages to the instructor and ask to take control of the main computer's mouse and/or keyboard. This enables students to perform actions such as: unobtrusively ask questions, move to another slide in the presentation, make annotations on the main screen to help clarify their questions, participate actively in online simulations, type in answers to questions, and an almost endless number of other tasks that require remote manipulation of the computer the instructor is using. At all times the instructor determines whether a student is permitted to take control of the system and can override that control as needed. The server program running on the main computer also allows the instructor to perform administrative tasks such as maintaining a list of authorized students, their logon IDs and passwords, as well as the IP network addresses to be used.

Introduction

In most universities and colleges large lecture sections have become very common. Unfortunately that kind of environment is not very conducive to meaningful interaction between students and the instructor. Ideally the instructor of a large lecture section should be able to move freely about the room to interact as needed with students as he or she is presenting the material to be learned. In addition it would be beneficial if students could have the possibility of interacting directly with the material being presented without having to leave their seats. We have developed a relatively inexpensive, Windows/PC-based "virtual blackboard" system that can be controlled at a distance by a classroom instructor and/or students in the class. [1] One component of our system is a wireless mouse emulator that is implemented using a software-controlled standard red laser pointer. With this system the instructor is no longer tethered to the computer, but is free instead to roam the classroom and interact with students as needed. The second component is an electronic system of communications between students and instructor. With this system any student can temporarily take control of the mouse and/or keyboard of the instructor's computer. This is a tested, full-featured implementation of the prototype communications system described in the paper "The Classroom of the 21st Century." [2] Figure 1 is a diagram illustrating conceptually how the system is used in a classroom. Figure 2 shows how it can be set





up.

Figure 1. The interactive classroom in action. **Figure 2.** Back-screen camera/projector setup

The Electronic Communication System

In this paper an electronic communication system between students and instructor is described. It is assumed that the instructor is using a computer projection system as the main mechanism for presenting the educational material. The instructor may, for example, be delivering a PowerPoint™ presentation, showing material from the World Wide Web, running a simulation that he or she wants students to be able to use, or executing any number of different programs on the main computer. With recent advances in networking technology it is becoming very common to have Internet connections available at every seat in the lecture hall. So quite commonly many students bring their own laptop computers to class. Our system enables any student in the classroom to use his or her laptop computer to send an electronic message to the instructor, and, with the instructor's permission, take control of the mouse and/or keyboard of the instructor's computer. This allows students do perform actions such as: unobtrusively ask questions, move to another slide in the presentation, make annotations on the main screen to help clarify their questions, participate actively in an online simulation, type in answers to questions, and an almost endless number of other tasks that require remote manipulation of the computer the instructor is using.

The keys to the system are two Microsoft Visual C++ programs that we have developed and tested. One of them (ClickServer) runs on the instructor's computer, and the other (ClickClient) runs on each s assumed that all computers are connected to some sort of a TCP/IP-based network. This could be a wired or wireless LAN.

The user of the ClickServer program (the instructor) is presented with a window that has, among others, an "Options" menu item containing "Accept Connections", "User Management", and "Configuration" submenu items. Within "User Management" the instructor, acting as administrator, can add users (user name, password, IP addresses from which the student can connect) and indicate whether or not the user is authorized to request taking control of the mouse and/or keyboard. Within this same dialog the administrator can edit the current list of users or delete users from the list. Figure 3 shows the initial ClickServer screen, Figure 4 the "Options | User Management" Window, and Figure 5 the "Add User Information" dialog box.

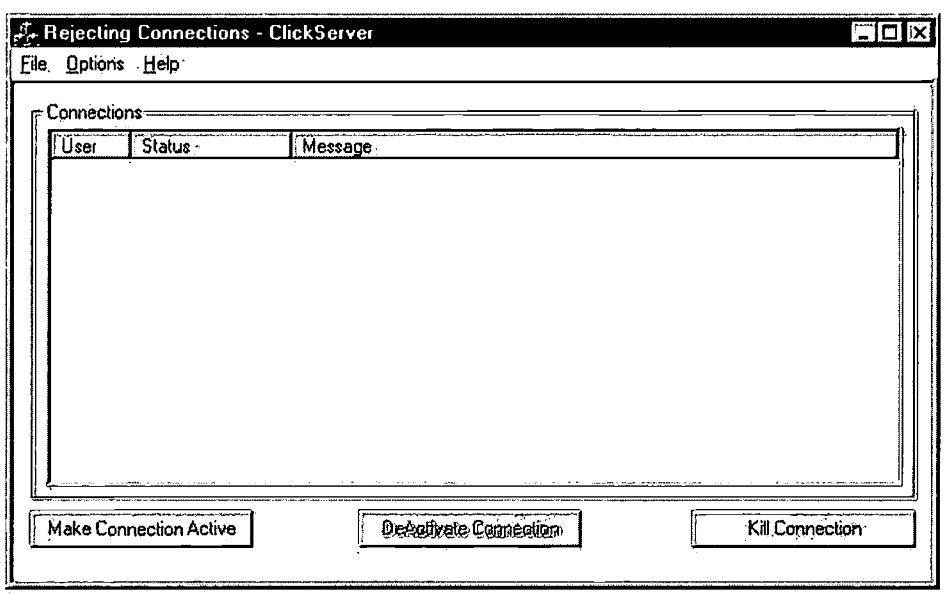
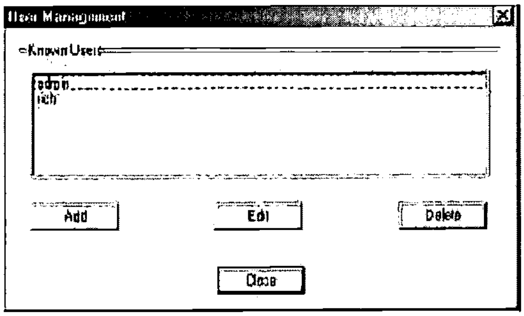


Figure 3. The initial ClickServer window.



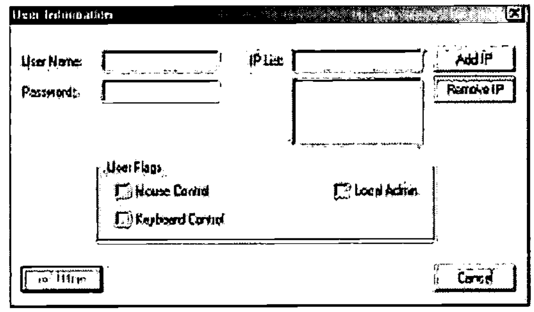


Figure 4. The "User Management Window".

Figure 5. The "Add User Information" dialog box.

ClickServer defaults to rejecting connections when first executed. To allow connections from student clients the instructor selects the "Options | Accept Connections" menu item, which puts the program into "Active Connection" mode. From that point on students can connect to the server program. A list of students who have connected appears within a large "Connections" window. Any messages sent by any student will appear along side that student's name, in addition to a "status" flag that indicates whether or not a given student has taken control of the main computer's keyboard and/or mouse. The instructor can, at any time, click on a button that will "activate" or "deactivate" a student, thereby enabling or disabling that student from taking control. In addition there is a "Kill Connection" button in which a selected student can be disconnected from the server. It should be pointed out that at all times, regardless of whether or not a student is controlling the main computer's mouse and/or keyboard, the instructor also has the capability of local mouse/keyboard control. Furthermore, at any time the instructor can override student control of the system.

ClickServer's "Options | Configuration" menu item allows the instructor (administrator) to set certain system parameters such as the TCP/IP port to be used, to configure "hot key" combinations, and to set or alter other system parameters. In most cases the instructor will not need to invoke this menu item.

When students run the ClickClient program on their laptop computers, they are presented with a window that allows them to enter their user ID, password, and the IP address of the ClickServer. Figure 6 shows the ClickClient screen that appears on a student's laptop when he or she starts the program.

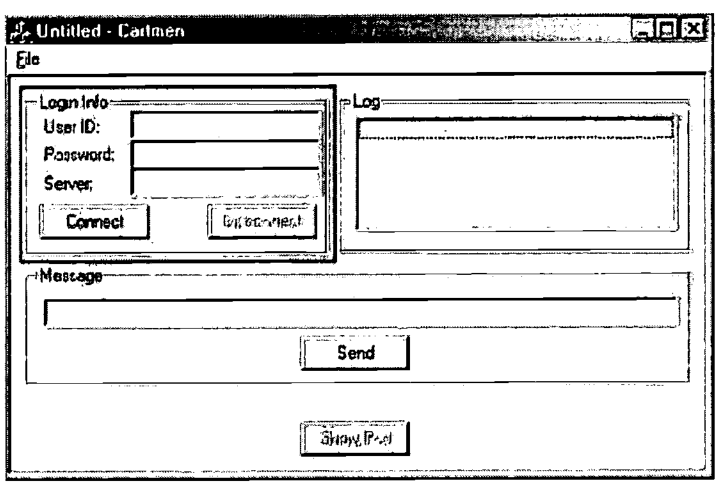


Figure 6. The initial screen that appears on a student's laptop when ClickClient is run.

When students want to connect to the instructor's computer, they can cl
student is an authorized user, has entered the correct server IP address, is plugged into the network, and ClickServer is running in "Active Connection" mode on the instructor's computer, the student will be connected to the server. Messages that specify what is occurring will appear in a "Log" window. Figure 7 shows the typical response that occurs when a student is connecting to the ClickServer.

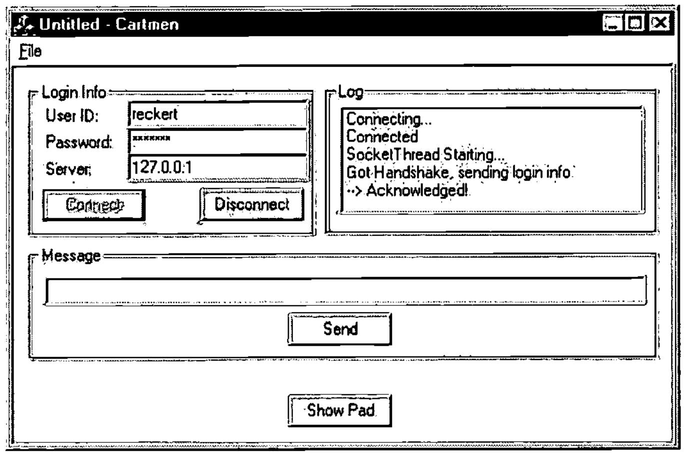


Figure 7. The ClickClient connection dialog.

At any time a student can send a message to the instructor by typing a line of text into the "Message"
utton. Figures 8 and 9 show the student's screen and the instructor's screen immediately after a student has sent a message to the instructor.

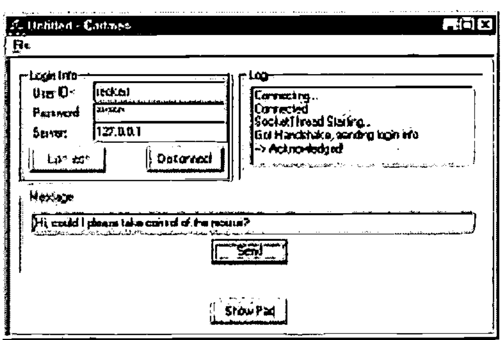


Figure 8. A student sends a message.

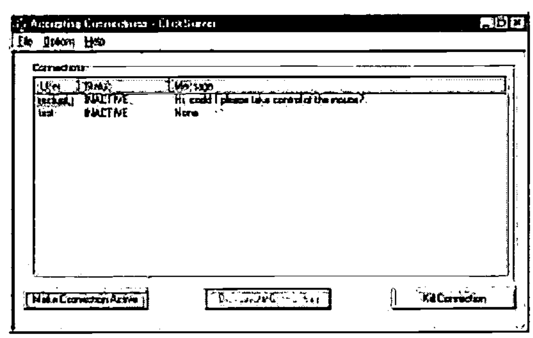


Figure 9. The instructor receives the message.

If a student wants to take control of the main computer's mouse and/or keyboard, he or she can send a message to that effect. If the instructor is willing to grant that control to the student, he or she can do so by clicking on the ClickServer's "Make Connection Active" button. Then, on the instructor's screen, the "Status" of the student who has been given control changes from "INACTIVE" to "ACTIVE". The student's "Log" box will reflect the fact that the student has assumed control by displaying a "Mode set ACTIVE" message. That student can then click on a "Show Pad" button to actually take control. At that point a large rectangular "mouse pad" area will appear on the student's laptop screen, and subsequent mouse movements and clicks while the cursor is over the pad area will cause the corresponding mouse actions to occur on the instructor's computer and be reflected on the projection screen. In addition, any student keyboard actions will also be directed to the main computer. Figure 10 shows the mouse pad that is displayed on the student's screen when he or she has taken control.

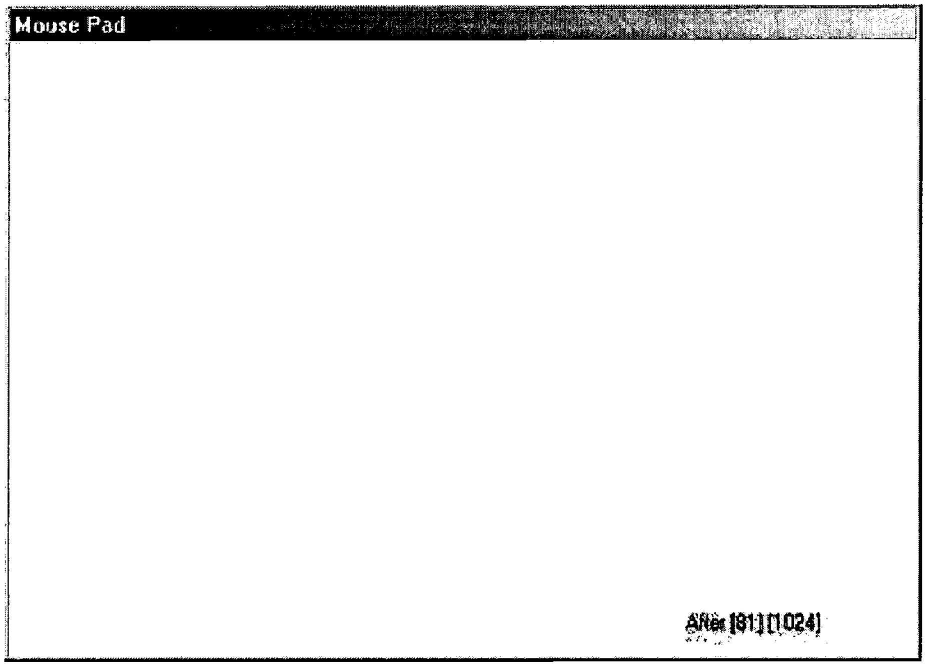


Figure 10. The "mouse pad" that appears on a student's laptop after taking control of the instructor's computer.

If the student tries to use the main computer's mouse and/or keyboard and is not the current active user (i.e., has not been given control by the instructor), messages to the effect that mouse and keyboard control are unauthorized will appear in the log window. At any time, in the program's main window, the student can click on a "Disconnect" button, in which case the server will close the connection of that student's computer to the server.

A demonstration of the ClickServer and ClickClient communication system will now be given.

Conclusions

The ClickClient and ClickServer software has been tested in several university settings. Both students and instructors have commented that the system is relatively easy to use and that it really does enhance interactivity in the classroom. It can be especially useful in those kinds of classes where it is important that students be active participants – for example in situations where the student actually needs to use the instructor's computer to do something. It has been ideal for allowing student manipulation of simulations. One example is a computer graphics ray tracing algorithm animation program that was developed by the author and one of his students. [3] The instructor explains and demonstrates the system at the main computer's projection screen, and then, from their seats, individual students are allowed to work with the ray tracer animator, while the professor guides them and explains what is happening in the animation.

References

1. Richard R. Eckert, Jason A. Moore, "An Interactive, Remote-controlled Computer Projection System for Use in a Large Classroom Environment," *17th International Conference on Technology and Education,* (Tampa, Florida, October 10-13, 1999).

2. Richard R. Eckert, Jason A. Moore, "The Classroom of the 21st Century," *ACM SIGCHI Bulletin, 32:2,* 33-40, (April, 2000).

3. David A. Goldman, Richard R. Eckert, Maxine S. Cohen, "Three Dimensional Computation Visualization for Computer Graphics Rendering Algorithms," *Proceedings of the Twenty-Seventh Technical Symposium on Computer Science Education,* ACM Press, (February, 1996).

Implementing a Pre-service Teacher Technology Infusion Model

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Abstract: In June of 2000, the Department of Educational Technology at the University of Northern Colorado (UNC) received a PT^3 grant. One of the most difficult, crucial, and comprehensive aspects for implementing the PT3 grant at this university pivots on how well both the university's and the state's standards have been integrated into the two technology courses pre-service teachers' are required to take before becoming licensed; more importantly, however, is how well these concepts have been integrated into the thoughts and practices of these pre-service teachers once they find jobs and begin creating courses and curricula. To put it another way, the challenge is how well the pre-service teachers have been taught the fundamental concepts of technology and how to apply that technology not only to both the university and the governmentally-mandated standards, but also to the course they will create and teach. This presentation will encompass three elements of the redesign process of the introduction to technology course that all pre-service teachers at UNC are required to take: first, various aspects of the data collection and evaluation will be explored; second, the integration of Colorado Department of Education's (CDE's) Standard 7 into the course's curriculum will be explained; and finally, one aspect of the PT3 grant implementation process will be evaluated. This presentation will illuminate the trials and tribulations of all aspects of the evaluation, course redesign, implementation, and field-testing processes.

Introduction

In June of 2000, the Department of Educational Technology at the University of Northern Colorado (UNC) received a PT^3 grant (Preparing Tomorrow's Teacher to use Technology). This university's grant has three overarching goals: graduates of the UNC teacher education programs will effectively utilize technology for instruction in their classrooms when employed as full-time teachers; two, UNC student teachers will effectively utilize technology for instruction in the partner school classrooms; and three, UNC faculty members will effectively utilize technology for instruction and model appropriate technology use for the preservice teacher education students. This paper will focus on how the PT3 grant team at the UNC will implement and integrate the best practices of technology use (both as a set of teaching tools, and as a model of how to use those teaching tools effectively in classrooms) into the second overarching goal of teaching pre-service teachers to use and to teach the use of technology in the classroom.

In 1996, Persichitte, Tharp, and Caffarella completed a study commissioned by the American Association of Colleges of Teacher Education, which investigated student and faculty use of technology by colleges and departments of education. The authors found that the 744 institutions surveyed generally had extensive infrastructure already in place, but the faculty were either not using it at all, or they were only using it for personal productivity, rather than for instructional activities. The data also showed that students were not being asked or required to utilize technology for class projects beyond basic word processing.

In a year-long research study, Lohr, Javeri, Mahoney, Strongin, and Gall, (2000) utilized a rapid application development (RAD) model to integrate various technologies into curriculum that could be used both as a self-paced instruction (SPI) format, and as an in-class instructional model. Qualitative data gathered and analyzed by Lohr et al., that is significant to this project, found students felt the following about the introductory educational technology class: (a) the self-paced format was not only convenient, but gave freedom and flexibility; (b) the projects and rubrics were not as challenging as they could have been; (c) more examples and non-examples of each project would have been beneficial; and (d) fewer open laboratories would be preferable. The graduate-level teaching assistants (TAs) felt that students who chose to take the course online and thus did not attend many, if any, of the classes turned in less sophisticated projects than those who participated in the weekly class sessions. The TAs further felt that students tended to copy the project example rather than create unique solutions of their own. The project team as a whole was disappointed that the rapid application development (RAD) process did not allow time for learner-based (rather than teacher-based) beta testing—a problem that proved to be a stumbling block during instructional delivery.

As a result of this study, the PT^3 team decided that self-paced instruction should be created using a template that has been originally designed to deliver learner-friendly instruction. This template would allow for continuity and uniformity of language and format. In the process of the Lohr et al., research study, the two educational technology courses it encompassed (a 200-level course for freshmen and sophomores, and a 300-level course for juniors and seniors) were brought current not only in the knowledge and skills they taught and developed, but also in the utilization and implementation of latest in computer hard and software.

In preparing to redesign the courses yet again, not only to incorporate the aims of the PT^3 grant, the improvements in technology, the more demanding standards of the university, and the CDE's governmentally-mandated standards into the curriculum, but also to meet the needs of partner schools as those needs related to the PT^3 grant, UNC's PT^3 team visited 21 partner schools (K-12) to speak with principals, teachers, and technology coordinators as well as observe each school's classroom uses of technology. For each of these visits, two to three team members visited each of the partner schools. Each member of every visitation took notes and wrote up a summary of their findings both from the principal's and technology coordinator's interviews, and from the classroom observations. The initial evaluation of the data collected have highlighted several key issues which need to be addressed in this, latest redesign of the 200- and 300-level courses: (a) all schools visited have a fairly extensive infrastructure, both new and old machinery that is not being used to its fullest potential; (b) networks and file servers are playing a much greater role than could have been imagined; (c) the balance between platforms is shifting away from MAC and toward PC machines running the MS Windows platform and this is true across all grade levels; (d) teachers are not able to generalize how to use software outside of the way they have been originally instructed to either use it, or utilize it; (e) K-12 faculty want and need activities that they can integrate into their curriculum successfully; (f) student information management systems have become a critical component both in the individual schools, and in those schools' districts because state regulatory agencies demand extensive and comprehensive student data every year; and (g) with standards and assessments demanding more and more physical (time and energy) and financial (budgetary resource) support, technology facilitators (technology support personnel) have, as of late, become one of the lowest priorities on the K-12 personnel/time-allocation matrix.

In order to integrate into this university's required technology courses not only the applicable overarching goals of the PT3 grant, but the latest parameters of governmentally-mandated (CDE) standards (Standard 7, see Appendix 2), conclusions gleaned from the Lohr et al. (2000) study, data collected from the PT^3 grant-facilitated school visitations, and information gained from the Persichitte, et al. (1999) study, were woven together to create a tapestry of what the latest redesign of this university's required technology courses. The second goal of this paper and the presentation is to outline the processes involved in revamping the introductory (200-level) technology course. Because the two courses (the 200- and the 300-level courses) are so dependent on each other, the redesign of one cannot be investigated without discussing the other; as a result, during this presentation the redesign of both courses will be discussed even though as this paper is being written, only the 200-level course redesign is nearing completion.

Redesign Process

Each of the PT^3 grant's three overarching goals are interconnected, and the key element the common keystone, if you will—in each of those three arches relies on, depends on, how well the university's pre-service teachers are taught; in other words, how well the fundamental concepts of technology have been integrated into these pre-service teacher's thoughts and practices. The pre-service teachers now enrolled in the university and those to come must be taught the best practices of technology use by their teachers. Preservice teachers must be able to recognize and address the technology-integration needs of schools into which they are ultimately placed, and they must be able to model the various technology's usages to and for the teachers withwhom they will be working. The goal and process of revamping the other courses (as well as the teaching philosophies of those course's professors) in which these pre-service teachers will be taught is ongoing, as is the design of the 200- and 300-level technology courses.

To best achieve the goal of integrating the knowledge, usage, understanding, and dissemination of technology into the consciousness of these pre-service teachers, it was important to create not only comprehensive, effective course material and exercises, but to make the instructions efficient and projects appealing as well. At the same time, the amount of material that needs to be covered to appease the needs and goals of the many interested parties (the PT^3 grant, this university's and the CDE's concerns and mandates, and the needs of the 21 partner schools, as well as addressing the findings from school visitations, Lohr et al. (2000), and Persichitte et al. (1999) was almost overwhelmingly extensive.

The first step in the process was to identify the 'optimals' (the skills necessary in order to meet the -service teacher standard 7, see Appendix 1). This required skills and knowledge base was then matched to the curriculum content of current 24x and 34x courses (the 'actuals' what we were teaching). The difference between the optimals and actuals illuminated for the team the gaps that needed to be addressed in the redesign process. Of the components identified in the optimals list, some were deemed so universally understood that they were dropped completely from consideration for the course material; others were categorized as basic enough to be listed as prerequisite skills for the course; and some were not presently being addressed, so were added to the required instruction for the course. Thetasks, skills, and knowledge-base requirements which remained were either left unchanged, redesigned, or combined with other tasks. Templates were then created for both the self-paced tutorials, and the rubrics used for assessing projects. The templates were designed to ensure that there was uniform wording and formatting both within the instructional content, and in the tools used to assess the students' skills acquisition and knowledge retention. From these templates, the new course's syllabus was created.

The next step, once the course syllabus had been created, was to assign the instructional design/redesign tasks to members of the team (see 24x Schedule Redesign). In the initial step in this redesign process, each instructional designer (ID) identified the critical components of skills and knowledge needed by the learner for the understanding and use of the tool for which the ID would be creating instruction. These components were placed in the rubric that eventually formed the structure from which the creation of the self-paced instruction would come. This process identified the specific tasks required of the learner to show proficiency in the understanding and use of the tools, and from which the learners' grade will be dependent. After each of these rubrics was created, it was presented to the whole PT^3 team for evaluation, feedback, and revision. The ID then implemented the agreed upon revisions and finalized the self-paced instruction module. Once the self-paced instruction was created, the entire team critiqued it for clarity, giving constructive criticism for its improvement. Each module was then beta tested by both the PT^3 grant/design team, and appropriate skill-level learners. Revisions based on feedback from these beta-testing sessions were also implemented into the self-paced instruction modules. This analysis/beta-testing/revision process will be ongoing over the next several months to ensure the most effective, efficient, and appealing courseware possible.

The 200-level course will be piloted during spring term 2001 as part of the formative evaluation process. As unexpected problems arise, they will be addressed by reworking the instructional content. Data will be collected from the learners during and at the end of each piloted class, so their input can be integrated into the final product. The team hopes to have the new courseware in its final form for summer semester of 2001.

At present, the redesign effort of the 300-level courses is in its initial stage, but it will follow the same process as the 200-level courses. The team understands that, due to the constantly changing hardware, software, and market requirements, any course that attempts to teach technology is a work in progress; as a result, this design team's efforts will continually be focusing on an illusive moving target.

Conclusion

At this time, the PT^3 team is in the middle of revamping the two-courses. This phase of the PT^3 grant implementation project will be completed by May 2001 for 24x and August 2001 for 34x. The data collection and evaluation phase turned up some fairly startling facts. First, there was much usable hardware and software already in place in the schools. Second, that while there were a few isolated individuals who were utilizing those tools to good and lasting effect, there still remains a huge gap in the schools' teachers and administrators' desire and ability to integrate those tools. Third, one of the most surprising (and negative) side effects of education's latest push for the integration of intrastate and cross-discipline standards is that the personnel needed to help integrate the technology that can only help expedite the implementation of those well-meaning and well-thought-out standards are being, of necessity, pulled away from what, in the long run, would be advantageous, so that more short-term and short-sighted goals can be met. Finally, even though these courses were extensively redesigned a short time ago, anew redesign is required in order to meet new standards, the changing needs of the market, and the changing complexion of the available hard and software.

Standard 7, the technology standard of CDE's curriculum-wide K-12 listing of standards, has been well-thought-out and is very comprehensive in nature. Integrating all those standards into two one-credit courses created a challenge almost too great to be overcome, especially given the many, varied, and often conflicting requirements of the various entities that warranted influence on this redesign process. Evaluating which of those many and varied demands could be subjugated to the myriad of others that absolutely had to be addressed by the two courses, proved to be a very powerful teaching tool and learning experience for the IDs on the PT^3 team. The result, thus far, has been well worth the efforts, and in the end, all of the crucial goals and requirements have been addressed.

Because of the two studies previously conducted and evaluated for this project, Lohr et al. (2000), and Persichitte, Caffarella, & Tharp (1999), this redesign has gone surprisingly well. There have been very few hitches, problems, or complaints. The redesign process has required an extraordinary amount of work by the PT^3 team, but the results have, thus far, shown that RAD does have a place in academia; however, using a proven template in conjunction with that RAD helps immensely to not only speed up the design process, but to eliminate some of the more frustrating foibles and hurdles the Lohr et al. redesign encountered. Time will tell if the highest of the overarching goals will be met by the efforts of the PT^3 grant team. We will have to wait for four slow-to-take-effect changes to occur before any real success or failure of that goal can be evaluated. Those changes include the revamping of university-wide curricula that affect pre-service teachers; the revisioning of the teaching philosophies of those professors who have applied to the grant for assistance in redesigning the courses they teach; the ability of the course redesigns to reach the students with both new information and with better and more comprehensive tools; and finally, how well those pre-service teachers integrate not only the technology they learned at UNC, but also the technology yet to come. Ultimately, realistically, any valid and reliable assessment of the PT^3 grant team's success or failure may prove unattainable. The success may have to lie in the efforts, aspirations, and desires of the individuals within that team.

References

Lohr, L., Javeri, M., Mahoney, C., Strongin, D. & Gall, J. (2000, October). *Rapid Application Development of Self-Paced Pre-Service Teacher Technology Course.* Paper presented at the meeting of the Association for Educational Communications and Technology (AECT)., Denver, CO.

Persichitte, K. A., Caffarella, E. P., & Tharp, D. P. (1999). Technology Integration in Teacher Preparation: A Qualitative Research Study. *Journal of Technology and Teacher Education, 7*(3).

Persichitte, K. A., Caffarella, E. P., & Tharp, D. P. (1996). *The Use of Technology by Schools, Colleges, and Departments of Education.* [On-line] Available: http://www.aacte.org/research.html

Appendix 1: Colorado Pre-Service Teacher Standard 7

Knowledge of Technology: The teacher is skilled in technology and is knowledgeable about suing technology to support instruction and enhance student learning.

Standard	*Task*	*24x*	*34x*	*Combine*	*Writer*
7.1	*Apply technology to the delivery of standards-based instruction.*				
7.1.1	Peripherals (camera, scanner, printer)	x			DC
	Computers (Mac, PC)	x			DC
	Web browsers (I.E., Netscape)	x			DC
	Evaluation/Selection of software	x	x		DC
	Preparation for software/version changes	x			DC
	Accessory tools (calculator, character maps)	x			DC
	Folder/File/Directory Management	x			DC
7.3	*Utilize technology to manage and communicate information.*				
7.3.1	Grade books	x		3	CM
	Spreadsheets	x			CS
	Databases (Flat files)	x			MJ
	Test generator		x		EH
	Student information management system	x			DC
7.3.2	Select and apply appropriate tools (See 7.3.1/7.4.1)	x	x		
7.3.3	Web page creation	x			CS
	Web page design/development		x		
	Email/Attachments/Listserv	x	P		CS
	Desktop publishing	x		1	MJ
	Basic Word processing	x		1	MJ
	Advanced Word		P		
	Voice mail	P	P		CM
	Presentation software	x			MJ
	Graphics Design (PhotoShop, Illustrator)	x		2	EH
	Scanning	x		2	EH
	HyperStudio	x			CM
	Video enhancing software & applications		x		
7.4	*Apply technology to data-driven assessments oj learning.*				
7.4.1	Grade books		x	3	CM
	Spreadsheets		x		CS
	Databases (Flat files)		x		MJ
	Test generator		x		EH
	Student information management system		x	3	DC
7.5	*Instruct students in basic technology skills.*				
7.5.1	Research tools (CD, Web)	x			EC
	Research applications (CD, Web)		x		EC
7.5.2	NETS student standards	x			DF

Appendix 2: 24x Schedule Redesign

Week	*Instructional Content*	*New/Old/ Adjust*	*Designer*	*Attendance*
1	Syllabus	New	DC	Mandatory
	Email	Old		
	Grade Book	New	DF	
2	Listserv	New	EH	Mandatory
	Web Searching	Old		
	Web Evaluation	Old		
3	Web Theft	Adjust (34x)	DC	Mandatory
	Attachments	Adjust (24x)	DC	
	Copyright	New	DC	
	File/Folder Management	New	DC	
4	***Stretch*** (Data Collection – Graduate Student/Project)			Mandatory
5	Excel I	New	CS	
6	Excel II, Grade Book	New	CS	Mandatory
7	Scanning, PhotoShop	New	EH	
8	PowerPoint I	Adjust	MJ	
9	PowerPoint II,	Adjust (EC)	MJ	
	Publication to Web	New	MJ	
10	Projection, Setup			Mandatory
	PowerPoint Presentations			
11	Presentations II			Mandatory
12	Advanced Word – Page breaks/Setup, Mail merge, Outlining, Columns, Tables, Sorting, Printer settings, Style sheets, Graphics/WordArt/Drawing tools	Adjust	Julie	
13	Advanced Word, Web Creation w/ Word	Adjust	LJ	
14	Front Page	New	CM	Mandatory
15	Front Page	New	CM	Mandatory
16	Finals Week			Mandatory
	Web Page Presentation			

Why Technology is Being Integrated into the Classroom at Such a Slow Rate: A Discussion of Self-Efficacy, Motivation, and Utility.

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Introduction

In the past fifteen years, there has been much attention paid to the issue of integrating computers into the classrooms. The CEO Forum on Education Technology in Washington, D.C., polled nearly 80,000 public schools and found that only about 3 percent of the schools are successfully integrating technology into the curriculum. Why is the technology not being integrated at a faster pace? Researchers have seemingly asked every question but one; "Are teachers motivated to use technology in their classrooms?" I contend that the integration of technology is not an issue of the availability of resources or information. It is an issue of whether or not teachers motivation, and their belief that the integration of the technology into the curriculum will bring about a level of instruction and learning greater then otherwise possible. This is an issue about some teachers' need to avoid negative images. Consequently, too many teachers are struggling everyday, not to master the technology, but instead to invent ways to avoid failing at using the technology.

Perceived Self-Efficacy

Generally defined, self-efficacy is the degree to which one believes that she is able to achieve a given task. A teacher's self-efficacy can be described as the belief that he or she is an effective teacher. More importantly, research supports the idea that a teacher's self-efficacy is significantly positively correlated with student achievement. Teachers' perceptions of how effective they are as teachers is based on how well their students perform the task they have taught. Teachers who do not possess the necessary skills to perceive themselves as proficient with technology will not believe that they can help a student achieve at the task. They will not foresee the students succeeding because of their efforts. The predicted failure of the student leads to the teacher's anticipation of a lower self-efficacy at the task of teaching technology. This anticipation of low self-efficacy presents a special problem for the teacher. Dweck (1988) suggests that self-efficacy at a given task, given certain conditions, can often give rise to negative affect and a significantly lowered perception of self-worth. This is more likely to happen when the individual attributes the failure to forces that are internal, uncontrollable, and stable. These are precisely the attributions that teachers generally make about their "failed" efforts to teach any given subject. The ability to teach the subject is within them. It is not viewed as an environmental or situational force. Where the failure is associated with information that the teacher does not possess, the forces are often viewed as uncontrollable. The final attribution that most teachers make is that the results are stable. They believe that every time they attempt to teach technology with the knowledge that they have, the results will be the same…failure. These factors combine to put the teacher in a position where failure has a negative effect on their perceived self-worth. Consequently, to avoid the negative affect associated with lowered self-worth, teachers develop some mechanism to protect their self-worth. Either they can increase their knowledge of the technology, subsequently raising their self-efficacy about teaching it, or they can avoid the task all together.

Motivation to Achieve

For an explanation as to why so few teachers choose the former of these two options, I consider Atkinson's early theory of achievement motivation. Atkinson (1964) states that "the motive to achieve success (Ms), which the individual carries about with him from one situation to another, combines multiplicatively with the two specific situational influences, the strength of expectancy or probability of success (Ps) and incentive value of success at a particular activity (Is), to produce the tendency to approach success that is overtly expressed in the direction, magnitude, and persistence of achievement-oriented performance." In simple terms, the individuals tendency to approach success is equal to Ms x Ps x Is. The motivation to achieve success is generally accepted as a constant characteristic of the individual. This variable is the same for learning technology, as it would be for learning mathematics, science, etc. The other two variables are where the degree of flux appears from task to task. Atkinson notes that these two variables depend upon the individuals experience in specific situations that are not unlike the one she now confronts. The difficulty of a task as it appears to an individual is represented in terms of the strength of the expectancy of success. Where the task is perceived as very difficult, the Ps is very low. The inverse is true as well. The probability of success (Ps) is, somewhat, subjective for tasks that fall between the impossible and the overtly easy. For most teachers, the Ps in mastering technology is very low. This is because of the perceived difficulty of the task. Atkinson's theory is that this perception is the result of previous experiences with like tasks. In the case of technology, I assert that these past experiences are not all computer specific. Since most of the teachers that are in the classroom do not use personal computers, the difficulty of this task must be generalized from other technology-oriented tasks. It is more likely that these past experiences include such tasks as programming VCRs, bouts with the school copy machine, and setting the clocks on microwaves and televisions. Because of the difficulties with this technology, and the perception that mastering computer technology is even more difficult then these "simple" tasks, the Ps for computer-oriented tasks is perceived as being very low.

The Utility Factor

Now the question becomes, "Why aren't we seeing teachers with high degrees of Ms for technology?" It is easy to see that if the Ms is high then the Ts will be high regardless of the Ps and the Is. This is where Atkinson's model is too simple in its approach. Atkinson fails to account for an individual's utility or value of the task. I propose that Ms is not constant from task to task, but in fact is dependent upon the individual's value of the specific task. An alternate writing of the equation would possibly be $Ts = (Ms +/- Vs) X Ps X Is$, where Vs represents the individuals value of the specific task. When the task is greatly valued, the individual is inclined to devote more energy toward the task, invoke the use of more volitional strategies to accomplish the task and work toward the task over a longer period. Consequently, the Vs is added to Ms proportionally. When the task is not valued, on the other hand, the Vs is not high, and in fact may even serve to detract from Ms (Ms - Vs). In this case, the individual does not care if failure comes. The failure does not effect the individual's self-efficacy as much as a valued task, and causes little of no negative affect. A further assumption is that if the Ps is small (a very difficult task) and the Vs is small (a relatively unvalued task), then Vs more readily becomes a negative figure. This is the case with many teachers and technology. The Author's personal research has attempted to examine this idea of teachers valuing technology. Middle and Secondary teachers were given a survey that questioned their beliefs about and usage of technology in the classroom. The study found that seventy percent of the teachers surveyed did not believe technology could make them better teachers. Teachers, in general, do not value the usage of computers within their classroom, and so they do not willingly attempt to tackle the task. The effect on their self-efficacy is not rooted in their valuing the task of teaching computers so much as it is in the task of teaching.

Intelligence Types

Dweck's research illustrates why teachers that do not believe that technology can make them better teachers often choose to avoid the task of integrating technology. Dweck suggests that there are two primary types of intelligence, Entity and Incremental. The Entity theory of intelligence is that intelligence is fixed and no matter how much effort you but into developing it, intelligence and performance are generally constant. The other type is an incremental orientation. This theory suggests that intelligence is malleable. These individuals believe that if one works hard and puts a lot of effort into a task, one can improve intelligence and subsequently performance. I assert that teachers that do not believe that technology can make them better teachers are more entity oriented, and those that do believe that their teaching skills can be enhanced with computers are often incremental thinkers. These two types of individuals have specific goal orientations and behavior patterns they display when they perceive their ability as high or low. Individuals that are incremental-oriented are more likely to seek challenges that foster learning. They have a high degree of persistence, and are mastery oriented. These individuals will display this behavior patter despite their perception of their ability to perform a given task. Their goal is to increase competence. This is not the case for entity-oriented individuals. Entity-oriented individuals strive to gain positive judgments and avoid negative judgments of competence. When an entity-oriented individual perceives her ability as being high, that individual will be mastery oriented. They will seek challenge and be very persistent in their pursuit of excellence. This individual does not fair so well, however, when their perceived ability as low. In this condition, the individual avoids the challenge and has a low degree of persistence. This is what happens entity-oriented teachers that have low perceptions of their ability to teach technology. They avoid the task because of their need to avoid negative judgments of competence…even when these judgments are primarily internal.

Discussion

For too long, we have been struggling with this problem. We have sacrificed teacher time and energy, in our efforts to conquer it. What we have not done is, gotten to the root of the problem: some teachers do not believe the technology can make them better, and are not motivated to integrate the technology. They are afraid of failing in front of their students and afraid of failing their students. Consequently, they have not invested themselves into the integration of the technology.

JavaScript for Teachers

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Abstract: Increasingly, teachers at all levels are making use of the Internet—both as a source of instructional information, as well as a medium for instructional delivery. Some instructors develop their own Web pages, which are typically written in HyperText Markup Language (HTML). JavaScript™, a browser scripting language originally developed by Netscape Communications, is a valuable tool that can enhance the functionality of any Web page. This paper examines the nature of JavaScript, and investigates how it can be used to enhance education-oriented Web sites of today's teachers.

Introduction

Increasingly, teachers at all levels are making use of the Internet—both as a source of instructional information, as well as a medium for instructional delivery. According to *Technology Counts '99*, an education technology survey conducted by Education Week magazine and funded by the Milken Exchange on Education Technology, most teachers across the United States currently have access to a computer, either at home or at school. Almost all teachers who have access to a computer use it for some kind of professional activity, and 61 percent use the Web to enhance instruction in their classrooms (Education Week on the Web, 1999).

Taylor (1980) provided a useful model of how computers can be applied to instructional purposes. His "tutor, tutee, and tool" model describes three different approaches to computer use: (1) computer as teacher (i.e., providing information and instruction); (2) computer as learner (i.e., learning tasks via computer scripting and programming); and (3) computer as classroom assistant (i.e., assisting in the completion of classroom projects) (Newby, Stepich, Lehman, & Russell, 2000). Each of these approaches can be applied to the use of the Web in the classroom as well.

JavaScript™, a browser scripting language originally developed by Netscape Communications, is a valuable tool that can enhance the functionality of any Web page. The purpose of this paper is to examine the nature of JavaScript™, and investigate how it can be used to enhance education-oriented Web sites of today's teachers.

What is JavaScript?

JavaScript is an interpreted, cross-platform, object-based scripting language that was designed for the development client- and server-based Internet applications. JavaScript commands can be embedded directly in HTML pages to allow for greater Web page interactivity and intelligence. JavaScript commands can recognize and respond to user actions such as mouse clicks, form input, and page navigation.

For example, a JavaScript-based script can be used to verify that users enter valid information into a online form. And, since a JavaScript script runs on a user's computer without any network transmission required (and the accompanying time delay), an HTML page with embedded JavaScript can immediately interpret the entered text and alert the user via a message window if the input is invalid. A JavaScript can also be used to perform an action (such as playing an audio file or communicating with a plug-in) in response to a user opening or exiting from a Web page.

JavaScript has a rich set of built-in functions and commands and, using JavaScript, even less-experienced developers are able to direct responses to and from a variety of events, objects, and actions. In learning to control and handle events using JavaScript, a teacher can develop Web pages that are dynamic, interactive, and three-dimensional, rather than static and two-dimensional. JavaScript provides anyone who can compose HTML scripts with the ability to change images; play different sounds; and output different information in response to specified events, such as a user's mouse click or screen exit and entry.

As Weiss (1999) pointed out, JavaScript was introduced "to make it easier for Web pages to 'process' information; that is, rather than merely display static information, JavaScript could be used to perform calculations, output results to the page, and so on. Typically, this power is best employed when triggered by the user who is, after all, the primary agent in a Web page."

JavaScript and Java

JavaScript™ is also useful for working in conjunction with, and complementing the many benefits -based applets. Applets are small intelligent programs written in Java™ programming language, that can be used increase a Web page's level of interactivity. JavaScript can be used to execute; modify the settings; and control the appearance and behavior of Java applets. Java applets can be developed for such things as Web page animations and Web page databases. One such example is a Web page database applet called *finditgrid*™ that was developed by DoubleOLogic™ Software Corporation (DoubleOLogic Software Corporation, 2000). This applet will sort information that is provided in a text-delimited format, and then allow a Web page user to search through the information interactively.

Whereas JavaScript is a scripting language that can enhance the functionality of HTML-based Web pages, Java is a general purpose, cross-platform, compiled, application development language that can be used to develop full-blown applications—both for Internet-based or non-Internet-based, standalone information systems. Java was originally developed by Sun Microsystems Inc.

Like JavaScript-based scripts, Java applets execute client-side (i.e., on a user's desktop computer using the browser software), instead of server-side (i.e., on a Web server). As previously mentioned, this feature allows for fewer network transmissions, and much faster processing of information.

Web Page Enhancements Via JavaScript

Below is a list of some of the many features that be added to a Web site and enhance it, through the inclusion of appropriate JavaScript-based scripts. Many of these features can be applied to educational purposes, both by teachers and students. And, for many of these features, there are Web sites that offer free downloadable (shareware) JavaScript-based scripts that will perform these functions. The Web site entitled *The JavaScript Source*™ (http://javascript.internet.com), developed and maintained by internet.com Corporation, is one such site.

Web page features possible through the inclusion of appropriate JavaScript code include:

- Web page input form functions: Field validation, checkbox changer, copy fields, etc.;
- Web page utilities: HTML page builder, print page, e-mail buttons, show link info, list of links, calculator, calendar, clock, etc.;
- Web page search features: Search engine, site search page, etc.;
- Web page dictionary features: Definition of unfamiliar terms, help popup, information box, etc.;
- E-mail: E-mail button, e-mail this page feature;
- Web page menus: Menu bar, pull-down menu, portable menu, midi menu (background music), etc.;
- Web page windows: Popup window, exit message window, etc.;
- Web page navigation: Remote control navigation, thumbnail navigation, page scrollbar, etc.;
- Web page security features: Password protection, text encryption, etc.;
- Web page graphical image display functions: Image slideshow, image previewing, photo/image album, drag-n-drop images, etc.;
- Web page messages: Animated headline messages, banner ads, exit messages, time-based greeting, visitor alert messages, etc.;
- Web page quiz features: User quiz, Math quiz, etc.;
- Web page games: Math Quiz, Maze, Buzzwords, Bridge, Insight Generator, Force Memory, Connect 4, Concentration, Catch a Spy, etc.;

- Miscellaneous features: Quote of the day, daily tip of the day, bookmarks, color picker, name alert, plug-ins alert, random number generator, etc.

Conclusion

The Internet and the World Wide Web, when used appropriately, hold great promise for improving the quality of educational content and delivery; for empowering students and teachers in their educational activities; for providing access to educational resources not previously available; and for making education more readily accessible to learners at a distance who might not otherwise have access. JavaScript is a simple, readily available, low cost technology that can help to support students and teachers in these endeavors.

References

DoubleOLogic Software Corporation (2000). *Java Web page database applets*. [On-line]. Available: http://www.doubleologic.com

Education Week on the Web (1999). *Technology Counts '99*. [Online]. Available: http://www.edweek.org/sreports/tc99/index.htm

internet.com Corporation (2000). *The JavaScript Source*. [Online]. Available: http://javascript.internet.com

Newby, T.J., Stepich, D.A., Lehman, J.D., & Russell, J.D. (2000). *Instructional technology for teaching and learning* (2nd Ed.). Upper Saddle River, NJ: Prentice-Hall, Inc.

Taylor, R.P. (Ed.). (1980). *The computer in the school: Tutor, tool, tutee*. New York: Teachers College Press.

Weiss, A. (1999). *Events in JavaScript: An inside look*. [Online]. Available: http://wdvl.com/Authoring/JavaScript/Events

Operationalizing a Technology Standard with Proficiency Skill Sets

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Abstract: The presentation of this interactive session will begin with an overview of the existing program which operationalizes the California technology standard for K-12 teachers with the California Technology Assistance Program (CTAP) Region 8 technology proficiencies. Lecture will be supplemented by a PowerPoint presentation and demonstrations of the following web sites: 1) the CTAP Region 8 site (http://www.ctap.org/ctc/) includes a rubric for three levels of certification and digitized video examples of exhibits at Levels 1 and 2; 2) the California technology standard (http://www.csub.edu/~dgeorgi/contents/techstand.htm); 3) the PT3 grant that helped coordinate these efforts (www.projecttnt.com). Next, a description of the process involved in coordinating this certification process with K-12 districts and teacher credential programs. To date, over 500 teachers have been certified including growing a cadre of Level 3 leader/mentors. An interactive discussion on implications for those present will conclude the session.

Introduction

In 1997, the California legislature passed a law mandating the development of a technology standard for K-12 teachers that would be used in the credentialing of new teachers and in the review of teacher credential programs. The Technology Education Advisory Committee (TEAC) was selected from among diverse constituencies to research the topic and develop recommendations for the Commission on Teacher Credentialing (CTC). The TEAC met many times over the next year and engaged the services of the State Librarian to research the efficacy of technology on the teaching and learning process (Umbach Report). A preliminary set of recommendations was sent to all pertinent institutions and individuals for field review. Taking the feedback from the field, the TEAC proceeded to develop language for a technology standard with a number of "factors to consider" that would be used to accredit teacher preparation programs (http://www.csub.edu/~dgeorgi/contents/techstand.htm). The recommendations were presented to the CTC in December, 1998 and were accepted. At first, the new standard was to be made effective in January, 2000, but a number of institutions requested more time and currently the standard will be effective in January 2002. All teacher preparation programs in California have been requested to submit plans for implementation of the standard and a number of methods have been proposed and were accepted.

Meanwhile, the California Technology Assistance Program (CTAP), a consortium of regional offices coordinated by the California Office of Education, was working on developing its own technology standards for teachers. Region 8, consisting of four central California counties, decided to build on the work of the CEAP by taking the technology standard's factors to consider and using them as skill sets for technology proficiencies. The CTAP Region 8 Advisory Committee met several times and developed a rubric for assessing technology skills (http://www.ctap.org/ctc/). The rubric has been used by K-12 districts to organize professional development activities and by teacher preparation programs at CSU Bakersfield. A federal PT3 project included a task force on Technology Proficiencies and helped coordinate the effort (www.projecttnt.com).

The CTC technology standard divided its levels of proficiency to articulate with the system for obtaining a teacher credential in California, which is a two level system. Meeting level 1 is a requirement for a candidate must be recommended for a preliminary credential. Meeting level 2 is required for recommendation for a professional clear credential. Level 1 is primarily personal computer skills with some application to teaching responsibilities; level 2 involves the integration of computer skills into teaching responsibilities.

CTAP Region 8 proficiencies have been organized into a rubric based on the two tiers described above and added a level 3 for advanced certification. All certification is done on the basis of portfolios assembled by the teachers. Teachers can be certified at level 3 as either mentors, whose main responsibility is training other teachers, and leaders, who serve as tech coordinators or administrators. Level 3 teachers can certify level 1 and 2 teachers.

Results

As a result of implementing a coherent approach to certifying teachers at various proficiency levels, a number of positive results have occurred.

First, technology skill training is directed toward meeting the levels of certification. This ensures that teachers attending training sessions are at an appropriate skill level and for specified skill development; avoiding some teachers being lost and others bored. This also allows all training at K-12 schools and university teacher credential programs to be articulated on the factors underlying the technology standard.

Second, teachers are encouraged to attain certification at all levels. Some schools offer a bonus for attaining level 2. Level 3 teachers often receive stipends for the training and administrative tasks they perform.

Third, by having level 3 teachers certify levels 1 and 2, the presence of expertise has been greatly expanded. Most local schools have at least one level 3 teacher and many schools are including the attainment of specified percentages of faculty attaining each level by specified deadlines. A strong cadre of level 3 teachers is being developed and will soon be adequate to provide technical support for local schools.

Fourth, by having a common certification system, unprecedented collaboration is occurring among schools and university teacher credential programs. Level 3 teachers are participating in the writing and implementation of a variety of grants and projects involving technology. One example is the Preparing Tomorrow's Teachers to Use Technology Implementation federal grant, which includes a Technology Proficiencies Task Force. CTAP Region 8, local teachers and university professors have collaborated in developing a web site that includes the technology proficiencies rubric, application for certification, and examples exhibits that meet most proficiencies. In addition, a list of certified teachers is maintained at the CTAP Region 8 office and is posted on its web site. This is a further incentive for teachers to attain certification as it indicates that all teachers are expected to have demonstrated technology skills.

In addition to the positive results of this system, a number of problems have emerged.

First, articulation between CTAP Region 8 and instructors in the university teacher credential programs has had difficulties. University professors have been slow to get certified to level 3. CTAP Region 8 has offered to provide such professors with level 3 teachers so students in university classes can have their portfolios certified officially.

Second, it is difficult to ensure that all candidates will have access to certification. The university credential programs have submitted a plan to the CTC stating that by June, 2001, all credential candidates will be required to attain levels 1 and 2 in order to be recommended for the preliminary and then the professional clear credential. Because of the large number of credential candidates, an independent study course in Technology Portfolio Certification is being developed to meet the needs of out of state teachers and others who fall through the cracks. In addition, the state of California has contracted with National Evaluation Systems to develop a test our procedure for level 1, primarily for out of state teachers.

Third, some universities in the region refuse to participate in the system, citing turf issues. They will be required by the state to meet the technology standard in their own ways.

Fourth, other regions and the state level CTAP are developing their own systems, which may have a future impact on the Region 8 system. Similarly, the ISTE standards are seen by some as a model on which to base training. In response, a correlation chart has been developed, which indicates where specific skills are located in each system.

Conclusion

The implementation of a technology proficiency skill sets certification system based on a state technology standard has had dramatic positive effects on the development of technology skills in local schools. The certification of hundreds of teachers at levels 1 and 2 has encouraged many teachers, including those with life credentials, to develop technology skills that enhance the teaching-learning process. The increasing presence of level 3 teachers is providing that most commonly missing element in technology professional development: adequate and accessible technical support. As an added benefit, the awareness of the importance of technology in schools among level 3 teachers has produced that second most commonly missing element: equipment and training as a result of grant writing activities. As the new technology standard goes into effect, the system described in this paper can be expected to continue to promote the development of technology fluent teachers in local schools.

Educational leadership, community partnerships and 24/7 access to educational technology: Bridging the technology gap in small, rural communities with anytime, anywhere learning.

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Abstract: This paper describes a project providing school children with 24/7 access to laptop computer technology in a small rural school community in western Kansas. Based upon the visionary leadership of school and community figures, this collaborative venture incorporates creative approaches to financing the project, a focus on actively changing approaches to pedagogy and the learning process, and an analysis of the impact of the project upon the school community. Key features of the project incorporate a focus on educational leadership; community partnerships; anytime, anywhere learning; the digital divide in rural communities; 24/7 access to computers; and constructivist learning in a technology dependent learning environment.

Introduction

The tenor of much of the recent literature on the use of educational technology in classrooms is predicated on the belief that the effective introduction of technologies into learning environments creates circumstances and opportunities under which there is a positive effect on student achievement (Honey, McMillan, Culp, & Spielvogel, 1999). Early claims suggested that using technology effectively in classrooms enabled teachers to be more successful and assisted students in learning what they needed to know to be effective citizens (Bialo & Sivin, 1990; Cotton, 1991; Means & Olson, 1993; Sheingold & Hadley, 1990). More recently however, it has been suggested that technology in and of itself, did not directly change teaching or learning. Rather, the critical element was how technology was incorporated into instruction (Office of Technology Assessment, 1995, p. 57).

Longitudinal data from the Apple Classrooms of Tomorrow (ACOT) studies indicated that technology was an engaging medium for student thought and collaboration and that "technology play[ed] a catalytic role in opening the minds of teachers to new ideas about children, about learning and about their own role in the education process" (Dwyer, 1996, p.29). In the words of ACOT teachers: "ACOT has revitalized the teaching process tremendously. It has been a catalyst for a transition from blackboards and textbooks to a method of instruction where students can explore, discover and construct their own knowledge" (p.25).

Others have described similar significant changes to the teaching environment brought on by the presence of computer technology. Sheingold and Hadley (1990) surveyed 608 computer-using teachers. Findings indicated that teachers expected more creative and edited work from their students and that they spent more time with individual students. Further, this research suggested that the presence of computers improved the teacher's ability to present more complex instruction and that the associated amount of time spent lecturing was reduced. Sheingold and Hadley (1990) suggested that data such as these indicate that the presence of information technology had the potential to modify certain practices in classrooms.

Parallel to this focus on technology use in the literature is an equal emphasis upon the incorporation of a constructivist approach to teaching. In stark contrast to the prevailing, traditional, teacher-centered classrooms, constructivist teaching practices do not focus on regurgitating newly presented information, but rather on helping learners to internalize or transform, new information (Brooks & Brooks, 1993). Deep understanding and not imitative behavior appeared to be the goal of these learning environments. According to Perkins (1999), considerable research showed that active engagement in learning often lead to better retention, understanding and use of knowledge. He suggested that "constructivism generally casts learners in an active role" (p.8). Further, Daggett (1999) and Schlechty (1997) have suggested that the skills needed for success today include the ability to access, analyze and apply information to solve predictable and unpredictable real life problems, the ability to manage information and to work in groups to solve problems.

The predominant form of schooling today looks quite different to these images however. For example, despite the fact that Gibson (2000) and Schlechty (1997) have made clear that the way people access, work with, and communicate information is fundamentally different than a decade ago, for the most part, the way learning is structured today appears to be much as it was five or more decades ago. Most teachers use a variation of a teacher-centered model of instruction where the emphasis is upon the presentation of a body of knowledge or a set of skills that students are required to learn (Glenn, 1996; Goodlad, 1984). The focus of power in these classrooms remained with the teacher and students were generally passive listeners. According to Dwyer (1996), in settings such as these, learning was viewed as the transfer of thoughts from one who is knowledgeable to one who is not, and where the work of the teacher was perceived as direct instruction. Common teaching methods include lecture, whole class or small group instruction, drill and practice exercises from workbooks or sheets with a dependence upon facts, rote learning and structured, clearly defined activities.

With the contradictions presented by juxtaposing constructivist and traditional approaches to teaching, and keeping in mind the often recognized potential represented by technology in classrooms, the question of the day then becomes, "How do we engage students in meaningful learning opportunities, and how can schools embrace information age technologies to better prepare students for the world in which they are living?"

The Project

The project described below attempts to address this question by exploring the impact of technology on a small, rural school community in western Kansas. Through creative partnerships and collaboration, educational and business leaders in this community have provided access to laptop learning technologies for students on a 24/7 basis. This working model is attempting to establish the viability of infusing cutting edge technology in all schools, for all students, despite limited school district resources. Conceived as a vehicle for transforming and improving existing pedagogy and curriculum as well as a bridge spanning the digital divide so common in poor rural communities, this project creates an arena for analyzing many of the questions common to school districts nationwide concerned about the impact of increased access to technology on student learning.

Designed to impact the delivery of education and improve access to technology for students, this multi-year project began in the fall semester of 2000, although collaboration, preparation, planning and conceptualizing preceded this beginning by many months. The concept driving the project describes a long term vision that includes a district-wide, wireless network complemented by internet access in students' homes. As the project develops, all 6-12 students in this district, and their teachers, will carry a laptop computer as core equipment for their daily learning activities. In this vision, learning will not be constrained by the arbitrary time divisions of the traditional school day. By redefining the basic building blocks of the traditional conception of 'school' and t expect to see significant positive changes in teaching and learning. These changes are expected to be directly related to expanded access to information and learning technologies and the associated changes in where and when learning actually occurs. In the conception of this project, these significant changes are accompanied by a focus on learning which has individual learners constructing their own knowledge sets, and creating an emphasis upon student-centered learning in the context of authentic and situated activities. Clearly, in these situations, the role of the teacher is expected to undergo significant transformation. Delivery of instruction is expected to give way to a supportive and collaborative role where team work and shared responsibility feature prominently.

Lest the reader be mislead into conceiving of this project as one focusing solely on the school-based learning process in isolation, an understanding of the entire context of this project is necessary. An analysis of the proposed plan of implementation reveals further possibilities of the expected impact on this small, rural community and the business partners supporting the endeavor.

The Implementation Plan

In the first phase of this project a district-wide, wireless network has been installed, capable of supporting the laptop computers provided to all middle school teachers and those leased by all sixth grade students. Ongoing staff development designed to prepare teachers to teach in this new environment has become a regular feature of school life. A charging station and a spare battery for each computer has been purchased to ensure reduced downtime and strain on the power grid of the school buildings. Internet access has been secured at a reasonable rate for all sixth grade families to guarantee continual access to the internet and district resources. Evening computer training opportunities are being provided for all parents to support the concept of parents as partners in the learning process. Teachers are designing and posting appropriate lessons, units of study, and associated activities for delivery over the internet. Subsequent years of this project will see additional grade levels of students and teachers involved in this rural attempt at anytime, anywhere learning. By the year 2007, the initial phase of the project will be fully implemented and all teachers and students 6-12 of this small, rural district will be involved.

The plan is dependent upon a unique set of partnerships and agreements between school district leaders and teachers, parents, and cooperating business partners. In the first instance, families will lease a computer over a four-year period for $200 per year. Families unable to meet this requirement (i.e. families eligible for free or reduced lunches) will contribute according to their circumstances. Agreements have been reached with community benefactors to cover the cost of these arrangements. At the end of the initial four year leasing period, families will be able to purchase the computer for $50. Arrangements have been made for these students to lease new computers for the remainder of their school careers for $300 per year with a purchase price of $50 at the end of 3 years. Insurance has been arranged by the district to cover damage or needed repairs for a cost of $14 per unit per year and the district will insure against loss or theft at $14 per unit per year. Internet access has been secured for families who cannot afford the monthly rate through the local ISP. This partnership has pledged 10 free Internet accounts for the first year and has potential for an increase in this number as the project grows.

A project of this scope cannot survive without the strong commitment and real involvement of community groups. For example, in this context, the local educational foundation agreed to serve as the fiscal agent for the project, responsible for managing all funds, in addition to conducting appropriate fundraising activities. Further, local benefactors agreed to subsidize a variety of costs during the pilot year. The local bank has established low interest leases for each family, and a local insurance agent has agreed to establish low cost and effective insurance. A further key component of the project is the support of the families involved. While all families will contribute some financial resources to the project, their active involvement was important in other areas preceding project implementation.

Simple in its conception, this project originated with a series of pre-implementation steps designed to create community involvement, buy-in, and increase chances for success over the period of the project. All interested parties were included in conceptualizing and planning: students, parents, teachers, school and district administrators, business partners, members of the board of education, and community members. Productive and active partnerships were established with business organizations and community groups capable of sharing appropriate experience and willing to contribute towards filling each identified project goal. Support from a local, community-based educational foundation was secured and school district personnel were active in revising the district technology curriculum during the previous year in preparation for this new direction. The intent of this curriculum revision was to ensure minimum competencies and the basic technology skills needed for students to function successfully in the new learning environment. In addition, teachers who were involved in the planning process recognized that changing their roles from 'purveyors of all knowledge' to 'facilitators of learning' was a dramatic change that would not happen easily or instantly. Consequently they have created a focus on continual and contextualized staff development as an integral component of the project implementation and maintenance plan.

Such dramatic adjustments to the traditional expectations of schools, teachers, and learners requires careful monitoring to ensure continual success and continual support from the community of contributors and participants of the project. In fact, it has been suggested elsewhere, that education will likely undergo many changes as a result of the incorporation of technology into everyday activities. Jukes (2000) has suggested that education will not be confined to a single place, a specific time, a single person, human teachers, paper-based information, memorization, linear learning, or controlling learners. With such dramatic changes occurring in education, it is part of the responsibility of educational innovators to describe the impact of such innovations on the learning process. The introduction of cutting edge conceptions of education, supported by appropriate technology in this small, rural community demands a serious attempt to gauge the success of this working model of anytime, anywhere learning.

Project Evaluation

To accommodate the need for thoroughly evaluating the impact of this project on the educational community of this small rural school district, and to widely disseminate the results, the project incorporates an evaluation component. The initial evaluation will be conducted by external investigators and will focus on three broad questions.

1. What impact has the introduction of full-time technology access had on the learning process?
2. What impact has the project had on the way teachers teach?
3. What impact has the project had on the school and community?

This activity will be an evaluation in progress. As a result of the longitudinal nature of the study, the possibility of variations in approaches to the research design and to data collection is possible in order to accommodate variations in the project as it evolves through time. During the initial phase of the project, the rationale, design, data collection strategies, and data analysis procedures for this proposed evaluation have been taken from the qualitative paradigm of research and represents a naturalistic approach to educational inquiry (Erlandson, Harris, Skipper, & Allen, 1993; Lincoln & Guba, 1985; Patton, 1990). Naturalistic inquiry was defined by Patton (1990) as a "discovery-oriented approach that minimizes investigator manipulation" (p. 41). As the intent of the evaluation is to determine the reaction of participants to the intent, impact, process and potential of the project, the need to describe their perceptions, expectations and attitudes forms the basis of the data collection process. Erlandson et al. (1993) suggested that although "both qualitative and quantitative methods can be used, qualitative methods are generally preferred, primarily because they allow for thick data to be collected that demonstrate their interrelationship with their context" (p. 16). Further, Babbie (1998) described qualitative analysis as "the non-numerical examination and interpretation of observations, for the purpose of discovering underlying meanings and patterns of relationships" (p. G5).

A variety of qualitative methodologies are proposed for use in this evaluation: interviews, focus groups, observations and document reviews. The evaluators considered that such an array of data collection strategies would provide the richness of data and the variety of perspectives necessary to understand the complexities of the situation under study (Erlandson et. al., 1993). Such a multi-source approach to data collection also provides a further element necessary in building the trustworthiness of the data collected: triangulation (Lincoln & Guba, 1985). Participants in these data collection strategies will include students who have leased a computer; teachers who are involved in teaching in the project, as well as those not involved; parents of students involved in the project; school and district administrators involved in the project, as well as those not involved; and community members who have been actively involved in the project.

Data will be analyzed using the constant comparative analysis methodology advocated by Lincoln and Guba (1985). Constant comparative analysis requires data to be unitized. Erlandson et al. (1993) defined unitizing "as disaggregating data into the smallest pieces of information that may stand alone as independent thoughts in the absence of additional information other than a broad understanding of the context" (p. 117). Once data from each data collection strategy are unitized they will be merged into one datafile in a relational database. A process of inductively grouping and regrouping the data will allow categories to naturally emerge from the units of data. In considering the common attributes among the data, common themes will be developed, and will lead to the production of conclusions based on the evaluation findings. The evaluators will use this information to form recommendations related to the guiding questions of the evaluation. The results of these analyses are formative in nature and will be used to modify and re-conceptualize the project as it progresses.

Conclusion

As educational reform is too often equated with "plugging students into anything that happens to plug in." (Stager, 1995, p.78), the goal of this collaborative community effort, unlike many technology initiatives, was not simply to purchase the technology and put it in place. Rather, the intent was to use the technology to positively impact the traditional teaching and learning processes that were prevalent in the district. In addition, this project provided the time teachers needed "to grow in their use of technology"(Miller & Olson, 1995, p. 75). There is no instant solution expected here. As Miller and Olsen suggested, "Educators who believe that technology automatically fosters effective learning styles and instructional patterns need to think seriously about such issues ... the real progress computers can stimulate comes from a healthy debate about what we really care about in classrooms and whether that is happening" (p. 77). This project not only provides a timely analysis of data regarding the merits of teaching and learning using laptop technology, but will also provide a model of community collaboration for public schools to consult when the issue of limited school/community financial resources appears to stifle technological initiatives.

This innovative, community based project also provided an opportunity to evaluate the effectiveness of the partnerships and community collaboration designed to remove the discrimination factor that variable access to technology often generates across subgroups of a population. By making technology accessible to all in this small, rural community, this goal has been partially addressed. Lemke and Coughlin (1998) suggested that emerging trends in research indicate "that under the right conditions, technology accelerates, enriches, and deepens basic skills; motivates and engages students in learning; helps relate academics to the practices of today's work force; increases economic viability of tomorrow's workers; strengthens teaching; contributes to change in schools; and connects schools to the world (p.14-15)." The approach to leveling the technological playing field, described in this project, has the potential to create an environment capable of providing longitudinal data over the next seven years to verify these claims. This project meets the challenge of the digital divide head-on, and provides patrons of this small, rural community with the tools to define their own educational futures and bridge the technology gap with their version of anytime, anywhere learning.

References

Babbie, E. (1998). *The Practice of Social Research.* New York: Wadsworth

Bialo, E. & Sivin, J. (1990). *Report of the Effectiveness of Microcomputers in Schools.* Software Publishers Association. Washington, D.C.

Brooks, J. G., & Brooks, M (1993). *In Search of Understanding: The Case for constructivist classrooms.* Alexandria, VA: ASCD.

Cotton, K. (1991). *Computer-Assisted Instruction. School Improvement Research Series, Close-up #10.* Portland, OR: Northwest Regional Educational Laboratory, May.

Daggett, Willard (1999), Paper presented at Technology Leadership Conference, Topeka, KS.

Dwyer, D.C. (1996). The Imperative to Change our Schools. In Charles Fisher, David Dwyer, Keith Yokam. *Education and Technology: Reflections on computing in classrooms.* San Francisco: Jossey-Bass

Erlandson, D.A., Harris E.L., Skipper, B.L. & Allen, S.D. (1993). *Doing Naturalistic Inquiry: A guide to methods.* Newbury Park:Sage.

Gibson, I.W. (2000). *At the Intersection of Technology and Pedagogy: Considering Styles of Learning and Teaching.* ERSC Seminar Series Paper, University of Keele: United Kingdom.

Glenn, A.D. (1996). *Restructuring Schools with Technology.* Boston, MA: Allyn and Bacon.

Goodlad, J. (1984). *A Place Called School.* New York: McGraw-Hill.

Honey, M., McMillan-Culp, K., & Spielvogel, R. *Critical Issue: Using Technology to Improve Student Achievement. Series: Pathways to School Improvement.* Center for Children and Technology. On-line at the NCREL web site: http://www.ncrel.org/sdrs/areas/issues/methods/technlgy/te800.htm

Jukes, Ian (2000) Windows on the Future. & McCain, Ted. On-line at Ian Jukes' website: www.ianjukes.com/jukes%20info/handouts/nsfnm.pdf

Lemke, C., & Coughlin, E. C. (1998). *Technology in American schools: Seven dimensions for gauging progress.* Santa Monica, CA: Milken Exchange on Education Technology. Retrieved September 3, 2000 from the World Wide Web: http://www.mff.org/pubs/ME158:pdf

Lincoln, Y. S., & Guba , E. G. (1985). *Naturalistic inquiry.* Newbury Park, CA: Sage.

Means, B. & Olsen, K. (1993). *Supporting School Reform with Educational Technology.* A paper presented at the American Educational Research Association, Atlanta, Georgia.

Miller, L., & Olson, J. (1995). How computers live in schools. *Educational Leadership, 53*(2), 74-77.

Office of Technology Assessment, Congress of the United States. (1995). *Teachers & Technology: Making the connection.* (Report No. OTA-HER-616) Washington, DC: U.S. Government Printing Office.

Patton, M. Q. (1990). *Qualitative evaluation and research methods (2nd ed.).* Newbury Park, CA: Sage.

Perkins, D. (1999). The Many Faces of Constructivism. *Educational Leadership, 57*(3), 6-11.

Schlechty, P. (1997). *Inventing Better Schools.* San Fransico: Josse-Bass.

Sheingold, K. & Hadley, M. (1990). *Accomplished Teachers: Integrating computers into classroom practice.* Center for Technology in Education: Bank Street College of Education, September.

Stager, G. S. (1995). Laptop schools lead the way in professional development. *Educational Leadership, 53*(2), 78-81.

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Internet Uses by Senior High School Teachers A Case Study

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Abstract

This research project employs the case study method to investigate the effects of instruction and learning with the Internet at the senior high school level. In the first year of this study, the main focus is to explore the current status of integrating the Internet into school management, teaching and learning. Some teachers were selected in six subjects, Chinese, Geology, English, Mathematics, Biology and Earth sciences, to use the Internet for their professional activities. The data collection instruments included the Teachers' Professional Use questionnaire and The Students' Computer Use questionnaire. The survey data showed that (a) more teachers and students knew how to access the Internet for instructional or learning purposes after the researchers intervened, and that (b) more teachers reported that they needed assistance for designing a web-based database and Instructional strategies for their Internet use.

Keywords: Computer Networks, Internet-aided Instruction, Internet-based Learning

Introduction

Over 90%of schools in America can access to the Internet (Becker, 1999). From statistics (Becker, 1999), 24% of teachers in American access Internet both at home and in their classroom, 35% of them access Internet in classroom only, and 15% of them access Internet at home only. This reveals the Internet begun to be habitual as an information and communications resource in the working and home environment of most teachers. However, most teachers are trained to teach from their textbook. Most teachers devote the majority of class time to presenting information, demonstrating how to solve problems, and assigning tasks to their students who usually have a single, short right answer. Few teachers are skilled integrating the Internet into their teaching. The teacher role is an important issue in the integration of technology into instruction.

Teaching is an active task of inculcating learners with the skills and cognitive processes to "direct" and on the Internet (Gilliver et. al., 1999). Current teacher education programs have not prepared preservice teachers to integrate the Internet and computers into classroom teaching. The necessary skills, such as computer skills, instructional strategies, and search skills were not taught, so most teachers feel anxious when computers and the Internet technology come into their classroom. Without support from teachers, students cannot learn effectively. Therefore, researchers not only need to evaluate the students' learning in a web-based environment but also investigate the teachers' adoption of technology including the changes in instructional strategies, the changes in learning activity design and changes in assessments (Beaudoin, 1990; Brophy & Good, 1986; Mc Kenzie, Mims, Davidson, Hurt & Clay, 1996; Thatch & Murphy, 1995; Verduin &

Clark, 1991). Other teaching skills also needed in effectively using the Internet for education are, searching for information, web-page design and socially interactive skills on the web. It is important that teachers know how to choose suitable learning activities and instructional strategies when they integrate new technology into teaching and learning in order to promote students' conceptual development and thinking skills (Mc Kenzie, Mims, Davidson, Hurt & Clay, 1996). Therefore, this study conducted questionnaires to investigate teacher Internet uses at a senior high school.

Method

This research project employs the case study method to investigate the effects of instruction and learning with the Internet at the senior high school level. In the first year of this study, the main focus is to explore the current status of integrating the Internet into school management, teaching and learning. Some teachers were selected in six subjects, Chinese, Geology, English, Mathematics, Biology and Earth sciences, to use the Internet for their professional activities.

Participants

The teachers and students at Luodong Senior High School were selected as the participants for this case study. Luodong Senior High School is located in the northern region of Taiwan. The Internet access at Luodong Senior High School was convenient. Most computers were located in three computer labs and some were in the teacher offices. Teachers and students could use the campus Intranet and T1 for Internet access since 1998. There were 59 teachers participating in this study in 1998 and 31 teachers in 2000. Only 23 teachers participated in both 1998 and 2000. The data from these 23 teachers were used for teacher measurement comparisons between 1998 and 2000.

Instrumentation

The instruments used in this study included measurements of teacher computer use and teacher attitudes toward computers. We constructed the Teachers' Professional Use questionnaire to survey teachers' computer use, teachers' access to the Internet, teachers' Internet use for instructional purposes, attitudes toward computers and the Internet, and teachers' anxiety concerning computers. The attitudes toward computers and the Internet consisted of 15 items with five subscales measuring class involvement. The instrument contained selected items from the tests developed by the following authors: Liu & Johnson (1998), Knezek & Christensen (1996) and Moroz & Nash (1997). A panel of experts, including nine professors from National Taiwan Normal University, established the content validity of the questionnaire.

Procedure

This study included three stages: (a) The preparation stage (from June 1998 to July 1998): According to research purposes, we selected a typical case or an available case. Luodong Senior High School was selected because of its available Internet access and full support from the principal. (b)

The baseline-building stage (from August 1998 to July 1999): In the first year, we conducted questionnaires to survey teacher computer use and teacher attitude toward computers. Informal Interviews and observations were also used to gain more information on teacher computer use and Internet access. (c) The intervention stage (from August 1999 to June 2000): Teachers in six subjects, Chinese, Geology, English, Mathematics, Biology and Earth Sciences, integrated the Internet into their class during the second year. At the end of the year, we surveyed teacher computer use and teacher attitude toward computers. Informal Interviews and observations were also used to gain more information on teacher adaptation to computers and the Internet for instructional purposes.

Data Collection and Analysis

The independent variable was the intervention; the dependent variables were teacher professional use and teacher attitude toward computers and the Internet. The survey data was shown as descriptive statistics to illustrate the impact of the Internet on teaching. Additionally, we conducted paired t-tests on one of these dependent variables (teacher attitude toward computers) between pre-intervention measures and post-intervention measures. The collected data was analyzed for teacher Internet use using SPSS (Statistical Package for Social Science, version 7.0).

Results and Discussions

Teachers' Changes Before and After the Intervention

1. Teachers' Computer Use

Most teachers reported making some use of computers in their daily life. Our survey asked about five uses in particular: accessing the Internet, playing games, editing documents, graphing or analyzing data, and using e-mail. A majority of teachers used computers for editing documents: 91% in 1998 and 78% in 2000. Teacher Internet access increased after the intervention from 46% to 78% (see Table 1).

Teachers used computers at home, in the office, in the classroom or the computer lab. The computer was seldom used either at home or in school before the intervention. There were increase uses in the second year (see Table 2). We surveyed teachers' computer-software use including MS word, PowerPoint, Excel, FrontPage and FTP relative software. The most popular software was Word for editing (about 87% of the teachers used it). The next most popular software was Excel for calculating student scores (about 60% of the teachers used it) (see Table 3).

2. Teachers' Access to the Internet

Seventy-four percent of the teachers knew how to access the Internet and 91% did after the intervention (see Table 4). More teachers knew how to access the Internet after the researchers intervened with teacher instruction and student learning with the Internet. A majority of the teachers (60% in 1998 and 74% in 2000) (see Table 5) accessed the Internet below five hours a week and most used it for browsing web pages (65% in 1998 and 87% in 2000) (see Table 6). The percent of teachers using e-mail and FTP through the Internet increased 17% and 9% after the intervention (see Table 6).

Table 1: Teachers' Computer Uses

	Number (Percent) Before invention	Number (Percent) After invention
Access to The Internet	10 (43.5%)	18(78.2%)
Playing games	1 (4.3%)	1 (4.3%)
Editing Documents	21 (91.3%)	18 (78.2%)
Graph or data analysis	9 (39.1%)	5 (21.7%)
e-mail	5 (21.7%)	8 (34.8%)
Others	2 (8.7%)	4 (17.4%)

Table 2: Teachers' computer use at home, in the office, in the computer labs and the classroom

	Number (Percent) Before invention	Number (Percent) After invention
At home	1 (4.3%)	3(13.0)
In their classroom	3 (13.0%)	7(30.4)
In their office	1 (4.3%)	3(13.0)
In the computer labs	1 (4.3%)	5(21.7)
Others	0 (0.0%)	0 (0.0%)

Table 3: Teachers' computer-software use

Software	Number (Percent) Before invention	Number (Percent) After invention
Word	20 (87%)	20(87%)
Power Point	9 (39.1%)	10(43.5%)
Excel	13(56.5%)	14(60.9%)
FrontPage	3 (13.0%)	8 (37.8%)
FTP relative software	2 (8.7%)	2 8.7(%)

Table 4: Teacher Internet access ability

	Number (Percent) (Before intervention)	Number (Percent) (After intervention)
Know how to access to the Internet	17 (73.9%)	22 (91.3%)
Don't know how to access to the Internet	4 (26.1%)	1 (8.7%)

Table 5: Teacher Internet access time per week

	Number (Percent) (Before intervention)	Number (Percent) (After intervention)
Below 2 hours	9 (39.1%)	9 (39.1%)
2~5 hours	5 (21.7%)	8 (34.8%)
5~10 hours	1 (4.3%)	2 (8.7%)
10~20 hours	1 (4.3%)	1 (4.3%)
Above 20 hours	0 (0.0%)	1 (4.3%)

Table 6: Teacher Internet Use

	Number (Percent) (Before intervention)	Number (Percent) (After intervention)
BBS	3 (13.0%)	2 (8.7%)
E-Mail	6 (26.1%)	10 (43.5%)
Browse web pages	15 (65.2%)	20 (87%)
FTP	6 (26.1%)	8 (34.8%)
Gopher	1 (4.3%)	0 (0%)
Games	0 (0%)	1 (4.3%)
IRC/ICQ	16 (69.6%)	0 (0%)
Others	2 (8.7%)	3 (13.0%)

3. Teachers' Internet Use for Instructional Purposes

Overall, few teachers made use of the Internet for instructional purposes before this study. Our survey asked about four professional uses in particular: student work on the World Wide Web, demonstrating web-based materials in the classroom, developing instructional materials using Internet resources, and requiring students to find information on the Internet. After the researchers intervened with teacher instruction and student learning on the Internet, more teachers used the Internet for instructional purposes; especially, for student work on the World Wide Web (from 9% to 17%), developing instructional materials using Internet resources (from 13% to 26%), and requiring students to find information on the Internet (from 13% to 30%) (see Table 7).

Table 7: Teacher Internet Use for Instructional Purposes

	Number (Percent) (Before intervention)	Number (Percent) (After interventio n)
Student work on the World Wide Web	2 (8.7%)	4 (17.4%)
Demonstrating web-based materials in the classroom	1 (4.3%)	2 (8.7%)
Using Internet resources to develop instructional materials	3 (13%)	6 (26.1%)
Assigning homework requiring students to access the Internet	3 (13%)	7 (30.4%)
Others	1 (4.3%)	2 (8.7%)

4. Teacher Needs for integrating the Internet into instruction

Since relatively few teachers reported using the Internet for instructional purposes, what capabilities do teachers need for using the Internet in the classroom? Our survey asked about six skills needed by teachers in particular: computer skills, skills for Internet access, skills for the use of editing software, skills for the use of graphic or image-processing software, skills for designing web-based database and Instructional strategies. Most teachers reported that teachers need training in computer and instructional skills. More teachers perceived that they lacked enough skills after the researchers intervened in their teaching with the Internet (see Table 8). Skills for the use of graphic or image-processing software (61%) and the skills for designing web-based database (73%) were needed most by teachers before the intervention. After the intervention, teachers reported that skills for designing a web-based database (70%) and Instructional strategies (65%) were needed most when they made use of the Internet for instructional purposes (see Table 8). With experience to use the Internet in the classroom, teachers perceived Instructional strategies were as important as the necessary computer skills.

Table 8: Teachers' Needs

	Number (Percent) (Before intervention)	Number (Percent) (After intervention)
Computer skills	11(47.8%)	17 (73.9%)
Skills for Internet access	15 (65.2%)	20 (87.0%)
Skills for using editing software	11 (47.8%)	15 (65.2%)
Skills for using graphic or image-processing software	14 (60.9%)	10 (43.4%)
Skills for designing a web-based database	17 (73.9%)	16 (69.6%)
Instructional strategies for integrating the Internet into the classroom	11 (47.8%)	15 (65.2%)
Others	0 (0%)	3 (13.0%)

5. Attitudes Toward Computers and the Internet

There was no statistically significant difference in teachers' attitudes toward computers and the Internet before and after the intervention. The pretest mean was 52.95 with a standard deviation of 5.30. In contrast, the posttest mean was 51.77 with a standard deviation of 8.44. The paired t-test results show that there was no significant difference between the teacher pretest and posttest on computer attitude ($t= 0.68$, $p>.05$; The data was shown in Table 9). This means that teacher computer attitudes did not show a significant change before and after the intervention.

Table 9: Summary Table for Paired t-test: Teacher Attitudes toward the Computer and the Internet

	Mean	S.D.	Paired t value	P
Before intervention	52.95	5.30	0.68	0.50
After intervention	51.77	8.44		

Conclusions

The findings in this study demonstrated that more teachers knew how to access the Internet and use the Internet for instructional or learning purposes after the researchers intervened. However, more teachers also reported that they needed assistance in developing skills for designing a web-based database and instructional strategies when they used the Internet for professional purposes.

References

1. Beaudoin, M. F. (1990). The instructor's changing role in distance education. The American Journal of Distance Education, 4 (2), 21-29.
2. Becker, H. J., (1999). Internet use by teachers: Conditions of professional use and teacher-directed student use. url= http://www.crito.uci.edu/TLC/findings/Internet-Use/startpage.htm
3. Brophy, J. & Good, T. L. (1986). Teacher behavior and student achievement. In M. C. Wittrock (Ed.), Handbook of research on teaching (3rd ed.). New York, NY: Macmillan Publishing Company.
4. Gilliver, R. S., Randall, B. J. & Pok, Y. M. (1999). The orbicular model-Cognitive learning in cyberspace. Educational Technology Review, 12, 18-22.
5. Knezek, G. & Christensen, R., (1996).Validating the Computer Attitude Questionnaire (CAQ), ED398 243
6. Liu, L. & Johnson, D. LaMont (1998). A Computer Achievement Model: Computer Attitude and computer Achievement,Computers in the schools, 14(3/4),The Haworth Press, Inc.
7. Mc Kenzie, B. K., Mims, N. G., Davidson, T. J., Hurt, J. & Clay, M. N., (1996). The Design and Development of a Distance Education Training Model. Presented in SITE annual meeting. Orlando, FL.
8. Moroz, P. A. & Nash, J. B., (1997). Bath County Computer Attitude Scale: A Reliability and Validity Scale, ED 408 319
9. Thatch, E. C., & Murphy, K. L. (1995). Competencies for distance education professionals. Educational Technology Research and Development, 43(1), 57-72.
10. Verduin, J. R., & Clark, T. A. (1991). Distance education: The foundations of effective practice. San Francisco, CA: Jossey-Bass.

Creating Technology Mentors for Rural School Districts: An Examination of the T.I.M.E. Mentor Program

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Abstract: This study examines the strengths and difficulties of the Technology Integration Mentors in Education (T.I.M.E.) program through accounts given by participants. The T.I.M.E. program, at its peak in 97-98, included approximately 400 inservice teachers from 55 school districts in eastern Idaho. Several inservice teachers who have successfully completed two years of the program were asked to participate in an extensive online interview and survey format (via WebCt) designed to pinpoint major characteristics of the program as well as attitudes. This research explores three areas of the T.I.M.E. participants' experiences: Workshop training experience, implementation of technology into their own curriculum, and peer mentoring activities. The detailed perspectives of these participants are critical to understanding the successes and difficulties of the program. The results of this current research will inform improvements in the implementation of the T.I.M.E. program.

Introduction

This study examines the strengths and difficulties of the Technology Integration Mentors in Education (T.I.M.E.) program through accounts given by participants. Several inservice teachers who had successfully completed two years of the program were asked to participate in an online interview and survey format (via WebCt) designed to pinpoint major characteristics of the program as well as attitudes. This is a pilot study for more comprehensive research into the T.I.M.E. Mentor program. Also, the results will inform proximal instructional decisions for the program.

About the T.I.M.E. Mentor Program

In 1996, the College of Education's Support for Integration of Technology in Education (SITE) team developed the T.I.M.E. inservice program. The T.I.M.E. program serves a mostly rural area that includes 55 school districts that cover about 40,000 square miles of eastern Idaho. At its peak in 1997-98, there were about 400 participants. This teacher-mentor program trains teachers to utilize tool and multimedia software in real-time classroom instruction. Then the teachers are required to perform peer-to-peer mentoring and formal training of teachers in their building/s. The program can be expressed in the following flow model: Technology Trainer → Mentor → Peer Teachers. This mentor model is tiered, in that there are three years of incremental instruction and mentoring requirements. Upon completion of the program, each mentor has had opportunity to become proficient at using computer technology in the classroom and at training peers to do the same.

Formal mentor programs are common in the business world, but recent examples can also be found in educational institutions. Knight and Albaugh (1997) report success in the "Teaching Software

Institute" (TSI) mentoring program, a one year model similar to the T.I.M.E. program. Teachers were trained in specific software applications and then required to train groups of teachers. The T.I.M.E. program is distinctive from the TSI program in that it is tiered in content and time. In other words, the teacher-mentors learn a progression of softwares (e.g., tool software basics to multimedia software) over a period of three years, and are expected to "ramp up" their mentoring opportunities from peer-to-peer contacts to also include the formal training of groups within their schools.

Research Design

This research explores three areas (constructs) of the T.I.M.E. participants' experiences: Workshop training experience, implementation of technology into their own curriculum, and peer mentoring activities. Participants, through survey (online), semi-structured interview (online) and submitted journals of mentoring activities, offer a participant perspective critical to understanding the successes and difficulties of the program.

The survey and interview are given in a WebCt environment. The participants are given an orientation to the WebCt site, and then allowed to take the survey and the interview when they wish. An important characteristic of both survey and interview instruments is their asynchronous design. Though the survey can be completed in as little as 10 minutes and the interview in about 20 minutes of continuous work, participants do not have to complete either in a single sitting. Within the basic time limits of this research, they can complete all instruments at their convenience.

During the orientation to the site, participants are also introduced to an open bulletin board forum with participant anonymity. The forum is seeded with two leading questions designed to grow a conversation among the participants. The bulletin board will always remain unstructured; the three constructs that guide every survey and interview stem will be absent. Potential dialogue may bring out aspects of the T.I.M.E. Mentor Program that have not been asked about in either the survey or interview instruments.

Results

At the time of acceptance of this research paper, the survey and interview processes were still underway. Completion by all participants and the analysis of the data is expected to be complete in early January. The full results will be presented at the time appointed for this paper.

Preliminary results show that this small selection of participants has had a qualified good experience as T.I.M.E. Mentors. Attitudes toward the program and its effectiveness appear to be related to attitudes toward the technology instructors and toward the handling of workshop and mentoring assignments by the technology instructors. More definitive results are forthcoming.

Summary and Conclusion

The current research examines the implementation of the T.I.M.E. Mentor program from the perspective of successful participants. The program is tiered in that there are three years of incremental instruction and mentoring requirements. The participants in this current research have successfully completed the second year of the program and are asked their views on the workshop training, their own implementation of technology into their curriculum, and their own peer mentoring activities. By examining the responses of the participants, the strengths and difficulties of the program will be clearer and will help elucidate the effectiveness of the program.

Reference

Knight, P. J., & Albaugh, P. R. (1997, February-March). *Training technology mentors: A model for professional development.* Paper presented at the Annual Meeting of the American Association of Colleges for Teacher Education, Phoenix, AZ.

The Florida Center for Instructional Technology

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Abstract: The Florida Center for Instructional Technology (FCIT) is located in the College of Education, University of South Florida, at Tampa, Florida. The Florida Department of Education funds FCIT, Office of Educational Technology and the Florida Information Resource Network, to provide leadership and support services to educational institutions with regard to the integration of technology in education. A primary focus of FCIT is the development of instructional materials and databases for telecommunications. The faculty members and graduate students in the USF Instructional Technology program contribute to many of the products created by FCIT.

Purpose

Established in 1982, the Florida Center for Instructional Technology (FCIT) has been a leader in working with educators to integrate technology into the curriculum. With its location in the College of Education at the University of South Florida, Tampa, FCIT is available to assist over 1,200 pre-service teachers who graduate from USF each year as well as thousands of in-service teachers in Florida. With funding from the Florida Department of Education, Bureau of Educational Technology, and the Florida Information Resource Network, FCIT provides many resources for Florida teachers, including training materials for telecommunications, interactive instruction on technology, and maintenance of online database resources. FCIT offers a wide variety of services and materials for Florida's educators.

VITAL

FCIT offers extensive support for the University of South Florida faculty through its membership in VITAL (Virtual Instructional Team for the Advancement of Learning). VITAL (USF's Virtual Instructional Team for the Advancement of Learning) was established in 1997 to assist faculty at the University of South Florida in the use of technology for the enhancement of teaching, learning and research. When VITAL began on campus, the instructional technology expertise of FCIT was tapped as a resource for USF faculty as well. Hence, a new "division" of FCIT was created to offer services to faculty in the College of Education and the University.

At the University of South Florida, several collaborative initiatives are addressing the challenge of integrating technology into the teaching and learning model. VITAL is not an entity with a physical location on our campus, rather it is a consortium of units housed in separate pre-existing areas, working together as a team to provide the best support for the most faculty possible. It is a virtual one-stop-shopping support unit. The majority of organizations that belong to VITAL have been providing these services and support to faculty as part of their overall mission for many years. VITAL combines the expertise and resources of these seven existing units to better support the development of technology enhanced education. Members include Academic Computing, the Center for Teaching Enhancement, Educational Outreach, the Florida Center for Instructional Technology, the Health Sciences Center for Information Services, the Tampa Campus Library, and WUSF-TV.

Faculty are encouraged to seek individual mentoring and assistance as well as attend workshops designed for small groups. Faculty who want individual assistance with technology issues can call upon a specific VITAL member, or they can reach a "generic" VITAL contact through multiple means. The many services that are offered by each VITAL member can be viewed on the VITAL Web site http://www.usf.edu/vital (see Figure 1). In addition, VITAL has an email list (vital@usf.edu) that reaches all members, any of which are able to answer support questions. Support is also offered to the "Learn from a Distance" program in the College of Education for those faculty teaching via distance.

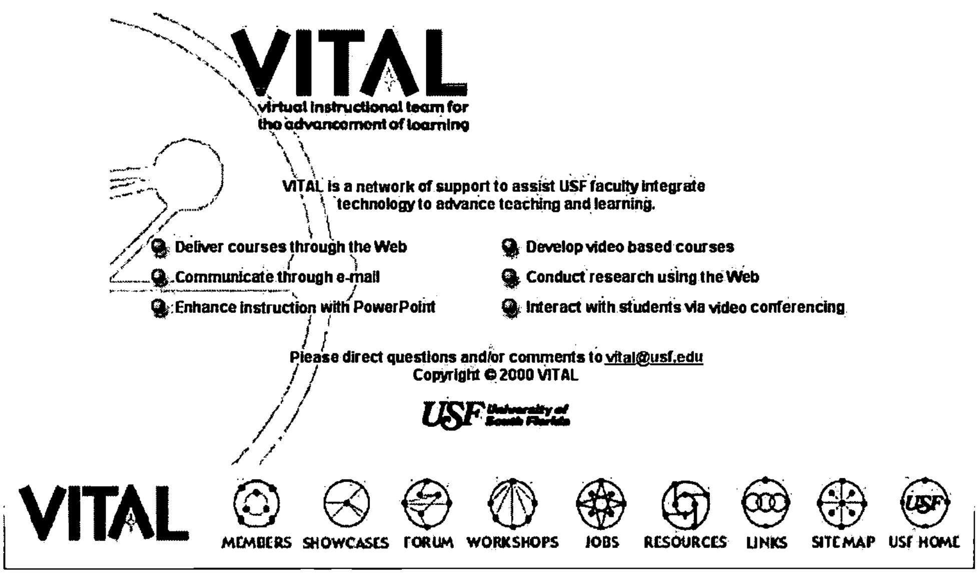

Figure 1: VITAL Web site.

VITAL provides many skill building and informative workshops on the uses of technology for teaching and learning. This past semester, VITAL facilitated 23 skill-building workshops in which faculty and graduate teaching assistants were able to improve their level of comfort and skills with technology. The workshops cover a wide range of technology topics, but many are related to enhancing teaching using the Internet. Some examples include; "Making the Right Choice: A Comparison of WebCT and CourseInfo", ing and Learning with Online Communication Tools", "Creating Web Pages: A One Day Workshop", "Improving Teaching and Learning with WebCT Version 3.0: A Two-Day Intensive Workshop" and Discovering Options: Using Streaming Media to Enhance Online Teaching and Learning".

Recently, VITAL began providing additional support personnel in a lab environment for use by the College of Education faculty and staff. The College of Education and Technical Services and Resources provide the lab to all employees of the College of Education yet was being underutilized. This lab is now staffed for 30 hours to assist those who need to use technology but may feel uncomfortable doing it alone or do not have the resources necessary in their offices. This has increased the number of faculty who take advantage of the technologies provided in the media lab as well as technology usage in general.

FCIT

FCIT provides leadership and support services to educational institutions, such as local schools, districts, museums and other educational agencies. Through these partnerships, FCIT has designed distance education tools, conducted research, provided technology assistance and staff development, assisted in grant writing, and produced multimedia instructional programs. FCIT booklets, brochures, and electronic media are distributed free-of-charge to Florida educators. Printed publications may be duplicated for educational purposes and online materials may be downloaded from the Center's Web site.

The FCIT Preview Center provides educators with an effective source of integrative technology for the classroom. The Preview Center maintains a library of over 3,000 educational software and multimedia titles to provide k-12 educators, faculty, and staff with the opportunity to preview the latest in educational software. The Preview Center also provides valuable services for preservice teachers at USF. The students are given the opportunity to use the software and to learn methods for integrating technology into the classroom. The Preview Center is equipped with a lab of 40 networked Macintosh and Windows computers so those educators can preview the software on the platform of their choice. Other featured technologies include telecommunications, Smart Boards, digital cameras, video conferencing, flatbed and film scanners, assistive/adaptive devices, digital video cameras, and MIDI keyboards.

Throughout the year, FCIT offers one and two-day hands-on workshops for K-12 educators. Many workshops focus on technology integration in a specific teaching such as reading, science, math, music, art, or foreign language. Other workshops cover topics such as Web page publishing, networking for Windows and Macintosh, digital video, digital imaging, computer graphics, the one-computer classroom, desktop publishing, internet for education, digital photography, basics of MIDI sequencing and mini-grants for technology. It is during these workshops, that the diverse software and hardware is featured, allowing teachers to experience what is available for integration of technology into their classroom.

FCIT has been given the opportunity to collaborate with the school district of Pinallas County on a variety of projects. One project is the Pinellas County Schools' Student Expectations Database, an educator's resource and reference tool to identify what students should know and be able to do at the pre-K through grade 12 level in ten subject areas. This guide relates the Pinellas County Student Expectations to the Sunshine State Standards, benchmarks, competencies, lesson plans, assessments, and resources. The Student Expectations Database was developed in partnership with Pinellas County Schools through the Goals 2000 Student Achievement Grant.

Another project is a television show called Digital Learning, is broadcast on a local cable channel. Digital Learning is a cooperative venture covering a wide variety of topics relating to the use of computer programs and networking facilities. The television shows provide teachers with the opportunity to have training at home or at school. Topics have included QuickTime, Inspiration, HyperStudio, MovieWorks, and how to scan.

Other projects included assistance to fellow departments at USF to realize some of the benefits of instructional technology. The first project was to develop a Web site for the International School Connection. This project underwent some change in scope as the project developed, but throughout had a focus on better enabling educators to have a global perspective on student learning and achievement. FCIT was responsible for creating the Web site for this program. This project also illustrated nicely the collaboration between the K-12 and the higher education components of FCIT. While the K-12 side was building the Web site, the higher education component was working on creating the Web-CT side of the program.

A second project that FCIT has worked on is "Thinking Like a Marketer". This was a grant from the National Training Collaborative for Social Marketing, funded thought the Center for Disease Control. The grant focused on taking the center's existing in-person training modules and provides them on both the World Wide Web and CD-ROM based format. This project was exciting in that in incorporated a number of different technologies. Transcriptions were created of the different sessions and recorded using a professional narrator. Those recordings were then compressed using and saved as QuickTime movie files. The sound files were then used allowing each session to have the real time feel that it does. Finally, Macromedia Coursebuilder was used to create the engagement questions that participants would be asked about content as they listened to the presentation. Combined, these different components came together extremely well and produced a viable way for health professional to easily receive training on marketing strategies.

Teaching N' Technology is a database of technology-related lesson plans developed by Florida educators. Search 400 lesson plans to easily find activities to enhance your curriculum. Each TNT lesson plan contains technological and subject information, as well as its correlation to Sunshine State Standards. Each lesson provides detailed instructions on how to implement the activity in your classroom. TNT enables you to search by subject area, by grade level, and by keyword. Select lesson plans from the TNT database were distributed to Florida schools on the "FCIT Teaching Tools 2000" CD-ROM, fall 2000.

Currently, FCIT is working with the Childhood/Language Arts/Reading Education department on a project called InterLnk. This project is being funded from a grant with the Corporation for National Service. The project will include working with one school in Miami, Florida, two schools in Tampa, Florida and one school in Memphis, Tennessee to develop model literacy classrooms with technology integration.

The print publications cover a variety of topics for educators. *An Educator's Guide to School Networks* provides an overview of computer networks and their integration into the school setting; *The Internet: Ideas, Activities, and Resources* provides an overview of the Internet and includes curriculum integration ideas for Florida educators. *A Teacher's Guide to Distance Learning* provides an introduction to distance learning technologies and applications in K-12 education. *Getting Started With Telecommunications* offers information on obtaining and using a Florida Information Resource Network (FIRN) account. *Language of the Internet* is a convenient guide to Internet terms and acronyms. *Searching the Web* is a beginner's guide to using Web search tools; and *HTML Quick Reference Guide* is a summary chart of basic HTML code.

In addition to all of the booklets and brochures available on the FCIT Web site, there are simulations. *Cruising the Information Super-Highway Simulation* provides information on the various features and components of the Internet and World Wide Web including Internet connections, Telnet, FTP, Gopher, WWW browsers and more. It also provides hands-on practice with Web page creation and video and audio conferencing. *Interactive HTML Tutorial* is a student project by David Tai. Learn basic HTML commands by typing text directly into boxes on the tutorial and see the results immediately. *Interactive HTML Tables* Tutorial is a student project by Lara Labastie. Practice constructing HTML tables and sees the results in pop-up windows.

CD-ROM products are distributed to Florida schools as a part of a Technology Literacy Challenge Grant. *The Teacher's Guide to the Holocaust* version two and the *Fourth Grade Reading FCAT Staff Development Tool* were distributed in late fall of 1999. Public school copies were shipped to the district Superintendent's office for distribution. Private school copies were mailed directly to the school address.

FCAT Reading 4 Staff Development Tool (See Figure 2) is designed to help teachers prepare students for the fourth grade reading Florida Comprehensive Assessment Test. Sections include teaching strategies, rubric scoring, practice tests, and references. This CD-ROM was distributed to Florida schools in the fall 1999.

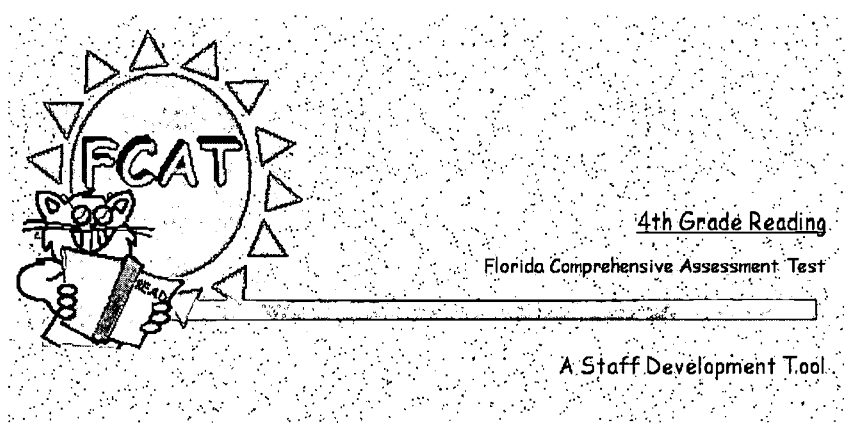

Figure 2: FCAT Reading 4

FCAT Reading 8 Staff Development Tool (Figure 3) is designed to help teachers prepare students for the eighth grade reading Florida Comprehensive Assessment Test. Sections include short and extended response rubrics, a self-test using scoring rubrics, two FCAT practice tests, teaching strategies, and related Web sites. Distributed to Florida schools on the "FCIT Teaching Tools 2000" CD-ROM, fall 2000.

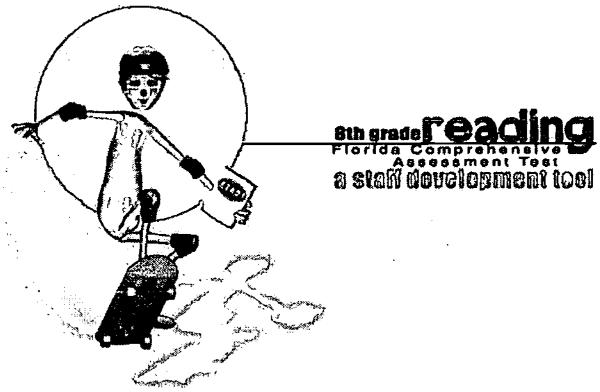

Figure 3: FCAT Reading 8

A Teacher's Guide to the Holocaust (Figure 4) is an overview of the people and events of the Holocaust through photographs, documents, art, music, movies, and literature. Version 3.0 adds thousands of new files to the Teacher's Guide including 600 new photographs, 25 virtual reality movies, 75 movie clips of survivor testimony, and a complete site index.

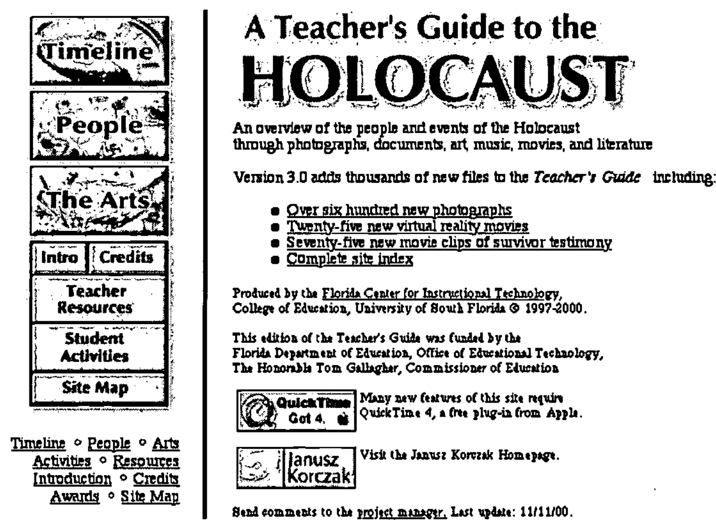

Figure 4: Teacher's Guide

Currently, FCIT is working on projects to be distributed in the fall of 2001. *A Teacher's Guide to Florida History* will include both a fourth grade unit and a set of resources suitable for use at any grade level. *FCAT Reading 10 Staff Development Tool* is being designed to help teachers prepare students for the tenth grade reading Florida Comprehensive Assessment Test. *FCAT Math 5 Staff Development Tool* is being designed to help teachers prepare students for the fifth grade math Florida Comprehensive Assessment Test.

FCIT has collaborated with the Research and Measurement department at USF to conduct a variety of research studies. The first research study was A Holocaust Web Site: Effects on Preservice Teachers' Factual Knowledge and Attitudes Toward Traditionally Marginalized Groups This study reported is an initial investigation of the impact of the *Teacher's Guide to the Holocaust* Web site on preservice teachers' knowledge of the Holocaust and attitudes towards traditionally marginalized groups. In addition, this research provides evidence of the extent of pre-service teachers' knowledge related to the Holocaust. Ultimately, this research should lead to further development and improvement of Holocaust instructional materials, as well as improvement of Holocaust education in Florida.

A separate study was Preparing 4th Grade Students for the FCAT Reading Test. The purposes of this study were (a) to determine how 4th grade teachers in a large Florida school district prepare themselves and their students for the FCAT reading test, (b) to investigate relationships between preparation practices and school characteristics, and (c) to estimate correlation between preparation methods and subsequent student performance on the test.

The final study is Computers in the Classroom: Teachers' Attitudes and Uses targeting their attitudes toward and use of computers in instruction. A special emphasis was placed on classroom uses consistent with the proposed NETS for teachers and students. The data for this study were obtained from a survey administered to all teachers in a large Florida school district. Surveys were distributed to each school site with instructions that all classroom teachers were to be provided the opportunity to participate.

Using Intelligent Agent Tutors

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Abstract

Intelligent agents are, in simplest terms, software programs built to perform certain specific tasks for the user. They are "autonomous" in the sense that they operate without specific user intervention. One form of intelligent agents, "chatterbots", is beginning to provide the capability to have intelligent tutors available to students at all times.

Many of these chatterbot software packages can be customized to provide content appropriate for individual lessons and can perform other tasks **automatically**, such as opening web pages, reading text, running other programs, answering questions and providing instruction. Further, they can even solicit information and distribute information. Several low-cost, easy-to-use packages have emerged, with useful features, such as anthropomorphic features and speech recognition. Soon, chatterbot agents will be providing useful information in many classrooms and over the web via distance education.

This demonstration will showcase several of these packages, including examples of how they are being used and can be created. One agent, Sylvie, will assist in the presentation of material.

Introduction and Background

One of the most interesting, and potentially important, aspects of the information technology revolution might be the rapid integration of intelligent agent tutors into the classroom environment. "Intelligent software agents", also known as "knowbots" or just "bots" have recently become more than just a better way to search or to find bargains on the internet[1]. Moreover, these second and third generation agents are taking on aspects of human intelligence, allowing them to assist educators with classroom functions. Interactive anthropomorphic agents are beginning to actually provide instruction, explain answers, grade exams, answer questions, give references, provide underlying theoretical logic, link to websites, and, in general, guide and instruct students---all functions heretofore were done by humans. The list of tasks that intelligent agents are already performing and might someday perform is rather extensive.

Intelligent agents (a.k.a. software agents and/or knowbots) are, in simplest terms, software programs built to autonomously perform certain specific tasks for the user. Intelligent Agents combine elements of Artificial Intelligence from other subsets (e.g., expert systems, object-oriented technology, neural networks, genetic algorithms, case-based reasoning, speech recognition, natural language processing, etc.) into an interface that has great applicability and appeal. Behind the agent front end is more often than not some simple rule-based programming which triggers actions when certain conditions are met. Some of the agents even have a crude capability to adjust their "reasoning" and "learn" from the user.

Current incarnations of intelligent agents can perform such useful tasks as retrieving information from the web, assisting in shopping for items by automatically finding the best price, monitoring auctions for specific items, gathering stock quotations and building customized newspapers. The latest generation of software agents moves closer to the ideal—an agent which can function autonomously to assist the user or the learner by providing help in dealing with what has become an information hyperabundance.

Today

Today, an important use of intelligent agents is providing features that can guide, advise, teach, critique and explain in an intelligent tutor or classroom instructor role. Although these early applications are often just prototypes, more importantly for educators is that the rapid development of intelligent agent tutors is becoming both a practicality and a necessity.
Being able to provide students with just-in-time learning, customized for what they need at the moment they need it is not possible with human instructors. Agents can also assist instructors in finding, filtering, and fusing the vast amounts of information now available. Due to the massive data explosion and the limited time and availability of human instructors, more often than not instruction is provided at a level which accommodates the majority in mostly a same time, same place environment. Now, however, the potential exists to tailor lessons specifically for each individual.

Soon it will be possible to have a personal tutor for each student. This intelligent agent tutor will be customized to not only provide the instruction that the student seeks at the time he or she seeks it, but the tutor will do so in a very effective manner. Several low cost, easy-to-use packages have begun to emerge, with useful features, such as impressive anthropomorphic features and speech recognition. Indeed, they could soon even become mentors for faculty as well as tutors for students. An interesting example in development is the agent Virtual Steve that can provide tailored instruction for training. [2] Virtual Steve has a virtual reality front end and an intelligent agent engine combined with speech recognition and speech synthesis. Unattended Steve is able to guide students, react to their actions, correct them if they make a mistake and admonish them if they ignore procedures. Although only a research effort at the moment, Virtual Steve is an example of the type of customized personalized instruction that is possible with intelligent agent tutors.

Many of these new software packages can be customized to provide content appropriate for individual lessons and can perform other tasks **automatically**, such as opening web pages, reading text, running other programs and answering questions. Further, they can even solicit and distribute information. Already they can provide answers to questions, instruct on how to perform actions and provide feedback to queries. Soon, agents will be providing useful information in many classrooms and over the web via distance education. Providing these services in a 24/7 environment makes them an attractive method for the delivery of customized instruction.

Agents can also provide great assistance to teachers and students by automatically finding and organizing data available over the world wide web. Using such agents leverages the valuable time and energy of teachers and students. Autonomous agents can function as assistants (someday even colleagues) and look for information relevant to the lesson at hand. Some agents can even assist in the knowledge management function, so necessary as the amount of information becomes overwhelming.

Future

The future is even brighter for the use of intelligent agents, both as software tutors and as Learner Relationship Management (LRM) assistants. Indeed, the use of intelligent agents for these purposes will soon be seen in several venues. So far, several articles have profiled the development of intelligent agent tutors, but few academics and faculty have begun to use them. In a recent issue of Educause Review an article by Alfred Bork gives a vision of providing instruction via intelligent computer tutors to everyone at an affordable cost.[3] The inexpensive use of software expert tutors means that superb instruction can be available at any time for anyone. Further, the instruction can be tailored to be different for every student. Just now beginning, the rise of intelligent agent tutors will become a flood as the technology matures. Their potential to provide valuable assistance not only in the traditional classroom but also over the web (e.g., distance education) is tremendous.

As the technology rapidly matures, the limiting factor will no longer be the technology itself, but the development of a new paradigm for teaching. Instead of "one size fits all" lectures, for example, lectures will be customized for each student and provide information at a pace appropriate for each student. This mass customization feature has been taking place in other areas, but, so far, has been limited in education. Intelligent Agents will provide the means to have a personal tutor or instructor tailored for each student. Instead of having to rely on one instructor, students will have the ability to tap the information reservoir through their intelligent agents who can link to virtually all information. Instead of having to wait for feedback on an exam or private counseling session, students will instantly know what they have done right and wrong. Instead of having to meet at a particular time and place, students will be able to meet anywhere, anytime with their personal agent tutor and still enjoy the richness of a face-to-face session.

Additionally, there will be an increased growth in the ability of the agents to learn for themselves rather than being constantly reprogrammed with new information. Increasing ability to "learn" from experiences, increased improvements in anthropomorphic features, increased friendliness, increased ability to collaborate and increased ease-of-use will no doubt boost the use of intelligent classroom agents. Already, some collaborative agents which can meet and share information are beginning to emerge. Gossip, for example is one such collaborative agent which can meet with other agents with similar interests, exchange web links (gossip) and ideas and return more knowledgeable about a subject[4]. It is not much of a stretch to envision these agents acquiring additional knowledge on a particular subject of interest, incorporating this new knowledge into the subject matter database, and updating their material for lectures or presentation automatically!

Likewise, the use of intelligent agents in the area of LRM appears to be likely. Imagine having an online assistant to aid students in answering their administrative questions. Unlike the tutoring use of agents, the LRM involvement of agents might take on a slightly different tenor. These LRM agents will, perhaps, have to examine the student data base to answer queries about courses to take; they might have to calculate grade point averages and suggest remedies or future studies; they will have to be more conversational in nature to be able to interact with students on a more equal basis versus providing instruction. The growth in LRM agents, however, seems likely as already such agents are providing similar assistance in the business world (see: www.extempo.com, for examples).

Summary

The development of intelligent agent tutors and LRM assistants has begun and will continue at a rapid pace, greatly expanding the ability to provide excellent instruction, tailored specifically for individuals at any place and time. Continued technology improvements will make the use of such "intelligent tutors" and LRM agents not only possible, but probable. Educational institutions will need to become involved with these developments since they will alter the way in which educational instruction is provided for many future students.

[1] References and links to the intelligent agents mentioned in this paper and others can be found at http://www.botknowledge.com.
[2] Virtual Steve can be found at: http://www.isi.edu/isd/VET/vet.html
[3] Alfred Bork, "Learning Technology," in *Educause Review*, January/February, 2000, pp. 74-79, http://www.educause.edu/pub/er/erm00/erm001.html
[4] GOSSIP collaborative agent can be found at: http://www.tryllian.com/.

A Framework for Integrating Technologies in Teaching & Learning

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Abstract: Convergence of IT & communication technologies brings about greater potentials & possibilities in using technologies as a powerful medium of delivery, instruction & communication. Changes in student demographics generate a strong demand for international higher education which can provide life-long, flexible learning programmes. Compelling change of skills needed at workplace drives education communities in all over the world to re-think about education requirements & processes. Combination of these factors set a scene of transformation in education causing a paradigm shift in teaching & learning, which poses new challenges to educators in acquiring skills & competencies not only in technology literacy but also in pedagogy. This paper aims at presenting a practical framework for integrating technologies in teaching and learning. The collective findings based on the author's experience and that of other institutions of higher education can serve as a general roadmap for an educational institution in adopting innovative educational practice supported by technologies.

Introduction

Integrating technologies in teaching & learning goes beyond setting up system infrastructure. The emphasis of integration is on curriculum re-design for using technologies to support student-centred, process-oriented curriculum & building learning communities in cyberspace. This paper seeks to offer insights into a range of issues confronting educators on deployment of technologies in teaching and learning. As with the case of any innovation, effective & successful integration of technologies in teaching and learning is best described within a framework. The framework comprises six components namely, institutional support, training & development, designing for integration, approach to integration of technologies, paradigm shifts in education & technological development, cultural change among educators.

Institutional Support

Research has shown that institutional support can exert both direct and indirect influence on the outcomes of staff in adopting innovations, therefore it plays a critical role influencing the success of integrating technologies in teaching and learning (Hart et al. 2000; Bottomley,1999; Collis,1997; Mogey,1997). Some form of top-down management decision and support is necessary in providing the initial 'push' and in maintaining the momentum of any innovation adoption. Hence, an institutional needs to establish a suitable climate or environment for change before any significant change can take place. The support includes a combination of the following :

- Establishing relevant institution-wide policy on the use of technologies
- Commitment of resource in terms of
  - Building a stable and robust IT infrastructure
  - Providing human resource in technical support at all levels
- Providing adequate computing access and facilities for both staff and students
- Providing recognition and reward to staff on teaching excellence and effective use of technologies in teaching and learning
- Providing time release for teaching staff who are involved in developing interactive technology-

based instruction

- Establishing academic support centers or units for providing on-going staff training as well as for assisting staff in developing technology-based courseware
- Inculcating sharing culture corporately so that experience, skills and knowledge on any innovation and the adoption of innovation will be shared among the staff. This practice provides a mechanism for enhancing knowledge of the staff via peer-teaching as well as prevents duplication and 're-inventing of wheels' of known innovations within the institution

Training and Development

A good classroom teacher is not necessary a good online teacher. Training plays the most critical role in the successful integration of technologies in teaching and learning (Hart et al. 2000; McCarton et al. 2000; Roger,2000; Lim,1999a; Littlejohn & Stefani,1999; Collis,1998; Canole & Oliver,1998; Mogey,1997).

Staff training and development is essential, both in terms of learning and handling the technologies and in terms of how to use technologies in a learning environment. Therefore, successful training goes beyond software skills training. It is important to develop cohesive training programmes with emphasis on learning which encompass an understanding of how people learn, course design and teaching strategies (Rogers, 2000; Verneil & Berge,2000; Littlejohn et. al, 1999).

While staff training provides the initial familialisation of various teaching methods and selected software, the actual learning is effected during implementation of integrating technologies in teaching and learning. It is during the implementation phase that the staff can experience the synergy of pedagogy and technology.

A one-off training event such as a workshop, a demonstration, or a seminar, will achieve little without proper follow-up in staff development. It is therefore, apparent that during staff development, which constitutes the post-training phase, the staff require a continuation of technical support and "hands-hold" sessions before they can gain confidence and competence in deploying innovative teaching which are supported by technologies.

Adoption of innovation with technology entails a learning curve for both staff and students. Therefore, students also need to be trained in technology literacy before they can use technologies effectively in their learning (Lim, 1999a; Mogey,1997).

Designing for integration

It is very common for staff to have a conception that going online equates to no more than presenting lecture material, in traditional print format, onto a Website so that students can access them easily, without due thinking through the process for student learning (Littlejohn et.al,1999). The consequence of poorly designed technology-based courseware is that students find the materials unclear, confusing, difficult to navigate, boring and non-engaging.

Another common practice among staff is to treat technology-based instruction as a separate entity from traditional teaching without proper integration with the rest of the curriculum. Consequently, students cannot relate the technology-based learning materials with the rest of the curriculum in terms of lectures, tutorials, lab session and assessment. Therefore, technologies in teaching and learning will not be effectively used unless it is properly and thoughtfully integrated into the existing curriculum (Lim,1998b, 1999a, 2000a).

Approach to integration of technologies

Traditionally emphasis has been placed on technologies without regard to teaching and learning aspects. It is important to avoid this pitfall by ensuring that the adoption of innovative teaching is educationally sound (Littlejohn et. al,1999; Mogey,1997; Lim,1999a,2000a).

Technologies alone cannot provide solutions to teaching and learning problems and needs. Neither can technologies themselves transform teaching, learning and assessment. Transformation comes from re-structuring or re-designing of existing teaching and learning practice with incorporation of technologies. Various findings from the research strongly indicate that deployment of technologies in teaching and learning goes beyond acquisition and set-up of technical infrastructure. Hence, the integration of technologies should not be technically-driven.

Pedagogical-driven approach begins with considering teaching and learning problems, needs and learning styles. Technology will be relied on when there is a need to accomplish desired learning outcomes (Lim, 2000a; Bottomley et.al,1999; Littlejohn & Stefani, 1999; Collis,1998; Mogey,1997).

With this approach, adopting innovative instruction requires raising awareness of alternative teaching methods (e.g, active learning, problem-based learning) necessary in addressing paradigm shifts in education, developing new skills with the methods, and know when to apply those methods to optimize student learning.

Paradigm shifts in education and technological development

How do the two diverse disciplines : education and technology synergize in the deployment of technologies in teaching and learning ?

This section of the paper examines contributing factors of paradigm shifts in education in the light of globalisation, contemporary learning theory and technology-supported instruction and learning.

Globalisation via flexible learning programmes

Benefits brought about by using Internet as a medium of delivery are well-documented. Internet-based education has been providing means of delivering education in ways not possible by traditional delivery methods. It is able to reach out to diverse groups of students in diverse geographical locations. Learning becomes borderless, stretching beyond the physical boundaries of "real" colleges and universities thereby greatly extending and enhancing learning experience beyond traditional classroom-based instruction can provide.

Shifting from teacher-centred instruction to student-centred learning

Traditional mode of instruction treating students as passive recipients of information is deemed as ineffective and inadequate in preparing students for the workplace of the new millennium.

A wealth of literature suggests the shift of teacher-centred instruction to student-centred learning in which active involvement of students in their learning is seemed as critical for effective learning (Felder et.al,2000; Lim,2000a, 2000d, 1999a; Rogers,2000; Ritter & Lemke,2000). The role of the teacher or instructor is shifted from being a sole information-provider to that of a facilitator for guiding students with different learning styles in attaining desired learning goals.

By capitalizing on interactivity, bringing together resources of different media (text, graphics, audio and video), and converging of IT and communication technologies, technology-supported flexible learning environment is capable of providing various pedagogical interventions necessary for active learning. These include provision of learner-control over pace, time, place of accessing materials as well as selecting or skipping of materials as required, student engagement in carrying out various online learning tasks and activities, self-reflection, and self-evaluation with the archived transcript of online conferencing (Lim,2000d; Ritter & Lemke,2000; Verneil & Berge,2000).

Shifting from content-based to more process-oriented curriculum

A truly content-based approach to instruction and learning can no longer cope with the proliferation of information and with the rate of change in technologies. Hence, students preparing for the workplace of tomorrow need to acquire a range of process skills besides having a firm grasp of discipline fundamentals. As defined by Wood et.al (2000), process skills are 'soft' skills used in application of knowledge. These include skills in construction of new knowledge, multidisciplinary problem solving, communication, writing, learning to learn, self-assessment, change-management skills. Well-designed Internet-based instructions are capable of supporting active construction of knowledge via information retrieval, evaluating, analyzing and synthesizing of information.

Shifting from individualistic learning to more collaborative learning

Group work plays an important role in promoting team-working skills which are greatly valued by employers (Rugarcia et.al,2000; Felder et.al,2000; Wood et.al,2000; Rena et al,1999; Kear & Heap,1999). Underpinning team-building skills is the notion that learning is a social process characterized by the exchange and sharing of ideas, thoughts, opinions among people, resulting in new ways of understanding the materials via multiple perspectives. Through team–building, members are able to appreciate diversity in views and respect views of others enabling them to work interdependently during problem solving. By working on real-world problems in problem-based learning helps students work collaboratively. Technologies can be deployed to facilitate problem-based learning (Lim,2000c). Computer-mediated communication (CMC) has been shown capable of supporting and promoting collaborative learning (Verneil & Berge,2000; Lim,1998a,1999a,1999b,2000a; Ritter & Lemke,2000; Salmon,2000) via group communication and work. The online collaborative tools used include e-mails, bulletin-board systems, newsgroups, chat, audio conferencing and desktop video conferencing.

Cultural change among educators

Cultural change among educators encompasses "buy-in", preparedness, commitment and engagement in adopting innovative teaching. Research has shown that educators are often unconvinced about effectiveness of technology-based instruction. Hence, one of the challenges for implementing an institution-wide deployment of technologies in teaching and learning is to determine the motivating factors which drive the educators to "buy-in".

Adoption of new teaching practice supported with technologies will call for major curriculum and course structure reviews, re-design, development and delivery as well as implementing of alternative teaching methods and assessment. The initiative and the effort of change will greatly rely on willingness and commitment on the part of educators to adopt innovative teaching practice and to expect and endure initial implementation hiccups. They also need time for adaptation and adjustment of their instruction in response to the changes in the practice (McCarton et al. 2000; Hart et al. 2000; Lim,1999a; Bottomley et.al,1999).

As integration of technologies cannot function based on the initiative of an isolated educator, the commitment and engagement of all educators for any particular course are recommended for an effective adoption of technologies in teaching and learning. This will ensure a coherent use of technologies across a course and not in isolated topics and subjects.

Conclusion

While institutional support provides the climate for adopting innovations in teaching and learning, true culture change will only materialize from the widespread adoption by many individual educators (Littlejohn & Stefani,1999, Collis,1999; Mogey,1997). Therefore, a successful integration of teaching and learning requires a mixture of initiative i.e, firstly from a top-down component via management support and decision and secondly, a bottom-up component via commitment and willingness of educators to change in adopting innovative teaching practice.

While there are sufficient and mature technologies capable of supporting student-centred, process-oriented curriculum and collaborative learning, the driving motivator of a successful institution-wide deployment of technologies in teaching and learning should be pedagogy rather than technology. Technologies are tools for complementing and facilitating teaching and learning. The initiative requires educators to re-structure their instruction to take advantage of the interactive capabilities of technologies. For an effective deployment, technology-based instruction should form part of the mainstream teaching and learning (Lim, 1998b,1999a,2000a).

Findings at Temasek Polytechnic and other institutions of higher education suggest that successful integration of technologies requires close attention be paid to pedagogical, institutional, cultural and technical issues (Rogers,2000; Verneil & Berge,2000; Lim, 1999a,2000a; Bottomley,1999; Littlejohn & Stefani,1999; Littlejohn et.al.,1999; Mogey,1997). The collective findings can serve as a general road-map for an educational institution in adopting innovative educational practice supported by technologies.

References

Bottomley, J., Spratt, C., & Rice, M. (1999). Strategies for organizational change in teaching practice : Case studies at Daekin University. Special Issue of *Interactive Learning Environments*, Educational Technology, University of Twente, Denmark

Canole, G. & Olive, M. (1998) A pedagogical framework for embedding C&IT into the curriculum. *Association For Learning Technology Journal*, 6(2), 4-16

Collis, B. (1998). Implementing innovative teaching across the faculty via the WWW. A keynote delivered at the 9th International Conference of the Society for Information Technology & Teacher Education (SITE), Washington, D.C.

Felder, R.M., Woods, D.R, Stice, J.E & Rugarcia, A, (2000). The Future of Engineering Education II. Teaching methods that work. *Chemical Engineering Education*, 34 (1), 26-39

Kear, K. & Heap, N (1999). Technology-supported group work in distance learning. *Active Learning*, 10, 21-26

Hart, G., Ryan, Y. & Bagdon, K (2000) Supporting organizational change : fostering a more flexible approach to course delivery. In *The Changing Face of Learning Technology*, ed. by Squires, D., Canole, G. & Jacob, G. University of Wales Press, UK

Lim, G. (1998a) Replacing Classroom Lecture with Web-based Instruction : Implications for Courseware Design & Development, *The Sixth International Conference on Computers in Education ICCE98 (Beijing)*

Lim, G. (1998b) IT as an integral part of teaching (Tutorial3), *The Sixth International Conference on Computers in Education ICCE98 (Beijing)*

Lim, G., Goh B.H., R.R.S. Chakravathy, Yeo S.A., Teoh A.P.(1999a) Implementing a Web-based Instruction - Issues and Lesson Learned, paper accepted for *the Eleventh Annual World Conference on Educational Multimedia, Hypermedia & Telecommunications, EDMedia99 (Washington)*

Lim, G. (1999b) Online Collaboration via Desktop Video Conferencing, presentation at *Technical Forum*, Temasek Engineering School, Temasek Polytechnic, Singapore

Lim, G. (2000a) Integrating Technologies in Teaching & Learning, presentation at Temasek Engineering School Staff Seminar, Temasek Polytechnic, Singapore

Lim, G. (2000b) Convergence of technologies : Impact & Implications for Education, presentation at Creating IT Courseware for the New Millennium Seminar, Temasek Engineering School, Temasek Polytechnic, Singapore

Lim, G. (2000c) Supporting problem-based learning with technologies. Temasek Engineering School, Temasek Polytechnic, Singapore

Lim, G. (2000d) Active learning and technologies. Temasek Engineering School, Temasek Polytechnic, Singapore

Littlejohn, A.H. & Stefani, L.A.J (1999). Effective use of communication and information technology : bridging the skills gap. *Association For Learning Technology Journal*, 7(2), 66-76

Littlejohn, A.H., Stefani, L.A.J& Niall, S (1999). Promoting effective use of technology, the Pedagogy & the practicalities : a case study. *Active Learning*, 11, 27-30

McCarton, A.; Watson, B., Lewins, J. & Hodgson, M (2000) Enabling learning through technology : some institutional imperatives. In *The Changing Face of Learning Technology*, ed. by Squires, D., Canole, G. & Jacob, G. University of Wales Press, UK

Mogey, N. (1997). LDTI : Supporting successful implementation of learning technology. *Active Learning*, 6, 1-3

Rena, M.P. & Keith, P (1999) *Building Learning Communities in Cyberspace :Effective Strategies For The Online Classroom.* Jossey-Bass Inc, Publishers, San Francisco, CA

Ritter, M.E. & Lemke, K.A. (2000). Addressing the 'Seven Principles for Good Practice in Undergraduate -Enhanced Education. *Journal of Geography in Higher Education*, 24 (1), 100-108

Rogers, D.L. (2000). A paradigm shift : Technology integration for higher education in the new millennium. *Educational Technology Review*, 13, 19-27

Rugarcia, A, Felder, R.M., Woods, D.R & Stice, J.E. (2000). The Future of Engineering Education I. A vision for a new century. *Chemical Engineering Education*, 34 (1), 16-25

Salmon, G (2000) *E-moderating : The Key to Teaching & Learning Online*. Kogan Page, London.

Verneil, M.D. & Berge, Z.L. (2000). Going online : Guidelines for faculty in higher education . *International Journal of Educational Telecommunications*, 6 (3), 227-242

Woods, D.R, Felder, R.M., Rugarcia, A, & Stice, J.E (2000). The Future of Engineering Education III. Developing critical skills. *Chemical Engineering Education*, 34 (2), 108-117

Zones of comfort, proximal development and technology skills diffusion: A critical reflection on a curriculum-based approach to inservice teacher training.

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Abstract: This paper explores the current practice of inservice teacher technology training through the lens of two theoretical constructs; Roger's Diffusion of Innovations theory as it relates to technology diffusion among select groups and Vygotsky's constructivist concept of Zones of Proximal Development as applied to practicing teacher's exposure to new tools in their working environment. The approach to training teachers in the context of their own workspace is directed at exploring situated experiences with new technological tools. The relationship between these tools and their patterns and habits of pedagogical practice are described through ethnographic and quantitative data collected during an inservice technology training for K-8 teachers.

Introduction:

An acknowledged problem with the infusion of technology into the classroom environment is the relative lack of skills-training current and new teachers receive both as part of their initial preparation for certification and during inservice training provided for professional development (OTA, 1995; NCATE, 1997). Information and communication technology (ICT) is positioned in close proximity to the working environment of teachers but these practitioners may not have the necessary skills (Cuban, 2000) nor the theoretical orientation to fully utilize it. A situation exists where investments in technology (hardware and software) are not providing the benefit sought by educational policy makers and planners, either as a lever for massive, systemic transformation of learning environments or simply as a means to raising achievement scores (Becker, 1994).

While government and private sector efforts currently emphasize preservice technology training as a way of insuring that new teachers are proficient users of technology, inservice training for practicing teachers is also encouraged and local school districts invest many resources towards this effort. Various models are used in this latter area of activity. Common among these is a model where teachers are invited or encouraged to attend summer, inservice workshops which typically concentrate on a few selected skills, often focused on specific software applications. The transfer of relatively complex skills into classroom practice using this model has proven to be inefficient and problematic. Teachers may, for example, demonstrate competence in using the new skills in the workshop itself but fail to implement the new skills with technology in their classrooms. Moursund and Bielefeldt (1999) also describe the problems associated with isolated technology courses for pre-service teachers advocating an integrative approach where skills are transparently meshed with the teaching of content or pedagogical methods. Technology training programs which utilize traditional instructional design methods (broad overview followed by component skills introduction and practice) in hopes of seeding the "revolutionary" change towards socially constructive, problem-based pedagogy, would seem illogical. It is the author's view that much of this type of training is conducted in the absence of any (intentionally) applied theory. This paper describes a theory and practice based approach to teacher inservice technology training which, following Byrom's (1998) suggestions, builds on known advantages to considering curriculum practices first, communicating technology transfer through peer or practitioner relationships, and through considering the levels of complexity of the target technology. In this latter regard, proponents of technology integration into preservice and inservice education have consistently overestimated time and resources (Conte, 1997), and professional "space" needed to develop the desired levels of technology infusion. There is no unifying theory guiding the practice of using technology in education. Traditional instructional systems models are often placed alongside sociocultural practices with each proposed as an effective means for achieving the same outcome; Technology integration. Multiple theories are used in rationalizing the cost and purpose of linking certain pedagogical practices with specific information and communications technologies.

In hopes of illuminating conditions which will offer alternative considerations, this paper will explore two disassociated yet related and well known theories, applied here to a single instance of teacher inservice technology training: Vygotsky's Zone of Proximal Development and Roger's Diffusion of Innovations in technology transfer. Several characteristics of these two theories, both related to how individuals construct new perceptions and skills related to tools and practices in their immediate environment, are explored under the rubric of a "curriculum-based approach". This approach situates the skills acquisition and development within a physical and socio-cognitive proximity to the practitioners.

Even though the zone of proximal development generally refers to an early developmental and sociocognitive concept, this paper posits that it has value in exploring socially constructed knowledge among adult learners as well and is generally compatible with works by Dewey and Kolb in relation to adult learning theory. In this sense, teacher/practitioners, as adult learners, have specific learning needs related to their highly individualized and established behavior patterns and constructed knowledge. The Curriculum-Based Inservice training model used in this case first sought to capture a "snapshot" of each participant's integrated technology skills as foreground and their approach to curriculum (as practiced in their classroom) as background. This was done through the application of a self-survey instrument and individual interviews prior to the training program.

In this paper, each of these perspectives are used as a way of understanding the emerging processes of the teacher's exploration of technology skills. In particular, the concepts of "zone of comfort and proximal development" are applied to the issue of complexity (diffusion theory) in learning new technology skills in relation to existing practice. The focus of this combined theory analysis is an inservice training in central New Jersey of 18, K-8 classroom teachers, one administrator and the school's technology coordinator.

The Training Design:

The general design of the training called for a three-phase modular approach. First, teacher/participants conducted (guided by the facilitator) a pre-assessment of their own teaching with technology skills including an inventory of existing technology skills. The inventory is a detailed, incremental list of skill categories and listed sub-skills with a 5 level, self-scoring rubric[1]. Many skills assessment tools are usually directed at identifying frequency of use in basic categories of technology such as word processing, spreadsheet software or presentation software. The use of a detailed, self-scoring rubric allowed for a higher level of analysis of each participant's zone of comfort with specific sub-routines such as "manipulating an email filter to sort and organize email messages". The self scoring rubric used is represented by the following table.

Table 1.
Self-scoring Rubric for Technology Skills Self-Assessment Tool.

Level 1	Level 2	Level 3	Level 4	Level 5
I am a complete novice in this area. I do not really understand the terminology or what this function/software is about.	I have heard of this function/software or I have seen it used and know something of its potential, but I have not actually used it or learned it myself.	I understand what this is and I have used the function/software occasionally with limited success. I feel I could learn much more about this.	I understand what this function/software is and what it can be used for. I use the basic features on a regular basis in my work but I am uncomfortable explaining it to others.	I am fully familiar with this function/software and I am able to explain it to others so they may use it also. I know and use many of the more advanced features associated with this.

This was followed by a simple questionnaire which elicited information for participant profiles. An additional part of the first phase of the training was an in-depth interview between the skills trainer (the author) and the participant. In this interview, a general sense of the participant's level of comfort and prior use of technology was elicited along with anecdotal information on successful curriculum design and implementation experiences. These latter examples did not need to contain any relationship to applied technology in the classroom and were generated for purposes of establishing the participant's own orientation towards creative and constructive curriculum practices.

As a second stage to this process, teacher/participants engaged in an intensive one-week exploration of skills related to their own individualized (and shared) curriculum goals. This workshop was designed to first introduce a variety of optional uses of technology in the classroom, including modeled examples of WebQuests, PowerPoint presentation software and uses of spreadsheet software for classroom organization and assessment.

The introduction of any one of numerous "kiddie software" (as the technology coordinator called them) programs was eliminated as the teachers already had numerous opportunities in the school to review the plethora of various "learning software" packages available. The initial list of available technologies were drawn then from the office productivity package used at the school and web-based classroom activities (WebQuests). As each of the identified technologies were introduced, their component skills were demonstrated and participants were "allowed" to interrupt the presentation and seek more detailed explanation. This process led to an emerging set of skills which became the focus of small dyads and triads of teachers, working collaboratively to explore a targeted technology tool. The movement of participants from the computer lab to their own classrooms in the week prior to the beginning of the new teaching year also proved to be an essential part of exploring new skills and knowledge within these zones. This allowed for the trainer to visit with and observe the transfer of newly acquired skills in the laboratory setting into the classroom where the teacher would likely employ.

In the third and final part of the training, (which as of this writing is in the planning stage) the teachers will re-convene during the school year for a half-day consolidation workshop. Finally, follow-up assessment activities for evaluating the effectiveness of the model will include a presentation mini-conference where teachers share their progress and experiences with parents, colleagues and community members.

Applied Theory in Technology Inservice Training

Two features dominate our thinking about technology as an integrated part of the teaching process. First, current forms of ICT being promoted in classroom use are relatively new, and not generally widespread as commonly observable and accepted routines of practice, and are therefore defined as an innovation in practice. This fact should not be minimized in the overall discussion. Whatever theories are used to dissect and study the process of how innovations interact with current states of practice, one common feature holds that all innovations, as changes in patterns of behavior and culture, are difficult to instigate and direct as an intentional outcome. Secondly, teachers need to be both comfortable with and "convinced" of the adaptability of the skills being introduced to current practice as a starting point for eventual transformation of the culture of teaching and learning in their own workspace. Technology training, therefore, carries the dual burden of presenting a highly complex array of new behaviors with challenges to the basic assumptions and underlying approaches to classroom practice conducted by the teacher. Given this, it is a wonder that teachers learn any new skills at all.

Technology transfer theory has informed us that new skills and practices are best utilized when a natural process of adaptation occurs. Adaptation is described here as a process of first receiving new information, transforming the modeled practice and information to form the best "fit" between existing patterns of behavior and those previously described which then results in new forms. This process of adaptation is crucial to teachers being able to use new skills in their teaching. It requires a maximum flexibility in defining the expectations for skills development as pre-defined learning outcomes may not match the resulting experiences. Rogers, in *Diffusion of Innovations* (1995) supplied 5 essential characteristics of successful innovation adoption, based on numerous studies of how various technology innovations have been introduced, accepted and become widely used among select population groups. In regards to technology in the classroom, these 5 characteristics can be used as a framework to discuss how teachers view technology in the applied inservice training example:

Relative advantage over what it replaces:
The new technology and associated skills, at the very least, must provide some clear advantage, such as saving time, minimizing redundancy, providing a better defined product, than performing the same task without the technology. This is an often overlooked characteristic in technology inservice training. The introduction of spreadsheet applications in organizing assessment records and class lists provides a useful example. These teacher tasks are common practice which traditionally involve pencil, paper and inexpensive and readily available materials. The advantage of using grade book software (specifically designed for this function) or spreadsheets (which require teacher input into basic formatting) must be demonstrated as easily "doable" and providing an advantage over traditional methods. Several teacher/participants who, once shown how a simple spreadsheet could be used to merge information with a form letter, quickly identified this as the most relevant and desired technology skill to focus on in the first part of the intensive workshop. The reflexive process allowed them to pursue this as a small group while others worked on different skills. The teachers looking at the

spreadsheet example saw an immediate advantage to more laborious methods in communicating letters to parents which typically need to be individualized for the learner yet containing much redundant information.

Compatibility
In a similar way, the technology needs to exhibit some degree of compatibility with the existing tasks facing teachers in the classroom (in their own work) or with the perceived structure of the individual teacher's classroom practice. This is a particularly difficult area for technology proponents and educators since in the most fundamental sense, the "new technology" being promoted is actually a demand for profound changes in the most personal and basic activity of the teacher's professional performance. It follows that new technology practices which are furthest from the existing practice of the teacher are the least likely to be seen as compatible.

Complexity
This perhaps is the most important of these considerations. Rogers (and other "diffusionists") identified many instances where even though a new technology had many demonstrable advantages over existing practices, the acquisition of skills needed to manipulate and work the new technology were too complex and required a higher level of effort which made continuing with existing practice more desirable. Complexity, however, is also directly related to Vygotsky's theory in that distant actions, currently out of the reach of one's proximal development zone, appear too complex and unattainable. The gradual scaffolding of new skill acquisition can reduce the perception of complexity.

Trialability
In a linear diffusion model, trialability has to do with a prospective adopter (of new technology) being able to test or to "try out" new skills in a safe and comfortable environment. This also has interesting connotations in the present discussion for understanding a teacher's own "zone of comfort" in encountering new skills. The training model employed here allowed for a safe and non-judgmental approach to testing out new skills in an un-pressured, loosely structured training environment. The extension of the training experience from the laboratory to the classroom and further, to the demonstration of use in practice after some period of time, allows for the much needed practice, modify and reapplication cycle promoted.

Observability (of results)
Related to the perceived advantages of using a new technology is the ability to see changes and positive outcomes to adopting the new skills and technology. If the positive results of the training process were not visible, little impact would be expected.

The short training program offered teachers a technology skills training tailored to their own classroom practice. The actual training itself was first preceded by defining the participant's existing comfort level, skills and classroom practice approach and then followed by activities planned to further build on the new skills. The acquisition of new, advanced technology skills is therefore fully integrated with their teaching styles, goals, learner outcomes and curriculum standards. The expectation is that as these new skills are acquired, the teacher's own practice will undergo a transformation both to accommodate the technology and to reflect the types of instructional activities the new technology can make possible. It is further possible that the transformation of teaching will occur through the development of technology skills which lead to a more constructivist-based approach to curriculum in the classroom.

Discussion and Conclusion:

Emergent preferences for personal productivity skills which resulted from the workshop activity could reflect a desire to gain control over the technology and associated skills prior to, rather than as part of, the integration of technology use in pedagogical activity. In this way, teacher's desire to be comfortable around their computers, in the face of colleague interaction and observation by the school administration, parents and the students themselves, would be a motivational factor in the acquisition of the newly introduced skills. Teachers' own level of comfort and self-assessment allowed for clear definition of individual zones of proximal development. From this, skills training could be targeted for high levels of efficiency, with the trainer serving to help identify the closest proximal relationship between the teacher's existing patterns of classroom activity and extended uses of technology with new associated behaviors.

Even though the described training model provided for an expanded and flexible orientation to individualized training needs, the continual support and monitoring to enhance a scaffold approach developing the teacher's use of the technology is difficult to sustain. The on-site technology coordinator, who participated in the training, provides additional assistance to the teachers but must also attend to maintaining the network system, software installation, equipment maintenance and provide services to other faculty at the school. While the training design allowed for individual exploration of specific technologies, workshop participants expressed in the workshop evaluation a desire for more directed, "step by step" training. This was an unexpected outcome, where teachers who are used to traditional models of direct instruction need to be provided with a highly-structured training targeted to very specific sets of skills and technology use. Identifying key technology skills related to personal goals would seem to be verified as an effective strategy for determining training needs but then should be followed by a highly individualized module which matches a specific technology use to the teacher's self-defined training goal. Such just-in-time training can be delivered through a variety of methods but must be established in the routine of teacher's expected professional development.

Finally, by designing a workshop training is such a way as to reflect both a diffusion of innovation and constructivist approach, the success and likelihood of technology skill transfer from the training experience to the classroom in the form of adaptable, sustained practices would seem more likely. Additional study of this particular group will yield further information related to the design.

References:

Becker, H. J. (1994). How exemplary computer-using teachers differ from other teachers: Implications for realizing the potential of computers in schools. *Journal of Research on Computing in Education*, 26 (3), 291-321.

Byrom, E. (1998). *Factors influencing the effective use of technology for teaching and learning: Lessons learned from the SEIR*TEC intensive site schools.* Excerpted from the South East and Islands Regional Technology in Education Consortium Year Three Report, Greensboro, NC.

Conte, C. (1997). *The learning connection: Schools in the information age.* Washington, DC: Benton Foundation. [On-line] Available: http://www.benton.org/Library/Schools/one.html

Cuban, L. (2000). So Much High-Tech Money Invested, So Little Use and Change in Practice: How Come? Paper prepared for the *Council of Chief State School Officers' annual Technology Leadership Conference.* Washington, D.C. January.

Moursund, D., & Bielefeldt, T. (1999). Will new teachers be prepared to teach in a digital age? *A national survey on information technology in teacher education.* Santa Monica: Milken Exchange on Education Technology.

National Council for Accreditation of Teacher Education (1997). Technology and the new professional teacher: Preparing for the 21st century classroom. Accessed online, October 15, 2000: http://www.ncate.org/accred/projects/tech/tech-21.htm

Office of Technology Assessment (1995). *Teachers and technology: Making the connection.* Report Summary. Washington, DC: U.S. Government Printing Office. OTA-EHR-616.

Rogers, E. (1995). *Diffusion of Innovations.* The Free Press: New York.

Schuttloffel, M.J. (1992). A visionary leader's attempt to transform the structure of schools and the role of teachers using technology: A cautionary story. *Paper presented at the National Ethnography Forum*, University of Pennsylvania, Philadelphia, February 19, 1993.

Vygotsky L.S. (1978). *Mind in Society: The Development of Higher Psychological Processes.* Cole M.; John-Steiner V.; Scribner S.; Souberman E. Harvard University Press, Cambridge, Mass.

Vygotsky L.S. (1986). *Thought and Language.* Kozulin A. (Ed.) . The M.I.T. press, Cambridge, Mass.

The Identification of Opinion Leaders in the Elementary School

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Abstract This study focused on the identification of opinion leaders by administrators and teachers in the elementary school. The intent was to determine the extent to which opinion leaders exist in the elementary school. Three methods were utilized to identify opinion leaders within the school social network; self-designation, key-informant and sociometric. Three areas of opinion leadership: (a) school policy issues, (b) curriculum issues and, (c) technology related issues, were analyzed. Results of these methods were combined to identify teachers viewed as opinion leaders by their teacher peers. The findings reveal that teacher opinion leaders exist in the elementary schools included in this study. Fifteen of the 117 teachers included in this study were identified as opinion leaders.

Introduction

Effective school systems make adjustments to meet the changing demands of society. Changes are continually necessary in both curriculum and pedagogy. A variety of forces are responsible for driving these changes. One such force is advancement in the area of technology. Microcomputers and networking capability affect the way we communicate, store and retrieve information, and the way we learn. Consequently, many educators recognize this time of rapid technological introduction and change as pivotal in public education (Poole, 1997).

Recent school reform efforts have a rich history from the introduction of programmed readers to the implementation of 'new' math. And, although schools would seemingly appear to have vast experience in adapting to and promoting change, attempts at change have often been unsuccessful (Futrell, 1994; Zaltman, Florio, & Sikorski, 1977). Many factors contribute to this inability of our school systems to effectively make changes. Some analysts believe that a portion of the difficulty lies in the fact that key teachers within the school system have been found to stop the change process (Webster, 1994). Webster's,

(1994) study in a secondary school found that a group of senior staff members prevented the adoption of a new curriculum because they did not 'buy into' the product.

Some researchers believe that the leadership model based on a top-down approach has impeded the change process (Hofstede, 1994; Lieberman & McLaughlin, 1992). Teachers who are not consulted when planning a change often have difficulty adopting the change (Lieberman & McLaughlin, 1992). Research suggests that the organization of our educational system can be more effective when the structure permits information to flow from the bottom-up (Mehlinger, 1996; Fessler & Ungaretti, 1994; Yarger & Lee, 1994; Kelly, 1994). This allows for teacher involvement when formulating school policies and procedure. Some teachers are influential in the school system and ultimately can either promote change or prevent it (Webster, 1994).

Diffusion of innovations research examines the manner in which a change, whether a product, procedure or a way of thinking is adopted. Rogers (1995), defines diffusion as 'the process by which an innovation is communicated through certain channels over time among the members of a social system.' Communication, and particularly two-way communication of ideas is necessary for the adoption of innovation or change initiatives. When planning for change in the elementary school, it is important to understand the school social structure and the school environment (Lieberman & Miller, 1992; Hall & Hord, 1987). These two factors significantly impact the communication that occurs. Social network analysis methods allow us to examine relationships or 'ties' connecting members of a society (Scott, 1991). By examining these social structures, we can better understand the processes affected by the communication of ideas (Rogers, 1995). This understanding can then be applied to efforts for planned change in the elementary school (Harzing & Hofstede, 1996; Han, 1996; Lieberman & Miller, 1992).

One area of diffusion research analyzes the impact that certain individuals have on the adoption of a change initiative. This research indicates that some actors within a social system have a greater influence than others to promote or halt the adoption process (Rogers, 1995). Individuals who are able to influence others' behaviors on a consistent basis are identified as 'opinion leaders'. Top down, bureaucratic leadership models assume the opinion leaders to be school administrators. However, opinion leaders may be either school administrators or classroom teachers. The entity promoting a change may solicit support from these opinion leaders to facilitate the change process and aid in the improvement of our schools.

This study focused on the identification of opinion leaders by administrators and teachers in the elementary school. A comparison of the formal leadership structure (principals, vice-principals, department heads) to the informal leadership structure, that includes opinion leaders was analyzed. The study also examined relationships between opinion leadership and the specific areas of: 1) technology, 2) curriculum, and 3) school policy.

Results

It is beyond the scope of this paper to include all of the data and findings generated from this study, therefore, general information and data related to technology will be reported. For more detailed information, refer to O'Rourke (1999).

The networks (i.e., elementary school) ranged in size from 16 to 29 teachers. The average size of the networks contained 23.6 teachers. These networks included regular classroom teachers, ancillary teachers and special education teachers. The schools in this study maintained computers in the classrooms or in the library and did not have computer labs. Therefore computer resource room teachers were not part of these elementary school networks. Grades kindergarten through fifth were represented in each school. One hundred and seventeen teachers in the five schools were invited to participate in this study. Ninety-five teachers (81%) returned the questionnaire.

The results of the three different techniques used to identify opinion leadership; (1) self-designating, (2) key informant, and (3) sociometric were combined to identify teacher opinion leaders in each of the five elementary schools included in this study. Table 1. Provides an example of the data utilized to determine opinion leadership. Teachers identified by all three techniques were considered to be opinion leaders. In addition those teachers identified by two of the three techniques and to a lesser degree the third were considered to be opinion leaders.

code	self-designating	key-informant	sociometric	identified opinion leader
A101		C-P		
A231		C-T		
A001		C		
A241		C		
A002	NR			
A251	X			
A232	X	T-P		
A121	X	C-P-S	X	X
A242		P		
A122		T		
A111				
A112		T-P		
A252	X	C-T-P-S	X	X
A071				
A072	NR			
A073				

Note. NR=no response, C=curriculum, T=technology, P=school policy, S=most frequently sought out, and X=identified by that measure as an opinion leader.

Table 1. School A: Opinion leader identification

The findings revealed that teacher opinion leaders exist in the elementary schools included in this study. Two of the fifteen teacher opinion leaders were part of the school's formal structure (department heads, head teachers). Conversely, thirteen of the fifteen teacher opinion leaders did not carry formal designation as a leader in the school system. These teachers seem to constitute an informal leadership structure within the elementary schools studied. The study revealed that only one teacher identified as an opinion leader was viewed as an expert in the area of technology, in the elementary schools in this study.

Implications

An opinion leader becomes valuable to any individual promoting change within a specific environment (Krassa, 1988; Hall & Hord, 1987; Harzing & Hofstede, 1996; Rogers, 1995). Studies have found that their influence is related to the success of the adoption of a new product, a new methodology or a new technology (Beal & Rogers, 1957; Coleman, 1957). Their influence on the members of a social system can assist or hinder the efforts of a change agent (Rogers, 1995).

The integration of technology into a school's curriculum involves the adoption of such technologies by teachers. Schools choosing to incorporate instructional technologies by utilizing a top-down approach may be impeding the change process. Research suggests that the organization of our educational system can be more effective when the structure permits the information to flow from the bottom, up (Mehlinger, 1996; Fessler & Ungaretti, 1994; Yarger & Lee, 1994; Kelly, 1994). This allows teacher involvement in instructional technology decision making. Some teachers are influential in the school system and ultimately can either promote change or prevent it (Webster, 1994).

Surry and Farquhar, (1997) suggest that analysis of social factors be incorporated into the instructional development process in order to increase an innovation's use. They believe that, "instructional developers should consider the potential adoption and implementation of their products as carefully as they consider the instructional outcomes." Other researchers have also included consideration of social factors in the adoption of educational innovation process. An Environmental Analysis (Tessmer, 1991), where factors within the school setting are analyzed and considered by the instructional designer, provides information that may increase the adoption rate. When teachers and other members of a school social network involve themselves in the adoption process, the integration of the innovation is more successful (Hall and Hord, 1987; Mehlinger, 1995).

Summary

The intent of this study was to generate information concerning opinion leadership within the elementary school. The opinion leaders in this study were influential in the area of curriculum and to a lesser degree school policy issues. Leadership within the area of technology seems to be quite different from those teachers whose opinion is sought out in regard to curriculum. The administrative educational technologist was cited as most frequently sought out regarding technological issues. Some teachers were also identified as opinion leaders in this area. However, only one teacher identified as a leader in technology was identified as an opinion leader in this study. Additional research in this area could provide further explanation for the cited difficulties in educational technology integration. An examination of communication patterns and influence as they relate to the diffusion of technological innovations in schools may yield information towards an explanation of the seeming failure of many teachers to fully utilize the potential of computer technology in the classroom.

These findings suggest that the diffusion of innovation process or teachers' willingness to adopt new technologies may be promoted or impeded by the school's social structure. An individual attempting to drive change in such a school system could benefit from understanding this structure and developing a formal plan for the adoption of innovations into the classroom by teachers. They may consider seeking out the teacher opinion leaders and soliciting their support. In addition, schools may want to offer additional training to teacher opinion leaders in the area of technology. If other teachers observe these respected teachers utilizing the technology and integrating it into the curriculum, they may recognize its value.

In summary, a school's social network should be analyzed and this information applied to a plan for the diffusion of technologies into the classroom curriculum. This may help to enable individuals responsible for promoting change in schools to facilitate the adoption process.

References

Beal, G. M., & Rogers, E. M. (1954). Information sources in the adoption process of new fabrics. *Journal of Home Economics, 49,* 630-634.

Coleman, J. S., Katz, E., & Menzel, H. (1957). The diffusion on an innovation among physicians. *Sociometry, 20,* 253-270.

Fessler, R., & Ungaretti, A. (1994). Expanding opportunities for teacher leadership. In D. R. Walling (Ed.), *Teachers as leaders: Perspectives on the professional development of teachers.* Bloomington, IN: Phi Delta Kappa Educational Foundation.

Futrell, M. H. (1994). Empowering teachers as learners and leaders. In D. R. Walling (Ed.), *Teachers as leaders: Perspectives on the professional development of teachers.* Bloomington, IN: Phi Delta Kappa Educational Foundation.

Hall, G. E., & Hord, S. M. (1987). *Change in Schools.* Albany, NY: SUNY Press.

Han, S. K. (1996). Structuring relations in on-the-job networks. *Social Networks, 18,* 47-67.

Harzing, A. W. & Hofstede, G. (1996). Planned change in organizations: The influence of national culture. *Research in the Sociology of Organizations, 14,* 297-340.

Hofstede, G. (1994). *Uncommon sense about organizations.* Thousand Oaks, CA: Sage Publications.

Kelly, J. A. (1994). The national board for professional teaching standards: Toward a community of teacher leaders. In D. R. Walling, (Ed.), *Teachers as leaders: Perspectives on the professional development of teachers.* Bloomington, IN: Phi Delta Kappa Educational Foundation.

Krassa, M. A. (1988). Social groups, selective perception, and behavioral contagion in public opinion. *Social Networks, 10,* 109-136.

Lieberman, A., & McLaughlin, M. W. (1992). Networks for educational change: Powerful and problematic. *Phi Delta Kappan, 73,* 673-677.

Lieberman, A., & Miller, L. (1992). *Teachers their world and their work: Implications for school improvement.* New York: Teachers College Press.

Mehlinger, H. D. (1996). School reform in the information age. *Phi Delta Kappa, 77,* 400-407.

O'Rourke, S. L. (1999). *The identification of opinion leaders in the elementary school.* Ann Arbor, Michigan: UMI Dissertation Services.

Poole, B. J. (1997). *Education for an information age: Teaching in the computerized classroom.* Boston, Massachusetts: MaGraw Hill.

Rogers, E. M. (1995). *Diffusion of innovations.* New York: The Free Press.

Scott, J. (1991). *Social network analysis: A handbook.* London: Sage Publications.

Surry, D. W., & Farquhar, J. D. (1996). *Incorporating social factors into instructional design theory.* [Online] Available: http://www.hgb.psu.edu/bsed/intro/docs/social/, August 1, 1996.

Tessmer, M. (1990). Environmental analysis: A neglected stage on instructional design. *Educational technology research and development, 38,* 55-64.

Webster, W. E. (1994). Teachers empowerment in a time of great change. In D. R. Walling (Ed.), *Teachers as leaders: Perspectives on the professional development of teachers.* Bloomington, IN: Phi delta Kappa Educational Foundation.

Yarger, S. J., & Lee, O. (1994). The development and sustenance of instructional leadership. In D. R. Walling (Ed.), *Teachers as leaders: Perspectives on the professional development of teachers.* Bloomington, IN: Phi delta Kappa Educational Foundation.

Zaltman, G., Florio, D. H., & Sikorski, L. A. (1977). *Dynamic educational change: Models, strategies, tactics and management.* New York: The Free Press.

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The Use of Two-Way Audio Video at the University of North Texas As a Tool for Practicum Supervision

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Abstract: One of the challenges of course delivery at a distance is determining an effective method to conduct practicum supervision. In the past, educators have used a variety of strategies to observe practicum students completing their field work. On-site supervision often required extensive travel for faculty or hiring adjuncts to conduct supervision. The University of North Texas Educational Diagnostician Program is involved in a research study using EnVision, desktop conferencing software developed by Sorenson, Inc., to supervise graduate students enrolled in an advanced practicum. This paper assesses the effectiveness of the EnVison System as a tool for monitoring practicum students in the Educational Diagnostician Program.

Using Technology to Enhance Practicum Supervision

Supervision of students during a practicum is often a major challenge in distance education. On-site supervision may required extensive travel for faculty or hiring adjuncts to conduct supervision. Earlier attempts at using technology to reduce faculty travel time included video taping practicum experiences and reviewing the video tapes to provide educators with feedback. Although this practice can reduce faculty travel time, very often it is difficult to provide timely feedback to students. The technology is now available to use desktop conferencing software as a tool for practicum supervision.

The University of North Texas Educational Diagnostician Program is involved in a research study to supervise graduate students enrolled in an advanced practicum using EnVision, a desktop conferencing software developed by Sorenson, Inc. We are interested in determining the accuracy of using the two-way audio video technology for supervision purposes. Students need to pass a check out procedure for using standardized assessments. This check out involves the university student administering the standardized test using correct procedures with the instructor scoring the assessment procedure and providing feedback. Travel and time are issues for both students and faculty. Therefore, using the EnVision software, we proposed the following research questions: Does the EnVision two-way conferencing technology provide the opportunity to observe students at a distance with the accuracy required for supervision? What are the perceived benefits and limitations to using two-way conferencing technology for supervision of a practicum at a distance?

Research Project

This study involved observing thirty students enrolled in three graduate level assessment classes using EnVision software. All students participating in this study were observed administering a standardized test (Woodcock Johnson R, PIAT, or WISC III). Protocols for check out on the tests was developed by two instructors in the Educational Diagnostician Program and checked for reliability prior to beginning the study. Each student participant was observed while administering an assessment instrument by two evaluators communicating through EnVision. One evaluator was on-site with the university student administering the assessment and one evaluator was observing at a distance. Reliability was determined by comparing scores with the on-site rater and the distance rater. In addition, a questionnaire was given to all participating students prior to and following the observation to determine perceived strengths and limitations of using two-way conferencing technology.

Desktop Videoconferencing Practicum Supervision

In order to maintain the same high quality supervision during the practicum component of the assessment course through distance education, affordable technology that provides audio and video connections point-to-point is required. The EnVision software uses compressed voice and video and runs via the Internet or ordinary phone lines. For this study one computer is located at the main campus in a faculty office and one computer is located at the student's practicum site. The system includes an audio video connection and a chat function with a save and print function. While supervision is taking place, the two observers type observation notes for each other's viewing without interrupting the student's performance in the practicum experience. Using application share software the two observers are able to complete the observation simultaneously.

The pre/post questionnaire given to students helped to assess the following advantages: ease of use of the system for supervision at a distance, accuracy of observation notes, and frequency and ease of use of the EnVision System. Possible disadvantages to be assessed of the use of this technology included: cost, ease of installation and subsequent use of the Envision Software, student confidentiality, and the effect that the Envision System may have on the reliability and validity of the practicum observation.

Program Assessment Procedures

A major part of field experiences for the educational diagnostician program centers on assessment procedures. Assessment is the process of collecting data for the purpose of decision making (Salvia & Ysseldyke, 1998). Aligning the assessment procedures to provide continuous monitoring of individual progress is required for teachers to meet the definition for special education as *specialized instruction* (Dyck, Pemberton, Woods, & Sundbye, 1999). In order to provide students with disabilities an appropriate education, teachers need information about student progress in a timely, systematic fashion that can be used to make instructional decisions on a per student basis. Educational diagnosticians provide expertise in the area of assessment to individuals working with students.

Students in the program master the competencies for norm-referenced assessments, which can provide information on an individual's performance compared with the performance of many peers (Taylor, 2000). These assessments provide information ranging from academic achievement to intelligence scores, depending upon the test selected. There is a need for students to master the correct procedures required for various norm-reference assessments. The EnVision software is one way for the instructor to observe the testing situation at a distance. The chat and document share functions on the EnVision software are both available as a vehicle to provide feedback that is not interruptive of the assessment process.

Parents, teachers, medical staff and students in a day treatment center are interviewed over the EnVision system as a part of the process for conducting a Functional Behavior Assessment. The goal of the functional assessment is to provide information to use in the redesign of environments and selection of new skills to be taught. A Functional Behavior Assessment to develop a positive behavior plan is now required by the Individuals with Disabilities Education Act of 1997. Part of this assessment is gathering information from interviews, questionnaires, and direct observation.

Advantages and Challenges of the Remote Supervision Technology

There are many advantages of using technology for supervision at a distance. First, it makes it possible to observe and supervise students in remote locations. Second, because travel time is eliminated, more frequent observations and more extensive feedback can be provided. Third, the potential for interaction between the student at a distance and the faculty member is unlimited. Faculty members can see and hear the students, understand the directions, and directly view the assessment procedures and provide feedback. Fourth, this technology provides an opportunity for students and faculty to observe quality assessments. Fifth, number of opportunities to interact through interviews with others during the assessment process has increased.

Challenges to the use of remote supervision technology include amount of technical support to set up, debug, and maintain equipment. The cost to equip each site limits the number of sites available. Issues of confidentiality and protocol used during conferences must be addressed for each use of the technology.

References

Dyck, N., Pemberton, J., Woods, K. & Sundbye, N. (1999). *Creating Inclusive Schools*. Lawrence, KS: Curriculum Solutions, Inc.

Salvia, J. & Ysseldyke, J. (1998). *Assessment, 7th Ed.* Boston: Houghton Mifflin Co.

Sorenson EnVision Desktop Video Conferencing. (1999). Logan, UT: Sorenson Vision, Inc.

Taylor, R. (2000). *Assessment of Exceptional Students*. Boston: Allyn & Bacon.

Effective Use of Technology in a Distance Education Program For Educational Diagnosticians

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Abstract: The University of North Texas Educational Diagnostician Program has implemented effective uses of technology to help address the critical need for diagnosticians in the Dallas/Ft. Worth Metroplex and surrounding rural areas. Students in the Metroplex often deal with traffic back up, while students in rural areas may need to drive long distances. Technology can assist in meeting the needs of these two distinct student populations. The challenge for instructors in the program became how to use technology to support student learning without compromising the requirements of a certification program that includes a rigorous state exit examination and a high level of expertise on the job.

Program Overview

The College of Education at the University of North Texas (UNT) offers a Master's in Special Education and/or certification as an Educational Diagnostician. This degree program is designed for students who want to be employed as an Education Diagnostician or for teachers who are interested in assessment issues in the classroom. A focus of this program is directed towards Curriculum Based Assessment and the implications it holds for teachers in making curricular decisions. In addition, students will be certified to administer standardized tests including the WISC-III. The curriculum is divided between didactic courses that provide knowledge in critical areas of special education and field-based practica that address assessment skills. Upon completion of the program, students must successfully pass an ExCET examination for certification in the state of Texas. Graduates are expected to demonstrate a high level of expertise in the area of special education and assessment for employment. UNT currently has a pass rate of 98% on the ExCET examination and 100% placement of graduates of the program.

Importance of Technology for Course Delivery

There is a critical shortage of educational diagnosticians in the Dallas/Ft. Worth Metroplex and surrounding rural areas. Students in the Metroplex often deal with traffic back-ups that require a huge investment of time. Accidents or road construction on key highways can significantly impact travel. Students in rural areas often must drive long distances to access university classes. Technology can assist in meeting the needs of these diverse student populations. The challenge for instructors in the program became two-fold: Use technology to provide easy access of content for students and support student learning without compromising the requirements of a certification program. In addition, the need to supervise students during assessment procedures to ensure accuracy was critical. The entire program is now structured for course delivery in a distant education format through the use of technology. Thus, the content becomes accessible to our diverse population of students.

Program Features

The goal of the program is to develop distance education technology that enhances and supports the delivery of a quality educational diagnostician program. The main features of the distance education program are:

1. Didactic classes are delivered through an electronic, microwave-based, interactive, closed circuit two-way television system. Our program is currently using five sites, with the option of adding more as the program expands. The program time slot is from 5:30 PM to 8:30 PM on two evenings a week. Broadcasts typically originate from the UNT System Center, but most professors broadcast from each site at least once during the semester. There is a support person at each site to address technology needs. During broadcasts, the instructors may lecture, conduct a class discussion, show a video, or present information on an overhead. Faculty present lectures using PowerPoint slides. Students give presentations, discuss and ask questions, and work in small groups. There are two large television screens at each site. The instructor and students are viewed live on television screens and that image is transmitted to all sites. The camera is voice activated and projects the image of the person speaking at the time. Students and instructors interact in much the same way as they do in on-site classes.

2. A program Web site provides general information about the program, application forms, and faculty to contact for additional information. In addition, each faculty member maintains his/her own web page for courses offered. Extended syllabus, assignments, class notes, announcements, and tests are transmitted through the Web site. In addition, students' work/projects may be posted in certain classes for other students' viewing and learning. Potential students can open the Web site and view information about the program prior to enrolling.

3. Email is used to communicate with students on advising issues, assignments and updates. Assignments are often sent in as attachments. Students are encouraged to email and share information with each other as they move through the program.

4. Practicum courses are supported through EnVision, a two-way audio/video desktop conferencing software developed by Sorenson, Inc. EnVision is available on the main campus and in one of the centers of the university. Students in their final year of study can check out an EnVision software system to use on their school computer. Faculty can observe students during assessment with standardized tests through EnVision and provide immediate feedback to the student. The chat function on EnVision is used to coach the student during the assessment process, if needed. The protocol currently used for assessment supervision provides information directly to the student through the document share function. Students can also discuss data collected on Curriculum Based Assessment projects with their university faculty member in a timely manner.

Students use EnVision in a connection with a day treatment school located away from the main campus. The day treatment school is for students with emotional/behavioral disorders or other health impairments. Part of the assessment process is gathering information from interviews, questionnaires, and direct observations. Students' assignments include interviewing teachers, parents and grandparents raising students with disabilities.

Advising students, and often students' peers that are interested in university work, can also take place over the EnVision system. This face-to-face contact and the demonstration of technology are both exciting and available to current and potential students.

5. Software programs to support diagnostic report writing assignments are located in two of the main computer labs for the university: one on the main campus and one in a university center located ninety minutes away. Students also can purchase a copy of the software for home or school use. This software provides students with an opportunity to learn best practices in completing reports following diagnostic evaluations. A partnership with Ewing Solutions has provided ReportWriter software to assist students with preparing appropriate psycho-educational reports in a time efficient manner. Additional software has been purchased to score various tests and rating scales. The use of scoring software greatly reduces scorer error. With the use of technology, scoring tests and writing effective psycho-educational reports can be accomplished in a time efficient, accurate manner.

Technology is an important component of the Educational Diagnostician Program. Needs of the students, instructors, and overall program dictate the technology used. Technology serves as a tool to make a highly successful program convenient for commuter students while enhancing the learning opportunities.

Open Source and the Diffusion of Teacher Education Software

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Abstract: Three recent reports, one from the U.S. government and two from European Union related groups, indicate that the open-source software development model is gaining worldwide acceptance. This model provides a means for teacher educators to create software that is sustainable, continuously improving, and sharable. As a result, it can reduce duplicated efforts among PT3 grant recipients and reduce the risk that a project's work efforts will go unutilized when a grant's funding ends. The paper gives a brief overview of what the open-source model is, explains how it can be used to benefit the different stakeholders in a grant funded project, and discusses how it can support the diffusion of technology innovations. The paper concludes with the recommendation that the U.S. Department of Education should encourage the use of the open-source model in all department-funded projects that have a software development component.

Introduction

> "The PITAC believes the open source development model represents a viable strategy for producing high quality software through a mixture of public, private, and academic partnerships. This open source approach permits new software to be openly shared, possibly under certain conditions determined by a licensing agreement, and allows users to modify, study, or augment the software's functionality, and then redistribute the modified software under similar licensing restrictions. By its very nature, this approach offers government the additional promise of leveraging its software research investments with expertise in academia and the private sector" (President's Information Technology Advisory, 2000).

These opening comments were part of the transmittal letter for a report by the President's Information Technology Advisory Committee titled "Recommendations of the Panel on Open Source Software For High End Computing." Although the Committee chose to focus its efforts on high-performance computing, the report provided some general observations about the open-source software development model that are applicable to all types of software, including educational software. In a similar report about the open source development model, the Working Group on Libre Software, created at the initiative of the Information Society Directorate General of the European Commission, reported that:

"The impact of open source technology is expected to be quite noticeable in the software industry, and in society as a whole. It allows for novel development models, which have already been demonstrated to be especially well suited to efficiently take advantage of the work of developers spread across all corners of the planet" (Working group on Libre Software, 2000).

Another European initiative, the Information Society Technologies theme in the 5th Framework Programme of EU RTD (IST), a division of the European Commission with a budget of 3.6 billion Euro, has specified two objectives in a draft version of it 2001 Workprogramme that support free and open-source software. The first objective is "to foster in Europe a critical mass of development of free software released under GPL [General Public License] - compatible licenses." The second objective is "to make available European based support services for free software projects" (Information Society Technologies, 2000). These objectives are not likely to change before they are adopted and will be used to guide the selection of projects that the IST will fund. One can read more about GPL compatible licenses at http://www.gnu.org/.

These three reports are clear indicators that the open-source software development model is gaining worldwide acceptance. This model provides a means for teacher educators, and educational software developers in general, to create software that is sustainable, continuously improving, and sharable. An immediate benefit is that this model can reduce duplicated efforts among PT3 grant recipients and reduce the risk that a project's work efforts will be under or unutilized when a grant's funding ends. The paper gives a brief overview of what the open-source model is, explains how it can benefit the different stakeholders in a grant funded project, and discusses how it can support the diffusion of technology innovations. The paper concludes with the recommendation that the U.S. Department of Education actively encourage the development of open-source software in future requests for proposals.

Open Source

There are two forms that every computer program is stored in. The first and most commonly experienced form is as a binary executable file made up of 1s and 0s that only the computer can read and cannot be modified by anyone. The second form is as human readable computer code, source code, which can be modified at any time and used to create a binary version of the program. The open-source model facilitates the sharing of source code and the binary files. Currently, the field of teacher education, and instructional technology in general, does not have a method to facilitate sharing and building on the building blocks/source code that other community members' used to create an intervention/computer program. Software development is the only area in these fields that is confronting this limitation. Unlike academic research reports, there are no established protocols and outlets for creators of educational software to share their work with others in a way that allows for it to be critiqued and built upon. Imagine a system where professors conducted research but no one could critique their research design, data collection, or data analysis methods and statistical procedures. Researchers would not have the option of selecting which parts of the study they found useful and reusing those parts. A researcher's choices would be to use the resulting intervention as is, or start from scratch. They would also be completely dependent on someone else to update and modify the procedure used as the environment changed. There is little doubt that researchers would recognize that each environment is unique and that they needed to be in control of the tools that they use and would choose to redevelop the intervention for their target environment. This scenario is very analogous to the one that teacher educators and instructional technologists who develop software applications currently face. Researchers working in these fields lose all of the advantages of the scholarly journal system that most other fields take for granted. The benefits of the scholarly journal system are what an open-source software development model brings to the field of software development for teacher education and instructional technology in general.

The open-source model is not a set model or procedure for developing software. It is closer to a philosophy than a process. However, the development process used by most open source projects is very similar to the rapid-prototype methodologies. The biggest difference between the rapid prototype model and the model used by most open source projects is that when the first prototype is released the source code is also released for other developers and potential user to examine and offer feedback on. Opensource.org (www.opensource.org/osd.html), a leading Web site in the open source community, provides a definition of what types of software should be considered open source. According to this definition, software should be considered open source if its associated license provides for (1) free distribution, (2) a means to easily access the program's source code, (3) the ability to distribute derivative works, (4) non discrimination against any person, group, or field, (5) distribution outside of the original product, (6) a means for not contaminating the licenses of other software that work with it, and (7) equal treatment for everyone who wishes to license the software. A more complete description of these criteria and a list of associated software licenses can be found on the site.

Open Source and Stakeholders

Some of the principles embedded in the definition of what qualifies as an open-source license are probably foreign to the stakeholders involved in a grant funded software development effort. This section will briefly explain the benefits to each major stakeholder of using this model. These are some of the arguments used when members of the Shadow netWorkspace (TM) project (**http://sns.internetschools.org**) successfully convinced the University of Missouri-Columbia to allow them to distribute software using an open-source license.

Funding agencies

Funding agencies often have the goal of each project have as large an impact on the targeted audience as possible (e.g. getting the most bang for their buck). Because software developed using the open-source model has all of its source code freely available, any organization that might have a use for the program can acquire a copy of it at little or no cost to them. Established online communities such as the one at **www.sourceforge.net** provide a means to publicize and distribute an open source program to a worldwide audience at no cost to the author.

In addition to knowing that the resulting software will be free, the process of publishing the source code ensures that other researchers can build on and modify the original product. This in effect embeds the ability for the program to be sustainable and continuously improving as versions of operating system or Web browsers change. In effect, this open approach to software development allows a funding agency to lower their exposure to risk. Even if the project can't support itself when the funding discontinues and the researcher moves onto another project, the open-source model allows anyone who finds value in any piece of the work to continue building on it. The result is that the risk of a funding agencies' investment going underutilized is greatly reduced.

Universities

Most universities have a goal of increasing their name recognition to support recruiting and fundraising efforts. Because the open-source model facilitates the widest possible distribution of a software program, an organization that sponsors the development of an open-source project, vs. a closed source project, receives the widest possible exposure. A university does not give up the copyright when they license the software under an open source license. This ensures that their name will be associated will all of the project's work.

The goal of generating revenue from the work efforts of its researchers has recently gained increased attention from universities. Giving away software that a researcher produces may seem contradictory to this goal. However, this simplistic view ignores the trend in the software industry to view the industry less as a manufacturing industry and more as a service industry. Universities that promote open-source projects are in the best position to capitalize on revenue generated from the services associated with these programs. Who is someone more like to turn to for service with a product, a name that has been associated with the product from its inception or a third party? There are multiple business models that are based on selling services associated with open-source software. The most notable of these is Red Hat, a company that supplies a version of the GNU/Linux operating system and associated services.

Developers/Researchers

From a developer's perspective, the open-source model offers a means to bring the time-tested model of sharing via journals and conferences presentations to educational software development. Just as is the case with traditional publishing, mistakes (bugs) in the work are easier to identify when more people review the methods used. Solutions, modifications, and workarounds to the limitation/bugs can be openly discussed so that others can confidently build on the work effort. This allows each researcher to evaluate, select, and reuse the pieces of a work effort that are appropriate for his/her context. None of these activities are adequately facilitated by the current system of close source programs. The result is unnecessary duplicated effort among developers because they can't

As described above, by appealing to a funding agency's desire to maximize results while at the same time reducing their exposure to risk, a researcher can gain a competitive advantage when applying for funding. Proposals that commit to using an open source approach embed the concept that the project maximize the number of users while allowing others to build on the resulting work. Researchers can use these points to their advantage when competing against others who propose to develop closed source program. There is a great difference between a researcher who simply promises to make a program freely available and one who proposes to provides a means to allows others to build on every aspect of what is produced. Researchers can highlight this in their funding proposals.

By using an open-source model, developers can also take advantage of online community sites such as www.slashdot.org and www.sourceforge.net to raise awareness of their project, recruit developers, and in effect multiply their development and user testing teams. Also, because using an open-source license and taking advantage of the existing online communities will likely result in a wider distribution of a software program, researchers will likely have a larger group of users and as a result have a larger pool of potential research subjects to draw from.

Supporting Diffusion

The nature of the open-source software development model encourages and, because of the associated licenses, almost requires users to form communities to support the use of the software. Because of this, encouraging the development of the open-source software would help form communities of educational software developers filled with educators communicating and sharing reusable software programs. Communities such as this have already developed around other open-source projects such as the GNU/Linux operating system, the Apache Web server, and the Perl programming language.

Everett Rogers has identified a set of attributes, as perceived by potential users, that affect an innovation's adoption rate. The five most important attributes that Rogers identified are relative advantage, compatibility, complexity, trialability, and observability (Rogers, 1995). A short comparison between the attributes of open-source software and these attributes reveal that the open-source model holds several advantages over the currently employed closed-source model of software development. Relative advantage is the degree to which an innovation is perceived as being better than the idea it supersedes. Because the open-source model invites comments and developer contributions throughout the process, it is reasonable to expect that a more attractive product (e.g. less bugs, more desirable features, etc.) will result. "Compatibility is the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters" (Rogers, 1995). By opening up the development process and gaining increased input and possibly increased work effort, the open-source model is more likely to be compatible with the needs of a larger number of users than if it was designed and developed by only a few individuals. "Complexity is the degree to which an innovation is perceived as relatively difficult to understand and use" (Rogers, 1995). Because potential users are exposed to more options for using and participating in the development of an open-source project than a closed-source project, projects using an open-source model do run the risk of seeming more complex than closed-source projects. Developers who are aware of this can take precautions to not overwhelm potential novice users with too many options. However, because of the increased opportunity for user and developer input, a project developed using an open-source model should be able to identify any potential perceptions of complexity early on. "Trialability is the degree to which an innovation may be experimented with on a limited basis" (Rogers, 1995). Because, using the opensource.org definition described above, all open-source projects are free, they hold a clear advantage over closed-source projects in the amount of trialability they offer the user. Anyone can download an open-source project, try it out and continue to use it for as long as they like without any limitations. Although this easy trialability can be true for a closed-source program, open-source licenses allow third parties to make copies of a program and distribute it. Unlike closed source programs, it is perfectly legal for teacher "A" to make a copy of a program for teacher "B" to try out. The last major attribute that affects an innovation's rate of adoption is observability. "Observability is the degree to which the results of an innovation are visible to others" (Rogers, 1995). Rogers states, "The observability of an innovation, as perceived by members of a social system, is positively related to it rate of adoption" (Rogers, 1995). Observability is one variable that both closed and open-source projects struggle with. Because software programs in general are relatively hard to observe being used, neither open nor closed-source projects have a clear advantage in observability. However, as this paper mentioned earlier, because users of open-source software are encouraged to join a community of users, open-source software could be seen as having an advantage in observability. Although this is a very short review of the attributes that Rogers identified as affecting an innovation's rate of adoption, it is intended to raise overall awareness of the attributes of the open-source model and hopefully initiate a discussion within the research community about the merits of this approach.

Conclusion

This paper briefly reviews reports by the President's Information Technology Advisory Committee, the Working Group on Libre Software, and the Information Society Technologies theme in the 5th Framework Programme of EU

RTD all supporting the open-source model of software development. It then gives a brief overview of what the open-source model is, explains how it can benefit the stakeholders in a grant-funded project, and how it can support the diffusion of technology innovations. In light of these reports and the arguments presented in this paper, we argue that the U.S. Department of Education should encourage the development of open-source software in all department-funded projects that have a software development component.

References

Information Society Technologies (2000, November 06). *A Programme of Research, Technology Development and Demonstration Under the 5th Framework Programme* (4.2), [Web]. Available: http://www.cordis.lu/ist/workprogramme.htm [2000, November 21].

President's Information Technology Advisory Committee. (2000, September 11). *Recommendation of the Panel on Open Source Software for High End Computing*, [Report]. Washington D.C.: Author. Available: Web: http://www.ccic.gov/ac/pitac_ltr_sep11.html [2000, November 21].

Rogers, E. (1995). *Diffusion of Innovations* (4th ed.). New York: The Free Press.

Working group on Libre Software. (2000, April). *Free Software /Open Source: Information society opportunities for Europe?*, [Report]. Author. Available: http://eu.conecta.it/ [2000, November 21].

Integrating Videos Into a Business Calculus Class

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Abstract: The authors have been using Excel and Maple in their Business Calculus courses, and they have also been using WebCT for managing the class and the students. This paper discusses WebCT and the idea of producing compressed videos of class work that are made available to the students through the Internet. The videos show the students how to use the technology (for example Excel and/or Maple) within the course. The students can view the videos as often as needed and then practice the concepts while watching the video. The advantages to students, course content, and time management are obvious.

Introduction

How does one integrate technology into the classroom without neglecting the subject matter of the course? This is an area of concern when trying to include Excel and Maple into a Business Calculus class. Using Excel and Maple would afford the opportunity to discuss more "real world" type examples without getting bogged down in mountains of algebra. This would also allow students to focus on what answers and calculus concepts mean instead of focusing on algebra and rote memorization of formulas. The challenge is that students must be taught how to use Excel and Maple, as well as the class concepts, in a very finite amount of time. Students may miss class or fail to immediately understand the "how to's" of the technology. Thus the authors have introduced compressed video into their Business Calculus classroom in order to help alleviate this problem.

The authors are currently using WebCT to manage the class and the students. This allows the students to have unlimited access to grades and class announcements. The authors have also recently started the production of compressed videos of class work that are made available to the students through the Internet. This affords the opportunity of unlimited access to class work as well as class announcements. The videos must show the students how to use the technology (for example Excel and/or Maple) within the course. The students can view the videos as often as they wish and then practice the concepts on their own. The advantages to students, course content, and time management are obvious.

WebCT

WebCT is a web tool that allows the instructor to create an intricate web-based course without having to design everything "from the ground up." It allows the instructor to create, with relative ease, learning and communication tools for students within the web-site, as well as providing class management options for the instructor. The authors use it for Business Calculus and a discussion of how they use it follows; however, it is not just a web tool for mathematics classes, and one may visit the WebCT web-site at http://www.webct.com/ to obtain more general information.

The homepage can be created quite easily and the instructor controls its organization. The following is a sample of icons on the homepage:

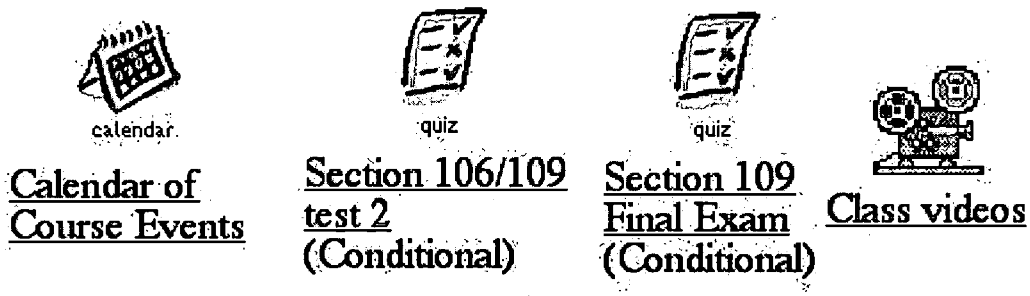


Figure 1: Icons available on the homepage.

The icons labeled "conditional" are not generally seen by the students. The instructor can program settings that specify when and how long the icon is available and also specify which students or sections are allowed to see the icon. The programming can be done through a point and click fashion within WebCT.

The calendar of course events is always available to the students. The instructor can provide messages, downloadable files, and homework assignments to the students and also include his or her own private schedule within the calendar. To view the day's assignments, the students need only to log into their WebCT account, click on the calendar icon, and then click the day of interest. The day's messages for the students are then displayed. Html code can be embedded within the calendar messages, permitting the instructor to provide downloadable files. The following is a sample of what can be seen by a student:

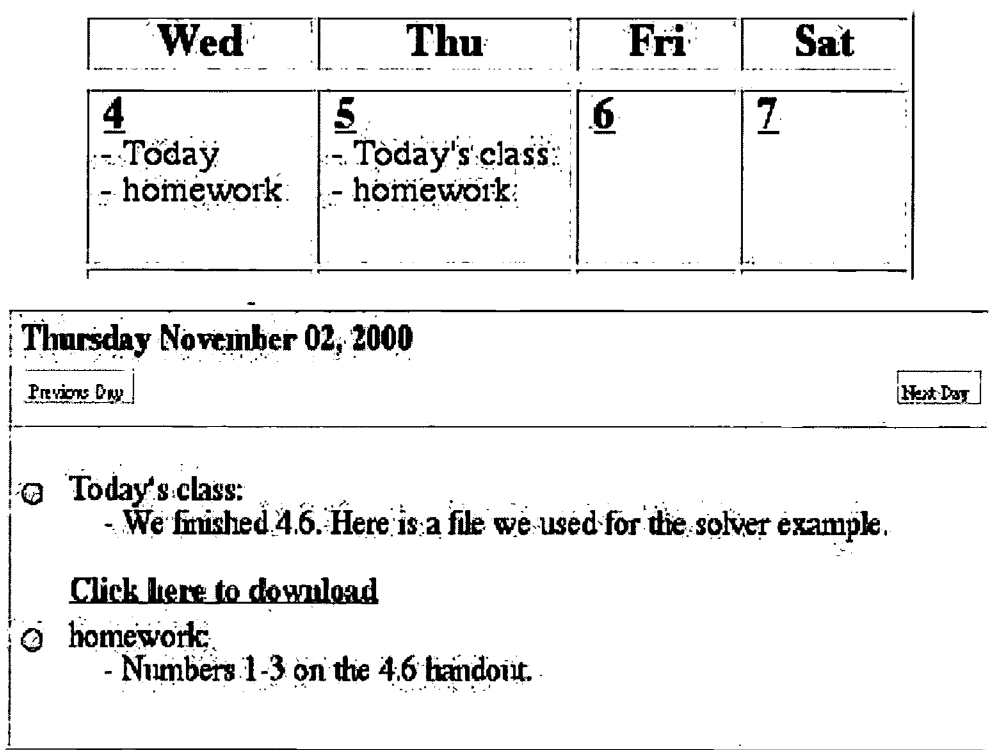


Figure 2: A sample of the Calendar of Course Events.

The instructor also has many options in managing a course or students within WebCT. Student names and grades can be stored in column format. Each column can be programmed to be viewable or hidden from student view. Each student can view, if the instructor allows it, his or her grades only and not the grades of other students. The order of student information and what is available to students is completely at the instructor's discretion. All settings can be programmed with ease. The following two figures show the point and click options for programming column settings:

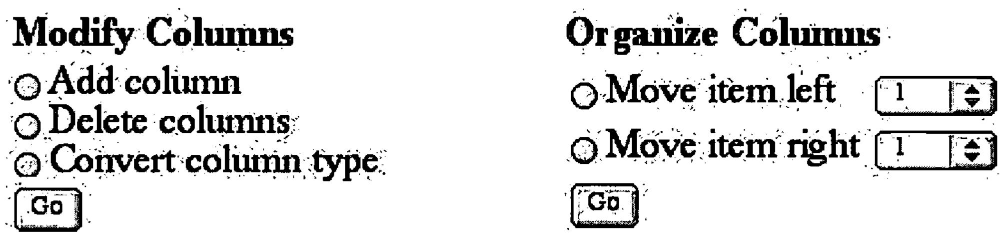


Figure 3: Column modification options.

Update

Select:	☐	☐	☐
Label:	Last Name	First Name	Final Grad
Type:	A	A	C
Alignment:	Center	Center	Right
Hidden:	No	No	Yes
Released:	Yes	Yes	No
Statistics:	---	---	None
Decimals:	---	---	All
Account Creation:	Not Shown	Not Shown	---

Figure 4: Column layout options

Tests can also be created within WebCT and graded by the instructor or by WebCT. Test questions can be categorized according to the instructor's desires. The test questions can be formatted as multiple choice, paragraph, short answer, matching, or calculated. Once a test bank has been established, an instructor can create a test within minutes, and grading can be done in seconds. In fact, it is possible to have final averages computed and available to the students within one second after the last student submits his or her exam.

Calculated questions allow the instructor to ask the same type of question, but WebCT randomly assigns different inputs, numbers for a math class, according to the instructor's specifications. All other question formats deliver the same question to each student. The following two figures show the students view of a calculated question and the instructor's editable version of the question:

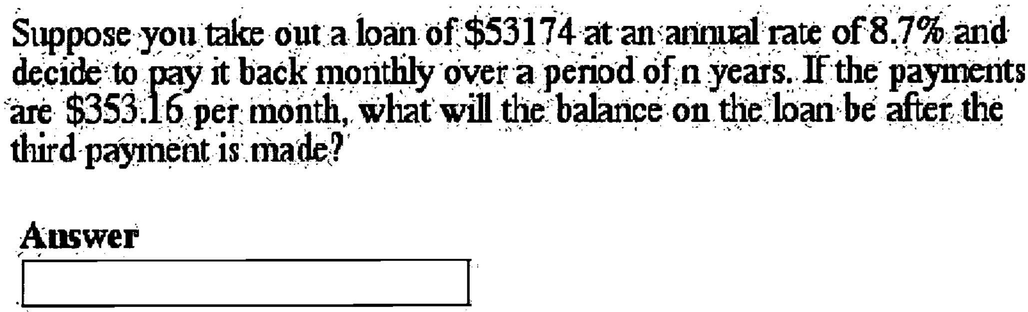


Figure 5: The student view of a calculated question

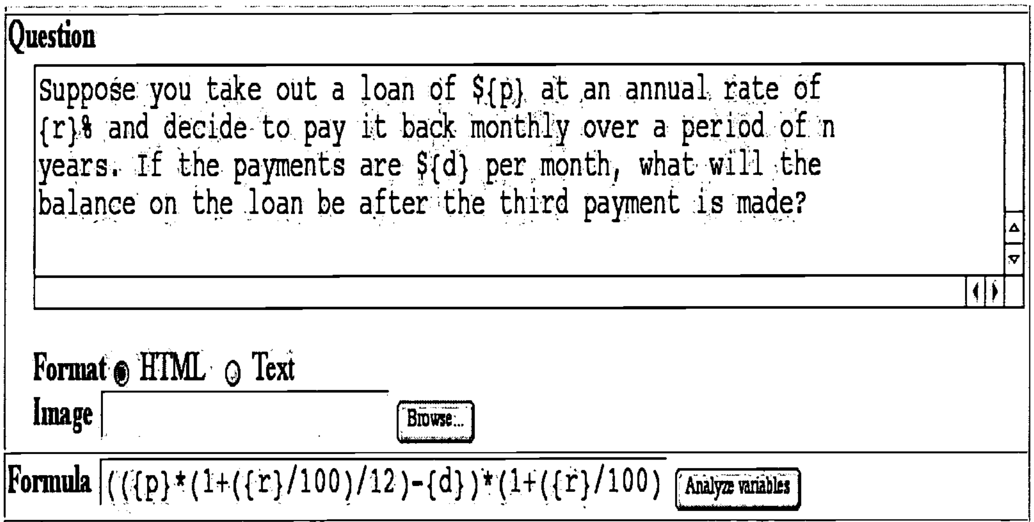
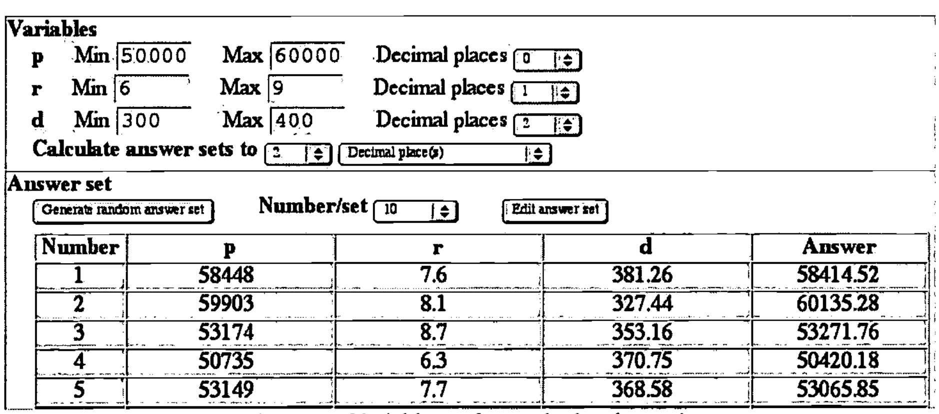


Figure 6: Part of the instructor's view of a calculated question

Once the question and formula are entered, the instructor clicks on "Analyze variables" and then enters upper and lower bounds on the variables. One then need only click on a button labeled " Generate random answer set" and the question is complete.



Number	p	r	d	Answer
1	58448	7.6	381.26	58414.52
2	59903	8.1	327.44	60135.28
3	53174	8.7	353.16	53271.76
4	50735	6.3	370.75	50420.18
5	53149	7.7	368.58	53065.85

Figure 7: Variable set for a calculated question

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Videos

The authors' Business Calculus course required extensive use of Excel, Maple, and WebCT. This afforded the opportunity of discussing more interesting "real world" problems; however, some class time had to be used to teach the use of the technology. Of course, at least one student would inevitably be absent, and others would not grasp the instructions immediately. The goal would be to maximize class time for the discussion of Business Calculus concepts while providing enough instruction on technology use for every student. With this goal in mind, the authors considered producing videos that explained class concepts and technology use.

Some problems do immediately arise. Production medium, availability, and file size are some of the major considerations. The production medium could be simply videocassettes of the class presentation; however, this seems impractical. The point is to make the movies accessible over the Internet. One could use a digital camera to create a video, but this creates a rather large file that would hamper accessibility. The video must be quickly viewable, downloadable, and contain all pertinent information for the concept.

The authors decided to use Snapz Pro, which can capture from 1 to 30 frames per second and can capture audio as it records the computer screen. Most of the videos were made on a Macintosh PowerBook G3 with color settings of 256 and a resolution setting of 640x480. Snapz Pro was set to record microphone input and record five frames per second. This produced videos of computer screen activity with audio and achieved a file size of approximately 500K per minute. Better color and resolution settings could be used to view the videos, and most of the videos required less than eight minutes. The videos were then hinted and made available on WebCT through either streaming video, or the student could download the video to his or her home computer and view it. In either case QuickTime Player was used to view the videos.

As long as students viewed the streaming video on computers with high speed Internet connections, the hinted videos worked well, unless students wanted to rewind the video. If one tried to view it with a 56K-modem connection, the results were troublesome. However, the video could be downloaded and viewed without any troubles. At present, only downloadable versions are made available so that all students can access them through any computer with an Internet connection.

The advantages of this approach are clear. The file size is not huge, so students can download and view the videos in a reasonable amount of time. Students can play, pause, rewind, fast forward, progress one frame at a time, and view the video as much as necessary.

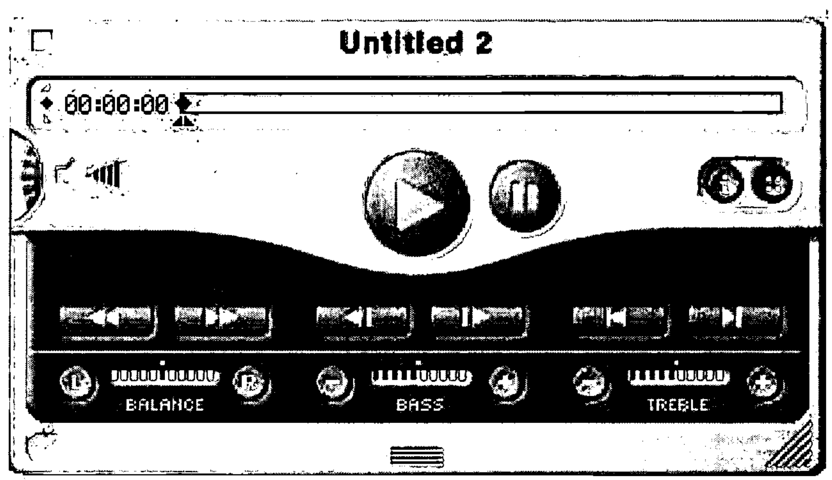

Figure 8: View of the QuickTime Player

From Figure 7 above one can see that the student has a great deal of control over the video. The students immediately see the cause and effect relationship of Excel and Maple commands and can practice them. In fact, students can work along with the video as it plays. Finally, if a student must miss class, then he or she can access the videos and keep up to date with the rest of the class.

Conclusion

By using Excel and Maple in Business Calculus, more useful examples and problems can be discussed. However, students can often have problems understanding the concepts or understanding how to use the technology. The goal is to provide plenty of instruction on how to use the technology in order to analyze the problems in the class.

WebCT is useful in helping to accomplish this goal. It is a wonderful tool for managing the students' grades as well as course content. The students can log into their accounts at any time and receive class updates. Any students that must miss class can still keep up to date with the class schedule. However, the student that misses class also misses valuable instructions that may not be communicated as well with the written word.

The present generation of students is well acquainted with computers and video of many types. Producing these class videos provide a useful tool to students in a medium to which they are accustomed. The student that must miss class can now keep up to date much better than before. The authors' students have been watching the videos, and student feedback thus far has been positive.

Implementing a Web-based Middle School Science Curriculum: An Evaluatiuon Report

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The Internet and its associated World Wide Web (WWW) have been marked by phenomenal growth and use in seemingly every aspect of life. The WWW has emerged as an area ripe for development of products that can support educational efforts at all levels. As a case in point, Active Ink Incorporated--a Texas-based firm specializing in development of web-based learning materials--has developed the eeZone Project. This project is a Science/Technology/Society (STS) on-line, web-based interdisciplinary curriculum. The intended audience is middle-school students.

Our primary purpose here is to report findings and related recommendations resulting from a year-long evaluation study of the eeZone Project. We sought to determine how teachers and students at a single South Texas middle school used the eeZone materials; what factors supported teachers' use of eeZone; and finally, what skills, knowledge, or attitudes students and teachers may have acquired along the way.

In this report, we include a review of literature, description of our method and findings, discussion, conclusions, and recommendations for the future.

Review of Literature

Criticality of Planning

Many educators agree that instructional technologies hold high potential for improving learning in the schools. However, like any major social innovation, adoption of IT by teachers is a complex, multifaceted, and lengthy evolutionary process.

One is also cautioned to remember that technology is a means--a tool which must be used thoughtfully and in planned ways. Providing hardware or using technology are not end results in and of themselves:

> Technology alone cannot improve teaching and learning. . . Technology use must be grounded firmly in curriculum goals, incorporated in sound instructional process, and deeply integrated with subject-matter content. Absent this grounding, which too often is neglected in the rush to glittery application, changes in student performance are unlikely (Baker, E.L., Herman, J.L., & Gearhart, M., 1996, p. 200).

Clearly, planning how to integrate uses of technology such as the eeZone Project into the school curriculum has emerged as one of the most critical issues facing educators and instructional technologists today. Growth of the Internet and the World Wide Web, advances in digital video technology, and the introduction of alternative, affordable storage media such as "write-able" CD-ROMs all add to the challenge of successfully integrating technology in today's school curricula.

Technology Standards for Texas Students

The Texas Education Agency (TEA) has developed a set of technology standards which closely parallel established national standards. These standards--placed as elements within the Texas Essential Knowledge and Skills (TEKS) standards--are known as TEKS for Technology Applications.

The TEKS address the acquisition of technology application skills as a continuum, progressing from the elementary to the grade twelve level. The technology TEKS are organized by benchmarks, not by grade level, so as to provide schools with flexibility in how to achieve them. Students are expected to demonstrate targeted proficiency levels before exiting second, fifth and eighth grades, respectively. Embedded within the grade clusters are four strands, or levels, with appropriate student expectations in skills and knowledge for each strand.

The first strand is the Foundation Level. Students are expected to demonstrate knowledge of hardware components. Specific skills at this level include using the correct and appropriate input and output devices, demonstrating keyboarding skills, navigating successfully within the desktop, saving files, and using peripherals.

The second strand--the Information Acquisition Level--requires that students gather varieties of information from electronic sources. This involves performing keyboard searches and navigating successfully to access information in text, audio, video, graphical, or combined modes. Students are expected to both gather the information and to evaluate the relative success of the search along with the credibility and usefulness of the acquired information.

The third area targets problem solving. Here, students are expected to create and modify problem solutions, using software to incorporate audio, video or graphic components. At this level, students also conduct research using electronic tools in order to be able to justify the recommended solution. The student should generally be able to use word processing and multimedia software to explain ideas and to solve problems.

The fourth strand is the Communication Level. Students should be able to present audiovisual information, selecting appropriate fonts, graphics, and color, all of which are geared to enhance communication. Other communication skills and knowledge include suitable printed output, consideration of monitor displays, video presentations, and use of electronic mail. The expectation is that the student should select appropriate applications in order to facilitate and evaluate communication.

The technology TEKS are useful. They provide direction to school districts, focus attention on the teaching and learning of technology skills, and encourage student and teacher use electronic communication and technology tools. The intention is a worthy one--to promote students' lifelong learning as citizens in a technological age. The goals of the eeZone Project are consistent with this orientation. By completing on-line activities within and related to eeZone, students focus on problem solving and communication--the third and fourth strands of the technology TEKS.

Constructivism and Technology Use

Constructivist conceptions about human learning have also emerged in the literature and at professional conferences as a central theme associated with technology use in the schools. The constructivist view holds that learning and knowledge construction are grounded in meaningful experience and individual meaning making. Again, we see that the design of the eeZone on-line curriculum is consistent with such a view. Jonassen (2000) asserts that students do not learn anything, per se, from computers. Rather, he argues that teachers should use computers to engage students in thinking meaningfully and representing their knowledge. Under this view, "... the most effective uses of computers in classrooms are for accessing information and interpreting, organizing, and representing personal knowledge" (p.4) rather than for studying traditional instructional software. The learning activities included in the eeZone curriculum are structured in a manner that is consistent with this view.

While the constructivist view holds appeal for many, most educators recognize that constructivist approaches must be used in balance with more traditional instructional strategies, including direct instruction.

A brief review of some of the tenets of constructivism is in order, as they serve to remind us of the need to engage students in meaningful uses of technology which foster knowledge construction. Jonassen, Peck, and Wilson (1999) provide an excellent summary of key, related views. Their views and related commentary follow:

1. **Knowledge is constructed rather than transmitted**: that is, knowledge cannot simply be handed off or passed from the teacher to the student. Rather, learners construct meaning and knowledge from experience. Technological assists here insofar as it is used to broaden students' base of experience. For instance, computer-based simulations allow students to experience a modified version of some reality such as planning a city that may not otherwise be possible. E-mail can increase students' experience in communicating with others across the country and world.
2. **Knowledge is acquired through activity**: accordingly, learners acquire knowledge by actively interacting with elements of the world around them. Instructional technologies are also consistent with this view insofar as they foster active engagement on the part of the student. It should be noted, however, that instructional software titles vary in the degree to which they require active learning.
3. **Knowledge is grounded in the learning context**: when a student interacts with phenomena in the world, acquired knowledge includes information about the context where the interaction occurred. This view suggests that teachers should be careful to help students see the linkages between computer-based learning experiences and the real world. Further, as students use technology for traditional curricular purposes, they are likely to gain separate skills and knowledge related to use of technology tools--specifically, computing skills.
4. **Meaning is subjective in the mind of the individual**: there is no absolute external meaning; people can hold common views or share meaning through the process known as social negotiation. The end result is that multiple perspectives of phenomena exist across individuals. Computers can foster shared meaning and social negotiation by bring individuals together to work on technology-based products such as multimedia presentations or web pages. Of course, e-mail and on-line chatting or discussion groups directly facilitate communication among individuals, which is at the heart of the matter.
5. **A student's interest in solving a problem or resolving some type of perceived dissonance will prompt that student's ownership of the learning task and increase relevance and meaningfulness**. Many students find the very use of computers or other types of technology such as video equipment inherently interesting. Many teachers report that this increased interest increases students' ownership of the learning task. For instance, a student might have greater ownership of producing a computer-based presentation than of producing a traditional essay.
6. **To truly learn and generate knowledge, the learner must articulate and reflect upon relevant learning experiences**. When used as a communication tool--whether for word processing or developing a multimedia presentation--the computer supports articulation of experience.
7. **Meaning may be shared with others**: learning is often a social process, and conversation can prompt meaning making. So called knowledge-building and conversation communities are natural extensions of this view. Technology supports the sharing of meaning when students use the computer to communicate with others. Engaging students in group projects also fosters conversation.
8. **Meaning is distributed within communities**. Our interaction with other members of a community influence our beliefs and knowledge. Again, technology can bring students together and further communication, thereby supporting interaction with others.
9. **Not all meanings are equally valid**. The viability of knowledge is determined by its acceptance and the degree to which it is acted upon. Technology can assist teachers and students in determining the validity of given meaning because it allows for the amplification and sharing of ideas.

Constructivist views remind us to place the learner at the heart of the schooling enterprise and to plan for learning experiences that will be meaningful and engaging to students. However, the views should be kept in balance. Fisher, Dwyer, and Yocam (1996), in discussing the Apple Classroom of Tomorrow (ACOT) project, offer related commentary: "Mature ACOT sites tend to balance use of direct instruction with a collaborative and inquiry-driven knowledge-construction approach to teaching and learning" (p. 8).

Educators should thus keep in mind that using computers to deliver test preparation software or other inflexible, commercially produced instructional software is insufficient. Rather, these uses should be balanced with more constructive activities involving analysis and display of data, communication between people, and development of multimedia and web-based products. It seems clear that the design of the eeZone Project is consistent with the conceptions about constructivism just described.

Purpose of the Study

Although leaders in the field of instructional technology have urged educators to include multimedia and instructional software as integral components of teaching and learning in schools, many teachers still struggle to meet the challenge.

The purpose of this study was to examine the implementation of a Science/Technology/Society (STS) on-line, web-based interdisciplinary curriculum to learn how its use affected teaching and learning at one South Texas middle school. The following research questions guided this investigation.

1. How do teachers use the eeZone materials to support student learning?
2. What conditions or factors support teachers' use of the eeZone online curriculum?
3. What knowledge, skills, and/or attitudes have students and teachers acquired through their participation in the eeZone online project?

Method

Participants

Participant informants in this qualitative case study included all of the eighth-grade teachers at one suburban South Texas middle school campus, their students, and the media specialist who also acted as a mentor for the project. The fifteen eighth-grade teachers were arranged in three teaching teams. Each team consisted of five teachers: two language arts teachers, one science, one math, and one social studies teacher. The teachers represented a variety of experience levels ranging from two to 38 years with the average years of teaching experience being 13. There were 12 female and three male teachers. Although one team had piloted the eeZone materials the previous year, the other two teams had never used the on-line eeZone curriculum prior to the 1999-2000 school year.

Data Collection

Data were collected through interviews, conversations, observations, and analysis of program documents and products. The use of multiple data sources allowed us to compare and cross check the consistency and validity of the data collected. Triangulation of data was also utilized to limit the effects of researcher bias.

Interviews

Interviews were conducted with both teachers and students regarding their use of the eeZone curriculum. While formal interviews were scheduled with individual teachers, we also met with teams of teachers in focus groups. Interviews with students were never scheduled, but were conducted randomly during site visits. A generalized interview guide approach (Patton, 1990) was utilized. Prior to conducting interviews, we identified a few key questions we wanted to explore with each respondent, but allowed the conversations with teachers and students to unfold based on their comments and interests. This allowed us to elicit certain information from every participant without rigidly structuring the conversation. Such an approach was found to be more responsive to individual participants expectations and concerns. The open-ended nature of the questions allowed respondents to share their unique perspectives without being limited by boundaries imposed by a rigid interview protocol. All of the interviews were conducted at the middle school. Formal interviews were audiotaped and transcribed.

Observations

In addition to interviews, we observed teachers and students engaged in eeZone activities. In September of 1999, we joined the eighth grade teachers for the initial training on the implementation of the eeZone curriculum. Throughout the year, we observed classes working on eeZone projects in the computer lab and in their classrooms. Field notes were recorded during site visits.

Documents and Products

Document and product analysis also contributed to our understanding of how the eeZone curriculum affected teaching and learning. We first reviewed the eeZone on line curriculum and even registered as users so that we were able to monitor the ActiveInk web site. We also monitored teachers entries to the Working Circles, an on-line reflective journal allowing teachers to log comments or responses to key learning questions. Some of the questions posed included:

1. How do technical problems affect student learning?
2. Does eeZone address our curriculum?
3. How does the technology of eeZone help students gain real-world skills?

Student products reviewed included maps, graphs, charts, and Power Point presentations. We also reviewed teacher products such as lesson plans and teacher-generated teaching materials.

Data Analysis

In order to bring structure and meaning to the mass of collected data, inductive processes of data analysis were employed. The use of inductive analysis allowed patterns, themes, and categories to emerge from the data. After each site visit, audiotaped interviews were transcribed and field notes reviewed. Interpretations and emerging patterns and themes related to the data were noted and recorded in quarterly reports.

Findings

Three major themes emerged from the data.

THEME 1: Implementation of the eeZone Online curriculum was inconsistent and hampered by unavailability of computing equipment, experience levels of team members, and other internal and external factors.

Calallen teachers and students got a late start on eeZone projects due to external factors such as lack of computers and the lateness of some projects coming on-line. Although teachers participated in the initial eeZone training in September 1999, implementation of the curriculum began in January 2000. The late start was due primarily to unavailability of classroom computers for some of the participating teachers. Although some teachers had classroom computers, teams delayed implementation until all team members were equipped with the necessary computer hardware. Unfortunately the computers were not received until late in the fall semester. In addition, some of the eeZone projects were not posted on-line until January. Many teachers reported that the lack of equipment and slow posting of some eeZone projects on-line significantly delayed their efforts to implement eeZone projects earlier in the school year.

Internal factors such as lack of time and experience and stress due to TAAS testing also contributed to the late start. Many teachers reported that even after the computers were delivered and all of the eezZone projects were on-line, they delayed implementation of projects so that they could prepare their students for the February administration of the Texas Assessment of Academic Skills. Even though math, science, and social studies teachers were not directly involved in the February testing, teams delayed projects while language arts teachers were focused on TAAS testing. As a result, all three of the eighth grade teams got late starts on eeZone projects. Once projects were initiated, many teachers temporarily abandoned their projects to prepare for the April administration of the TAAS. Overall, it seemed that the emphasis on high-stakes testing drew teachers' and students' attention away from eeZone.

Teachers' level of experience also affected their implementation of eeZone projects. The value of related prior experience was evident. For example, the Eagles team, composed almost entirely of teachers who worked with the eeZone Project last year, completed more eeZone project activities and exhibited a higher level of confidence. Teachers also reported that it took a great deal of preparation to integrate eeZone into their existing curriculum and identify related TEKS. Most teachers suggested that it would save them a great deal of time if ActiveInk would clearly identify TEKS related to eeZone project activities. However, by the end of the school year, all teams had initiated a project related to their discipline and aligned with state mandated TEKS.

Overall, teachers' comfort levels with eeZone projects varied based upon their prior experiences. However, teachers viewed the 1999-2000 academic year as a learning experience and felt that they would be more proficient in using the eeZone Online curriculum next year. One teacher summed it up this way:

> I don't feel like we've accomplished our objectives this year because of the late start. Next year I'd like to see better coordination between the teachers on my team. But next year we will be ready because we have developed more skills. I think we did pretty good this year. You know, the first year, you get your feet wet. The second year you do better, but the third year, we will have great coordination and it should be terrific (Lowe, 5-11-00).

THEME 2: Critical support for teachers implementing the eeZone Online curriculum came from other teachers on their campus.

As is common with any instructional innovation, the teachers often felt uncomfortable and incompetent during initial attempts at implementation. Most of the teachers were unfamiliar with the use of eeZones web-based software and initially weren't sure that the eeZone curriculum would help them meet the instructional standards mandated by the Texas Essential Knowledge and Skills (TEKS). In addition, some teachers expressed difficulty understanding how the inquiry-based environmental eeZone projects fit into their existing curriculum. Several teachers described themselves as technology illiterate. Although they used computers for word processing, they had little experience with utilizing technology and multimedia in their instructional practices. As a result, they initially expressed anxiety and frustration about their abilities to utilize the eeZone program.

The technology specialist on the campus who also served as the eeZone project mentor provided critical support for the teachers. The project mentor acted as the liaison between ActiveInk and the pilot teachers. She reported concerns and difficulties to the software designers and provided trouble-shooting expertise when teachers experienced problems with hardware or software. She also assisted teachers in the computer lab and made classroom visits. The specialist also provided training for the teachers in the use of digital cameras and software programs such as Excel and Power Point.

The technology specialist also assisted teachers in their efforts to relate the online projects to local environmental concerns. For example, when the teachers chose the eeZone graffiti and landfill projects for their classes, she copied related articles from the newspaper and regularly distributed them to the teachers. She even participated in a field trip to the local landfill with one of the teams.

On the whole, the teachers expressed much appreciation for the support that the technology specialist provided. Teachers indicated that her support was instrumental in their successful implementation of the eeZone projects.

Teachers also reported that their peers provided valuable support. Since teachers planned as teams, they had opportunities to share successful strategies or materials with other team members. This was particularly evident on the team that piloted the eeZone materials the previous school year. One of the language arts teachers on the team was new to the campus. She was very positive about her participation in the eeZone project. We found this surprising since many of the other teachers who had never previously used eeZone seemed much more uncomfortable than she did. When we questioned her more closely, she credited the other members of her team with giving her the support and encouragement she needed to feel successful. She reported:

> We started with the waste project because we felt we would have an advantage going in that direction since the other teachers on my team used it last year. They know where they had problems and they have new ideas about what they want to do this year. So I am

really leaning on the experience of the other team members because they have done it before and they share ideas during team meetings. (Brown, 2-28-00)

Overall, teachers shared materials and ideas with one another and tried to provide assistance to team member who were experiencing difficulty. They indicated that teaming provided a support mechanism that was readily available and trustworthy.

THEME 3: Teachers enhanced their technology skills as a result of their participation in the eeZone projects.

Both teachers and students perceived that their personal technology skills improved as a result of their participation in the eeZone project. While improving students technology skills was clearly an anticipated outcome of the schools participation in the program, improving teachers technology skills was an added benefit. During interviews, teachers often reported increased competence and confidence with regard to the use of computers and multimedia in planning and delivering instruction. Their new found competence and confidence went beyond the use of eeZone software, extending into other computer uses and applications.

The teachers reported that one factor significantly contributing to their enhanced technology skills was increased access to computers. Many of the teachers had never had a computer available in their classrooms prior to receiving one through the eeZone pilot program. Teachers noted that once they had a computer in their classrooms, they began to experiment with new software, to review web sites that could be used to enhance instructional units, and to generally increase the use of technology in classroom instruction.

At the end of the 1999-2000 school year, one of the participating math teachers decided to leave the school district to pursue a Masters degree in educational technology. He credited his experiences with the eeZone project as the catalyst that sparked his decision. He reported:

> Before the computer was put in my room, before I was made to do eeZone, I had been through some computer workshops. But I didn't feel confident. Now I feel confident that I can do computer work, that I can do research. I can do downloading; I can converse with others through e-mail. I can get on the computer, go to sites, answer questions. I feel a lot more confident. On a scale of one to ten (10 being the highest level of competence), I was about a three at the beginning of the school year, now I'm about a six. Yeah, I'm much better, more confident. That's why I applied for the technology/math program in San Antonio (Villarreal, 5-11-00).

Even teachers who described themselves as technology illiterate or anxious at the beginning of the year, perceived that their computer skills had improved. The social studies teacher on the Patriots team provided one such example:

> At first, I wasn't real sure what to do with it [eeZone Online materials]. I was pretty technology illiterate. I began to play around with itÉlearning how to do new things. As a result, I've improved my computer skills. It has made my planning much easier. I've started using a computer grade book and, boy, that has really been great. I'm doing projects I haven't been capable of before, but there's a lot more Id like to learn. On a scale of one to ten, I was about a two in using computers, now I think I'm about a six. I like it. I've always been a book, pencil, and paper kind of teacher. I don't like to play games. I don't think kids benefit from that when they go to high school. But computers are different. That will be something that will help kids when they go to high school (Lowe, 5-11-00).

On the whole, teachers credited their enhanced computer knowledge and skills to the increased availability of computers. They also perceived that their classroom instruction improved as a result of their enhanced technology skills.

Discussion and Conclusions

Our evaluation produced some positive findings while also revealing some pitfalls associated with implementation of an on-line curriculum project such as eeZone.

On the positive side, our study revealed that the project empowered some teachers in the use of the computer for instruction. Many teachers reported a gain in skills and confidence in computer use. Teachers also expressed how much a skilled technology mentor can contribute to successful project implementation by providing moral and technical support and general encouragement. These findings suggest that use of a project such as eeZone can have positive effects on development of teachers' computing skills. They also support the view that a strong on-campus technology leader and mentor can have a powerful influence on teacher behavior relative to implementing a project such as eeZone.

Students also expressed positive views concerning use of the eeZone curriculum. They were generally enthusiastic about their on-line learning experiences, seeing them as a favorable, more active alternative to traditional classroom instruction. Some students who worked on the waste project indicated that their awareness of how much trash they generate increased. Others stated that they had learned how to use electronic mail in conjunction with their eeZone work in order to receive directions from a teacher. Some developed multimedia presentations on their eeZone research. Clearly, the majority of students enjoyed using the materials and found the experience to be fun. This suggests that students are likely to find future interactive web-based science curricula such as the eeZone project both appealing and motivating.

While positive outcomes resulted from use of eeZone in the school, certain problems related to implementation also emerged. Foremost among these was uneven implementation. In some cases, teachers waited until the last two months of the school year to begin using eeZone with their students. Such a delay in using the on-line materials certainly undermines the likelihood of providing students with a rich, deep, and meaningful learning experience. Problems obtaining computing-equipment for the project no doubt hampered things at the start; however, as time wore on, lack of motivation on the part of some teachers to "get to it" seems another major cause of the weak implementation. Teams which lacked a member with eeZone experience or strong technology skills were also hindered when it came to implementing.

Teachers also delayed use of eeZone due to concern about preparing students for the Texas Assessment of Academic Skills (TAAS). Others expressed uncertainty as to possible linkages between eeZone and the Texas Essential Knowledge and Skills (TEKS). Addressing teachers' concerns in these areas would do much to foster more timely, sustained implementation of the project.

Recommendations for the Future

Based upon the findings of our study, we offer the following recommendations:

1. **Establish time-certain milestones for project implementation**: rather than providing teachers with free reign as to when they will complete project activities, establish a timeline for achieving milestones and try to monitor and hold them accountable.
2. **Ensure that each eeZone team includes an experienced user whenever possible**: encourage formation of teams to include an experienced eeZone or technology user as a support mechanism for the less experienced teachers. In this regard, a general strategy would be to build on teachers' previous successes using eeZone.
3. **Provide additional, accessible teacher support materials to foster stronger implementation**: in many cases, teachers failed to see how eeZone might contribute to students preparation for TAAS or how it correlated with the TEKS. Support materials--possibly in print format--providing explicit guidance in these two areas might do much to encourage greater and more timely implementation.

Closing Thoughts

The development and implementation of the eeZone Project represented a massive undertaking. As with most human endeavors, the effort at the school we focused upon produced positive results along with ideas for "how to do it better" in the future. For some involved teachers, lack of follow-though emerged as a prime cause of poor and less than timely implementation of the project. On the positive side, students expressed appreciation for eeZone as an interesting and fun alternative to more typical learning activities. Teachers too indicated that their technology skills improved due to their involvement with the project.

In sum, the evolution of projects such as eeZone holds great promise for engaging students in powerful on-line learning activities that relate to the real world.

References

Baker, E.L., Herman, J.L., & Gearhart, M., (1996). Does technology work in schools? Why evaluation cannot tell the full story. In C. Fisher, D.C. Dwyer, K. Yocam (Eds.), Education and technology: Reflections on computing in classrooms. San Francisco, CA: Jossey-Bass.

Fisher, C., Dwyer, D.C., & Yocam, K., (1996). The Apple classrooms of tomorrow: An overview. In C. Fisher, D.C. Dwyer, K. Yocam (Eds.), Education and technology: Reflections on computing in classrooms. San Francisco, CA: Jossey-Bass.

Jonassen, D.H. (2000). Computers as mindtools for schools: Engaging critical thinking (2nd ed.) Upper Saddle River, NJ: Merrill.

Jonassen, D.H., Peck, K.L., & Wilson, B.G. (1999). Learning with technology: A constructivist perspective. Upper Saddle River, NJ: Merrill.

Patton, M. Q. (1990). Qualitative Evaluation and Research Methods. (2nd ed.). Newbury Park: Sage Publications.

WEB-LIBRARY

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Abstract: This paper presents an effective use of the World Wide Web by schools. This is a multidisciplinary proposal intended to integrate disciplines from the school curriculum in a common project. A description of the steps to develop this virtual school library for its use as a tool in the everyday process of teaching and learning is provided. School teachers have tested this Web-library and their comments greatly contributed to the paper.

Introduction

It is difficult and challenging to find new ways of teaching and organizing information. Any learning experience today involves not only the mastering of the fundamental concepts in the field but also, the use of technologies (Bruce, & Levin, 1997). Nowadays, the improvements in educational technology help educators to deal with completely different methods of teaching and organizing knowledge (Nicaise, 1998). Computers and the Internet open the door to thousands of possibilities, hence a lot of ways of exploiting those possibilities.

The Benefits of the Internet

A recent study of uses and impacts of the Internet, WWW, and related technologies in community colleges found that library and learning resources are seen as the application with the most potential positive impact on students' outcomes and institutional effectiveness (Layton, 1997). The Internet has become the least expensive method for communicating and distributing information (Friedman, McGrath, & Barron, 1997).

Projects that include technology help in improving people's fluency with information technology. This fluency is defined as the key to survive in the current and future world by the Committee on Information Literacy (1999).

The Purpose and Advantages of the Web-library

Our proposal is to build a library according to the school needs and not just to explore somebody else's creation. It differs from others in the sense that it points to the creation of the site by those who will be the potential users.

This library source will cover the areas required in the curriculum, because the teachers of those areas will be involved in the organization and design of the site.

The material will be considered as *owned* because teachers will feel they are not adopting something imposed, as software. The difference is marked by the relationship of what teachers and students are doing in the process of exploring learning: Either following somebody else's agenda, or following their own (Papert, 1993).

The material will be customizable since the users will be able to edit or add things as they use it, so it will be *framed to their needs*; it will answer to the needs of that school and for the time it is created, but with the potentiality of updating and customizing.

Our purpose is to encourage schoolteachers, staff, students, and parents to create a space on the WWW that will function as a source of information, a non-linear library made by hyperlink connections, for their use as a tool in the everyday process of teaching and learning.

This cyberspace would be unique to each school, though it will contain documents, which are shared with all the Internet community. The sense of uniqueness is given by the way this documents are selected and organized from a huge amount of possibilities.

The implementation of this virtual library will save the time spent in exploring sites at random, and will allow teachers and students to make immediate use of the information already evaluated, selected and appropriately listed in the web library.

This project can equip educators with a new dynamic teaching tool and addresses the national science education standards since the students can apply the information that they gather with the Internet to solve real-world problems. The data that students can collect can be obtained for real sources of scientific research, then making the learning experience an absolutely real scientific work.

Project Development

The actions proposed to carry on this project can be synthesized in these terms: engaging, building, using, maintaining, and the cycle will be constantly looping.

Now that the advantages of this approach have been considered, the stages to develop the project will be described. First the basic requirements to start the project will be mentioned, and next detailed steps to carry it on.

Assuming that schools will be provided with Internet connections, the ideal situation for carrying on this project would be several computers in the classroom where the users can access and retrieve the data on demand.

This project will need the involvement of member of the school personnel (or PTA) with Internet skills, that is with the ability to communicate using e-mail, browse the Internet, develop a web site, and be able to solve the basic problems encountered in the process from browsing to publishing. A person aware not only of the advantages that the information super highway can bring to the class, but also the danger of the misuse or irresponsible use of it, if necessary and agreement on the possibility of a previous training should be considered. This is a very important point that shouldn't be disregarded. Eastwood et al. (1998) affirm that unless staff development is properly addressed, infrastructure per se will do little to improve teaching and learning.

Then it is necessary to group those that will be in charge of starting to develop the project, taking into consideration computer skills, areas of study, and position in the school.

The number of individuals that have to compose the team should be determined by the scope that the school want to bring to the project, a minimum of one teacher and student per area of study should be involved, though more people in the same area make more sense because in the process of selection of the information various criteria would help a better result.

Once the school is engaged in this project, the starting point will be developing a productive and time-efficient search approach. The process that goes from collecting data to using that data as knowledge base resource will follow these steps:

1- *Determining the Needs*: The first step will be to decide what are the most important topics that will be included in this bank of information. To decide about the topics the team will have to consider items that are shared by various disciplines, are taught in various grades at different levels, and are still subject of study in many areas so they are constantly updated

2-*Collection of Data*: There are several factors to consider in data collection to make it more efficient and organized: a- Who will look for the information? b- How long will be devoted to the collection of data within the whole duration of the project? c-What amount and what type of information shall be considered?, d- How will the information be stored?

3- *Search Strategies* : Learning about the Internet search tools and some of their strengths and weaknesses should be included in an outline to follow a search plan.

4- *Assessing the quality of information*: Because the web is available to almost anyone with access to a computer, teachers must assess the quality and trustworthiness of the information they have accessed. This task can be accomplished having in mind the following aspects: The scope of the information, the audience form whom it is intended, the author, the publishing body, the currency and treatment of the information, and the ease of use (Fenton & Repass, 1999).

5- *Documenting the search:* The final outcome of the preceding work is a list or database that will document the search. This list will be the one that the school will use as a knowledge base resource. This will not differ much from an ordinary library card or a catalog.

6-*Development of the web-library site*: The team will design and create a website which will host the selected information resulting from the search process. This will be the visible outcome of the project.

7- *Maintenance*: The group must be in charge of keeping the library web pages updated.

Online Test Version of the Web Library

The web site developed as a result of this project can be found on the Internet at http://www.students.uiuc.edu/~scagnoli/weblibrary/. This is a version that we developed for the schools that we invited to test and explore its usability. The site consists of

- *A Front Page*: This introduces the idea of the project and explains how to use it.
- *A Search Page*: That will allow users to type in the topic and search by category, topic, name of the site or keywords
- *Results for their search*: The results will be displayed in order of relevance with the topic.
- *List by Categories*: Users can select any of the categories displayed on the menu and a complete list of all sites in that category is showed on the screen. They can access to the site by clicking on the URL (Fig. 1).
- *Add a Site page*: A form that allows users to add new sites to the library (Fig. 2).
- *Edit a Site page*: With the same procedure that the sites are added they can be updated or deleted.
- *Add/Edit a Category page*: The sites are indexed according to disciplines or categories. In this case the categories correspond to the main areas in the school curriculum. They can be added/edited or deleted from the web library when necessary.
- *Add/Edit a Sub-Category page*: Categories can be divided into sub-topics.

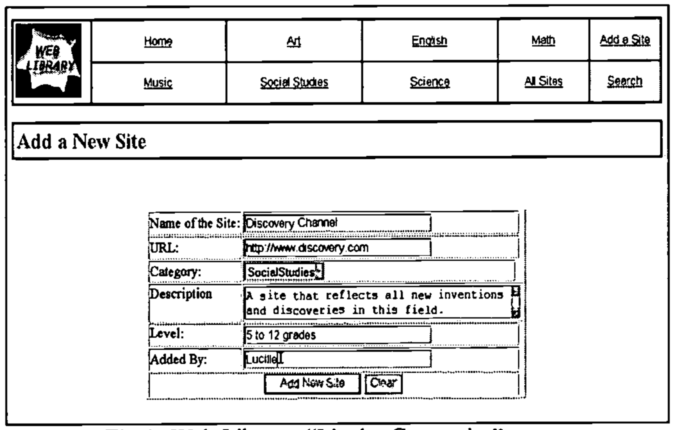

Fig 1- Web Library: "List by Categories" screen

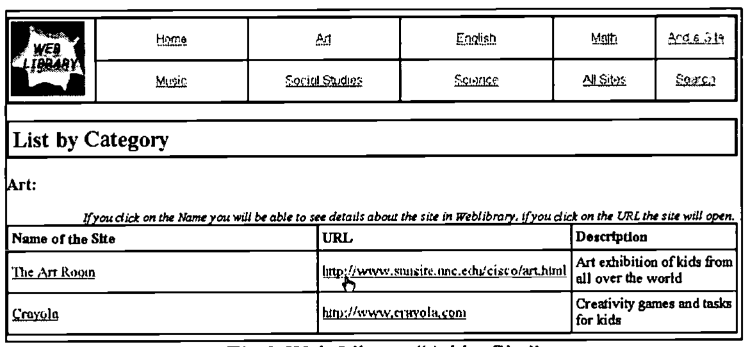

Fig 2-Web Library "Add a Site" screen

Conclusions

Most schools are in the technology game. This web library proposes a customized guide achieved by the collaborative work of the school people, which will ensure saving time, sharing expertise and encouraging involvement. This project has been presented in schools in Urbana Illinois, USA (Urbana Middle School and Martin Luther King Elementary School) and their feedback has been used to improve the project. Since we believe in the usability of the project we plan to expand its scope making it available to larger audiences and other school settings.

References

Bruce, B. C., & Levin, J. A. (1997). Educational technology: Media for inquiry, communication, construction, and expression. Journal of Educational Computing Research, 17(1), 79-102.

Committee on Information Technology Literacy, National Research Council (1999). Being fluent with information technology. Washington, DC: National Academy Press.

Eastwood, K., Harmory, D., & Chamberlain, C. (1998). Opening the electronic doorway into classrooms: How one school district joined the technology revolution. Learning & Leading with Technology, 26 (1), 48-52.

Fenton, S. & Repass, G. (1999) The search dilemma. In Fishing for web treasures: A comprehensive guide. Technology & Learning, 19 (2), 22-23.

Friedman, E. A., McGrath, B., & Baron, J. (1997). Web adventures in K-12 science. Technos, 6 (4), 21-24.

Layton, J. D. (1997). Community college and the Internet: Uses and impacts. Unpublished dissertation thesis, University of Illinois, Urbana-Champaign.

Nicaise, M. (1998). Cognitive research, learning theory and software design: The virtual library. Journal of Educational Computer Research, 18(2), 105-121.

Papert, S. (1993). The children's machine. New York: BasicBooks.

Planning Makes "Perfect?" - A Comprehensive Look at Successful Implementation of Technology and Teaching at a Major University

Abstract: Temple University has demonstrated success at infusing technology and at implementing innovative approaches to teacher education. This presentation is comprised in five segments that address successful strategies and programs at different university levels: university, college, department, course, and community/school district collaboration. Each segment will address specific topics such as Preservice Teacher Education, technology diffusion, faculty development, and diversity. One of the primary goals of this presentation is to connect strategic planning at the university and college levels with successful implementation of innovative programming at the program, course, and community/school district levels. Presenters include faculty, professional staff, and graduate students.

University Level: Temple University Instructional Technology Planning

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Major comprehensive changes in technology planning began in 1994 in conjunction with the establishment of a "Teaching-Learning Technology Roundtable" (TLTR) at Temple University -- (the first developed in accordance with American Association for Higher Education (AAHE) guidelines). This resulted in University-wide emphasis on the theme that "curriculum and instruction should drive technology" (instead of having technology drive curriculum and instruction).

This paper is written from one faculty member's perspective, based on TLTR and TLTR Academic Planning Committee (TLTR-APC) membership since 1995. Much information reported previously was presented in TLTR-APC or TLTR documents. Many people collaborated in developing ideas and procedures that serve as the foundation for Temple University's planning processes and results. Though certainly not "perfect," it is this author's view that Temple's approach to technology planning has stimulated much more thought and discussion about programmatic planning than existed previously at Temple. Comments in this paper about TLTR activities at Temple mainly focus on University and College annual IT planning processes; however, it should be acknowledged that other TLTR committees have made similar positive contributions. For example, one committee was closely involved in the design of a new high technology classroom building, and other committees have explored prospects for cross-university collaboration on various IT ventures.

As examples of how some "outsiders" (i.e., professionals <u>not</u> participating in Temple University TLTR activities) view TLTR planning, here are quotations from the <u>Middle States Commission on Higher Education Report</u> as a result of Temple University's review during Spring 2000:

> "The TLTR has been a catalyst for infusing academic technology into teaching and learning at Temple. A broad-based and inclusive faculty membership with a commitment to process and communication provide responsiveness and flexibility to re-engineering curriculum with technology enhancements in a collaborative framework. The TLTR operates through a structure of working committees drawn from faculty representing a cross section of all programs. It is fair to say that Temple is noticeably ahead of other universities of similar size and mission."

> "The TLTR created technology-planning guidelines that are used to examine the curricular and pedagogical requirements at the college level and to create the college's plan for the use of technology to meet these requirements. The TLTR faculty review the college's plans and from them develop a set of recommendations for funding technology investments and initiatives within the college for the University administration."

During early discussions about TLTR, many questions were raised as to (a) whether such a venture could be successful, (b) why and how people might be willing to be involved with TLTR in the long term, and (c) what ways TLTR and its respective committees might be a constructive influence for students, faculty, staff, individual colleges, and the University. Some illustrative questions, issues and concerns include the following: What is to be accomplished via "TLTR activities"? Why should TLTR and its committees be xisting assemblies, committees and other groups? Why "bother" identifying curricular goals and potential career impact of IT resources, instead of simply "listing" the computers, software and other resources that "we" (in whatever college) really feel we funds or other favorable results? Won't such discussions produce "turf wars" regarding distribution of limited funds and other resources? If college IT plans are required annually to receive funds for IT resources, what kinds of guidelines should be provided for development of college IT plans? Once planning processes (and IT plans) "mature," how might "supplemental plans" be developed annually rather than preparing an almost completely new plan each year? What might happen if "reasonable" rates of funding do not regularly result from regular programmatic planning?

The importance of technology planning is illustrated by the following statement contained in University feedback to annual college IT plans: "The technology planning process is expected to be continuous and active, and can help the University focus its attention on using technology to improve teaching and learning. This process brings accountability to all parties involved, assists in establishing priorities for technology investment, and provides the Provost and Vice President with solid information to make their case for increased technology investment to the Board of Trustees."

College Level: College of Education Technology Planning

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Glenn Snelbecker, Ph.D.
Temple University

The Instructional Technology Committee of the College of Education at Temple University is an advisory committee to the Dean and works in close collaboration with the provost and vice president of Computer and Information Services. This committee, chaired by Dr. Slesaransky-Poe, is faculty-led and includes multiple college and university stakeholders (i.e., faculty members from the four departments; students; staff; administration; and K-12 school personnel, including technology specialists).

The Instructional Technology Committee interacts with other college and university committees. Several committee members also participate in the university-wide Teaching, Learning, Technology Roundtable (TLTR), mostly through the academic planning process, and are members of the TLTR Executive Committee.

The overall goal of the Instructional Technology Committee is to promote and develop improved methods of teaching and learning through the effective use of technology. To achieve this overall goal, the committee creates a very comprehensive annual Technology Plan. The planning process includes: 1) setting priorities based on curricular goals for our students' needs and national and state standards; 2) designing, implementing, and evaluating a multi-modal faculty development process; 3) developing a needs assessment of human, physical, and fiscal resources; and 4) assessing outcomes based on the technology plan.

Several significant outcomes resulted from the solid planning process. They include physical and curricular changes. For instance, all classrooms are connected to the Internet with "smart carts" available to faculty; the College Educational Computer Center is equipped with state of the art hardware and educational software commonly used in K-12; all courses in the new undergraduate teacher education program are required to document how they will integrate effective uses of technology.

These examples resulting from the successful planning and careful implementation of instructional technology contributed to place the College of Education at Temple University at the forefront of the field of technology to improve teaching and learning.

Department Level: Two Approaches to Program Development

On-Line Masters Degree in Education

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One aspect of Temple's *strategic plan* is to address the ongoing professional developments educational requirements stipulated for K-12 inservice teachers by legislative mandate. For too many K-12 teachers, the professional responsibilities along with family obligations coupled with geographic distance makes compliance with legislation, such as PA Act 48, onerous if not wholly unfeasible. A second component of the *strategic plan* is to maintain the University's commitment to meeting student and pedagogical diversity concerns. These issues were the driving force for developing the Online Master's In Education 2001 program. Identifying and developing new courses for the program was obtained from face-to-face feedback given by K-12 teachers in surrounding communities who attended information sessions designed to develop locally delivered Master's programs. Temple's locally delivered face-to-face Master's programs vary from site to site because of the expressed professional development needs in each district. However, many of the requests for specific courses from the different districts are quite similar, if not almost exactly the same. The Online Master's program has targeted ten of these "frequently requested" courses as the basic core for the online program.
Not all participants will want to complete a full Master's degree. Hence, successful completion of the first three courses in the sequence will earn each participant a Certificate Of Advanced Professional Development In Education. This allows participants the opportunity to meet legislative mandates and to forgo formal matriculation into the University's Graduate School of Education.

Several of the courses proposed for the Online Master's program have been taught as web-enhanced courses with inservice teachers where some of the classes have been held online and others held face-to-face. This process has afforded faculty time to experiment with the various aspects of online learning. Not all faculty will use the same online platform to deliver courses but many of the pedagogical approaches are highly similar and reflect the use of best practices for online learning. Feedback from K-12 inservice teachers is extremely diverse. While many K-12 teachers value the online learning process, there is a smaller but significant number of teachers who clearly do not value online learning - despite the active online participation among full classes and smaller group breakout online meetings. We have discovered that one aspect of the digital divide, as it relates to current inservice teachers, is that many of today's learners have barriers, such as limited learning styles, that will keep them from cyber learning as much as the lack of equipment and a paucity of computer related skills define the digital divide for other segments of society.

Some K-12 teachers are preparing to deliver online teaching to their students for a variety of reasons such as illness, special needs and lack of access. These inservice teachers comprise the strongest body of interested online learners. They should be identified early on and used as used as models, where appropriate, in a graduate level online course. Somehow these teachers tend to self-select into smaller groups and the cross-fertilizations of their ideas and instructional approaches often stimulate others to become more proficient online learners and users of more experimental pedagogical approaches to teaching.

Instructional Learning and Technology Specialization in Educational Psychology

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The Instructional and Learning Technology (ILT) specialization in the Educational Psychology program is the result of a long-held vision endorsed by educational psychology faculty and championed by individuals throughout the University. This vision gained college and university-wide support in 1999 when an Instructional Technology program was included in the College of Education's Instructional Technology Plan and endorsed by the University's Teaching, Learning, Technology Roundtable. Faculty and professional staff from the College of Education as well as from throughout the university wrote the initial proposal for a Masters degree in Instructional Technology. Of note is that this strategic planning was mirrored by activity at the Pennsylvania's Department of Education where development of new requirements for Instructional Technology Specialist Certification was underway.

The goal of the planning team was to develop a multidisciplinary program that would serve graduate students from a range of professional and academic backgrounds. The multidisciplinary foundation of the program is supported by two kinds of relationships with other academic units. First, courses in other programs, departments, schools, or colleges would serve as cognate areas of study for students enrolled in the ILT specialization. Second, Instructional and Learning Technology courses would serve as a cognate area of study for other programs.

The decision to create a specialization in the Educational Psychology program is consistent with current trends in educational psychology as well as within the field of instructional technology. The mission of the specialization is not just to stress the practical "how" of using learning technologies, but also the "why." This distinction is important in the employment arena, where it is advantageous for an applicant to have a knowledge base in instructional design theories as well as application and technical skills.

Historically, programs in instructional technology have evolved from the confluence of educational psychology and educational media programs. The rationale for the intersection of instructional/learning technology and educational psychology is a logical one. Since its inception as a discipline, the field of educational psychology has been concerned with the "aims," "materials" and "methods" of education (Thorndike, 1901). This attention has taken many forms and the field of educational psychology is widely viewed as a multi-faceted discipline that includes learning, development, cognition and measurement as core areas. In more recent years, this focus has included application of instructional and learning technology. For example, in his review of articles published in the Journal of Educational Psychology, Ball (1984) categorized 14 topic areas. One of these (admittedly a small percent of articles) he identified as relating to "educational technology, media and computers." Similarly, in a review of educational psychology graduate programs, Klausmeier (1988) identified one of 10 content areas as "artificial intelligence and information processing technology" including "computer and other technologies."

In summary, the strength of the new program specialization is that is grounded in this intersection of educational psychology and the technologies of learning and teaching. In addition, it was developed as part of a larger strategic technology plan from an interdisciplinary perspective.

References

Ball, S. (1984). Educational Psychology as as academic chameleon: An editorial assessment after 75 years. *Journal of Educational Psychology, 76*(6), 993-999.

Klausmeier, H. J. (1988). The future of educational psychology and the content of the graduate program in educational psychology. *Educational Psychologist, 23*(3), 203-219.

Thorndike, E. L., (1910). The contribution of psychology to education. *Journal of Educational Psychology 1,* 5-12.

Course Level: Two Approaches to Preparing Preservice Teachers to Infuse Technology in Teaching

The Effective Use of Instructional Technology in the Classroom

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Appropriate incorporation of technology into classrooms is essential for any teacher in the 21st Century. The College of Education at Temple University recently implemented a new core curriculum that included a course specifically addressing effective use of instructional technology in the classroom, not merely computing skills. This course was the product of a committee of faculty who worked together, using the standards established by ISTE and the Commonwealth of Pennsylvania, to redesign the original computer-based instruction course from a basic skills course to one that infuses multimedia, web-based instruction, distance education and other emerging concepts in Pre-K12 education. This process continues through bi-weekly meetings to discuss pedagogical issues related to the course, share materials, and to discuss how computer resources are used with other core courses and the subject-specific teaching methods courses. One goal of the continued discussions is to gain insight into how a course on instructional technology can support other pre-service education courses, and vice-versa.

Project LITT – Literacy Improvement Through Technology

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Project LITT (Literacy Improvement Through Technology) infused technology into classroom academic standards-based instruction in Language Arts portions of our Teacher Preparation Programs from March 1999 to June 2000. In seven cooperating schools (3 elementary and 4 high schools), 160 elementary and 60 secondary preservice teachers (for approximately 7,280 K-12 students) were trained to deliver technology-based classroom instruction. Preservice teachers paired with in-service teachers developed and implemented standards-based instruction heavily steeped with technology resources, and collaborated in two Summer Institutes demonstrating and teaching technology-supported standards-based instruction received classroom instruction influenced by Project LITT.

Results showed that faculty will adapt to using new technologies in classrooms when appropriate equipment, software, training assistance, and technical help are available. Additionally, technology activities started by Project LITT have been extended within the College of Education. Cultural changes have occurred within the language arts teacher preparation program; faculty, students and staff now recognize and accept a role for technology resources along with other teacher preparation resources in preparing our future teachers.

Project LITT staff developed a hardcopy and web-based manual offering college faculty and classroom teachers information and ideas to consider when integrating technology into the classroom. The Project LITT website is www.temple.edu/LITT-L2L.

LITT was supported by Link-to-Learn, PA Dept. of Education, a Microsoft Software Award, and Temple University.

Community and School District Collaboration: Project RAINBOW

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Project RAINBOW (Restructured Academic INclusion BOnded with the World) was designed to integrate computer and Internet resources in K-12 classroom curriculum and instruction. This Project, originally scheduled for five years, is currently in its sixth year. Project RAINBOW goals are to help teachers, librarians, and other educators to: (1) increase student intellectual skill development, especially higher order thinking, (2) reduce student isolation, and (3) provide other teacher training and curriculum development. Project RAINBOW's vision is that technology resources are valuable in K-12 schools to the extent that they are integrated with more traditional curriculum and instruction resources to facilitate students' academic achievement and motivation to gain a good education. Activities are designed within a two-level framework – (a) for classroom use and teacher-student interactions, and (b) for teacher-teacher networking via Internet communication – in support of off-line as well as on-line educational application of Internet resources. Project RAINBOW is a collaborative project by Temple University with the Audenried Cluster of the School District of Philadelphia, started as a "Technology Challenge Project" funded by the U.S. Department of Education.

Guidelines for faculty development in effective use of IT resources were developed using a test bed approach, instructional psychology ideas were tested, revised, and implemented to facilitate K-12 teachers' use of Internet resources in their work. Barriers to achievement of IT training objectives are identified, (lack of/unequal access to instructional technology resources, individual differences in teachers' prior experience with instructional technology resources and some negative attitudes towards the use of instructional technology resources), and training modifications implemented to address these barriers are described.

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Use of FrontPage 2000 to Develop and Manage a Teacher's Educational Web Site

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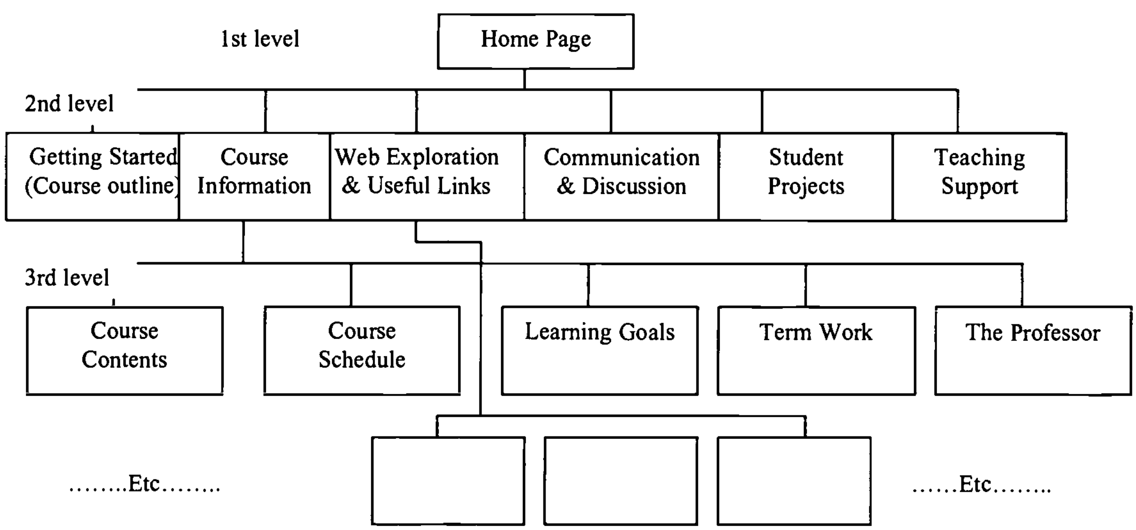
In this paper, I will describe briefly the necessary steps to build a simple Web site to support the teaching process and promote learning outcomes. Here are the main steps that I will show throughout this session:

Draw a structure of the Web site on paper

You can use the drawing tool of Word to prepare a mock copy of the Web site you like to develop. This approach helps you to think about the elements (course info, student projects, etc.) before building the Web site using FrontPage.



Creation of a quick Home Web page

I will demonstrate how to create a Home Web page for the educational Web site. The Web page may be different for each teacher according to his/her needs. The Home Web page has to be simple and appealing to encourage the learners to surf the Web site. Make it simple …use simple vocabulary and simple images if necessary. The menu Insert presents objects that you can add to the Web page.

A quick preview in the Browser

As you create a Web page, I encourage you to view it in the browser (Internet explorer or Netscape Communicator). Then, you can bring changes now before you upload to it to the Internet.

Linking the Home Web Page to the other Web pages

Now that you home Page is created, create quickly simple Web pages (2nd level of your Web site) and links them to the Home page. Later on, you can edit them to improve their contents:

2th level

Getting Started (Course outline)	Course Information	Web Exploration & Useful Links	Communication & Discussion	Student Projects	Teaching Support

Improving the appearance of the Web Page

The menu **Format** presents commands that can help you to improve the appearance of the Web page. You can add a theme, a background, or a style to a page. Some of the features will be demonstrated during this session.

Use frames to facilitate the navigation of the Web site

Why use frames? Frames are useful to organize the display of pages in a Web site into regions in a Web browser's window. FrontPage makes the creation of web pages including frames easy. You can create frame or resize the current ones by clicking and dragging. You can control displaying a page in a frame by creating a hyperlink to the page and specifying the frame as a target of the hyperlink:

1st frame including a navigation bar with buttons	A Web page will be displayed in this frame each time the user clicks a button in the left frame

Images and Image Maps

FrontPage presents a set of tools to create, edit, and manipulate images. Image Composer, part of FrontPage, can be installed to create images and change their appearance. You can import images or use images from the Microsoft Clip Gallery. A nice way to facilitate the navigation of the Web site is to create hyperlinks from image maps.

Quick creation of a Web site

FrontPage presents a functionality to build quickly a Web site with specific features such as discussion lists, registration form, and calendars. Let us experiment with this functionality (**New** command from **File** Menu).

Integration of Web pages created by Word and Excel

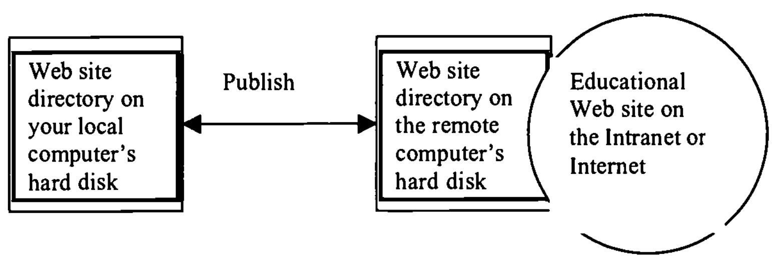
Word or Excel can convert a basic document to a Web page (command **Save as a HTML page** in **File** Menu) that you can save in the Web site directory on your hard disk. Then, you can import or open this file in FrontPage to improve its contents and features.

Organization of the Web site

As you add more Web pages to the Web site, you may have to organize the Web site that includes several Web pages. The buttons **Folders**, **Navigation**, and **Hyperlinks**, displayed in the FrontPage Views bar, provide different ways to look at Web pages in different directories and reorganize them. I will demonstrate some of the features.

Publication of the Web site

You are ready to show your Web site to your learners on the Web. How do your accomplish this task? You may post the contents of the Web site on an Intranet (inside the organization) or the Internet as shown in this figure (**Publish FrontPage Web** command under the **File** menu):

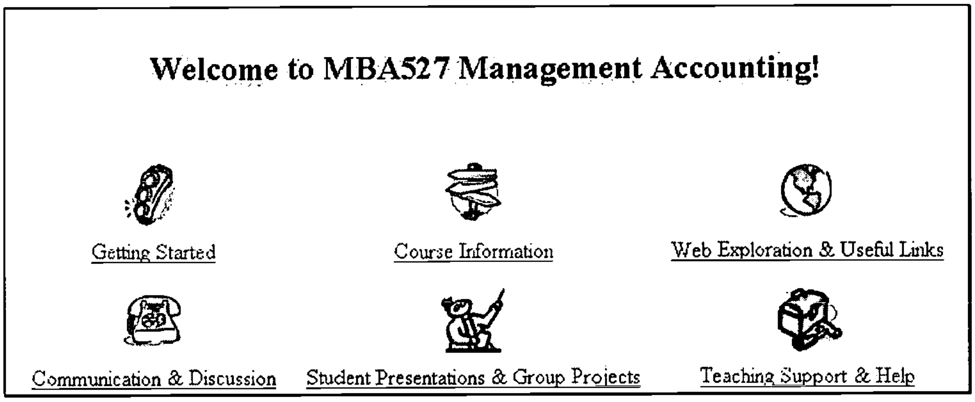


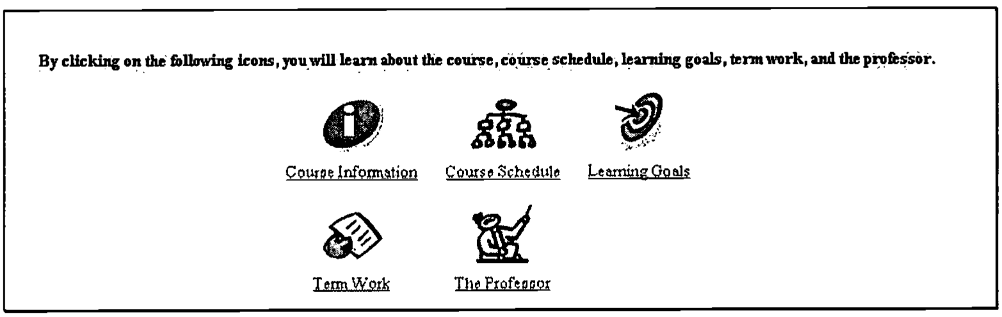
Maintenance of a Web site

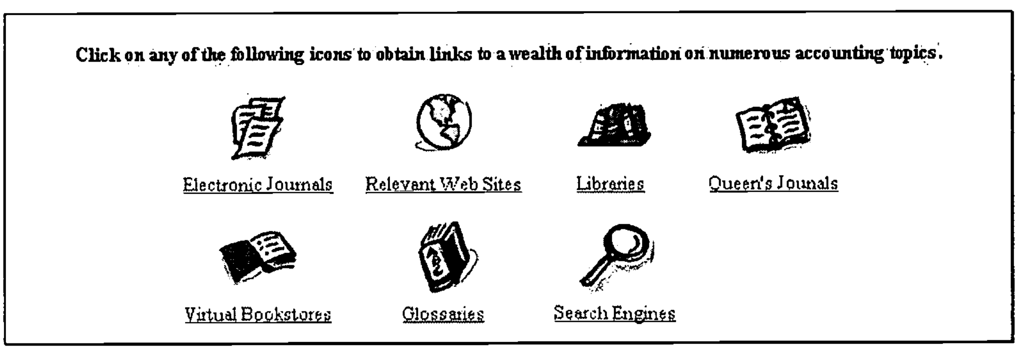
After your posted the Web site on the Internet, you have to maintain the Web site on your local disk such as the contents. For example, you may have to change the student project for the course, modify the course outline, add a new homework, etc. FrontPage presents some tools to help you verifying broken hyperlinks (**hyperlinks** button), check the spelling of all selected pages, add new tasks to be done or complete the ones already started (**Tasks** button), or include sophisticated features such as animated images, sound clips, and others using (JavaScript or VBScript).

An Educational's Web site sample

The following images present an example of the components of a Web site to promote teaching outcomes.







Conclusion

The field of instructional technology is evolving, especially due to the change in Web technology. We are living in a communication age and open learning systems will dominate traditional classrooms. The Web teaching tools and services now available such as Bulletin Boards, chat rooms, Web pages, e-mail, etc., are present in this society and will be more effective than the old methods for many aspects of teaching. Web-based teaching prototypes with sound instructional technology will be multiplying every day, thus the learner will study anywhere at any time. Distance and time will no longer be constraints to the learning process.

In summary, the goal of this session was to demonstrate the creation of an educational Web site prototype using a tool such as FrontPage.

Collaborative University-Public School Partnerships: Development of an Online Network for School of Education Faculty and Public Schools

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Abstract: This paper details the development of a collaborative network that supports a university-school partnership. The intention of this proposed network is to help School of Education faculty develop and maintain collaborative relationships with their public school counterparts. We describe the various stages of development of this network, as well as an analysis of features available in existing online teacher networks. We expected that the testing of this network will yield several issues related to developing effective university-school partnerships.

Proposed Collaborative Network

Increasingly, higher education institutions are expected to develop partnerships with public schools, particularly Schools of Education and Arts and Sciences faculty. *Partnerships of Excellence* is an example of this type of partnership and is an initiative of East Carolina University's School of Education (SOE). The expectation is to develop a reflective practitioner relationship (Schon, 1984) between SOE faculty and practicing teacher professionals within the East Carolina region. The impact of this initiative is two-fold: (a) enhance teaching and learning in public schools; and (b) augment existing research and theories about teacher education. While these goals are admirable, the issue is how to develop increased and effective collaboration amongst SOE faculty and their partnership school counterparts. How can the SOE initiate, implement and provide online support to maintain existing and form potential collaborative relationships? Though there have been several successful individual collaborative projects amongst SOE faculty and public schools, our question is how can the SOE collaborate with all of its schools in the entire region?

We looked at the existing literature on collaborative teacher networks. Fortunately, there have been considerable collaboration amongst public school teachers. Teachers collaborate with their colleagues in several national and regional computer networks devoted to promote collaborative public school sites (e.g., LearnNC, EdGate) . However, we could not duplicate these networks and expect SOE faculty to effectively work with public school teachers. There are distinct differences between higher education faculty and public school faculty. SOE faculty have different motivations and incentives than public school teachers. For example, SOE faculty not only teach pre-service teachers, but they conduct research that could impact future classrooms and thus, actively pursue external grant monies. We propose that exact duplication of existing teacher networks would not achieve effective collaboration between higher education and public school faculty.

Description of Initial Project

This proposal describes a project that created a collaborative online network that linked School of Education faculty at East Carolina University with their Partnership schools, named East Carolina Clinical Schools Network. There are approximately 800 schools in this network. Initially, we had questions on how to develop such a network. Some of these questions included:

- How will faculty assess the importance of collaborating with public school teachers?
- How can we design a network that will maximize the collaboration between SOE faculty and their public school counterparts?

Namely, the intention of this project was to achieve two goals:

- Build and initiate collaborative relationships between Partnership members with School of Education faculty, and also,
- Build and initiate collaborative relationships amongst SOE faculty members.

Some of the features of this proposed network included:

- *"Knowledge bases"*: These resources inform School of Education faculty and their school partners about current educational trends.
- *Mentoring advice*: This support system offers professional development opportunities for its clients. SOE faculty and school partners participate in peer mentoring activities. For instance, a fifth-grade teacher can offer his/her insights to an Instructional Technology faculty member about the social development of ten- and eleven-year olds.
- *Online review section*: Faculty members or school partners can edit and collaborate on publications and/or grant proposals.
- *Online bulletin board*: Faculty members and school partners can "advertise" about their teaching and research interests. The School of Education thus communicates information about important events or recent information (e.g., clinical teaching intern placements) sponsored by SOE and various partner schools.

Development Process

With these goals and proposed features, we sought to evaluate the effectiveness of our proposed network. We adopted the rapid prototyping approach (e.g., Tripp & Bichelmeyer, 1990) and evaluated the network in three iterative phases. Successive feedback from each iterative influenced the next phase of our project. Below is a description of these three iterations.

Iterative phase #1

First, there was a needs assessment of three major stakeholder groups related to this project. The three stakeholder groups included: School of Education administration, School of Education faculty, and public school teachers. With this information, a prototype was developed. School of Education faculty and teachers evaluated the strengths and weaknesses of the first prototype. The features of this prototype included:

- Partnership-Faculty alliance
- Directory
- Current events
- Workshops
- Discussion roundtable
- Research
- Advice
- Information resources

Overall, each participant approved of each of these sections. There was some confusion about the similarities between these sections. For instance, participants were unclear about the differences between the Partnership-Faculty alliance section and the Research. In our next iteration, we sought to eliminate this overlap and consolidate these sections.

Iterative phase #2

Six public school teachers and two School of Education faculty members participated in usability sessions. These individuals evaluated each section illustrated in the current prototype (see Figure 1). There were three goals of these sessions, namely: 1) effectiveness of prototype's interface; 2) effectiveness of specific features found in prototype; and 3) overall satisfaction of proposed collaborative network between School of Education faculty and public school teachers. These usability sessions yielded the following information:

- Overwhelmingly, participants expressed satisfaction with proposed features found in the prototype.

- Next, the prototype should provide a pathway to specifically find particular items within the collaborative network. Participants did not want to search for specific items. They wanted to readily access features in which they were interested.

- The collaborative network should not be a typical web site, but present some enticement to potential users to visit web site. Next, the prototype should use a newspaper/magazine metaphor.

- When visualizing how they would use network, participants expressed primarily information-related activities.

Iterative phase #3

Prior to the development of the revised prototype, an assessment of current teacher online networks was made. This evaluation yielded additional features that were "borrowed" from existing teacher online networks and incorporated in our current prototype. The intention of this iterative phase was to evaluate the effectiveness of the newspaper/magazine interface. It also examined how School of Education faculty and public school teachers anticipated how they would use this proposed network. With the results of these usability sessions, the development of a "final" offline beta prototype took place. The initial screen of this prototype is found in Figure 2.

Final outcomes and impact

It is expected that the outcome of this project will yield potential answers to several questions related to university-public school partnerships. Some of these questions include:

- Would School of Education faculty collaborate online with public school teachers? If so, for what purposes? How successful would these interactions be?

- How do School of Education facultyperceive the use of a collaborative network? How do public school teachers perceive the use of a collaborative network? Are there any similarities or differences between these two perceptions?

- What kinds of impact does this collaborative network haveupon School of Education and public school students?

Conclusion

It is assumed that higher education faculty can benefit from forming collaborative relationships with their public school counterparts. Can a networked environment help develop this relationship? Will higher education faculty express the need for such an environment? More importantly, will faculty actually use this proposed networked environment effectively? Our study and presentation will address these questions and related issues.

References

Schon, D. A. (1984). *The reflective practitioner: How professionals think in action.* New York: Basic Books.

Tripp, S. & Bichelmeyer, B. (1990). Rapid prototyping: An alternative instructional design strategy. *Educational Technology Research and Development*, 38 (1), 31-44.

East Carolina schools network

Members and Institutions
Find out who we are...

Inservice Workshops
Learning opportunities...

Current Events
East Carolina school events...

Discussion Roundtable
Talk about your ideas...

Resource Library
Professional links and related projects...

Figure 1: Initial screen (Iterative phase #2)

Smoothing the Transition to the Instructional Technology Age: A Change Model Based on Professional Development and Innovation

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"THE SIGNIFICANT PROBLEMS WE FACE CANNOT BE SOLVED AT THE SAME LEVEL OF THINKING WE WERE AT WHEN WE CREATED THEM."

Albert Einstein

Abstract: Transition to the information and communications age will be chaotic and disconcerting for many, including educators. While the bumps are inevitable, there are steps which can be taken to minimize the trauma. Successful transition requires us to rethink the process. More specifically, the past failures of instructional technology to gain widespread use or to provide transformative effects on education can be understood in the light of successful and unsuccessful diffusion of innovation. The TIES was developed to specifically address what we have learned about innovation diffusion over the years. This paper will report on the philosophy, foundation, structure and operation of TIES in a university setting. Extensions to technical schools and public schools will be made.

The Problem of Change

Humanity has passed through several major eras, based on technological advances, which have changed society dramatically. Sometimes the change was for the better, sometimes for the worse. Examples include changing from 1) hunter to agrarian, 2) quill pen to printing, 3) agrarian to industrial, 4) manual to electrical, and 5) bits to digits (the digital revolution). The latter is also called the information technology communications (ICT) revolution and we are currently engaged and embroiled in its infancy.

After each of these major social revolutions became fully diffused into society, periods of relative calm, peace and stability ensued, interrupted by the occasional war. During each of these periods of transition to the new order of things, however, there was major chaos, upheaval, and uncertainty. For example, the transition to the age of electricity witnessed the major dislocation of slaves in the United States as the spread of rural electrification made them too expensive to maintain. The industrial revolution witnessed one of the greatest mass migrations in history as people left rural areas to form burgeoning urban areas which led to the growth of social support systems.

We are currently embroiled in the next major revolution, stimulated by the microcomputer and attendant digitization. This has been referred to as the Information Communications Technology (ICT) revolution. This revolution is resulting in significant changes in the way people and organizations communicate and function. It is radically changing, in both qualitative and quantitative ways, how we carry out our day to day activities.

A subset of this revolution involves the application of ICT to the process of teaching and learning. Known as the Instructional Technology revolution (IT), it is beginning to be evidenced in the way instructors and education and training institutions carry out their day to day activities. However, there are also disturbing signs of implicit and explicit chaos from a variety of sources and viewpoints. If history is any indicator, education will experience significant chaos during the transition process. This chaos may be long lasting and will certainly be highly disruptive. Are we to batten down the hatches and try to survive the bumps and bruises, or is there some way we can minimize the disruptions and smooth out some of the larger bumps along the way? The thesis of this paper is to describe a strategy which may be helpful toward meeting this goal.

Overview

The purpose of this paper is to describe a change system that was developed specifically to increase educators' use of instructional technology (IT) in the process of bringing about major and systemic change in education. The basic assumption is the major reason that IT has failed to reform education is not in the technology, but in the tendency of individuals and institutions to resist change. While many would agree with this statement, very few systems have been put into practice to deal head on with the issue of change. The strategy of the change system is professional development and the system is called the Training, Infrastructure and Empowerment System (TIES). The roots for TIES stretch back to the middle 1970s but the current implementation was developed over beginning in 1996 and implemented in a large educational institution with funding from the Government and University of Alberta.

This paper will examine some of the things learned about instructional technology (IT) and educational reform during the past 4 decades and compare the ideal, potential state of affairs with reality. The TIES, which is based on characteristics of innovation will be described, with emphasis on the main components of vision building and empowerment through professional development of leadership teams.

What have we learned from four decades experience with digital IT?

IT has been extensively researched over the years (Szabo, 1998a) and it is clear that instruction which makes substantial use of IT, when compared with conventional forms of instruction, results in

- equal or higher achievement,
- equal or better attitude toward learning and the subject,
- significantly reduced learning time, of the order of 10 to 50 percent savings,
- significantly greater access to education through distance or alternative delivery,
- significantly reduced delivery costs (Harapnuik, et al ,1998),
- easily scalable, and
- revolutionary changes which have increased the capacity and ease of use of IT.

While it is difficult to pinpoint the exact role of IT, these findings are impressive and lead us to believe that IT holds great potential to improve and reform the way we conceive of and deliver education. However, examination of the practice in the field reveals a very different picture.

The reality is that while there have been sweeping changes in hardware, software, courseware, tele-ware and skinware (people) during the past four decades;

- very few educators make use of IT; most use is confined to low level,
- education has been left unchanged or unreformed (the self-contained classroom dominates),
- vast sums of money have been spent with little to show for the expenditures, and
- many remain uneducated or under-educated, in poverty, unable to share the riches of an expanding global economy where the vast majority resources and money are controlled by a small number of individuals

Why has IT failed to live up to its potential?

First, individuals and institutions have a natural and rational reaction to anything as different and innovative as IT; they resist it in order to preserve the systems they worked so long and hard to build and are so comfortable with. Secondly conventional approaches to professional development are either unaware of this important aspect of human behaviour or unable to deal with it, resulting in less than optimal results. For example, most professional development efforts are built on the theme "Build it and they will come." History shows this to be a myth. Finally, there have been many over zealous proponents of IT who made grandiose predictions about the revolutionary nature of IT. As these predictions fell, one by one, disappointment and disenchantment with the field grew.

In spite of this, professional development efforts grew and flourished. By and large they are characterised as having:

- good and honourable intentions and goals
- high quantity and quality of training
- recognition of the challenge of learning to use IT
- the lack of urgency to provide increased access
- expended significant amounts of money

The poor results are more surprising in light of these positive elements.

What is the solution?

The solution is to create a complete system of professional development around IT which successfully addresses several major topics. First, it acknowledges and works with key elements (hindrances to) change and reform in education. Second, it provides training in the use of how, why and when to use IT to improve education or reach out to new opportunities. Another important element is the use of IT to provide a model which can be emulated and enhanced by instructors. Finally, the system must be delivered in accordance with recognised principles of adult learning and development. But just what are these topics and what do they look like? While all have been addressed in TIES, this paper will focus on the elements of reform and developing willingness to change.

Three guiding principles came out of the study leading up to TIES. First, we must assume that IT is a major and significant innovation in the way instruction is delivered. This leads to the second point that to understand IT means we need to understand the characteristics of successful and unsuccessful innovation. To this end, a study of innovation in society, politics, technology, religion and administration was undertaken. The overwhelming conclusion is that while we verbally accept innovation as an abstract concept, we have a poor understanding of its characteristics. These characteristics are described in the following section. The third principle is to synthesise our knowledge about innovation and develop a comprehensive system for reform around that knowledge.

Lessons learned from Innovation

- Most innovations fail—there is considerable <u>risk</u> involved. Thus, while innovation is warmly embraced, at least verbally, the recipe for disaster may be in the making.
- Successful innovations evolve into something different and more useful than originally envisioned—people need a <u>vision</u> for the future and the ability to tailor the innovation for their own environment and <u>ownership</u>. When there is no clear path, one must have a vision to rely, and be able to adapt in moving toward the vision.
- Widespread adoption is a sign of successful innovation—this presents enormous <u>logistical</u> problems of training, distribution, etc. Every educator, regardless of grade level or subject taught, is a potential user of IT. To train and support all educators, using conventional approaches to training and support is logistically an impossibility. IT itself must play a role if the job is to get done.
- There are three <u>stages</u> to successful adoption of innovation—success or failure needs to be judged based on the current stage.
- Creating an innovation requires a different type of person and organisation than does leading an innovation to successful adoption. The former calls for a person with missionary-like zeal who will face all obstacles head-on to achieve his or her dream. Often this is a person who works alone and because of the fervour has been called the 'keeper of the dream'. The latter needs to inspire change through leadership (Kotter, 1996) rather than micromanagement or decree, because the former inspires the creativity needed to innovate while the latter stifle it. The leader must also be capable of garnering a team to bring about change.
- Successful adoption of an innovation takes significantly <u>longer</u> than we would like, significantly longer than the tenure of politicians and administrators. It took 250 years from the discovery that citrus fruits prevent scurvy to the requirement that ocean vessels carry citrus fruits; it took 200 years for the industrial revolution to flower; and it took 20 years for

the computer mouse to migrate from the laboratory to everyones' computer. We often do not have the patience to let innovation flower and either abandon, ignore, or put it out of its misery.

Other sources of change and reform were consulted in the area of education (Fullan, 1991), society (Rogers, 1995), business (Senge, 1991; Kotter 1996) and IT (Szabo, 1996).

Training, Infrastructure and Empowerment System (TIES)

The characteristics of change and innovation have been crafted into a system to promote change and reform of education through professional development using the area of IT. The premise of TIES is rather straightforward. It states that reform of education through IT must be guided by a powerful vision of what an educational institution will look like in the future and that vision must be implemented by those who are driving the teaching program of the institution. Furthermore, the vision will be unique to each institution and the implementation will vary within the institution according to the needs and goals of the different units.

An analogy is useful here. Suppose there is an individual, who has neither the time nor expertise of a painter, who wishes to have a particular painting commissioned. The commissioner specifies the fee and describes the vision of the picture as having a large sailboat, sailing into the sunset on a light breeze, and there can't be any pink colours in the painting. The artist is then free to interpret this vision using the skills and resources he or she has developed over the years, within the constraints specified by the commissioner. This example is analogous the operation of TIES.

Development of Vision

In first part of TIES, chief academic officers create, nurture and commit to a vision of what the institution will look like in some specified period of time, say 10 years. This is accomplished in a retreat and workshop setting, away from the pressures of the institution. The retreat is ideally conducted over 3 to 4 days and achieves four goals. The first goal is to expose the administrators to the world of IT in general and more specifically to individual exemplary applications at the local, national and international level. In part the purpose is to establish a sense of urgency to stimulate action (Kotter, 1996).

The second component of the workshop is designed to produce a vision of the future of the institution with emphasis on IT as a new form of instructional delivery. The vision is stimulated by the following exercise. Imagine it is 10 years into the future and the vision you developed at the workshop became wildly successful. If you were to walk through the institution, city, province, country and abroad, what evidence would you see of its success? This exercise helps develop a vision which is concrete, visualizable and realistic. Some time is then taken to refine and polish the vision.

The third component of the workshop is the identification of barriers to that vision. One common barrier is finding a way to convincingly communicate the vision to the rest of the institution. Another is to find a way to demonstrate verbal and tangible commitment to the vision. Faculty quickly recognise that a verbal commitment without tangibles is no commitment at all.

A third barrier comes in the form of providing the infrastructure necessary to meet the vision. Infrastructure needs to be analysed carefully, as there are two kinds: hard and soft infrastructure.

The list of hard infrastructure varies with what particular brand or flavour of ET is being used, but usually includes the following.

- Hardware—computers, VCRs, projectors, videoconference/audioconference facilities, digital capture and editing facilities.
- Software—application programs for video, audio, computer assisted and managed instruction, web browsers, e-mail.
- Telecommunications—high speed access to the internet and WWW via modems

Soft infrastructure refers to more than people. It includes a strongly positive environment with corresponding attitude from all concerned. It includes experts to conduct the training and support for instructors. It is guided by the vision of the future. It is enhanced by a positive, supportive, and risk-aversive environment at the department, faculty, and senior administrative levels. This environment must be demonstrated in overt commitment. An administrator who offers some resources, however modest, to help instructors use ET is demonstrating commitment, while one who applauds the idea and suggests the instructor apply for a grant to do the work is exhibiting virtually no commitment, regardless of the words.

A final barrier is the development and support of a culture which promotes reform through IT after sufficient learning has taken place, not before.

In the fourth and final stage of vision-building, the participants begin to prioritise the barriers and identify how they may be overcome. Throughout the whole process, the emphasis is placed upon brainstorming rather than criticising the work to date.

Develop the Leadership Task Forces to Carry out the Vision

Once the vision has been completed and communicated, the artist takes over and carries it out. Unlike the painting analogy, however, the administration cannot hire completely new personnel to do the job. They must engage in extensive professional development with the extant staff.

TLTF terms of reference: TIES uses teams who will function in a leadership capacity. These TIES Leadership Task Forces (TLTFs) are trained to implement the vision in their unit. Specifically, they are asked to accomplish four tasks (and provided with the training and infrastructure to do so). First, they model the use of IT in their own classes, thereby demonstrating that IT is not so complex that the typical instructor cannot use it. Second, they identify the training needs within their own unit and arrange to meet those needs. Third, the TLTF identify the on-going support needed and arrange to provide that and support. These are to be just-in-time, effective and credible for colleagues. Finally, armed with experience and a good feeling for the size of the task, the TLTFs develop a multi-year, rolling plan to move their unite from the current culture to the new IT culture.

TLTF selection criteria: The selection of TLTF members is critical to the success of the system. While a team effort is necessary in order to distribute the work load and involve diverse opinions, most education is not done by teams but by individuals in self-contained classrooms. It is hard to break this mold. The impact of TLTFs must be leveraged, that is they must function at a point of power, where decisions are made or broken. In a university, that is often the department head, while in public schools the head of the school often holds the power to make or break innovations.

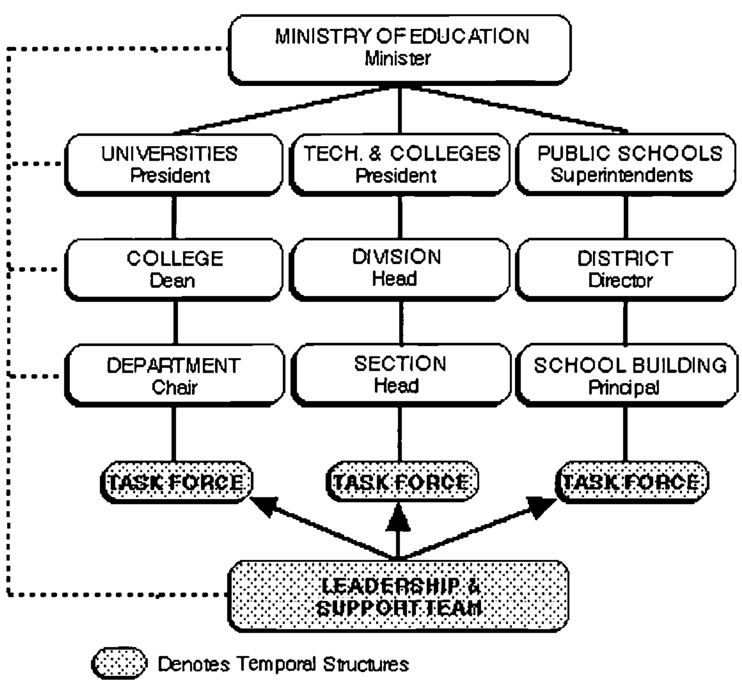

Figure 1. Organizational structure of the TIES

TLTF members are selected and invited to participate by the departmental administration using criteria supplied by the Central Leadership Team. TLTFs must include key opinion leaders in the department, as well as at least one departmental administrator. Along with the department administrator comes a commitment to support the Task Force for at least one year following their initial training. A curriculum and technology specialist is also an important person to have on the TLTF. The number of TLTF members should be 10-20 percent of the department, with a minimum of three.

TLTF training approach: Training TLTF members must be done (1) to insure the members are qualified and (2) as part of professional development leading to empowerment. As is common in education, the skills and knowledge possessed by the TLTF members varies greatly. In addition, they must be trained using adult learning principles (andragogy).

The training of TLTFs from several department takes place during a one week intensive workshop and one of the goals is to build cohesive departmental teams. Individuals complete an exercise to assist them to identify their skills and knowledge strength and weaknesses and to select which modules to complete. To facilitate a mixture of team based and individual independent study both during and following the workshop, the instructional materials have been assembled in modular format suitable for small group or individual, self-paced learning and delivered via the Internet.

TLTF training content: TLTFs need to be well versed in (1) how to use IT, (2) how to integrate it with the curriculum and evaluation structure, (3) how to provide leadership in their environment, and (4) miscellaneous topics, such as copyright protection. There several dozen modules which cover these topics in a self-paced learning format and delivered through the Internet (Szabo, 1998b).

TLTF support: A key element in the success of a complex venture such as this is the availability of support during the year following training. A Central Leadership Team, which developed and operated TIES, provides support as needed by the TLTFs. The support provided models the support the TLTFs are asked to provide during their work and should be effective, current and believable. The CLT advises departments, facilitates workshop training, and facilitates communication within and between different TLTFs and administration.

Progress to date

TIES was pilot tested in a major research university in Canada in 1998. A visioning retreat was conducted with the participation of chief academic officers of the institution. Five departments or faculties committed to training and support of TLTFs. The CLTs provided support to the TLTFs during the subsequent year. The findings and conclusions from this work have been documented by Szabo, Anderson & Fuchs (1998).

References

Fullan, M. G. (1991). *The new meaning of educational change*. NY: Teachers College Press.

Harapnuik, D., Montgomerie, T.C. & Torgerson, C. (1998). "Costs of developing and delivering a web-based instruction course." In *Proceedings of WebNet 98--World Conference of the WWW, Internet, and Intranet.* Association for the Advancement of Computing in Education. Charlottesville, (In Press). Available at: http://www.quasar.ualberta.ca/IT/research/nethowto/costs/costs.html

Kotter, J. P. (1996). *Leading Change*, Boston, MA: Harvard Business School Press.

Rogers, E.M. (1995). *Diffusion of Innovations* (4th ed.), New York: The Free Press

Senge. P. (1990). *The Fifth Discipline: The Art and Practice of the Learning Organization*, New York: Currency Doubleday.

Szabo, M. (1996, June). *Change in the use of alternative delivery systems through professional development within colleges and universities*, Paper presented at the annual meeting of Ed-Media/Ed-Telecomm 96. Boston, MA. Available at: http://www.quasar.ualberta.ca/IT/research/Szabo/Change.html

Successful Multidisciplinary, Thematic Curriculum Activities: Development, Implementation, and Impact

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Abstract: This paper will focus on a multidisciplined, integrated, and thematic curriculum unit developed and taught by teachers from two Nebraska school districts involved in a U.S. Department of Education Challenge grant. The teachers from these schools designed the units using an online form and database developed by the grant project's staff. The project teachers received staff development training on several aspects of effective teaching/learning, such as multi-intelligences, brain research, multi-disciplinary strategies, efficient assessment, and the importance of connecting learning to community and real world situations. This paper explains the process of curriculum development, online availability of the units, training for teachers, local school support, lessons learned, and the impact of this type of activity on student learning, teacher growth and attitudes, school climate, and community connection to student learning and the school. In addition, the benefits to undergraduate and graduate education in a college of education will be discussed.

Introduction

"The Connections Project; Strengthening Learning Through Technology-Based Integrated Curriculum and Professional Development" has been successful in helping teachers to use technology effectively and to integrate it into their class curriculum. This project is a United States Department of Education Technology Innovation Challenge Grant, of which the lead sites are four Nebraska school districts and two adjudicated youth centers. In addition 16 school districts are partner sites participating in teacher training and in several interdisciplinary curricular projects that include effective teaching/learning techniques such as multi-intelligences, brain research, multi-disciplinary strategies, efficient assessment, and connection to community and real world situations. The project is designed to improve student learning through effective teaching that includes technology-integrated curricula reflecting state curriculum standards/frameworks and national standards. In addition, special focus is given to high-risk students, as well as developing partnerships among educators, business, agriculture, industry, and parents. The grant evaluation team is from the University of Nebraska at Omaha College of Education Office of Internet Studies. The process of change used in this grant is important to teacher education, as all learn from the successes of P-12 schools and teachers. The university professors on the evaluation team use the ideas and examples in their own lesson plans for both undergraduate and graduate teacher education classes.

Designing curriculum that engages students, has connections to their community, and has real-life activities has been found to be a successful way to revitalize the learning environment of students. An example of this type of effort is the *World Hunger* curriculum unit at two Nebraska high schools participating in the Connections Project Challenge Grant.

School Settings

One of the Connections Project's lead schools is Morrill High School, a small rural high school in the northwestern part of Nebraska. Mitchell High School is a Connection's Project partner school to Morrill and is within 30 miles. These two schools work together in many ways. Each month, teachers from both schools meet. Activities include introduction of teachers, discussion of units that they have written, and challenges to write new units. In addition to major units, they also were challenged to work with one other teacher to develop a "mini-unit." The *World Hunger* unit, the first unit completed and undertaken by teachers from these two schools, was one that would be unique to teachers across the state

Example of an Integrated Curriculum Unit

Unit Design

This interdisciplinary curriculum unit, designed by teachers from the two partner schools, was titled *World Hunger is Local TOO.* The goals of the unit were as follows: a) make students aware of world hunger and how it affects their own communities, b) inform students as to what they can do to help alleviate world hunger, c) promote teachers working together to encourage learning, and d) design a unit that could be presented at a conference. The uniqueness of this project was that not only were connections made between curriculum areas but also between two schools and two communities. Curriculum ideas for each discipline were outlined. These included:

1. Geography/Social Studies--research countries and world hunger
2. Home Economics/Foods--compare calorie intake of the countries researched by the geography/social studies class
3. Business/Computers--make charts using the facts found by the home economics and geography classes, make posters to advertise food drive
4. English--write analogies from the information collected
5. Journalism--write an article for both school newspapers and the local town paper, design an advertisement about the food drive
6. Reading--character analysis and story plans on books about hunger.
7. Art--design an advertisement about the food drive, decorate food collection boxes

The unit would be introduced by a PowerPoint presentation, designed by the Connections Project Site Coordinator. This presentation would be shown at both schools, challenging both students and teachers alike to participate in the project.

The timeframe for the unit was between Thanksgiving and Christmas. Classwork began right after Thanksgiving vacation and the actual collection of food was limited to the last five days before Christmas vacation. Some parts of the unit were completed in both schools and some were done in only one school, according to how best each part of the unit fit the situation at the respective schools. It was found that in order to encourage more communication between the schools, it was necessary to have some parts completed at one site and then sent to the other site for follow-up work.

Additions to the project during the implementation included: a) the writing of a script for a skit incorporating the challenge theme, with presentation at each school by the opposite school's students; b) hosting a guest speaker on the subject of world hunger; c) student volunteer work at the local soup kitchens; and d) more teachers being encouraged to become involved.

Introduction

An introduction to world hunger, via a PowerPoint presentation, was presented to the social studies, home economics/foods, reading, business/computer, and English classes as well as to the Student Councils of both schools. Students were asked to bring cans of food for the charity and teachers were asked to use the world hunger theme in their courses. Also each school challenged the other to see which school could collect more cans of food. Numerous facts about world hunger were presented along with ideas of why hunger exists. The presentation encouraged all students to become involved in the project. The "9 Steps to Third World Living" was included in the slide show. This captivating part of the presentation really helped students relate to people in need. Students were also given many examples of Internet resources containing the information needed to complete their specific class assignments. The PowerPoint presentation ended with a challenge to students: "What can you do to help stop world hunger?"

Gathering Facts

The social studies (Morrill) and geography (Mitchell) classes had group discussions on identifying *indicating factors* relating to their specific curriculum area that might cause world hunger. They gathered data on hunger in several countries on each continent, focusing on such facts as population, life expectancy, literacy rate, arable land, and per capita income. The geography students defined what *developed*, *third world*, *G-7* and other terms meant while categorizing nations. After categorizing nations, they sent the list of countries to the other classes. Students also looked for facts about hunger in their own county and state. Students searched for data in class textbooks, almanacs, encyclopedias, atlases, and on the Internet. Students started their Internet search with the site <http://www.thehungersite.com/> which has a map of world hunger in which the countries dim when someone dies of starvation. Other Internet sites used in the social studies and geography classes were <http://www.overpopulation.com/index.html> and <http://www.worldhunger.org>

Students in the home economics/foods class (Morrill) discussed indicating factors that would help determine the cause of world hunger. They learned about nutrition and the food pyramid and studied the food web from their textbook chapter on nutrition. After learning about nutrition, they created a menu for different areas around the world. Next the foods class searched for data on nutrition, malnutrition, and calorie intake for the list of countries that was sent from the geography class (Mitchell). Students searched for information in textbooks and on the Internet using the site http://www.overpopulation.com/child_malnutrition.html. Each student chose an area of the world and made a list of foods eaten and the number of calories in the diet for that group of people. After all research was finished students designed a *Menu for the Hungry*. Students in home economics/foods class also determined the information to be on the *tags* for world food intake for later use in assemblies. The *tags* represented world hunger figures: 70% are hungry; 20% are adequately fed; and 10% are well fed. The final project for the home economics/foods class was to prepare the food for the soup kitchen.

Graphs/Menus/Tags/Flyers/Posters

The information found by the classes doing the research was sent to the business class (Mitchell) where students formulated the data, using the software Microsoft Publisher. They created posters with charts and graphs and made flyers advertising and promoting the project. The business class also made the *tags* for the assemblies from information sent by the home economics/foods class.

The menus from home economics/foods class was given to the computer class (Morrill) where the students made printed menus similar to those found in restaurants. In the computer class (Mitchell) students were grouped in pairs and given research data relating to a country. They used the data to create a worksheet and graph. They then used the worksheets and graphs to make a poster about how their topic related to world hunger.

Paragraphs/Character Analysis/Story Plans

After hearing a poem by Sandra Alesiani, the students in the junior high reading class (Morrill) described to a partner what it might be like to be a victim of hunger. Following the descriptions, students were given a list of books about hunger and the homeless. Each student read one book, completed the character analysis and story plans worksheets, and then wrote a paragraph summary of their book to share with the class.

Analogies

The senior English class (Morrill) received a folder containing all the above materials. Students read and analyzed the materials on world hunger, both in graph and written form. Students then created an analogy and were given a choice of presenting it in either written, narrative, or artistic format. Students then determined what elements were necessary to write a script to challenge the student body at Mitchell High School to participate in the food collection project. They were asked to use things such as humor, facts, cordial challenge, and loaded words. Students used the scripts for skits presented at assemblies, half time at basketball games, and the final presentation to the food pantry.

Presentations and Advertising

Pep rallies were held in both Mitchell and Morrill. Two to six Student Council members from each school went to the other school's site and challenged each other's school to beat theirs in a food drive. They used the skits prepared by the English class students.

Students in journalism/yearbook business and art classes were asked to design an advertisement for the local paper to promote the food drive. The advertisement was to meet the following guidelines:

1. Have a headline or illustration (or both) that seizes the reader's attention.
2. Have a block of copy that does some or all of the following: a) recognizes the problem/desire of the client, b) recommends a solution to the problem, c) promises benefits, d) personalizes those benefits for the reader; has a call for action; and includes a logo and information on how to purchase or participate.

The journalism class (Morrill) also reported on one phase of the Hunger Project for the school newspaper.

The Yearbook class (Mitchell) took pictures of the project to be used for a display at the final assembly, a page for the yearbook, and a class presentation. They put together a PowerPoint presentation of 5 slides, an avid cinema presentation of 2 minutes, and an 18x24 poster. The business class (Mitchell) made posters (as previously explained) to advertise the food drive in the schools and local businesses. The art class (Morrill) decorated boxes to collect cans for the food drive.

At the Mitchell versus Morrill basketball game students passed out the *tags* (which indicated the level of hunger) to spectators as they came into the game. The project was explained by students in a skit using the script prepared in the English class with help from Student Council members. World hunger was demonstrated by a representative sample of the spectators: 70% received a pizza crust, 20% received crust with sauce, and 10% received a pizza with all the toppings. Then students encouraged spectators to donate food to help alleviate hunger.

Outcomes of the Project

The Scottsbluff Star Herald published an editorial, saying: "A fun way to give, Morrill and Mitchell students devise a friendly contest to help others at Christmas time." Also, several teachers involved with the unit were excited about its impact. Nancy Sakurada, teacher at Morrill said, "Being able to use computer technology allowed us to see a bigger picture of our world....especially the developing countries where poverty and adversity is the norm. We were able to see that the majority of our world does not live as we do in the United States. I feel that this project and the way we applied the curriculum changed our way of thinking about standards of living around the world." Teacher Ellen Ramig from Mitchell added, "During the *World Hunger is Local TOO* project, my students entered the data into spread sheets and charts. This project was very beneficial to my students. They also were able to participate in a project that required them to take raw data and make conclusions using a variety of learning styles."

After completing *World Hunger is Local TOO*, the group decided to do more of these types of integrated units. The next unit dealt with an important local industry, sugar beets. The new project is titled *How Sweet? Sugar Beet Sweet!*

Summary

The efforts of these two schools, in developing a unit that infused technology, centered around a theme, and included two different school districts is an excellent example of a vibrant, exciting curriculum activity. Not only did students become more engaged and excited about learning, but also teachers and the community both benefited from participation in the project. Because of this unit, the teachers at the two schools have continued to develop new curricular units and activities. The community gained heightened awareness about world hunger. These types of activities are important to teacher educators, as they provide examples to research and to share with future teachers.

"Adopt-a-School" – a Program of Hope in a South African Community

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Abstract: With the aim to play an active role in the community and in support of the National Education Department's Tirisano Project 2000-2004, the Technikon Free State (TFS) in Bloemfontein launched its Adopt-a-School program in September 2000. The program, in which the Lereko Senior Secondary School will be assisted in various ways, is a collaborative action between the TFS and a disadvantaged secondary school in the Free State province. In the first phase of the program, the emphasis is on the professional and personal growth of Lereko's teachers, with computer literacy as one of the main objectives. The TFS equipped a computer laboratory with Internet facilities at the school and started with the training of teachers. The discussion of the progress of the project presents a preview of what can be achieved when the more advantaged reach out to the less advantaged in this country with its unhappy past.

Introduction

The Technikon Free State (TFS) in Bloemfontein, South Africa, launched its Adopt-a-School program early in September 2000. The program, in which the school will be assisted in various ways, is a collaborative action between the TFS and a disadvantaged secondary school in the Free State province (Lereko Senior Secondary School), with the possible support of a business partner. The aim is to play an active role in the community in support of the National Education Department's Tirisano Project 2000-2004. The program is aimed not only at empowering teachers to teach effectively, but also at exposing teachers as well as learners to real technological education in addition to fostering an entrepreneurial climate in the development of school education in disadvantaged communities.

The Partners

Technikons – as they are known only in South Africa – offer higher career-oriented education – and should be distinguished from technical colleges that offer more basic career training. The TFS offers programs in four faculties: engineering, applied sciences, human sciences and management. The programs include degrees, diplomas and certificates in various information technology fields as well as technical teacher education and paramedic sciences. In 1999 the student population totaled 7105, with roughly 60% of the students from formerly disadvantaged communities. The TFS has reached a relatively high level of academic excellence and is one of the institutions that has advanced to the point where the possibility of converting it to the status of a technological university is being investigated.

Lereko Secondary School is situated in the Mangaung township in Bloemfontein, the capital of the Free State province. The school enrolment is roughly 1500 learners, with 45 teachers and a number of administrative staff members. The community is extremely poor and, although the double-storey school building is relatively new, the signs of vandalism and neglect are very obvious. Previous interviews with teachers revealed serious problems such as a shortage of school textbooks; almost no teaching aids (except one overhead projector in a working condition and a television set); only one laboratory for the whole school; a lack of science apparatus; no duplication facilities; and, of course, no computers - even for administrative purposes. Teaching methods are restricted to the chalk-and-talk and textbook methods. In summary, the Lereko of the past reflected a lack of commitment from teachers and learners and, undoubtedly, a lack of a culture of teaching and learning.

Tirisano is a corporate plan of the National Department of Education (DoE) that was announced in 1999 (Department of Education 2000). The vision of Tirisano is of a South Africa in which all inhabitants have access to lifelong education and training opportunities, which will, in turn, contribute towards improving the quality of life and building a peaceful, prosperous and democratic society. Organizational values such as Team Work ("Co-operating with one another and our partners in education in an open and supportive way to achieve shared goals") and Learning ("Creating a learning organization in which staff members seek and share knowledge and information, and are committed to personal growth") are highly rated.

The TFS Adopt-a-School program clearly falls within the priority range of Tirisano. In the first phase of the program, the emphasis is on the professional and personal growth of Lereko's teachers, with computer literacy as one of the main objectives.

Implementation and Progress

The TFS equipped a computer laboratory with 30 computers and Internet facilities at the school. The training of teachers started in late September. The Department of Information Technology at the TFS handles the IT component of the program. It will carefully monitor the progress of the teachers over the next twelve months and will adapt its training to the teachers' needs. In the first phase attention was paid to keyboard and other basic skills, as about one-third of the teachers have not used a computer before. After doing basic word-processing, they proceeded with Excel, as knowledge of spreadsheets proved to be a handy tool for teachers handling very large classes. From the beginning of 2001, staff members will be trained in using computers for administrative purposes that will greatly enhance the effectiveness of this relatively large school. The provincial administrative program, FREESAD, will be used for this purpose.

As several of these teachers are enrolled at institutions of higher education for postgraduate degrees and diplomas, the utilization of information communication technologies in supporting them in their studies will be investigated. It is hoped that on-line facilities will improve the communication with the provincial department of education and also serve as a tool to keep teachers informed about implementation strategies in Curriculum 2005, the new outcomes-based education model adopted for the country. A logical outflow will be the implementation of IT in classroom teaching and the establishment of computer laboratories as well as literacy programs for learners.

Teachers are considered as full partners in the Project. They are free to air their views and make suggestions to improve the program. They also complete questionnaires on a regular basis. Those who had not worked on a computer before, reported problems with their keyboard skills and with using the mouse and doing the "clicking". They also found the saving and retrieving of information difficult in the beginning. But they are all very enthusiastic. When asked how they were going to use their newly-found skills at Lereko, most said they intended to type their examination papers and undertake the processing of marks. Several expressed the wish to teach computer skills to their learners. They also asked for more advanced skills, such as doing the school's administrative work, preparing timetables and work schedules, typing mathematics papers and drawing geometrical figures.

Conclusion

The TFS has now officially taken Lereko under its wing. Although implementation problems can be expected, the program offers a valuable opportunity to educators at the TFS to serve their local community and, at the same time, gain valuable insight into the problems of implementing information technology programs in a school in a developing community.

References

Department of Education (2000). *Implementation plan for Tirisano*, January 2000 – December 2004. Pretoria, South Africa: Department of Education.

Collaborative Technology Exploration: Bridges Between University and K-12 Education

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Saginaw Valley State University teacher education and content faculty are engaged in a research and development initiative through the United States Department of Education Title II Grant (Teacher Quality Enhancement). One strand, identified for study and implementation by the Title II Grant, is technology. Content Development Teams (CDT's), comprised of participants from the following areas; university content faculty, two per team; university teacher education faculty, one per team; and K-12 master teachers, two per team, are expected to use technology in some manner as a pedagogical tool. Content and teacher education professors and master teachers are engaged in learning about and implementing various technological methods. Syllabi are being redesigned to be placed on a web site created especially for each course. Course web sites will include an interactive component, search engines and other online resources important to the course. CDT members will also be trained to use Blackboard technology and will integrate it into redesigned courses. Our group is curious about the effectiveness of technology as a pedagogical tool in university content and teacher education classrooms and elementary and secondary classrooms. In this process, we intend to re-examine our ideas about student participation, instructor roles, and expectations with technology use.

Our project perspective, therefore, is one of collaborative examination and learning about technology as a pedagogical tool in each of our disciplines. Our aim is to work together, examining various technology options and software, Blackboard, GroupWise, PowerPoint, and Daedalous, in in-service development. We are collaboratively and individually investigating the effectiveness of infusing our various practices with technology. Our data consists of recorded formal conversations from weekly meetings and in-service development meetings. Meetings and collaborative work on multiple strands, delineated by the Title II Grant, take place during fall semester 2000, and winter semester 2001. E-mail communications about Grant technology implementation between our CDT members will also comprise data. Student evaluations of technology initiatives, piloted in winter semester courses, will add a student perspective to our thinking. Individual manuals developed through this process including our collaborative work will add substantively to the data as well.

Preparation of classroom teachers requires teacher educators to construct curriculum that uses technology as a pedagogical tool to teach content and methods (NCATE, 1996; Holmes Group, 1988; Michigan Curriculum Framework, 1997). Collaborative examination of technology incorporation into existing curricula by university content and teacher education faculty and k-12 master teachers will facilitate: rethinking student participation, instructor roles, and expectations in the teaching learning process. Additionally, participants will evaluate the effectiveness and pitfalls of technology as a pedagogical tool while piloting a redesigned course. Lessons experienced and analyzed will benefit other teacher education and content faculty members and master k-12 practitioners.

The Holmes Group (1988, February/March). Tomorrow's Schools. East Lansing, Michigan: Author.

Michigan Curriculum Framework (1997). Michigan Department of Education.

NCATE Standards, 1996.

TELECOMMUNICATIONS: GRADUATE & INSERICE

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Telecommunications, according to Webster's Collegiate Dictionary, is "the science and technology of transmitting information, as words, sounds, or images, over great distances, in the form of electromagnetic signals, as by telegraph, telephone, radio, or television." The field has expanded, with the varying technologies that have emerged, and with the types of uses to which those technologies are being put. Education has seen a rapid growth in the use of telecommunications at all levels, for both administrative and instructional uses. Teacher education is in a unique position – using the technology to teach current and future teachers, and preparing them to effectively use it in *their* classrooms. So what technologies are now being used, and what do they contribute to the fields of teaching and learning? Which technologies are promoting appropriate and effective integration of information technologies into teacher education? Who is using these, what are they doing, and what are the results? How do we find the answers to these and other questions that will undoubtedly arise as we both follow examples and develop new approaches?

This year's papers in this, the Graduate and Inservice Telecommunications section, reveal an emphasis on the online world – on courses, activities, resources, and a variety of other issues. The 30+ papers reflect the activities (often collaborative) of 65+ individuals who share their knowledge, experiences, successes, and lessons learned. They provide us with thought-provoking ideas that address the questions above, and suggest paths and ideas that we might take and adapt for implementation in our own programs. Numerous themes overlap, occurring in multiple papers, with the papers themselves often containing a number of these different themes in any given paper. The following arrangement provides a stroll through the garden of Telecommunications in Graduate and Inservice Teacher Education.

Many students are now arriving in teacher education programs with increasingly sophisticated computer skills. There has been much discussion about the need to move from teaching basic technology skills to teaching how to integrated technologies into the classroom. Participation in online classes may require students to do more than learn *about* the technology – they learn *with* it, as they are immersed in it. Van der Kuyl, Kirkwood, Grant, and Parton describe a training course for teachers, in which information and communication technology (ICT) skills are learned and practiced in meaningful contexts as and when required in a metacognitively rich learning environment. Teachers are involved in identifying and planning for their own needs. The course is offered in a variety of formats — totally online, in a traditional class (with some required online activities), or as a combination of both. A key to success is the combination of teaching and learning and the active involvement with the technology, rather than just the delivery method alone.

The use of multiple delivery methods is also described by Davis, Li, and Nilakanta, who employ a hybrid delivery method (with both face-to face and online sessions) and a constructivist approach as students examine and develop case studies about distance learning. The authors suggest two dilemmas that exist for instructors: a balance between breadth and depth as it relates to content, and the need for structure as well as the freedom from it. It is interesting to note that these concerns are not strictly related to distance learning – they are issues related to teaching and learning, and not specific to the technology.

Several other papers also describe programs or projects that are grounded in constructivism. Sujo de Montes and Blocher describe a program based on constructivist principles. They discuss the importance of interactions throughout their online Educational Technology Master's degree program, and explain how they incorporate virtual reality, using the program *Active Worlds*, to promote this interaction. Michelle Adelman describes a program where high school teachers taking *Foundations of Educational Technology Theory* applied constructtivist theory to project-based curriculum, while learning to create web pages, and then combined these two elements as they used them to conduct online research in their content areas and then to construct Virtual Field Trips. Constructivism is addressed more directly in an online professional development program described by Monaghan and Slotta. The Web-Based Integrated Science Environment (WISE) includes a web-based curriculum, a virtual community, and virtual mentoring, and participants explore constructivist pedagogy, best practices, and specific curriculum development techniques that they can take back to their classrooms.

Richards and Bhattacharya discuss issues related to converting reluctant Internet users into 'keen' users of the same. They suggest that their conversion model of learning with technology is based on constructivism, but goes beyond it in two ways. It emphasizes the important role of the teacher, and the authors suggest that this might make some teachers less fearful of learning the technology, when they realize that they will not be replaced by the technology.

Obermeyer and Gibson describe the Virtual Professional Development School Consortium's shift from a NetCourse model to a NetSeminar model. They discuss problems with and lessons learned from the former, and the advantages of the latter (including the creation of constructivist, problem-solving, and collaborative learning environments), and their belief that there is an even more responsive system that will surface in the future.

Assessment is a major issue throughout education, and the area of distance learning is no different. Roblyer and Ekhaml discuss the importance of interaction in distance courses, the use of rubrics, the importance of interactive qualities in distance learning, and specific interactive qualities in distance learning courses. They go on to explain how they developed their rubric, and include a copy of their Rubric for Assessing Interactive Qualities of Distance Learning Courses.

Research studies are being conducted in an attempt to determine what is and is not effective in the distance learning environment. Molinari reports on a qualitative study of two online groups of nursing students, and describes findings in task, relationship process, and online communication categories. Student responses may provide online instructors with food for thought as they design and modify their courses.

Another area of assessment relates to student reaction to (or evaluation of) courses. Harmes and Barron conducted a study, over six semesters, of students' reactions to tools and techniques used in a distance learning class. Only one of the 79 respondents would not like to take another course via the web, and 99% reported a positive feeling about web courses. Only 13% felt isolated or alone, while 87% felt the level of group participation was at least the same as in a regular course.

Student reactions are also discussed by Joyce, Nodder and Young, who describe postgraduate computer education courses that met face-to-face four weekends, spaced throughout the semester, supplemented by online activities between meetings. For two semesters, from one course, discussion board postings were collected and analyzed, and at the end of each class, students were asked to rate the usefulness of the different course components. During the first semester, when there were more postings, students indicated that they valued classroom interaction more, whereas during the second semester, with fewer postings, students rated the Internet activities above other resources.

Harrison Hao Yang also reports on student responses, with a concentration on the course content. Meeting in a computer-enhanced classroom, students participated in project-based learning, as they studied "Multimedia and Internet for Education." The four major design principles on which the course was built are described, and findings from student final written reports are presented. Students' reflections revealed major positive effects related to the usefulness of extended learning, effectiveness of production, and proficiency of technology integration, and students indicated that they would take what they learned, share it, and continue to use and learn.

Project-based learning is also the subject of Tyndall's paper describing the Camp Internet Distance Learning Consortium. Camp Internet is a project-based teacher technology training and content delivery program that combines live teacher training with immediate online classroom applications. After a 4-day intensive training session, participants have monthly continuing education sessions, and on-line education and support continues to provide assistance with 4^{th} – 12^{th} grade classes. The Camp Internet project trains the teachers, and also provides online classroom materials for the entire year.

With the rapid growth in the offering of online courses, it is essential that online resources be available for use by online (and other) students. Many of the previously described papers include information about resources that result from the described courses and programs. Several papers, though, deal primarily with the production or provision of online resources in various content areas. Peter Serdiukov discusses the structure and organization of ESL websites, with an emphasis on the DEEEP (Distance Education ESL Endorsement Program) website. The website is designed for "teachers who need continuous, updated, effective pedagogical resources for their productive classroom activities and professional growth." Heaton and Stemhagen express concern about problems that keep teachers from fully utilizing the World Wide Web resources for their content areas. Using ARC (the Algebra Resource Center) as an example, they explore three primary functions of content portals on the web. Portals should include filtering, providing content, and building community Each of these will facilitate the finding and retrieval of web resources, but the final one also has the potential of reducing the isolation of the classroom, as teachers join together in communities, working and studying together. Materials are also prepared and disseminated as part of a project shared by Klemm. A College of Veterinary Medicine, a Center for Rural Public Health, and a College of Education are collaborating to develop science curriculum and training for rural middle-school teachers in the field of environmental health information. Klemm describes some of the existing and future modules, explains the related teacher training that is available, and provides information for accessing the web sites.

Marcelo, Mingorance, and Estebaranz continue the professional development theme. They discuss the importance of professional development in teacher education, and the concept of networks as professional development. These concepts are illustrated by a description of the Andalucian Network of Trainers program. Key components are the use of asynchronous communication and group web pages. Zhang and Sextro also discuss an approach to professional development. They describe the HOST (Holden Online Staff Training) Model, the goal of which is to move teachers forward in technology implementation in the classroom. One key component is a web site with web-based video-training clips available for all.

Another example of professional development for teachers in conjunction with the creation of online resources is described by Cathy and Terrence Cavanaugh, who explain how university faculty worked with Florida Professional Development Schools teachers to develop an online workshop to address identified needs. The online format was convenient for teachers, and helped teachers become more comfortable and confident, as they worked with the technologies at their own pace. Key to the success was the involvement of university faculty, but faculty involvement with technology is not the case at all institutions. Joel Levine addresses this issue of faculty and technology. He discusses various models that have been developed in the areas of acceptance, adoption, and use of new innovations. He then suggests support strategies that may assist faculty as they move through the various stages in the adoption of distance education technologies.

As online classes, programs, and/or activities are planned, it is essential to

The importance of community is also discussed by other authors in this section. Bennett and Ekhaml state that the development of supportive learning communities is essential in distance education classes. They suggest specific elements that contribute to the development of such communities, advocating the use of case studies and problem-based learning. Laferrière, Breuleux, and Montané discuss their research that takes place within emerging practices, where they are asking "What happens when classrooms get networked?" and "What knowledge is to be transferred in order to prepare 21st century citizens?" In the process, communities of practice shift to communities of inquiry, leading to a community of interpretation and the development of 12 design principles for creating activities for networked classrooms.

In order to build community in an online class (or among any online group), it is essential that frequent effective communication occur. Abramson and eight doctoral students (Bibeau, Birrell, Cohen, Lundy, Norton, Scalese, Star, and Toral) describe the students' experiences in the process of preparation, posting, and mentoring online, and provide individual reflections that share best practices. Instructors may identify with many of the observations and other comments presented, and may find some innovative ideas to adopt. A recurring theme throughout this paper is that of collaboration, and communication is a key to that. Vizcaino, Favela, and Prieto also discuss these topics jointly. As they address the issue of group collaboration, they examine one approach to overcome the problem of "inefficient conversations," which they feel interferes with the collaborative atmosphere. They suggest the presence of a virtual student moderator to overcome student complaints about off-task discussions, and to foster learning. It is interesting to compare the two different – the real and the virtual.

Types of communication have also been addressed in papers about mentoring and virtual teams. Which type of communication is most effective? Pauleen describes how different virtual teams preferred different types of communication. One group facilitator considered the telephone essential at the group formation stage, while others considered only a combination of Internet-based synchronous and asynchronous modes. ICQ instant chat was determined to be quite effective for some groups. Shafer, reflecting on experiences mentoring beginning teacher researchers, concluded that using both synchronous and asynchronous interactions might be more effective than using just e-mail. She also suggests that limiting communication to one medium may be too limiting, and suggests further study in the area. Communication of various modes is referred to by Carlson and Repman, as they discuss some guidelines, techniques, and cautions related to offering virtual internships. The reminder to check professional accreditation and licensure requirements carefully in especially important as people are looking for creative ways to supervise student teaching.

A recurrent theme throughout this section has been the need for teachers to have training and access, so they will know what to do and how to do it, and they will also have the resources that are needed for successful implementation. Iverson and Baxter acknowledge that learning the *perfect* software program will not help, if the teacher has no access to that technology in the classroom. They have created a Virtual Learning Community (VLC), a set of free, low-cost, or readily available tools to support teachers and students in traditional classrooms, and they provide related faculty development. URLs of web sites with examples and the tools are also provided in the paper.

Implied throughout has been the concept of appropriate integration of the technology into meaningful instructional settings. Many of the papers have discussed specific projects that illustrate this concept. Gersch uses another approach, as she describes ways to use the Internet in the classroom. Her discussion is filed with URLs providing access to ideas she shares, and she then concludes with a list of suggested design criteria for Internet projects. This paper might provide guidance for instructors wishing to introduce Internet applications into their teacher education classes.

So what are some guidelines that might be considered by people wishing to begin developing online courses. Throughout the papers, there have been comments about what has worked and what people would do differently. We will conclude with a paper that provides a framework for developing online courses, and then two papers that provide lessons learned, so that other people will know what to avoid and to do differently. Leggett, Dirksen, and Anderson present a systematic approach to developing online courses. They present a framework of questions in seven domains to guide instructors who are developing such courses. After teaching an online directed readings course in science education, Kevin Barry has described both the pleasure and the pitfalls he experienced, and then he provides helpful lessons learned, so assist others in the design of their classes. Mims and McKenzie present lessons learned of a traveling type, as they discuss factors to be considered when teaching online course in different countries. Based personal experiences, problems encountered and tips for success are shared.

This stroll through these papers reveals that, in teacher education, telecommunications is far more than "the science and technology of transmitting information ... over great distances ...." as was quoted at the start. It also includes the planning, design, implementation, and evaluation of teaching (and./or training) courses and programs and of resources – all designed to improve the education of our students at all levels. Teaching, after all, is teaching, and the delivery mechanism is just a tool to help us achieve our goals. Telecommunications provides a way for us to reach people who are not able to attend classes (due to time, distance, or other factors), and the papers in this section will help provide guidance as we plan for success.

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Practicing the Skills of Online Communication

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Abstract: Too much of what is considered conversation is little more than taking turns speaking. When this process is translated to a print medium, such as an electronic forum or bulletin board, it quickly ecomes evident that keeping on track is very difficult. The current literature extols the virtues of collaborative learning and the Internet that makes possible collaborative learning across the miles. However, learning is much more than discussion and a good discussion is rare indeed. As part of a graduate course in online

learning environments, distant students took turns mentoring and participating in online conversations that adhered to specific guidelines.

This institutional session will be of great interest to everyone involved in online learning. Graduate students, most of whom are actively employed in distance learning initiatives will share lessons learned and skills mastered in the art of online communication in a learning environment. Each presenter will begin by describing the process of preparation, posting, mentoring and end by reflecting with an emphasis on sharing best practices

Introduction

Too much of what is considered conversation is little more than taking turns speaking. When this process is translated to a print medium, such as an electronic forum or bulletin board, it quickly becomes evident that keeping on track is very difficult. The current literature extols the virtues of collaborative learning and the Internet that makes possible collaborative learning across the miles. However, learning is much more than discussion and a good discussion is rare indeed.

The Assignment

In the process of refining a methodology for post-baccalaureate distance learning, it soon became obvious that before one could facilitate a cognitively rich online course, one would need to practice the skills of online communication. Forty students met on campus for a week in July 2000 and then returned to all parts of the globe. A customized Allaire forum system readily available on the World Wide Web (WWW), with password access for students, was the tool used for skills development. The assignment required each student, or students in groups of two or three, to mentor a discussion related in some way to online learning.

These online mini-conference threads or conversations were required to be sufficiently motivational to attract at least three participants. They were to be announced in advance for recruitment and could run anywhere from one week to three weekends and the two interim weeks. The assignment recommended that the mentors not assign homework so that focus could remain on discourse and not subject mastery. Instructions were distributed and discussed in class for methods of conducting an on-line conference thread. At the end of the conversation, the mentor(s) had to post a conference summary and copy it to a class thread called Conference Summaries.

Three weeks following the end of the conversation, each student was required to submit a reflections paper written in the first person. The paper was to include where expectations were met, where the mentor disappointed himself, where others disappointed the mentor, and lessons learned about online conversation.

The Outcomes

This first iteration of the assignment has been gratifyingly successful. The makeup of our doctoral classes is very unpredictable since our major entrance requirement is a B+ average in an accredited masters program. As educators, we have learned that a strong top of the class pulls everyone else up. In this case, the top of the class was terrific. Among the students were online community college and four-year college instructors, people in charge of instructional technology for colleges, school districts and even state departments of education, and K-12 technology trainers. Members of the class jumped into the assignment with an enthusiasm always hoped for and seldom seen.

Members of this panel have self-selected to discuss the processes of moderating and participating in online discussions. Although all the participants are doctoral students, the conversations were, for the most part, not cognitively demanding. The best practices learned will apply to a wide range of adult, Internet-based, distance learning environments. Below are reflective remarks about the process prepared by each of the panelists.

Synchronous and Asynchronous Learning Environments
Shelley Bibeau

Three doctoral students who had just met at a week-long summer institute got together in a rather hurried way and decided to share an online conference forum. Crystal Daughtery, Cynthia Townsend, and I, Shelley Bibeau began our collaboration with a very brief discussion of a topic. After institute it seemed a simple thing to plan; after all, we had e-mail and were somewhat computer savvy. So we returned to our home states secure in the knowledge that this assignment would be straight forward, or would it be? For some time I had considered online delivery modes. I was wondering what new experiences teachers were having, specifically with the Internet. It was becoming obvious that synchronous delivery, although useful, was difficult due to schedules, time zones, and the vagaries of imperfect technology. Asynchronous methods seemed to be growing both in use and availability, but development often required time and a learning curve. Soon our group made a first e-mail contact. I jotted down some questions around the topic and asked for comments and other suggestions. When my cohorts responded that the topic was fine I honestly felt disappointed. I thought this was an opportunity to share ideas; instead I felt like the dominant student in a face-to-face classroom who had cowed the other classmates. I resolved to avoid that in the future; after all, this was an opportunity to learn about learning environments while in one, and we did have a good topic, or did we? We decided a one third stint with each of us as co-moderators would be more workable for our busy schedules. We planned to stay in close communication during the forum time period. While we succeeded at that, communication was not always the result. E-mail can be misinterpreted by the reader; more so when you are doing an assignment. I found that my e-mails were sometimes misinterpreted and I misinterpreted others as well. These encounters could be both frustrating and humorous.

The Forum Conference
Our topic was synchronous and asynchronous learning environments. We set out to answer four questions. They were:

1. Briefly describe your experiences with synchronous and asynchronous learning environments.
2. What tools are you aware of/have used before? Briefly comment on their usefulness
3. What underlying pedagogies/andragogies can be found in synchronous/asynchronous learning environments?
4. Do you think there is or should be a difference between synchronous/asynchronous learning environments as used in fully online courses or as supplemental to a traditional classroom? Describe how.

After the call for conference went out and a good-sized group signed up, Cynthia started off the discussion. Her strong communication skills got the participants responding well to question one. She was able to get the group to find common ground by relaying their personal and professional experiences and she sparked lively communication by offering some relevant URLs for the group's reflection on questions two and three. Excerpted articles generated more discussion of how pedagogy should drive the choices of instructional technology, and the baton was passed on to the next co-moderator.

Crystal followed up with an appeal to efforts that would provide a body of research for educators concerning effective techniques and pedagogies for synchronous and asynchronous online activities. Crystal offered some best practices literature and definitions. These helped continue to answer questions three and four. Crystal's leg of the forum occurred at a time when students were struggling with assignment deadlines. She felt her technique was ineffective and would not be consoled otherwise. In retrospect a phone call may have been more helpful than an e-mail - the latter mode does not seem to have the impact as do a few kind words.

I conducted the last third of the forum. The participants now had an opportunity to try some hands-on use of synchronous technologies by visiting a Web-based learning environment, TappedIn, which afforded a free place to "chat." When educators experience various technologies first hand I believe their sophistication increases and will be better armed to work online effectively. In these sessions we continued with our conference questions and examined synchronous learning modes as we compared them to our experience at the moment. Due to the anonymous nature of the sessions people also expressed frustration and anxiety over assignments. Thus, it was difficult for the inexperienced to keep up with several conversation threads, but at the end of each session a log was sent to each participant for their examination and reflection. In general the participants seemed to understand the forum topic and what was expected of them, and they did an excellent job.

After the Forum Conference - Personal Reflection, Personal Foibles

When the forum was over it was time to wrap things up, thank the participants, write a summary and do a few post mortems. Our summary posting was hampered by a few miscommunications, but when it was finally done we breathed a sigh of relief over what was a challenging process. In retrospect I think the forum went a bit too long - nine days would have been enough. I also feel the topic was too broad. If I had to do it again I would have tried to focus the topic specifically on one mode (e.g. synchronous online real-time conversation) rather than be spread so thin.

A couple of my reflections revolve around some of my own personal foibles. I need to have more patience. When activities are performed electronically there is always a wait time and this is hard for me. Another foible is that I still think about comments made in forum that I disagree with, especially some of the "hot button" issues of pedagogy driving technology vs. technology driving pedagogy. I need to find the courage to speak up more, yet, at the same time not be reluctant to argue with people on issues about which I sense there is an emotional investment. To be honest I'm still not quite sure how to do it but the desire is there. Balancing patience with participation is one of my goals.

Working with two co-mentors was both challenging and enjoyable. Frankly I don't know how I would have gotten it all done without our collaboration and mutual support. I was very satisfied with the job my forum group did. We shared personal experiences, some review of the literature, and a hands-on experiential portion that worked well. In retrospect it may have been better to change the order of those three parts but I'm not quite sure in what way.

There were a few disappointments. We could have had better communication during the forum. With our busy lives this was difficult, however. As I stated before I disappointed myself with my impatience. I have a hectic schedule and in order to get things done in a reasonable amount of time I like to start early. I truly believed that this intimidated my co-mentors. That was not my intention, and to their credit they were much too gracious to tell me. My over all satisfaction with my co-mentors was high, however. They taught me some new ways of interacting with people online. Here are some of the major lessons learned about online discussion groups:
Early preparation is a good idea - the conference took more time and attention than any of us had anticipated.
Read and participate in the other forums - they are wealth of free how-tos!
Communication between co-mentors may require phone calls.
Keep the topic focus narrow.
Choose an appropriate time for a forum.
When people post to the forum give them feedback as soon as possible.

The Best Thing – Variety

If I had to select what I thought was most effective about our forum conference it would be its variety. Looking back I like the three-way approach to the topic -- reflection on previous experience, literature review, and hands-on experience. It permits a variety of interaction styles. Some participants were very active in the chat environment, yet they did not post. Since I did not ask them why they didn't post I can only assume they felt more comfortable in a casual more anonymous setting where their input was neither public nor permanent. My co-mentors, whose personal styles brought different people into the conversation was another exhibition of variety. Each of us had a slightly different array of contributors, posting at a different pace (some more than others). The variety was effective. The mix made for an effective forum conference. As for conference forums in the future we still need to address the issues of students/participants dominating topics, others holding back, participation, and sharing knowledge and ideas.

Virtual Field Trips

Susan Birrell

Overview of the Process

We are the experts when it comes to our own learning! Participating by being a moderator in this first online forum experience was an invaluable learning experience and opportunity. During the end of September I was part of a triad that moderated a discussion about virtual field trips. The three of us decided to become a team in July because we all worked in K-12 education in the capacity of technology and learning. Very few other students in the class were from this environment. All of us were interested in exploring online learning for students in kindergarten - high school. Many of us had participated in some kind of collaborative project, i.e. Classroom Connect or Scholastic Network, or another curriculum project in the past. However, all three moderators were new to Nova and in particular moderating. We corresponded online about our respective interests, timelines and responsibilities. We came to consensus easily about the rules, dates, and topics for the weekly topic discussion. It was interesting to note that all three of us, upon reflection, had different definitions for "effective virtual field trips" and because of that became learners and open us to new and innovative definitions. I learned a great deal from this experience. First of all by enrolling participants from a wide variety of backgrounds and occupations in this forum we acquired a wide diversity of perspectives. The definition and categorization of a virtual field trip became very dependent on the life experiences, ages, and professions of the participants. I had never really experienced web cams and videoconferencing in the K-12 environment and these new technologies opened my mind to the possibilities. I must admit that when the discussion turned to critiquing the field trips as boring I did take it personally. Tramline's collection of virtual field trips left the voyeur with a flat affect but there was still some thought and effort that the creators of the site employed. I felt a little bit devastated and shy and reluctant to express these emotions in a posting. I also felt a little bit angry that somebody would use such a strong word that evoked negative thoughts such as "boring" in a posting. There was no other way to take this remark without becoming defensive. After the anger and shock and discomfort subsided, I was pleased to see that this label did evoke some wonderful discussion and strong feelings by other participants. The forum became more interesting and more vital. People seemed invested in the topic and wanted to write a response that contained a definitive opinion. It was almost a relief to be able to express some emotion in a posting.

A Personal Perspective

As a first semester doctoral student who has never participated in any forum previously, I notice that many of my postings in my classes do not elicit responses. I am very cautious to make sure that I quote learned authorities and although I have much practical experience in my field, I often have to squelch my communication because its ideas are solely my own and not a refereed authority. My postings are very impersonal because I am concentrating very much on finding peer reviewed articles to echo some opinions that I vaguely share. However, these posing that must contain references to peer reviewed articles limit my passion and my own voice and commitment to these causes. This structure tends to inhibit my investment in wanting to communicate often and with passion. I am sure there is an art to this and after semester one, my responses will become less stilted and more genuine.

I am grateful for this written reflection paper as it dignifies and makes important my transformative learning experience in moderating a forum. I think I have reframed my experience to be one that can be learned from. I have already begun to post differently to my other class and I am reinterpreting and reframing my ideas and ideals about forums and facilitation. My sense of empowerment and confidence will grow over time with this method of communication. I believe that it will take some practice and some work. Learning about the ways we learn is something that this process of moderating a conference has provided me. By engaging in the process, we become facilitators of the learning experience. Learning how to participate as a team member and work collaboratively is another outcome that as a participant I have garnered.

Your Transition to Online Teaching

Deborah Elizabeth Cohen

My Goals for the Miniconference Thread

The mini-conference thread I led was on transitioning from classroom to online teaching. I hoped participants would explore their feelings about the changes that they had to undergo as a result of teaching in this new way and that they would share best practices. I also hoped this discussion thread might serve as a forum for students to debrief their experiences in moderating these discussion threads. In my invitational statement in which I solicited participation in the forum, I made the participation guidelines pretty broad: "for those who have made the transition from classroom to online teaching (anyone who's conducted a forum here qualifies) and anyone who would like to learn from them".

The Process of Preparation, Posting and Mentoring

The process of preparing for the conference was long and organic. The topic had been in gestation for over a year, and I had had the opportunity to do some preliminary research and to engage in some discussion with professors. Due to taking this course, I had participated in many mini-conference threads. The perspective I brought to the topic was that of a former classroom teacher and college instructor and someone who had had the opportunity to watch people transition from vocations to the same vocations incorporating the use of the computer. In my most recent stint as an instructional designer adapting college courses for delivery over the web and Internet, part of my mission had been to help professors transition to their first online teaching. I had never taught online myself. The Saturday a week before the discussion thread was to start, I started reaching for pen and paper to record notes on ideas that were bubbling forth.

The next day I woke with a start to realize that the forum would be starting in a week. In order to get the attention of those students who do most of their schoolwork on weekends, it would be wise for me to post the invitational statement that day. With the aid of the notes I had put together the previous day, and relying heavily on the invitational statements from previous message threads, I began to compose mine. The invitational statement summarized the content of the thread – the questions we would be addressing - and the "rules" under which we would be operating. I grappled with whether to state my expectation that participants would contribute three times over a two-week period. Was that too demanding? I also wrestled with whether to include a statement asking for participants to treat each others' postings with empathy. Was that insulting? I decided in favor of including both.

I posted the statement and waited…for two days. It was an uneasy time in which I was beset by many paranoid thoughts about why my fellow classmates weren't responding. I wrote one recruitment email and pondered writing others, began thinking of alternate topics to do, and finally had the presence of mind to share my dilemma with my professor, Dr. Trudy Abramson. She assured me that the topic was fine and shared that students' participation was dwindling since it was the end of the semester. Moderators of other mini-threads were having the same experience. She sent an email to everyone in the class, and by the end of the next day I had twelve registrants. (Only seven of the registrants would turn out to be active in the sense of participating regularly.) Every prospective registrant submitted a posting indicating interest. My next challenge was to welcome everyone without being too repetitive. I wanted to convey basically the same message – you're welcome, glad to have you – but not in identical words. I didn't get out the thesaurus, but I did spend time and attention wordsmithing my responses.

A day before the thread was to start, I posted the first communiqué, welcoming everyone to the forum and laying out a schedule and an agenda for how the next two weeks would unfold. I began our discussion thread by asking participants to answer the following questions: "How has this transition caused my role to change? How has my relationship with my students changed?" Participants sent in postings, some in response to housekeeping matters, but mostly related to the topic. I checked the forum regularly and responded to each posting in 24 hours or less, trying to zero in on the substance of what the participant had posted. When someone made a point that I thought was suitable for group discussion I highlighted it and asked for responses. I requested clarification when it seemed called for. Often I didn't receive it. Also– probably to allay my anxieties about feeling isolated – I requested that participants provide me feedback if I did anything as moderator that bothered them. It resulted in one beneficial posting: a request that I provide a heading for the postings of each "round" of the threaded discussion.

This was an example of just one of the ways I benefited from having experienced online instructors participating in my discussion thread. They provided tips that I was able to immediately employ, such as sending out emails to individuals to let them know when an old thread was being put to rest and another was about to begin. That's what I did for the next round. I also posted the next set of questions on the forum: "Are there competencies upon which I formerly relied that I've had to give up? Which new competencies have I had to develop? Has there been a change in the way I feel about myself as a result of these changes?" This round generated the liveliest discussion of the threaded discussion, though probably an equal number of postings as the first round. While I checked the forum several times daily, I did not answer every posting as participants were doing a lot of dialoging with each other. I tried to summarize and/or respond to main points.

Time for the next round came around, and I sent out an email saying a new thread was beginning and the old one was finishing up. I also announced logistics for a synchronous chat session to which three participants had committed to participate. This was to take place towards the end of our time together: on the Thursday preceding the Saturday on which the conference thread was to end. In the discussion thread I posted Round 3 questions: "Have my day-to-day activities changed? Have I felt adequately supported by my institution in making these changes? What is adequate institutional support?" As an introduction, I also posted something about the differences between how I would normally teach a class and how I was moderating this discussion. Results for this third round were disappointing. Only one participant submitted anything – a link to an applicable report that she had written. I read her report, which I found very worthwhile, responded to her in the thread and informed the group that we could discuss her report at our chat session. There were no other responses.

Four of us showed up for the half-hour chat session. I had emailed two of the participants the day before to provide a heads up that I would be asking them in the chat session to clarify some statements that they had made earlier in the discussion thread. The majority of the chat session revolved around these issues, and it made for an interesting discussion.

Earlier on the day of the chat session (Thursday), the fourth round had begun. I had not sent out an email publicizing the new thread and announcing last call for the old. In the discussion thread, I asked participants to share any as-yet-unshared tips for teaching online. I also asked several questions from a portion of a report I had asked participants to read in preparation for our discussion, but told people they could answer the questions even if they had not read the report. The questions had to do with (1) the mechanisms that are available online to help with teacher attentiveness to students and (2) how concern that students become educated can be translated to online teaching activities. A single student submitted three postings summarizing the effectiveness of distance education, providing information on effective feedback techniques and improving interaction, and providing best practices for the design phase. I responded to all three postings with one posting, but no one else did. I ended the mini-conference thread by summarizing the fourth round, posting a thank you to the participants, and placing a summary of the entire proceedings in the discussion thread.

Reflections

Was this discussion mini-thread successful? In my estimation, it was mixed. Yes, in that it met its original goals of providing for an exchange of worthwhile information about the practice of online teaching. Yes, in that it provided the opportunity for an inexperienced online moderator to moderate for the first time and to begin to acquire a little bit of skill. Was it enjoyable? I can now identify with the instructors who report a difficult transition to online teaching. I have to disclose that at least some of the time I found leading the mini-thread anxiety producing, and as a socially motivated person, teaching in a classroom is more personally enjoyable to me. What caused the most anxiety, I think, was the sense of loss of personal control: not knowing which of my actions improved the discussion thread and which developments were the results of forces outside of myself. I am left with some certainties regarding best practices. It is helpful to send email notifications when new topics start and old ones end. Personal email in general seems to be a plus. It is important to craft questions so they are clear and focussed. Tracking the discussion carefully and being responsive are priorities. A simultaneous chat session for participants to clarify issues is of benefit. But I am left with many questions. Why were the first two rounds – particularly the second - so successful, and why did people virtually drop out of the last two? Was I somehow responsible? Was it the combined demands of the end of the semester? Should this two-week mini-thread only have been one? Ideally, the next time I moderate a discussion thread I would like to simultaneously employ usability testing to better evaluate the causes of what occurs.

Use of Simulations as Online Instructional Strategy

Jo Lynne Lundy

Asynchronous Online Communication

Communication is the most important activity that we perform as humans; it is the heart of everything that we do. For communication to take place, there must be a sender, a receiver, and a message. If the message is intended as instruction, there must also be an environment in which this educational communication occurs. Asynchronous online communication promotes a type of interaction that is often lacking in the traditional classroom. It allows learners the freedom to explore alternative pathways, develop their own styles of learning, and opportunities to research and reflect on the discussion taking place. Thisreport summarizes my experience of participating in and moderating an online asynchronous discussion thread. Participation in the online class discussions involved reviewing the topics and choosing a topic of educational interest, yet one in which an intellectual contribution could be made. Some of the thread titles proved misleading. Other threads had rigid rules, and participation in these was exhausting and more of an exercise in survival. However, many threads were interesting and relevant, and I benefited from both lurking and participation.

Co-moderating a Discussion

I moderated a thread eight weeks into the term, so I had time to learn from others what was successful and not so successful. The initial plan was to moderate the thread alone, but as I outlined the topic and schedule for the two week thread, a classmate expressed interest in the same topic. Over a four-day period, we decided to co-moderate the thread, obtained permission from the instructor to do so, outlined our duties and responsibilities, and posted our opening comments and questions. Planning for the two-week discussion was difficult in such a short time frame, but we were both relieved to not have to face the moderating assignment alone. During the next two weeks, we realized that flexibility, adaptability, good communication, and voicing expectations were the keys to our successful discussion. Keeping our group to a maximum of eight participants allowed us to handle the discussion well; some threads had 12-15 members, and the discussions seemed difficult to manage.

Moderating the thread was more difficult and time consuming than I imagined, but the goals outlined for the discussion were accomplished. I tried to respond to participants within 12-24 hours, and at times was overwhelmed by the pressure to keep the discussion on track, along with acquiring some needed HTML skills. I was challenged by the participants and learned much from the references and links that were posted. Believing that the role of moderator should be one of a facilitator, guide, director, monitor, and peer, I attempted to keep the discussion informal, yet informative.

Reflections on this experience include: feeling more confident about using electronic communication, learning from others what was successful and what invited failure, learning to write in a public forum and for an interactive purpose, learning to analyze and respond to the writing of others, and learning to express an intellectual position on a topic. Learning occurs as a result of both planned and unplanned activities. The asynchronous communication assignment provided a rich learning experience, and should be considered an important instructional strategy for distance education.

Tests??!! We Don't Need Online Tests!! Or Do We?

Mava Norton

Forum Overview

Moderating an online discussion for the first time is a learning process. A classmate and I co-moderated a forum where the goal was to gather input from practicing distance students and distance educators regarding the *appropriateness, effectiveness and challenges of online testing*. The conference began with participants reading an article to start them thinking about testing and assessments in the online environment. As participants began the discussion they were asked to define the range (level and subject) where they were teaching and/or working. The discussion began with the following questions:

1. In an online course, why type of assessments are appropriate?
2. Does testing even make sense? And if so,
3. Should online courses have tests proctored – either on campus or where the student resides?
4. What assessments do you think most reflect the mastery of course materials?

Other questions addressed during the discussion were:

1. When dealing with online assessments, projects or self-check tests, what are our objectives when developing the assessment?
2. What are the challenges offered with this type (project-based) assessment?

Participants

There were nine people discussing the issue - seven participants and the two co-moderators. There were college professors, corporate trainers, and educational technology staff. Several participants posted daily or very often and others posted over the course of two or three days. The times where several people participated with their different viewpoints and opinions being offered created some lively conversation. I feel we had good discussions and received a great list of references and links from the participants. Even though I thought I had my mind made as to what online testing should be like, I have to admit this forum caused me to rethink some of the issues.

Preparation

Via email, my co-moderator and I discussed the topic, what questions to start with, whom to post the conference beginning and summary and whom to respond to participants. We decided to split the forum moderating time with him responding to daytime postings and me to nighttime but with both of us participating and responding when we login. Up until the last couple of days of the two-week forum, I was unable to connect to the forum site from work because of firewall issues and he preferred daytime because of family issues. This division worked well for both of us so that we knew someone was checking the forum frequently everyday.

Expectations

This is the first forum where I've been the moderator (or co-moderator). The topic, testing in the online environment, is of interest but any topic would have worked since it was just the tool for the learning process. I started without too many expectations. I wanted to explore the moderating process and all the aspects that go along with being an effective moderator. And to have constructive forum where all participants receive something. I feel that this was fulfilled through this forum. It was definitely a learning process and I now have a greater appreciation for forum moderators.

Disappointments

During the two-week session I was so intent in trying to keep the conversation going that I forgot what a forum should be… communication between participants. My job was to check things like links and other reference contributions and encourage conversation. Not dominate it. I don't think I was too dominating but I did tend to "push" the conversation without letting it evolve naturally at it's own pace. Several participants were slow in contributing. As the moderator, this was frustrating; however, looking at it from the other side, I know that I've not always been the most faithful contributor in forums for many reasons. I'm sure that they had valid reasons as well. I hope that if these were not class projects and were just informational forums that more interest would be applied in contributing since the participants would choose to register.

Lessons Learned

I learned many things from this process. First and foremost, *forum moderating is very time-consuming*. Even if others have not made a contribution, just the process of trying to stay on top of everything requires logging in several times a day. Checking links and references and providing corrected information requires time and effort. I always felt like I had to comment or ask a question to make sure the conversation did not lag. In doing this, sometimes I was too quick and didn't stop and think. When I moderate a forum again, I will be more careful to read and assimilate the information before responding. Letting some "silence" be around is not bad and can encourage others to contribute. I learned that *I would not like to moderate by myself* unless I was able to do it as my main job function and not in addition to a full-time job, as a full-time student and full-time mom. My classmate and I worked extremely well together in this co-moderating process. Having someone to discuss all the aspects of the forum process was extremely beneficial. Knowing he was there to contribute or keep things going and on track helped keep the pressure from being too overwhelming

A great lesson learned here and from participating in other forums is that *forums are great places for obtaining current up-to-date information*. Participants provide great links and references. I'm not sure if
others have more time or are just better researchers; however, I've obtained some excellent references and information to use in research papers. I intend to find conferences to participate in, as I get closer to the dissertation process. I know they will provide valuable information that can be utilized in my research and writing. And maybe I can help someone else in what they need as well. I learned that *having active participants is a moderator's dream.* I hope I can be a better participant because of this process and seeing the issue from the moderator's point-of-view. And finally, what I've learned is that *moderating and participating in these forums is a great learning tool.* I definitely have more appreciation for the whole process now that I've seen it from both sides of the coin (so to speak). Knowing what I do today, I would definitely recommend moderating and participating in forums.

Communication within Postsecondary OLE's:
Students' Expectations vs. Professors' Ability to Deliver
Ellen Scalese

I co-mentored an asynchronous online forum. Having mentored discussion threads, during the process of instructing in an online masters program, I was secure in my ability to mentor an online forum. I had already had three years of experience, which had helped me to learn the difference between posting answers and questions and communicating. I knew the difficulties inherent in trying to maintain the proper balance of intellectual freedom and keeping the forum to the topic simultaneously. As a first term doctoral student, I was not as confident of my ability to formulate a topic that would elicit peer participation. I decided that co-mentoring with a more experienced student might be the best method of approach. I met Paula Harvey, a third term student, who was taking the same Institute Courses. We spoke often during various breaks, developed a rapport, and decided to co-mentor a discussion thread.

The Co-Mentored Approach

Before defining our tasks and dividing up duties, Paula and I had to decide on our topic. We listed topics of interest to each of us and then discussed them jointly. Paula wanted to use a topic of particular interest to a variety of students. The topic was student-professor communication as an issue in perceived success or lack of success in an Online Learning Environment. That was a topic I also found interesting. However, as an experienced online professor, I wanted to include not only the students' expectations, but also the demand on the professors' time. Many professors in OLE's, myself included, are faced with larger class sizes and a large number of assignments to be graded, needing to be balanced with students needs for timely feedback. Our topic was formulated and our forum was given a title: Communication within Postsecondary OLE's; Students' Expectations vs. Professors' Ability to Deliver.

By mutual decision, we defined our tasks and divided our responsibilities. Paula would find a referenced background piece that would elicit thought and participation. She would formally state the conference goals and compile thought provoking questions intended to elicit interest and response from: first time distance learners; experienced distance learners; and distance educators. I would be responsible for the daily monitoring of the discussion. Paula would contribute as a participant. I would remain the unbiased mentor until the conclusion. I would respond to participants in a timely fashion. Although not one of her delineated duties, Paula frequently acknowledged participation and provided her personal feedback. I would provide mentor feedback to what was stated and ask additional questions and raise issues to promote response from other participants. I would summarize when needed and attempt to keep the topic on course without squelching intellectual freedom. I would close the forum and provide a summary. Paula and I would communicate by e-mail and telephone throughout our co-mentoring of the thread.

Thread Overview

The goal of this thread was to gather input from practicing postsecondary distance learners and distance educators regarding the degree of communication necessary to retain students, promote collaboration to offset isolation, and to explore communication options, time constraints, and conveyance of professionalism at a distance. Everyone was asked to read a thought-provoking article titled: Response on Demand – Professor Available to Students 24x7. The general topics for discussion included questions to novice distance learners, to experience ones, and to distance educators.

The interaction among the participants resulted in meaningful discussions promoting a further understanding of the amount, formats and timeliness of communication, between professors and their students, perceived by the students to be necessary to their success in OLE's. It is my perception that it also encouraged the participants to realize that professors cannot be available 24 hours a day. While we did not arrive upon a definitive "number" for response time or "amount" of necessary words, we did arrive at a group consensus of opinion on several items.

- Communication is perceived as a key success factor for students in an OLE by both the professor and the student;
- The amount of communication is not as important, as a perceived presence of the instructor in whatever online format is being used;
- The exact amount of response time to questions and assignments is not as important as a covenant being determined at the onset and that covenant being adhered to.
- Communication needs to be established immediately in order establish a sense of community and to foster a comfortable relationship between students and the professor.
- Students are not unaware that the professors have many demands on their time, or that there are many more students than professors. They just want to feel that their professor will respond to their needs in an acceptable fashion.

Reflections

I did not anticipate the difficulty we had in recruiting participants to join our forum. When we originally posted our thread, we had one immediate response for participation, then nothing. We waited a few days while continuing to lurk in other forums trying to judge what was garnering their participation. Paula and I both contacted other students and requested their input as to why we were not gathering a forum. We both received the same response several times. People who were interested were already involved in one forum and could not shoulder more responsibility or the timing was poor; there were several assignments due for the various courses at this time. Paula and I decided to repost once again with a new start date and a slightly changed title, as well as begin an e-mail campaign requesting participation. This garnered us the needed participants.

After a rather difficult beginning, the participants who joined the thread promoted lively discussions, meaningful opinions, facts and ideas. They formed a community and responded to each other in a comfortable yet professional manner. The participants not only shared personal opinions and experiences, they shared a wealth of informative references. They appeared to feel comfortable with both agreement and disagreement. They communicated amongst themselves using meaningful and constructive comments. When they became sidelined they were very responsive to my directing them back to the initial focus of the forum. They participated frequently out of interest rather than an assigned number of times. They obviously spent time and thought on their responses.

The partnership that Paula and I formed was most successful. Through the course of our co-mentoring, we discovered that we have differing skills, approaches and experiences that complement each and helped to form a very successful partnership, that benefited the forum as well as ourselves. Paula is an experienced 3rd term DCTE student from a corporate background. She has a wonderfully expressive style of writing and skill with words. She has a way of writing that draws the reader in. She did a wonderful job presenting our initial topic. As a participant, she incorporated humor that promoted community. Whenever the forum was lagging, she "popped in" to revive things. I, as an experienced distance educator, was already aware of the inordinate amount of time and effort it takes to mentor a thread. I was successful at providing timely acknowledgement of all contributions. I would spend several hours a day reading participants postings and carefully wording responses that were neutral and yet would elicit further response. I am experienced in the fine balance that must be maintained in order to promote freedom of thought in students and stay on task simultaneously. At the midway point, I summarized the consensus we had arrived at to date. I reiterated questions as yet unanswered and requested each participant respond to a few of the untouched issues. I waited until the end of the final week to express my opinion as a distance professor, so as not to distract from the students' viewpoints.

Having mentored graduate discussion groups in the past, I was already aware of several lessons learned by my partner. I was aware that there would be various qualities of responses among the participants and that careful guidance is necessary to keep a discussion group alive. I learned how much easier it is to mentor with a partner, each having their own roles to play. When I mentor threads alone, they do not usually form such an immediate sense of community and comfort. This is due to my more formalized approach. I will attempt a slightly more relaxed approach in the future. One of the main lessons I learned is that the more ownership or community the students feel in a forum, the more thoughtful and professional their responses become. Pride prevails and they are more willing to invest the "extra time" needed to raise the quality of the forum.

Are you a Survivor?

Lisa Star

This discussion thread was created to explore the characteristics required to teach in an online learning environment. We thought this would be an appropriate topic since many of the students in the class have extensive experience with online learning and in contrast others have little to no experience. Using this discussion forum to research the topic and then present results provided a collaborative effort for both learning and evaluating. My partner had no experience in online learning environments and I had considerable experience. We used our relationship as model and it proved a good balance.

Process of Preparation, Posting and Mentoring

The timing of our discussion coincided with the sensationalism of the "Survivors" television show, so we agreed to blend that popular theme into our research project. We wanted the participants to search for what characteristics were needed to "survive" teaching online. Our goal was to solicit a dozen participants. We fell short of that, but were glad in the end that we had fewer than expected participants because of the time element of group dynamics and needs.

The participants were divided into two groups and assigned tasks. We wanted to achieve both independent participation and group work. We were also looking to see if certain people would step forward and take a leadership role - no one did. Participants were expected to do research and submit the characteristics they thought were necessary to teach in an online learning environment. We requested that their responses be supported by references that followed the stated format. After each participants submitted a list of characteristics the two groups each posted them and voted. The top five from each group were joined to form a list of ten comprehensive references. Then the entire conference voted on the top five. We did see some overlap in the characteristics and allowed people to vote for the most articulate responses.

My partner and I met for the first time in class and just seem to connect, so we agreed to work together with no topic in mind. We spent several weeks exploring online journals and articles searching for a topic. We even spent a few sessions on the phone. We established a great working relationship that far exceeded my expectations. Group work can often become frustrating. We divided responsibilities and took turns monitoring the threads. It worked out great. This characteristic is a key dynamic of the process, in that two strangers team mentored the thread creating a wonderful collaborative relationship. Our institutions were physically located hundreds of miles apart, and I spent the majority of the two weeks on vacation in California, with a laptop of course.

People signed up and started participating right away. We found they went faster then we expected at times. I have found this in my own classes, that some students seek out the next step and if you have it posted they will act on it before you are ready. This did not prove to be a problem, and groups both completed all tasks.

What did prove interesting was the dynamics of the two groups. My group had a very diverse set of responses and tended to avoid literary support. Beth's group on the other hand provided detailed references to most all responses. The participants seemed to follow the "leader" and mimic the first postings. I believe that I follow this model as well. I often read the examples posted by others students and respond in accordance to their style. We only had one person not fully participate or follow our required dates. We received many outside emails from the group participants and we tried to respond to group members in email as much as possible. Everyone who joined the conference completed it. We did post a summary of all the tasks and participants, which included a check off sheet to show what they had completed. I think that this thread helped clarify the tasks. Being able to visualize the process often helps in an online environment.

Reflecting on best practices

I must admit that I was surprised by the responses that were finally chosen to represent the top five characteristics. I found they differed from my perceptions. I also found that there were large discrepancies in the voting. I was surprised that some of the characteristics did not make the final vote. I believe that we meet our desired goal of engaging a group of students to establish a dialogue on this topic. Even if the "list" was not truly academic, the discussion was lively and informative. I did learn that conferences take a considerable amount of time. I think that my partner and I underestimated the amount of commitment this project would take. This may have stemmed from the fact that we participated and moderated. We were impressed that the discussion went along at a steady pace and the number of hits to the conference exceeded 100.

Final Five Characteristics Required to Teach Online

The instructor must be:

- Knowledgeable about subject matter
- Able to communicate effectively
- Warm and Friendly / Human
- A Motivator
- Able to foster a comfortable learning environment

Collaboration and Interactivity in Online Learning Environments

Pilar Toral

Preparation

The "Seminar in Online Learning Environments" course at Nova Southeastern University required the mentoring of an asynchronous threaded discussion on a topic related to online learning environments (OLEs). During the required week-long visit to Nova for the Summer Institute, another student and I decided that we would to work together on this task, and agreed that we would divide the forum mentoring; she would moderate the first week and I would moderate the second week. Although my co-mentor and I come from different parts of the world and very different cultures (Israel and Puerto Rico), we were both first term students at Nova and biology professors. This common ground helped us establish a comradeship that began that week at Nova.

After returning to our work and families, we continued to communicate through e-mail, trying to decide what issues we would cover in our online discussion. It took us some time to agree on a topic as severalof the subjects that we considered had already been discussed in other forums. We continued searching for possible topics and after a great deal of shared brain storming, we decided on "Collaboration and Interactivity in Online Learning Environments". After researching the literature and discussing the subject, we decided that she would mentor the discussion on *interactivity* during the first week of the forum and I would mentor the discussion on *collaboration* during the second week. When time came, we *collaborated* by writing the forum goals, the introduction, and the conference summary together. Each of us wrote our part of the discussion We then read and corrected each other's part before posting them in the forum. Our goals for the forum were to discuss the importance of collaboration and interactivity in the success of online learning environments. We also decided on suggesting examples for collaboration and interactivity, reviewing the pertinent literature, and exploring various collaboration and interactivity tools and free software available. These goals, the forum's beginning and end dates, the rules for signing up for participation, and an invitation for peer participation were posted six days before the forum's start date. The discussion was limited to ten participants. We asked them to contribute to the thread at least three times during the two weeks. Although references were not required, postings that included references or active URL's to appropriate Internet sites were welcomed since they would benefit everyone.

The Discussion

Our threaded discussion began on September 17, 2000 and ended on October 1 with five registered participants and one non-registered participant (lurker). My co-mentor began the conference by describing the topics to be discussed and initiated the discussion by asking for the meaning and importance of interactivity in online learning environments. Different definitions for interactivity in online learning environments from the literature, other examples, and shared experiences were discussed. Participants also mentioned the three important types of interaction: learner – content, learner – instructor, and learner – learner interaction. I continued with the discussion in the second week and started with a reference to an article that presented collaborative online activities such as online debate, online peer evaluation, online case study, online guest speaker, and online bulletin board activities. Various free collaboration tools available through the Internet, in addition to two commercial products, were also brought up for group discussion.

The forum had a slow beginning; we received the first contribution after a friendly reminder was posted three days after the forum started. My colleague and I were worried that the small number of participants could make the discussion slow or cause it to have poor interaction. Two other forums were running simultaneously with ours but fortunately, after the slow beginning, we had a good level of participation from our five contributors during the rest of the forum's existence. Participants could post their replies to any of the previous postings and they would receive our feedback within 24 hours. The mentor who was not moderating at the time, would contribute to the online conversation in order to keep the dialogue active and on the right path. In general, the participants stayed on track, although occasionally they did not respond to the questions or situations that we presented to them. During the discussion we occasionally had to rephrase or change the questions since they were not as well received as we had counted on and did not elicit any responses. Overall, the participants would usually comment on what they already knew or had experienced, sharing their knowledge, opinions, and any references they had on the topic. This is one of the advantages of peer online conversations - sharing one's experiences and expertise with others and at the same time acquiring and evaluating new sources of information. This "knowledge exchange" can contribute to expanding one's knowledge in a more natural and effortless way.

Reflections

Our threaded discussion achieved the goals we aimed for. Most importantly, I learned the basic skills that are required to have good online conversations and that good communication and collaboration are needed when a forum is co-mentored. I learned that trying to keep an online conversation active and interesting for the participants can consume a lot of time and effort and that it requires good knowledge/research on the topic at hand. The topic of this co-mentored forum is collaboration and interactivity; the best example of collaboration in an online learning environment is precisely the co-mentoring of the forum. I truly enjoyed the opportunity of sharing this unique experience with one of my peers. The fact that I was able to work hand-in-hand with a colleague and not alone also helped to relieve some of the pressure and responsibility of mentoring a high-level discussion forum for the first time. I have benefited greatly from reading and participating in online discussions. They have helped me to refine my skills on how to communicate effectively in online environments and to obtain and share information and references on a variety of topics. The discussions also made it easier to maintain direct contact and communication with my peers and professors throughout the term.

Teaching Technology with Technology

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Abstract: This paper reports on the experience of a two-person team instructing urban high school teachers to use computer technology. The course is presented entirely on-line in an asynchronous environment. It is the first course in a series of four in a Teaching and Learning with Technology certificate program.

Course I, Educational Technology Theory, presents and actively involves student in discussions of cognitive science and learning theories and their practical applications. At the same time, students receive instruction on constructing a web site. As the course progresses, the students build an instructional resource web site that they will be able to use in their classes.

This presentation will describe the process used in the on-line environment, demonstrate student projects, and relate student's plans to implement technology in their own classrooms.

I hear and I forget
I see and I remember
I do and I understand
(Ancient Chinese Proverb)

The pilot program offered by the New School University in the fall of 2000 explored the significance of this proverb and the implications it has for teaching in a 21^{st} century urban classroom. Well situated in the heart of Greenwich Village, New York City, the program was nevertheless delivered asynchronously via the web. Participants were all teaching in New York City alternative high schools or middle schools. Although most of the schools implemented a project-based curriculum with portfolio assessment the teachers were responsible for ensuring that their students would meet new standards on state achievement tests.

The first course in the sequence was *Foundations of Educational Technology Theory*. Participants examined philosophical and pedagogical underpinnings of the current educational system and began to explore cognitive science principles that facilitate meaningful learning. They reevaluated the work of John Dewey, one of the founders of the New School. They applied constructivist theory to project-based curriculum while focusing on the new state standards.

At the same time they engaged in a parallel activity, learning basic html coding and Macromedia Dreamweaver™, the web-site authoring program. In addition to learning new skills, they engaged in active learning. We believed that they would master the technology and apply it in a meaningful way if they used it in their own learning process.

The New School University provided an opportune environment for this experiment since it has a solid history of offering robust distance learning courses. Dial, a proprietary instructional interface, provided the discussion-based environment. Participants were able to respond to instructors' questions or assignments, upload responses, and email individuals privately. An orientation period preceded the regular class session so participants would not be overwhelmed by the technology. On-line and telephone support was available 24/7. Our program thus began with a solid technical foundation.

Participants came to the program with a variety of skills. Some were quite proficient with computers. Others were hesitant, to say the least. We wanted to find out how to engage each one on his or her level and help them develop the technical skill set. As you can see in Figure 1, they started by uploading a message introducing themselves.

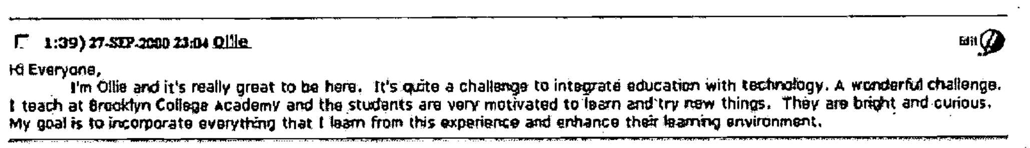

Figure 1: sample on-line dialogue, student introduction

They then conducted on-line research in their subject matter areas and constructed a Virtual Field Trip lesson as seen in Figure 2.

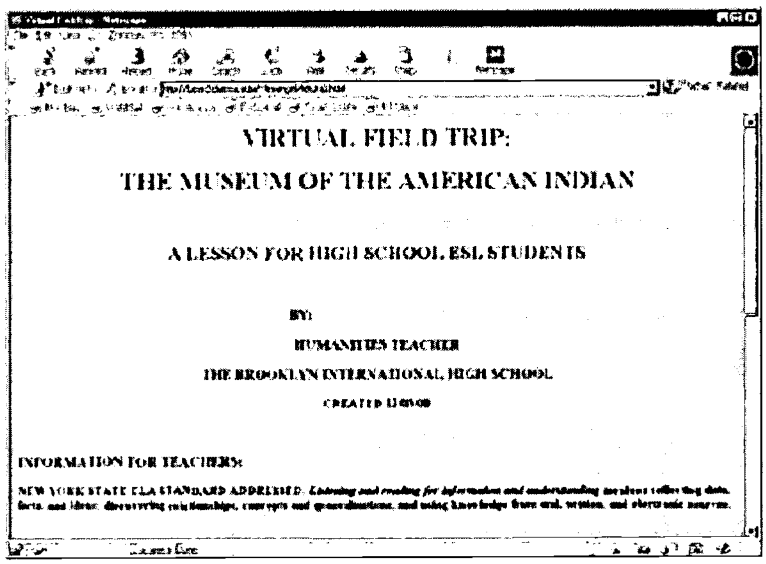

Figure 2: web-based lesson, Virtual Field Trip

The asynchronous environment enabled participants to fit the course into already crowded work and family schedules. The discussion based environment facilitated group interaction, resulting in sharing and helping each other, in short, creating a community of learners.

At this point we have only anecdotal observations. More extensive studies will be conducted in the spring. We are especially interested in identifying factors that facilitate conversation and participation.

Pitfalls and Pleasures in a Distance Based Directed Readings in Science Education Course

Abstract

What works when facilitating a distance education directed readings in science education with graduate students that are also teaching full time? The author will share experiences from teaching in the University of Notre Dame's Alliance for Catholic Education (ACE) masters in education program. This directed readings course includes 25 students that are teaching at Catholic schools in under served areas throughout the south. The course is conducted during the fall and spring semesters using WebCT's bulletin board system and an electronic mailing list.

Introduction

In the midst of my second time teaching the Alliance for Catholic Education's (ACE) directed readings in science education course I have had an opportunity to experience a number of successes and failures in a distance education environment. Fortunately the failures have provided lessons that have, based on the anecdotal evidence improved the experience for the students taking the course.

ACE students are in a Master of Education program at the University of Notre Dame. Admission to the program is selective with about 1/3 of the students applying being admitted. There are approximately 75 students in each class cohort and 150 total students in the program. The program is based on the pillars of Academics, Community and Spirituality. Students in the program have there tuition covered and are paid a $1,000 per month stipend. In return they teach for two years in Catholic schools in underserved communities in the southern and western United States.

The program begins with an intensive 8 week summer session during which first year students complete basic education courses and have supervised teaching experiences in local schools. The students then report to their assigned schools where they are full time first year teachers. The commonly have 3, and many up to 5, preps as they begin there first year teaching. In addition to their first year teaching duties these students participate in 2 to 3 three credit, distance based courses that extend across the entire academic year. Second year teachers have completed another intensive 8 week summer session and take an additional 2 to three internet courses during their second year teaching. In addition to traditional assessments of students work they submit a portfolio documenting their teaching experience at the end of the second year of teaching.

The directed readings in science education course consists of a mixture of first and second year students that are teaching at a variety of levels, 4^{th} through 12^{th} grade, and a variety of courses, basic science through AP physics.

Pitfalls

Technical Difficulties

The first time that I taught this course was the first year that the courses were offered in this format. There were many delays in getting equipment setup and some technical difficulties after it was in place. These problems made progress in the course very difficult.

Other Obligations

The students in this class, like those in most distance education environments, have many other pressures that demand their time and unless the class is made a priority it can very easily slip.

Motivation

Students in this class seemed to want direct practical applications for what we were discussing than in my experience with face to face classes. I believe this is a result of their being immersed in real teaching situations and having problems that they need to solve immediately.

Pleasures

Technology

For my second time around teaching this course the technology was, for the most part, in place and functioning. As a result I had a very early assignment that verified everyone's ability to participate. I found that even in cases where a house computer wasn't working the students good get access using a computer at their school or public library. As a result of the infrastructure being ready is that we got off to a good start.

Participation as a Priority

Though the students have an equal number of obligations as before they are better able to keep this one in mind as the course progresses. This seems to be from a combination of the early start reserving a place for the course in the routines of the students and a much more structured grading system in which the students cannot turn in late assignments. In the current class over 80% of the assignments have been submitted even thought the structure lets the students opt out of several assignments without a negative impact on their grade.

Motivation

This time around I have taken a completely different approach to my role as a motivator. Before every assignment is due I send a note reminding everyone. Then as the first few submissions arrive I acknowledge them publicly and comment positively on the work that is being done and how important it is to the success of the class. The students seem to respond well to these efforts which, with the measures mentioned above, have resulted in excellent reviews of literature and discussion of those reviews by the students. These are strategies that I have never had a need to use in traditional classroom based settings and were, at first, a bit awkward for me. I have now become accustomed to cheerleading and feel comfortable that by performing that role I am providing a valuable service to the students.

Developing Communities of Learning in Distance Education Courses

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Abstract: As the popularity of distance education courses increases, so does the pressure to design robust distance courses that support maximum student achievement. One criticism of distance education courses has been that the medium encourages minimal student engagement and passive participation. Incorporating a community of learning approach into the design of distance courses requires students to be actively involved with course content, fellow students, and the teacher. This paper describes strategies that contribute to the development of learning communities in distance education courses.

Introduction

Distance learning courses, whether online or mediated, offer many benefits to instructors and students -- particularly in terms of when and where they can engage in course activities. Many students enroll in distance education courses because of the convenience. However, once enrolled, student participation in these courses varies widely. Some students sign on faithfully and contribute regularly to the online or mediated course activities and discussion. Others "lurk" or participate passively, choosing to limit their interaction to reading posted materials or listening to course proceedings with only an occasional comment. A few students don't participate at all (Kearsley, 2000).

Though it has been recognized that students may derive some benefit from simply listening or reading materials online, students who actively contribute to a group learning experience maximize learning and achievement. Unfortunately, active participation is a goal that may be difficult or impossible to elicit from students in a traditional distance education course. Students may be uncomfortable using the technology, or may not feel the need to engage in conversation with classmates or the instructor since they are geographically removed. However, incorporating a community of learning framework into distance education course design provides strategies to stimulate students to actively engage and participate in collaborative learning.

Communities of learning involve all students as full participants (Vaughn, Bos, and Schrumm, 1997) in a collective effort of understanding (Bielaczyc & Collins, 1999). Learning communities are committed to the concepts that students learn by directing their own learning, working with people, dealing with complex issues, collectively sharing knowledge, and showing respect and appreciation for all (Bielaczyc & Collins, 1999). Applying these principles in distance environments is similar to employing them in face to face classrooms. It means providing students with individual choices to make course work personally meaningful as well as engaging them in collaborative group work to support collective growth. Case studies and simulations offer students the opportunity to deal with authentic, complex issues. Encouraging students to develop and share expertise in individual areas of interest broadens class scope and develops appreciation for individual strengths and differences. Without a supportive learning community, distance education students can easily become isolated, lose interest and motivation, and may eventually drop out. In a nurturing community of learners, distance students help each other learn, become involved, and contribute their unique experiences and resources.

This paper describes course elements that contribute to the development of learning communities in distance education courses. The major strategies include making sure students and instructors become acquainted with each other early in the course; sharing responsibility for collecting and contributing course-related information and experiences; encouraging and scaffolding mediated interaction; and providing active, authentic learning activities. These techniques have been used successfully in distance education courses to help students become active participants and contributors in both online and closed-circuit video courses.

A number of activities can be employed to help course participants get acquainted. Having an initial face to face meeting provides an opportunity for students to interact directly. Traditional face to face ice breakers such as having students interview and introduce each other can get things started, but posting class member biographies (derived from the face to face interview) and photos is a good follow-up to reinforce connections and awareness. An online practice quiz that highlights interesting information about course members helps participants get to know each other as well as familiarizing students with the quiz utility. In addition, students can be assigned online buddies or assigned to small study groups to begin discussing course issues immediately. The sooner the students become comfortable with each other, and with the communications medium, the stronger the learning community will become.

Students must also accept responsibility for contributing to the class information base. This can be accomplished in a variety of ways. Small groups can research basic terms and concepts, or read different articles and share their findings with the rest of the class via bulletin board postings. The bulletin board also provides a venue for follow-up discussion and clarification of unclear material with students serving as the experts for the information they shared. Individuals and groups can also research and make class presentations on major course issues. Working in groups, even at a distance, reinforces the sense of community as well as expanding the class information base. However, it should be noted that group interaction via distance communication tools can be difficult initially.

Getting students comfortable with mediated public interaction is critical to nurturing the learning community. Most students will be comfortable with private email, but they must also participate in public communications to the entire class. Early activities can be simple listserv and bulletin board conversations where students post personal reflections and experiences about things they are currently doing. As they gain confidence using the communication tools, they can use the chat rooms for structured interchanges and communications. Guest speakers can address the class in chat rooms, and respond to questions from the class. Or, small groups can debate hot topic issues in chat rooms. For chat interactions, communication protocols must be established to take the place of the visual cues that signal when a person is through talking. A common practice is to post the word OVER when a person finishes speaking.

Designing active, authentic learning activities begins with the identification of problems that are relevant and contextualized in real world experiences. Case studies and problem-based learning activities offer students the opportunity to interact via email with real experts about real problems, brainstorm solutions in small groups on the bulletin board, and then share problems and solutions with the whole class using web presentations or videoconferencing. Employing these approaches virtually brings the world into the classroom, and expands the community of learners globally.

References

Bielaczyc, K. & Collins, A. (1999). Learning communities in classrooms: A reconceptualization of educational practice. In C. Reigeluth (Ed.) *Instructional-design theories and models: A new paradigm of instructional theory, Volume II.* Mahwah, NJ: Lawrence Erlbaum.

Kearsley, G. (2000). *Online education.* Belmont, CA: Wadsworth, Thompson Learning, Inc.

Vaughn, S., Bos, C., and Schrumm, J. (1997). *Teaching exceptional, diverse, and at-risk students in the general education classroom* (2nd ed.). Needham Heights, MA: Allyn & Bacon.

Field Experiences at a Distance: Virtual Internships

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Abstract: Online instructors face the dilemma of providing meaningful field experiences for learners. In the *Social Life of Information,* John Seely Brown and Paul Duguid revisit Jerome Bruner's distinction between "learning about" and "learning to be." Brown and Duguid state (p. 128) "In the age of the web, learning about is easier than ever before." The real challenge for internet-based education is to help students learn how "to be." Field experiences and internships move students away from focusing solely on information toward an understanding of how knowledge informs practice. This paper explores creative ways to facilitate meaningful experiences in the field of practice for students-at-a-distance.

Internships and more extensive field experiences

Advanced or intensive internships are an important part of many professional education programs, and in many cases certification or accreditation agencies require supervised internships. Internships are a challenge in any setting when students hold down full time jobs and have family responsibilities. Since these characteristics are common with non-traditional students enrolled in on-line courses you will have to consider a variety of flexible approaches, including virtual internships (discussed below). You will also have to find ways to observe students while they complete their internship assignments. This may be accomplished using web cams (synchronous observation) or videotape (asynchronous observation). With either method, be sure to obtain proper permissions from everyone involved. Online students should keep extensive field experience notes, which can become reflective journals. Students should e-mail notes and journal entries to you regularly so you can monitor their activities. Site supervisors should also be in regular contact so that you can provide appropriate guidance and feedback. No matter what method you use, read professional accreditation and licensure requirements carefully. In some fields students may have to complete internships following very specific requirements, including specific qualifications for internship supervisors and direct observation. You should not assume that a licensure agency would consider a virtual internship to be equivalent to a traditional internship.

Virtual internships

A quick search of the web reveals numerous examples of virtual internships. Dr. Thomas Barker from Texas Tech University (http://english.ttu.edu/courses/5378/inet/about.htm) suggests that there are mutually beneficial advantages to this form of internship. For the intern, the experience provides:

- Flexibility - Unlike conventional enrollment patterns, virtual internships may span semesters and summers.
- Experience - Virtual interns develop skills at using the latest communication technology applications and paradigms -- email, file upload/download, desktop videoconferencing, white board, real-time audio and video, and chat in both synchronous and asynchronous modes.
- Convenience - Virtual interns can complete the course requirements from any personal computer, in any location that has the appropriate software.

- Supplemental income - Some virtual internships pay up to 1/2 or more of entry-level salaries. The paid internships are very competitive.
- Research - Virtual interns develop research, writing, and problem solving skills that they will be able to apply in later work experiences.

Virtual student teaching

With more and more emphasis being placed on online instruction, especially for students in advanced teacher education programs, you might want to consider providing a virtual student teaching experience. Unlike the internships and field experiences described above, in virtual student teaching, students practice their instructional skills in an online environment, under the guidance of an experienced distance educator. One example of this model can be seen at http://hale.pepperdine.edu/~bsouza/ed630a.htm. In this graduate education course, students collaboratively plan, direct, and assess and online instructional experience. In this case the students teach instructional units to other students enrolled in the same course, but this model could be extended to other types of virtual learning experiences.

Virtual internship administration

Most virtual internship programs include a formal and business-like application process. Control of the process may be with the educational institution or with the employer, depending on the institutional arrangements. Most require a letter of application, a short resume, and a work proposal or statement of interest. If there seems to be a match between the proposed intern's skills and the nature of the available internship, then there may be a negotiation between the employer, educational institution, and the intern over the specifics of the internship. Specifics about the time commitment (full-time or part-time) and length (starting time and total number of hours or product to be produced) need to be agreed on. The expectations for equipment to be furnished by the employer, employee, and the educational institution must be resolved. Another important detail is whether the intern will receive pay and at what level. Commonly, if the interns are paid, they are paid at about half the rate of an entry-level position. The matter of supervision must also be addressed. Most of the time the employer provides the direct supervision. At the end of the internship, the employer then writes a letter of evaluation to the educational institution. Grades are typically assigned from that letter.

Field experiences and internships are critical parts of any learning experience. Online educators will probably have to work harder and be more creative to establish these relationships until technology and our technology comfort level catches up with our goals and objectives. You might start with a small project, such as having students conduct e-mail interviews with professionals or subject matter experts, and then let this initial communication build into a deeper relationship. Or you may set up a full-fledged virtual internship program based on one of the models described above. No matter what approach you take, you will help your students become part of the community of practice.

Web Internship Examples

The Allegiance & Arkansas State University Virtual Internship Program (http://www.astate.edu/docs/acad/coba/VIP/home.htm)
***Central Europe Review*'s Virtual Internship Programme** (http://www.ce-review.org/_internships.html)
The Manhattan Institute of Management (MIM) (http://www.vinternship.com/online_internship.htm)
The Virtual Volunteering Project (http://www.serviceleader.org/vv/)
Mighty Mentors: E-mail Mentoring for Teachers (http://www.mightymedia.com/mentors/)

References

Brown, J. S. & Duguid, P. (2000). *Social Life of Information.* Cambridge, MA: Harvard Business School Press.

Standards of Practice: Online Educator In-service Workshop on Curriculum Standards and Technology Applications #63

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Abstract: "Standards of Practice" is a 10-hour, asynchronous web-based workshop designed for a broad range of educators. The workshop provides an overview of curriculum and technology standards, and integration of effective technology into standards-based teaching. Topics include searching, evaluating web sites, and research on the web. The workshop was developed by university education faculty under a professional development schools grant to meet needs of area schools. "Standards of Practice" was offered to teachers in the professional development schools. After completing the workshop, teachers received a certificate that they submitted for district inservice credit toward certification renewals. The workshop is composed of six modules: Introduction to Technology Standards, Sunshine State Standards, Searching the Web, Evaluating Web Resources, Research using the Web, Best Practices in Integrating Technology into Standards-Based Instruction. Each module includes instruction on the topic, links to web materials, self-paced practice activities, and suggestions for finding further information on the topic.

Teachers in a cluster of Florida Professional Development Schools (PDS) recently identified their needs for continuing education. The main themes that emerged were understanding of curriculum and educational technology standards, improving technology skills, and learning best practices for teaching standards with technology. The state university's college of education working with this group of PDS teachers used grant funds to develop a package of professional development experiences addressing the needs of the teachers. The experiences included university graduate courses, hands-on technology skills and integration workshops in an area instructional technology center, and an online workshop. The menu of options enabled teachers to choose topics, schedules and learning styles that best suited them.

The teachers were familiar with courses and workshops, but most were new to online learning. The attractive features of an asynchronous web-based workshop included flexibility in location and time of learning, and self-paced and independent learning. The intimidating aspects of an online workshop involved the lack of face-to-face interaction and immediate instructor support, and the requirement of basic computer skills and web access. The online workshop format was well-suited to teachers who possessed the prerequisite technology skills and access, those who enjoy independent learning, and those who had limited time to travel or meet in a structured classroom. The online workshop also opened the opportunity for teachers who participated in face-to-face workshops to continue and extend their education independently.

University faculty worked with the PDS teachers to develop the online "Standards of Practice" workshop. The workshop was designed for all educators working at K-12 across content areas. The workshop offers an overview of national and state curriculum standards relating to technology, and educational technology standards, and practice with integrating effective technology into standards-based teaching. An evaluation of the technology components within the state standards across the curriculum areas revealed common themes and skills, which led to the workshop topics. Topics include effective searching, how to evaluate web sites, and how to do research on the web. The workshop was delivered using the online course environment WebCT. The workshop is structured as six modules. The module topics are: Introduction to Technology Standards, Information Literacy and State Standards, Searching the Web, Evaluating Web Resources, Research using the Web, Best Practices in Integrating Technology into Standards-Based Instruction.

Before beginning the workshop modules, users are instructed to print the study guide page, as an advance organizer for workshop activities. Each module includes instructional information, online references, self-paced practice activities, and suggestions for further information on the topic. Upon entering a workshop module, the teacher/learner reads an introduction to the topic and its importance. Next, important concepts are described, and web pages are recommended. Readers are invited to explore recommended web pages. Readers have the freedom to leave and revisit modules at any time. Modules conclude with an interactive activity, such as evaluation of web resources, self-assessment instrument, or practice with skills and knowledge. After completing each module, a five-question limited response quiz is given. Users must achieve a satisfactory score on the quiz before proceeding to the next module. The purpose of the quiz is to document successful participation in the workshop so participants may receive continuing education credit from their school district.

Module Outline:
Module One, Introduction to Technology Standards:
Discussion of the need for educational technology and curriculum standards, review of US Department of Education and International Society for Technology and Education (ISTE) standards for teachers and students, exploration of Milken Foundation Dimensions for Gauging Progress, review of state and American Library Association technology literacy standards, self-assessment instrument where teachers receive a rating on the continuum from Learner to Leader in educational technology, and web sites for further reference on the topic.

Module Two, Sunshine State Standards:
Overview of information literacy, discussion of the state goals for improving education with technology, list by grade and content area of the state curriculum standards relating to technology, a drag-and-drop activity matching information literacy skills and examples of classroom application, and web sites for further reference.

Module Three, Effective Web Searching:
Overview of the value of web searching skills, discussion of the tools for seeking and assessing information on the web and their relationship to the standards, comparison of web searching tools and guidance for choosing appropriate tools, searching strategies and operators, information about critically assessing information located on the web for an education task, a list of web sites for further reference on the topic, and activities in which users compare the results and capabilities of a group of common web search tools.

Module Four, Evaluating Web Sites:
Discussion of the need for web users to critically evaluate web content, questions and criteria to use when evaluating a web page for educational use, a sample web resource evaluation checklist, a list of web sites for further reference on the topic, and a practice web page evaluation activity involving the judgment of sample web pages for specific educational situations.

Module Five, Researching on the Web:
Discussion of the value of using the web for educational research, flowchart of an online research process for students, skills for managing information located online, procedure for citing electronic references, Fair Use guidelines for using electronic information in an education context, a list of web sites for further reference on the topic, a multiple choice activity in selecting the correct citation format for online references.

Module Six, Best Practices in Classroom Computing:
Discussion of classroom structures recommended for effective use of computers for learning, an information literacy approach, teaching and management strategies for classroom technology, findings related to the physical setting for classroom technology, a list of lesson plans and further resources related to the topic, a likert-scale activity for rating the effectiveness of classroom technology scenarios.

"Standards of Practice" was offered free of charge to any teacher in the university's professional development schools, and teachers earned a stipend during the grant period upon completion of the workshop. After completing the workshop, teachers received an automatically generated certificate stating that they satisfactorily competed requirements of the workshop. Teachers submitted the personalized certificates for school district credit toward renewing their teaching certificates.

The workshop met the needs of the target audience by providing them with experience and knowledge within the curriculum standards, skills using the technology as a teacher and learner, and information about best practices for integrating technology into curriculum. The online format was very convenient for teachers who had limitations in attending face-to-face training. This format also allowed the teachers to become more comfortable with the technologies as they worked at their own pace.

Dilemma Analysis of Constructive Case-based Approach to Distance Learning

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Abstract: This study explores the dilemmas faced while teaching a course on distance learning based on constructivist learning principles using case studies. The course is open to undergraduate as well as graduate students. It is a hybrid course. The class meets once a week for two hours and the remaining time interacts online using WebCT, an online course management software. The course design draws on constructivist learning theories of Vygotsky and Lave and Wenger's theory of authentic learning. The students are introduced to concepts of distance learning by studying real-life cases and also developing and analyzing their own cases of distance learning. Such an approach presents dilemmas at every stage of its development, for example, the need to strike a balance between breadth and depth of content to be covered. The authors continue to struggle with similar issues causing them to constantly review and revise their design leading to a fuller, richer learning experience.

Introduction

This is a pilot study exploring the dilemmas faced while teaching a course on distance learning using case studies and based on constructivist learning principles.

The year 2000 is a time of rapid transition and convergence with both communications technologies and distance learning. Indeed, such rapid evolution of education is also challenging traditional distance learning institutions, such as the renowned UK Open University. Such rapid changes have intensified the dilemmas faced by teachers. The topics and content of the course to be taught are changing by the month and multiple views must become visible. Indeed, students need to be assisted to handle this ambiguity and rapid change as they learn the principles and a wide range of practice within a 16-week semester

What is a small course team of one faculty member and two graduate students without start-up funding for instructional designers and technologists to make of this dilemma?

As a response, Dr. Davis developed an approach that is case-based and constructivist in nature with support from graduate assistants, Qian Li, and Rema Nilakanta. The flexibility and "open architecture" of a constructivist approach adapts well to the fast-changing content and technologies. The dilemmas emanating from such an approach are continuously confronted through an action research approach to course development and implementation over time. Action Research has been used in technology and teacher education for some time in the UK (see for example Somekh and Davis, 1997); our approach of development and research is described in Davis & Trend (1999).

Course design

The course, Curriculum and Instruction (CI) 407/507: Principles and Practices of Distance Education (DE), is open to undergraduate as well as graduate students. It informs students of current and old practices, principles, and technologies involved in DE. The recommended texts are provided in the reference section of this paper including the required text, Kearsley (2000). The course design draws on constructivist learning theories of Vygotsky as well as Lave and Wenger's theory of authentic learning. In some ways a constructivist approach to teaching implies that the students are involved in creating their own learning. The teacher's approach is to challenge students to search for relevant information and to integrate it within their existing and developing sills and knowledge.

Cased-based instruction lends itself to a constructivist approach. Case method has been used for some time in professional schools, such as law, business, and medicine. Cases can be used to uncover underlying principles and concepts similar to a well-defined problem in problem-based learning (PBL) where "the given state, goal state, and the allowable operators are specifically clear to the problem-solver" (Mayer & Wittrock, 1996, p. 48). This kind of use implies an established body of knowledge where the student is expected to acquire the knowledge deductively, as in the fields of law and medicine. Cases can also be used to discover or develop new principles when faced with an unfamiliar situation as seen in the field of business education. This is similar to an ill-defined problem in PBL where "the given state, goal state, and the allowable operators are not specifically clear to the problem-solver" (Mayer & Wittrock, 1996, p. 48).

We are attempting, in this course, to combine the two uses of case-based instruction. The students will be introduced to concepts of distance education by studying cases of DE and also develop rich case studies that they can repeatedly return to as they uncover salient principles and practices of DE. They thus engage with the principles, theories, and models of distance education within the context of cases and project-based learning.

The classes are conducted in a hybrid environment. Students meet face-to-face once a week for two hours as well as online with the help of WebCT, an online course management software. The course contains a rich collection of cases from which students draw the distance education design and delivery principles and practice. These cases are drawn from different situations of distance learning, including higher education, K-12 schools, as well as professional development training. In addition, students are expected to develop and study one case of DE of their own choice as well as analyze the course itself, CI407/507. The approach is unique in that while studying and analyzing different cases of flexible learning students are also actively creating their own case of distance learning because much of their interaction is conducted online. Students thus investigate and evaluate the use of WebCT within their own learning.

The cases used in CI407/507 are different from traditional cases in that these cases are presented using multimedia technology. Traditional cases are mainly text-based, but our cases are presented with many hypertext links, images, and audio files; thus presenting a fuller, richer picture to the student. Bronack et al. (1999) provide another but different example of a case-based learning environment.

Dilemmas of a constructivist approach

The above course design propels the student into active learning, which involves learning through exploration. However, implementing this kind of approach is a challenge. It brings up early dilemmas at every stage of its development. Below are some observations based on data collection.

One of the dilemmas we faced during the early stages of course design and which still continues, is the need to strike a balance between breadth and depth as it relates to content. On the one side, we want to introduce students to a variety of applications of distance education and to let them have a taste of different course management software (e.g. WebCT, ClassNet, Blackboard.com, etc). On the other hand, we believe students should be encouraged to acquire deep understanding of distance learning, which implies a focus on fewer applications of distance education and online courseware. In other words, a superficial browse of a wide range of technologies is unlikely to lead to high quality transferable knowledge.

A second ongoing major dilemma we are facing is the need for structure as well as the freedom from it. How much structure do the students need in order to facilitate their learning, but at the same time have the freedom to explore on their own? In other words, how high and deep should the scaffolding reach? These dilemmas appear to become more acute when dealing with undergraduate students.

Future plans

The next stage is to revise this and other courses led by Dr. Davis and the mode of delivery so that they can be studied through distance learning by students in more than one university (ISU and London University Institute of Education). CI 507 will be offered for the first time in Summer 2001 with students on both sides of the Atlantic — in Ames, Iowa and London, UK. Progress will involve expansion of the teaching and action research team as well as evolution of the course design and content. It is also likely to involve more innovative on-line environments and communities of professional development. However, we must not jump ahead too fast. The immediate first step is to complete our first round of development and research on case-based learning at Iowa State University. We also suspect that our development and research is likely to study dilemmas that others face within and beyond the context of the teaching and learning at a distance.

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References

Bronack, S. C., Kilblane, C. R., Herbert, J. M. & McNergney. (1999). In-service and pre-service teachers' perceptions of web-based, case-based learning environment. *Journal of IT for Teacher Education*, 8, 3, 305 - 318.

Davis, N. E. & Trend, R. (1999). Developing and researching information and communication technology as a research tool. *Computers in the Schools*, 15(3/4), 101-115

Harris, J. (1998). *Virtual architecture: designing and directing curriculum-based telecomputing*. Oregon: ISTE. *
Kearsley, G. (2000). *Online education: Learning and teaching in cyberspace*. Stamford, USA: Wadsworth. *

Mayer, R. E. & Wittrock, M. C. (1996). Problem-solving transfer. In D. C. Berliner and R. C. Calfee (Eds.), *Handbook of Educational Psychology* (pp. 47-62). New York: Simon & Schuster Macmillan; London: Prentice Hall International.

Moore, G. & Kearsley, G. (1996). *Distance education: A systems view*. Belmont, CA: Wadsworth Pub. Co. *

Palloff, R. & Pratt, K. (1999). *Building learning communities in cyberspace: Effective strategies for the online classroom*. San Francisco: Jossey-Bass Publishers. *

Picciano, A. G. (2001). *Distance learning: making virtual connections across space and time*. Columbus, Ohio: Merrill Prentice Hall. *

Somekh, B. & Davis, N. E. (Eds.). (1997). *Using information technology effectively in teaching and learning: Studies in pre-service and in-service teacher education*. London and New York: Routledge.

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USING THE INTERNET IN THE CLASSROOM

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This article will focus on how to use the Internet as a tool to enhance classroom teaching. The "Internet Style of Learning" is helping teachers and students change the approaches to teaching and learning. Teachers can easily take one of their traditional lessons and turn it into a web-based lesson using resources from the Internet, or take a topic being taught and create a collaborative inquiry-based project than can be shared with a class in another location, nationally or globally. Once you know where and how to use the Internet to find resources for such lessons and projects, the process is not difficult.

The Internet also allows you to meet hundreds of teachers from around the globe. Why not learn how you, too, can meet them! By going to http://www.epals.com , you can search for educator around the globe and create an opportunity for sharing, collaboration, etc. There are so many ways that teachers around the globe are using the Internet to bring the world into the classroom. Examples of many projects and collaboratives can be found at sites under "Projects" at the web site at http://www.schoollink.org/twin.

Most traditional lesson plans can easily be enhanced by adding Internet activities. These activities can include research exercises, communication with other students or experts, virtual field trips, publishing, collaboration, interactive activities, or Internet searches. It is always good to have students use the search engines that are designed for students (http://www.yahooligans.com) or http://www.ajkids.com (Ask Jeeves for Kids). Teachers can learn a lot from each other when they join listservs. You can find out about listservs by going to http://www.liszt.com. Many teachers have already created lessons that include Internet components, so we should take the time to view such lessons at sites such as http://www.thegateway.org/, http://ali.apple.com/ali/, http://www.sdcoe.k12.ca.us/score/cy912.html, http://edweb.sdsu.edu/webquest/matrix.html.

Some teachers find it better to start with new lessons when creating web-based Internet activities for instruction. They use their traditional lessons as outlines for their new activities. It can take a long time to create the new weblesson. Time has to be spent searching for the right sites for the lesson. Once the sites have been chosen, the next procedure is to develop some meaningful activities for students to complete when they visit the site. If the students are going to communicate with other students/experts, make sure they understand time zones and realize that they won't get responses immediately. Once students are proficient in using the Internet, they can do scavenger hunts on the Internet to find information. Of course, it's a good idea to try out the lesson before teaching with the Internet. Be aware that there might be technology problems so always have a backup lesson. WebQuests are always a good way to get started with Internetized lessons http://edweb.sdsu.edu/webquest/webquest.html. For information about WebQuests you can read *SOME THOUGHTS ABOUT WEBQUESTS* at http://edweb.sdsu.edu/courses/edtec596/about_webquests.html. An excellent tool for teachers to use to create their web-based activities is found at the *Filamentality* web site http://www.kn.pacbell.com/wired/fil/. After reviewing the site, you can easily create Samplers, WebQuests, and Hotlists. To create the assessment rubrics, you can use a tool at http://landmark-project.com/classweb/rubrics/.

Once web-based lessons become the norm for teaching, Internet projects should be the next step. Such projects should include students collaborating with other classes to exchange data, share writing activities, and create discussions on topics of interest. In addition, mailing lists often post requests for participation in hundreds of Internet projects. There are many commercial projects available for those who prefer to "buy in" to a packaged project. Project ideas can be found at http://www.iearn.org, http://www.thinkquest.org, http://www.gsn.org, http://www.eduplace.com/projects/index.html, and http://www.globalearn.org.

What is a project

Projects are collaborative, interactive learning activities that allow students and teachers to interact with each other to carry out a research activity that supports the existing curriculum in new and exciting ways. Students use the Internet's research, communications, and publishing tools to get involved in data exchanges, team writing projects, world explorations, and even global shopping. The classroom walls become invisible as students connect to global partners and experts via the Internet. Through such projects, students around the world work together, sharing the experiences, research, and learning resulting from their work.

Ideas for projects come from students and teachers, and projects vary as widely as the people participating in them. Some projects consist of writing assignments, which are then posted to conferences and eventually gathered into a publication, a Web page, or other multimedia presentation. Others consist of art projects, in which students from different schools exchange works of art. Still others provide ways for students to get directly involved in helping to solve problems in other countries.

Projects are usually organized according to the age/grade levels of the participants and by curricular subject matter. Participation is open to either students of all ages, primary/elementary students, or intermediate/secondary students. Subject areas include environmental or natural sciences; social studies, politics, and economics; arts and literature; language-based; and other/interdisciplinary.

Projects have been classified in a variety of ways. I*EARN (http://www.iearn.org), The Global SchoolHouse (http://www.gsn.org) Judi Harris (http://www.esu3.k12.ne.us/institute/harris/Harris-Activity-Structures.html), and Bernie Dodge (http://edweb.sdsu.edu/webquest/webquest.html) have made outstanding contributions to the use of Internet projects. For example, I*EARN has categorized projects as structured, unstructured, and Learning Circles. Judi Harris has done extensive research in the area of Internet projects. As a result, she has classified projects into the following categories: Online Correspondence and Exchanges, Information Gathering, Problem Solving, and Competitions.

What follows are some suggestions and helpful hints in getting started with Internet projects.

Suggested Design Criteria for Internet Projects

While teachers try to accomplish a variety of activities during their classroom instruction, it is possible to achieve many of the following goals when implementing Internet projects into the regular classroom curriculum.

Internet projects should:

- focus on getting students to use their minds well; raise real questions and allow students to do authentic work rather than exercises from a workbook;
- develop instruction around the questions, ideas, and concerns of students;
- recognize and use learners' purposes for learning; view learning as meaning-making and constructive rather than passive reception and regurgitation of transmitted information;
- develop active approaches to learning and encourage students to express their ideas and opinions;
- give students ownership of their learning;
- view teachers and students as co investigators both should seek knowledge and solutions to problems; foster collaborative/cooperative learning and devise activities that help build a
- sense of community;
- view students as producers of knowledge and publishers of their work;
- provide moments when everyone takes time to reflect on what they have learned;
- contribute to understanding of other nations and cultures;
- strengthen students? literacy and academic skills; and
- provide ample opportunity to strengthen students' technology and Internet skills.

The Internet can make teaching and learning exciting while encouraging students to become lifelong learners, contributing members of society, and valuable members of the world of work. The research, communications, and publishing skills learned by students through Internet activities are essential for now and the future. I have been using the Internet for 12 years. I often ask teachers who aren't using the Internet, "How are you accessing information"? "How are you communicating"? "How are you teaching"?

Assessing Distance Learning Tools and Techniques: A Case Study

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Abstract: Distance learning offers students many advantages over traditional courses. This study examined student reactions (through the use of a student survey) to an entirely web-based course. The course was a graduate-level class titled Telecommunications in Education. Of the 79 responses, all but one responded that they would like to take another course via the web. Ninety-nine percent of the students reported a positive feeling about the ease of use of the web course. Additional items solicited feedback with regard to specific features of the online course.

Introduction

Many studies have compared the effectiveness of learning in a traditional on-campus course with the same course delivered via distance. Of these, several have found that distance learning courses (regardless of instructional medium) are equally, and in some cases more, effective than their face-to-face counterparts (Clarke, 1999). To be effective, these distant courses must include timely feedback from the instructor and opportunities for interaction among the students. In addition, the delivery method must be appropriate for the tasks (Moore & Thompson, 1990; Verduin & Clark, 1991).

Most of the research on distance education has focused on its effectiveness, i.e., comparing student course grades or performance on exams between traditional course delivery and distance-based instruction. Little mention has been given in the literature to students' attitudes and reactions after experiencing distance education. This study was designed to explore student reactions to a course delivered entirely on the World Wide Web. The goal was to gather information that could be used to improve the design and delivery of distance education courses. In particular, the study was designed to investigate students' reactions to tools and techniques used in web-based delivery. Answers were also sought related to student perceptions of community, time commitment, and amount of learning in the web-based environment.

Method

To address these issues, a survey was designed. This instrument contains ten items, each with an individual response scale generally having four or five options. Following these ten items are two open-ended questions designed to solicit more qualitative data about students' overall experience with the distance learning course and advice that they would offer other students who might be considering a distance course. The survey was given to all students in a graduate-level course (EME6936: Telecommunications in Education). This course is delivered completely via the web (using WebCT software). Data were collected over a series of six semesters. There were a total of 79 students in the six-semester period. Individual class sizes ranged from 8 to 15. All surveys were anonymous and voluntary.

Results

An interesting result to note is an overall satisfaction with the distance learning experience from this course. Of the 79 total students, only one responded that they would **not** like to take another course via the web. Ninety-nine percent reported a positive feeling about the ease of use of the online course.

Of the features employed in this web-based course, students reported that the bulletin board was the easiest to use (37%), followed by e-mail (29%), chat (21%), and the quiz (14%) functions. The chat feature was by far the hardest to use (37%) with the bulletin board (25%) and quiz (14%) following.

Students' perceptions of "community" when taking a distance learning course have been a major area of concern in discussions of distance learning. Of the students in this course, 87% reported feeling a level of group participation at least the same as a regular course, if not more. Only 13% reported feeling isolated and alone (one student commented that this was a positive attribute).

The most frustrating portions of the distance learning course were reported to be problems with software (e.g. using AOL's browser), trouble communicating with other students, and long download times (30% each). Trouble communicating with the course instructor was reported to be the least frustrating aspect (1%).

When asked about their perceptions of the amount of time required for the course compared to traditional courses, fifty percent of the students reported spending about the same amount of time and work on the distance course as they would have in a traditional on-campus course. Thirty-six percent reported spending more time and work on the distance course.

With regard to the amount of learning they acquired in the distance learning course compared to traditional courses, the majority of students (64%) felt that they had learned more in the distance course than other college courses. Almost all of the students (96%) felt they had learned the same amount or more in the distance-based course.

Data from the first open-ended question, "What is your overall impression of online learning?" were first categorized as positive, neutral, or negative. There were two negative responses, seven neutral responses, and seventy positive responses. The negative responses mentioned dissatisfaction due to the increased amount of time required to complete course activities and frustration with connecting to the USF server. Neutral responses were general comments about distance learning, such as "I'm not an education major", or "Benefits from the course depend on the student." The most common positive response was "I loved it!" Other positive comments included the benefits of time and distance removal, as well as increased personal attention from the instructor.

Responses to the second question, "What advice would you give future students in online courses" clearly centered on the need to keep up with the coursework and not fall behind. Students also wrote about the benefits of having a "buddy" in the course, i.e., someone to encourage you and help eliminate any feeling of isolation. The third most prevalent response suggested the need to be familiar with using the web, and to have the most powerful computer with the fastest connection to the Internet that you can afford.

Summary

As more and more college courses are being offered via the web, it is important to assess students' perceptions and obtain feedback on effective practices and techniques. The lack of variability in this data (with the majority of students providing positive responses) is very encouraging. Further analysis might involve investigation of response patterns over time, as more students became familiar with the web environment. In addition, researchers may investigate patterns in student interactions as they relate to course satisfaction.

References

Clark, D. (1999). Getting results with distance education. *American Journal of Distance Education* 12 (1), 38-51.

Moore, M. G. & Thompson, M.M. (1990). *The effects of distance learning: A summary of the literature. Research Monograph No. 2.* University Park: The Pennsylvania State University, American Center for the Study of Distance Education (ED 330 321).

Verduin, J. R. and Clark, T. A. (1991). *Distance education: The foundations of effective practice.* San Francisco, CA: Jossey-Bass Publishers.

Mission Possible: Project-Based Learning Preparing Graduate Students for Technology

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Abstract: This paper addresses how the project-based learning was designed and then implemented in a graduate applied technology course at State University of New York at Oswego. The focus of the course was to engage students to produce projects that were authentic, meaningful, and intended for future teaching and professional use. This paper outlines the course content, provides an overview of the processes involved in developing the project-based learning activities, and reports the responses of students in the course on effectiveness of learning process and perception of technology integration on completed projects. Discussion for using project-based learning and examples of students' projects (educational web review, WebQuest, and web-based portfolio) are included.

Introduction

Project-based learning is frequently used by educators. Why the interest in project-based learning? Research shows that project-based learning can capture the complexities of real life situations. Not only does it provide an effective way for students understanding the connection of knowledge to the contexts of its application, but it also provides students with opportunities for self-reflection and a sense of agency. Essentially, project-based learning is based on tasks, groups, and sharing. It provides a practical method of combining many of the elements of authentic activities and collaborative learning (Wheatley, 1991; Grabe & Grabe, 1998).

Although technology provides many opportunities for classroom projects, we often find that students who completed the projects with technology learned relatively little from the hands-on activities of simply "doing" without "understanding". In such cases, students are busy taking actions without appropriate reflection and deep learning. Barron and the Cognition and Technology Group at Vanderbilt (1998) have identified four major design principles that appeared to be very important for project-based learning: a). defining learning-appropriate goals that lead to deep understanding; b). providing scaffolds such as beginning with problem-based learning activities before completing projects; c). including multiple opportunities for formative self-assessment; d). developing social structures that promote participation and a sense of agency (p. 306). This paper describes the adaptation of these 4 principles into a graduate applied technology course at State University of New York at Oswego in which students were required to complete authentic, meaningful projects.

The Study

The Course "Educational Topic: Multimedia and Internet for Education" was offered in summer 2000. The class was restricted only to graduate students and was limited in size (17 students, 9 males and 8 females). Students and instructor met 3 hours twice a week for 6 weeks at computer-enhanced classroom.

Learning-Appropriate Goals

Technology especially multimedia and Internet has been changing and growing very rapidly. In order to avoid "doing without understanding" and to foster focused inquiry, three interrelated and graduated "learning-appropriate" goals were developed for the class: 1). Search and evaluate Internet educational resources; 2). Structure Internet inquiry activities via multimedia tool; 3). Design and develop educational web. These goals helped students reflect on the technology integration, and helped them direct their learning. Furthermore, students were willing to learn how to achieve these goals since they could make easy connection between what they were learning and what they were going to apply in the real world. Specifically, students were required to complete three projects to reach these three learning goals:

1. The educational web sites evaluation report (the first goal)
2. The inquire-oriented multimedia WebQuest project (the second goal)
3. The web-based educational portfolio or educational project (the third goal)

These projects were enhanced each other in contexts and skills and balanced the difficulty of implementation.

Scaffolds Before Initiating Projects

Most students entered the course either with little exposure to multimedia and Internet applications or with limited skills and understandings needed to integrate technology into their teaching and learning. Previous research indicated that it is crucial to create a foundation of necessary concepts and skills for hands-on program (Yang, Shindler, and Keen, 2000). To initiate each of three projects, instructor started with a simulated problem in the form of linear or open-ended project. This scaffolding served two ends: the first end was to share the related concepts/knowledge and particular technological skill that students needed to prepare their undertaking actual projects; the second end was to help student reflect and discuss the possibilities for extending the ideas and technologies into real world projects. For example, after students applied search strategies and educational web evaluation standards to complete their educational web review report project, instructor challenged students by asking how to implement the relevant Internet resources into curriculum and lesson plans, and how to engage learners in "active" involvement with those Internet resources. To seek the answers, Instructor initiated and developed a multimedia slide show "What eveloping multimedia presentation, the WebQuest -- an inquiry-oriented activity in which some or all of the information that learners interact with comes from resources on the Internet was introduced, six attributes of the WebQuest (introduction, task, process, resources, evaluation, conclusion) were discussed, and multimedia application components were demonstrated. Following the open-ended scaffolding, students were teamed into groups. They began their WebQuest projects on the more flexible levels of skills, understanding, and complexity. The instructor mainly staged in the role of resource providing "just-in-time" suggestions/guidance on the aspects of contexts and technical parts.

Opportunities for Formative Self-Assessment and Revision

Formative self-assessment is one of the most effective ways that promote the quality of the project-based learning. Through formative self-assessment, students get opportunities to see how they are doing and to revise their learning processes as necessary (Barron et al., 1998). The instructor facilitated formative assessment by taking two approaches. Internally, students were working on each common project – web review, WebQuest, and web based educational portfolio or educational project at the same period of time in the same computer classroom. With this common ground, students were encouraged to make communication in the process of completing projects. They were actively sharing the ideas and solution strategies that might be insightful to revise their projects. Externally, the instructor supported the assessment and revision process by providing content related resources links on the class web site (http://www.oswego.edu/~hyang2/edu). These resources allowed students to compare their projects with projects generated by others around the country who have been working on similar ideas.

Developing Social Structures That Promote Participation and a Sense of Agency

There are many ways to establish active, reflective learning. Allocating time for students to present their ideas, methods, and products is one of the most powerful ways. This is essential not only at the conclusion of a project, but also as the project grows. Presenting projects is an authentic activity that provides an enormous motivation for students (Wheatley, 1991; Grabe & Grabe, 1998). According to Barron and the Cognition and Technology Group at Vanderbilt (1998), "presentations, coupled with authentic outcomes and fairly explicit criteria for what counts as a good plan, can provide a strong incentive to prepare and revise" (p. 286). For this study, when each project was done, the instructor required students to present their products in front of the class. Class interactions and classmates' reviews were generated during and after the presentations. In addition, after the class presentations, students' projects have been published in the class web site for students' future reference and other classes' access (http://www.oswego.edu/~hyang2/edu/studentproject.htm).

Findings

Findings from final written reports reflected positive student reactions in project-based learning. Following are three major positive effects:

- The usefulness of extended learning. Students addressed that interrelated learning-appropriated goals, authentic projects, and interactive learning atmosphere made them emerging as active, engaged learners. One student wrote: "I think the process of web resource research and review to the ultimate creation of the web made sense. We layered on our skills with each new project using the newly learned skill by applying it to the next level... The decision to work in a team helped me achieve my goal of learning, while my partner and I brainstormed to accomplish tasks. Being able to work together took the anxiety out of the way, so learning could be primary. Additionally, after projects were presented the class was able to discuss and with that we learned more."
- The effectiveness of production. Most students indicated that working on their own real and related projects made their understanding deeper than simply "doing and missing". One student addressed: "I was pleasantly surprised and amazed on how knowledgeable my colleagues are within their own content area. I was very impressed on the quality of work that was given to you by your students just in six weeks. To have this information at one's fingertips would be invaluable. Not only is this information good within the content area, but also it would be great to have to share it with other teachers outside my content area. I would like to share this kind of information with teachers who do not use these techniques, and show them that it can be done very easily with a little time and dedication. These new techniques could revitalize some teachers' careers and make the classroom enjoyable again."
- The proficiency of technology integration. Written reports from students showed that by experiencing project-based learning, students knew how to locate, evaluate, and use information and technology effectively. One student reported: "I know that we may only touch the part of multimedia presentation, WebQuest usage and website design. But I'm comfortable enough to continue to explore the possibilities of becoming more proficient with these technologies. I loved what I learned; my challenge is how to incorporate them into my content area. I think integrating technology into the classroom is very important and now I have some good ways to build a curriculum upon and become a more successful teacher."

References

Barron, B. J S., Schwartz, D. L., Vye, N. J., Moore, A., Petrosino, A., Zech, L., Bransford, J. D., and The Cognition and Technology Group at Vanderbilt. (1998). Doing with understanding: Lessons from research on problem- and project-based learning. *The Journal of the Learning Sciences, 7*(3&4), 271-311.

Grabe, M., and Grabe, C. (1998). Integrating technology for meaningful learning (2nd ed.). Boston: Houghton Mifflin Company.

Wheatley, G. (1991). Constructivist perspectives on science and mathematics learning. Science Education, 75, 9-21.

Yang, H.; Shindler, J.; and Keen, A. (2000). Minds on, hands on: The linear-nonlinear problem solving approach to a multimedia and Internet course. In D. A. Willis, J. D. Price, & J. Willis (Eds.), *Technology and Teacher Education Annual: 2000* (pp. 738-743). Charlottesville, VA: Association for the Advancement of Computing in Education.

Creating a Web-Based Curriculum Tool: Helping K-12 Teachers Harness the Potential of the World Wide Web

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Abstract: The World Wide Web offers a great deal of potential for enriching the teaching and learning experience in the K-12 classroom. In many cases, however, teachers lack the time and skills to locate resources on their own. What can be done to help teachers and students take better advantage of the Web? Using the Algebra Resource Center (ARC) as an example, this paper will describe three areas of focus that can improve the effectiveness of sites designed as content area portals for classroom teachers—filtering, organizing, and correlating content to state standards; providing "real world" context for exploring content; and working to build a community of new and returning users.

Introduction

Resources available through the World Wide Web offer great potential for enriching the teaching and learning experience. A question we might want to ask, however, is—why has this potential not turned into reality? A recent *Business Week Online* article (Symonds, 2000) indicates that "Schools have rushed to buy computers and plug into the Net, but most students still don't use the Web much and most teachers don't either." The article indicates that about 16% of teachers use the Internet as a resource for developing lessons and around 30% require students to use the Internet for research. Articles by Hoff (1999), Roschelle and Pea (1999), and Trotter (1999) all indicate that teachers need help locating resources, developing technology integration ideas, and improving their skills with technology in general.

What can be done to help teachers and students take better advantage of existing web-based content? Offering the Algebra Resource Center (ARC) as example, we will explore three functions that portals developed for K-12 teachers can serve. While the ARC website focuses on resources for Algebra I teachers and students, the concepts discussed here—filtering, providing context, and building community—are relevant to any content area.

Making the Web More Accessible

<u>Filtering</u>. One of the primary services provided by ARC is locating relevant resources and organizing the results in an accessible format. With the rapid growth of the Internet (over a million new web pages per day by some estimates) searching for relevant information and sifting through the results is an increasingly difficult task. The literature, and our own experience, indicates that teachers do not have time, and often lack the technology skills (Hoff, 1999; Roschelle & Pea, 1999; Symonds, 2000; Trotter, 1999), required to wade through the nearly infinite quantity of information available on the Web for any given subject.

Mindful of the limited time that teachers have to spend sorting through resources, ARC staff members work to locate and organize resources into user-friendly, cross-referenced categories (including a state standards index, topical index, interactive sites, homework help sites for students, and professional resources for teachers). Within each category website links are accompanied by brief descriptions that provide teachers with the information needed to determine whether a certain link or part of the site will be useful to them. Users of ARC have responded well to this approach. Related to the use of website descriptions, a user commented, "Otherwise you are on the computer all the time looking at what it's about, but if somebody has done that for you it's going to save time." Another user ore thought into it than other people have...like in the activities section you say that 'this could be tied in here.' It eliminates a lot that isn't useful to teachers."

<u>Providing Context</u>. With the Web, teachers and students have access to more information than ever. While there are a variety of education specific sites that provide activities and lesson ideas, what makes the Web increasingly beneficial is the potential for bringing "real life" applications of content into the classroom. A major challenge for teachers, regardless of content area, is helping students recognize the relevance of what they are

learning. While the standards movement has helped clarify what should be taught, it has at times led to the teaching of isolated components at the expense of application—breaking the curriculum down into small parts or skills to be mastered.

One of ARC's primary objectives is to provide resources and instructional ideas that will allow students and teachers to explore algebra concepts in the context of "real world" situations. The massive amount of data available online, for example, is a primary candidate for exploring everyday needs for using algebraic concepts like graphing, working with matrices, or solving equations. Students can access up-to-date sports statistics and see the equation for calculating a quarterback rating in football. An online source for Hollywood box office data can be the starting point for exploring the usefulness of matrices, and the results of this exercise can be represented graphically. Users also indicate that this approach is helpful "to get the student out of the daily book routine," and have found the inclusion of sites like the one for "Major League Baseball" as "a good place for finding statistics." The possibilities are virtually endless.

Building Community. In the process of developing, revising, and updating ARC we have spent a considerable amount of time sharing the website with teachers throughout the state. Early in the development process a teacher asked, "How are you going to let everyone know that it's there? How are you going to get all the algebra teachers in Virginia to find out about this?" ARC staff quickly recognized that simply putting the site online would not be enough to attract new users and keep them coming back.

Since going online in early February 1999, building community has become a much greater focus for ARC staff. Teachers need to know that the site is out there and many need some degree of assistance getting started. During the past eight months we have been spreading the word about ARC through informational brochures, school district newsletters, focus group discussions, and regional conference presentations.

Feedback has been positive, and the site is growing. A summer workshop attendee wrote, "I enjoyed the workshop we attended because it made me sit down with someone who could help me get through some of my computer difficulties. I have visited this site before but never for more than 5 min. Today, I finally realized what a wealth of resources are not only available but categorized for our use. What a time saver."

Our interest in building community goes beyond our efforts to build an audience. We also want to get teachers actively involved. There is no better source of instructional ideas for a given content area than the teachers of that subject. This simple but powerful notion is at the core of our hope that ARC will be able to serve as a valuable communication tool for sharing and interaction of and between the state's Algebra I teachers. While we are encouraged by the site's use by teachers in search of useful curriculum augmentation, we have hopes that the site will become more of an electronic meeting place where teachers will come to interact with their colleagues. Our online discussion forum is the starting point toward our vision of ARC as a true community of practice for the state's Algebra I teachers.

Conclusion

It is our belief that ARC has helped make the World Wide Web more convenient and useful for Algebra I teachers. While we are excited about the site's contributions to Algebra I pedagogy, it is the generalizability of ARC's three-pronged focus that we hope might influence website design/construction in other content areas. Our efforts support the notion that web-based curriculum tools employing the three functions highlighted in this presentation—filtering and organizing content-specific resources, providing "real world" context for exploring content, and building a community of users—can be valuable assets for classroom teachers.

References

Hoff, D. J. (1999). Digital Content and the Curriculum. *Technology Counts '99* [On-line]. Available: http://www.edweek.org/sreports/tc99/articles/curr.htm [1999, September 29].

Roschelle, J., & Pea, R. (1999). Trajectories from today's WWW to a powerful educational infrastructure. Educational Researcher, 28(5), 22-25.

Symonds, W. C. (2000). "Wired Schools: A technology revolution is about to sweep America's classrooms". *Business Week Online* [Online]. Available: http://www.businessweek.com/2000/00_39/b3700114.htm [2000, October 9].

Trotter, A. (1999). Preparing Teachers for the Digital Age. Technology Counts '99 [On-line]. Available: http://www.edweek.org/sreports/tc99/articles/teach.htm [1999, September 23].

Virtual Learning Center: Online Tools Support In-class Teaching

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Abstract: This interactive session presents "old teaching techniques in new packages." It presents an approach to transforming teaching activities, which is economical and does not require too much extra time on the teacher's part exceptions in the world of modern faculty development in technology use and application. It demonstrates how teachers can create a Virtual Learning Community of online tools and resources to provide an electronic infrastructure to support their in-class teaching. This Virtual Learning Community can be used by elementary, secondary and post-secondary teachers, as well as teacher educators to transform traditional teaching practices into more effective "asynchronous" online activities, that frees up valuable class time for higher order cognitive activities and for social learning experiences. The tools we demonstrate are low-cost, free, or widely available already in schools, so our Virtual Learning Communities approach can be implemented in almost any teaching setting by any teacher who uses email and the Internet on their own. This is a practical, no-frills approach to modernizing your teaching.

Support that makes sense without expending lots of dollars

We have used and taught faculty how to use a variety of software and hardware and telecommunications tools over the years. In the early days of personal computing, networking, Internet, and telecommunications, just having faculty who had seen or used individual software or hardware tools was an important goal of faculty development. What we have observed, is just as the level of computer experience and the baseline competencies of incoming students rises over time, with increased access to these tools in school and at home, and more effective integration of these tools into teaching especially in the elementary and high schools, so the average competency of teachers as computer users is increasing.

We have also observed that teaching faculty how to use complex software, such as Director, or Dreamweaver, takes more than just the hours of a workshop. Faculty who attend software workshops, but then do have the time and opportunity to continue to use and practice and learn the software, are unable to put their workshop knowledge to use in practical ways that assist them in their teaching. This can be frustrating for the faculty and counterproductive for schools and institutions that are seeking to provide opportunities for faculty development.

However, if our faculty development efforts step back from the cutting edge of technology, and revisit our roots in pedagogical practices and what we know about "what works" in teaching, we can provide effective faculty development that will allow the integration of technology into typical classrooms quickly and effectively.

Thus in our work in faculty development and technology, we now combine simple, widely used tools, like email, and Internet browsing or, in new ways that make what teachers have always done (assign homework, give students individualized feedback, make interesting assignments) more effective. We call our idea of how to use and apply the tools creating a Virtual Learning Community (VLC.) The VLC is a set of tools that create an online infrastructure that supports a teacher and the students in a traditional classroom. It can be adapted to classes with no in-class access to computers and to those that meet in computer labs. It has been our aim to look for tools that are low-cost, free, or readily available for other purposes to make the parts of the VLC. This way, we provide faculty with the means to transform several time-honored pedagogical practices into new forms that make use of what computers and digital technology do best, and thus free up important in-class, "face time" with students so that teachers can engage in higher order cognitive activities with their students.

Why this Works

Time on task is the strongest predictor of student achievement. If teachers can monitor homework and out of class time more effectively with online technologies than was possible previously, they can gain more "face time" with students to pursue higher order learning. Student motivation, another predictor of achievement, increases with the perception that the teacher is interested in work completed between classes, and is maintaining contact with them out of class. The faster we can provide feedback to students about their learning, the more effective that feedback is. The techniques we demonstrate in this interactive session are easy to learn, can be done with inexpensive software tools, and allow teachers to create an online infrastructure to transform the way they teach by transforming the way time is spent on class activities in and out of class. The tools simply update time-honored teacher practices for the 21st century. It is the ubiquity and ease of use of the Internet and its tools that will bring educational ideas about how computers can assist learning into the mainstream in ways that previous incarnations of CAI were unable to do.

Integrating several telecommunication features into what we call a Virtual Learning Center, teachers can monitor lower order cognitive learning during out of class time, and thus free up more "face time" in the classroom to pursue higher order activities. Scoring and grading can be done immediately, and students can see how they did without waiting until the teacher wades through all the work to be graded. Assessment of higher order learning, which is more complex and requires the teacher, gets more time, because time-consuming lower-order assessment can be done via the online infrastructure. We unify the use of email lists, online forms (mail-in types and automatic feedback types), and simple teacher-created web assignments (from annotated HTML bookmarks)

What You See is What you Learn

In our interactive session we will demonstrate several of our techniques. We sill show how to use email to keep students involved in class between class sessions, how to create online assignments that make students' use of the Internet an effective learning experience (not just a surf session) and how to create online forms to collect reflective student responses. Additionally, participants can view demos of tools they can easily use (in terms of their own skills, and in terms of being able to afford these tools) to see how to create online self-evaluations that provide students with corrective feedback and how to create quizzes and tests that are scored and graded automatically, as well as variations of these techniques.

Most of the tools we use are free, low-cost or at least readily available to educators (e.g. Netscape Composer, MS Office, www.discovery.com teacher tools) and we focus on how to use technology to speed up things like scoring tests, so more time can be spent on learning activities. None of the techniques or tools that we present are original to us. That is the beauty of our Virtual Learning Communities. These are not new ideas that need to be tested. These are applications from technology to solve problems and speedup bottlenecks that have existed and impeded common teaching activities in ways that have been viewed as endemic.

Educational critics often say that a doctor from 100 years ago would not recognize a modern operating room, but a teacher of 100 years ago would feel right at home in the modern classroom. The introduction of networking and computer technologies began the transformation of the classroom in the same way that the operating room has been transformed. In order to continue that transformation, we need to enable teachers to perform simple, basic, teaching activities in new ways, enhanced by technology. This interactive workshop will demonstrate how to do this, and set many attendees on the right track to transform their own classroom or school for our new century.

We can help you if you are...

The audience for this interactive session can consist of teachers and administrators who routinely use email and the Internet outside of their direct teaching activities. This session is not designed for teachers with no Internet experience, or those who have created extensive websites or developed online classes. Teacher Educators should find this an interesting and exciting session, provided they have the prerequisite skills.

The learning objectives of the interactive session are that participants will be able to create email lists for their classes and compare and contrast the use of this kind of email with listserv and one-on-one email. Participants will be able to describe the community building aspects of this tool. Participants will be able to create, reorganize, and use bookmarks (favorites) to create interactive, active assignments for their students. Participants will understand how the vision of Vannevar Bush underlies this tool, and its importance in modern academe. Participants will be able to create an online form in several ways (using hosted tools or a word processor or an HTML authoring program to create the form.) Participants will understand the difference between "post" forms that have their contents returned as email, and forms processed via CGI and other applications that return data that has been graded or evaluated to the form creator.

The software used in this interactive session is Netscape and Netscape Composer, teacher tools from several online sites, such as: (http://school.discovery.com/quizcenter/info/userguide.html), Microsoft Office, and Dreamweaver. Prior to the interactive session, we will provide an example of a Virtual Learning Community, to support the Interactive Session and as a resource for the participants. You can view supportive materials about the theories underlying our work, and Virtual Learning Communities at http://acweb.colum.edu/users/biverson/fipse

Literature References

Iverson, B. K. *Teaching with STYLE* short paper presented in Montreal, Canada July, 2000 at EdMedia2000.

Iverson, B. K. *Praxis Looks to Theory & Research: Students Transform a Scholarly Text and Psychology of Creativity gets "hypermediated"* Roundtable discussion paper presented at HyperText 2000 in Austin, Texas, May 2000.

Iverson, B. K. & Baxter, J. *Teaching with STYLE Workshop* presented for Syllabus Conference in Chicago, IL April 2000 repeated during Technology Immersion Month at Columbia College for Columbia faculty.

Iverson, B. K. & Prados-Torreira, T. *Liberal Ed meets High Tech: Interdisciplinary Collaboration to Improve Instruction.* World Association for Case Method Research and Application Conference, Extremadura, Spain, July, 1999.

Iverson, B. K. Tutorial *ABCs of Collaborative Multimedia Projects in the Classroom.* EdMedia99 World Conference on Educational Multimedia, Hypermedia & Telecommunications, Seattle, Washington, June, 1999.

Iverson, B. K. *Making New Media in Everyday Classrooms.* Presentation with Andrea Polli at Lilly Atlantic Conference, Towson College, Baltimore, MD, April, 1999.

Iverson, B. K. & Prados-Torrerira, T. *Digital Technology & the Teaching of Women's History* at "The Stuff of Women's History: Using Artifacts, Landscapes & Built Environments to Research & Teach Women's History in the Classroom," Organization of American Historians & The National Park Service. Seneca Falls, N.Y,. August 21, 1998.

Iverson, B. K. & Prados-Torreira, T. Integrating digital tech into classrooms: Warp & Weft, Might & Magic, Mettle & Motherhood. Presented at SIGGRAPH98 Education Program, Orlando, Florida, July 1998 & in SIGGRAPH Abstracts, 1998. (http://www.acm.org/pubs/citations/proceedings/graph/280953/p61-iverson/) (http://digdesign.colum.edu/fipse)

Iverson B. K. & Prados-Torreria, *T. Integrating Women's History and CyberTechnology.* Presentation at *Women's INterVENTIONS in Science, Art, and Technology, Fifth Women's Studies Symposium.* Purdue University, March, 1998

Fraser, B. J. , Anderson, G. J. and Walberg, H. J. (1991) Assessment of Learning Environments: Manual for Learning Environment Inventory (LEI) and My Class Inventory (MCI). Perth, Western Australia: Curtin University of Technology, Science & Mathematics Education.

Jonnasen, D. H. Peck, K. L. & Wilson, B. G. Learning with Technology: A Constructivist Perspective. Prentice Hall, Upper Saddle River, N. J.

Tinto, V. Colleges as Communities: Taking Research on Student Persistence Seriously. The Review of Higher Education 21.2 (1998) 167-177. (URL: http://muse.jhu.edu/journals/review of higher education/v021/21.2tinto.html

USING AN ELECTRONIC DISCUSSION BOARD TO SUPPLEMENT CLASSROOM SESSIONS WITH POST GRADUATE TEACHER EDUCATION STUDENTS

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USING AN ELECTRONIC DISCUSSION BOARD TO SUPPLEMENT CLASSROOM SESSIONS WITH POST GRADUATE TEACHER EDUCATION STUDENTS

ABSTRACT

When the postgraduate computer education programme at UNITEC Institute of Technology was developed it was considered essential that it be accessible to students in full time employment. Consequently all classes are held at weekends and Blackboard Course Info is used to facilitate student-student and student-teacher interactions between classes. This paper outlines the structure of the programme, profiles the students, explains the approach taken by the lecturers, and reviews the learning experiences of staff and students in three classes.

Keywords

Postgraduate computer education programme, electronic learning support, student evaluations.

1. THE PROGRAMME

The postgraduate computer education programme at UNITEC Institute of Technology was approved by the New Zealand Qualifications Authority in December 1999 and classes began in February 2000. Students may complete a Postgraduate Diploma, consisting of two compulsory courses and six optional courses, in one year of full time study (or the equivalent part time). The Master's degree requires four compulsory courses, and either three optional courses and a thesis or seven optional courses and a dissertation; it may be completed in two years of full time study (or the equivalent part time). At present the optional courses focus on networks, instructional technology, interactive multimedia, and the Internet.

2. DELIVERY METHODS

To accommodate the needs of students in full-time employment, classes are held at weekends. Each course meets on four weekends, about a month apart, for four hours on Saturday and four hours on Sunday. The lecturers use a range of approaches, including lecturer presentations, student presentations, group work, electronic discussions and individual communications (by email, telephone or face-to-face). The students complete three assignments per course, some as individuals and some in groups. There are no final examinations.

3. THE COURSES

The first course under review is called The Impact Of Information Technology On Society (referred to as 801 below): it explores past, present and future impacts and ethical issues. It was anticipated that few students would have much experience of exploring social issues, which made it very important that they have plenty of opportunity to discuss ideas and situations, both in class and between classes. For that reason, the lecturers reminded the students at all class meetings to use the discussion board to supplement face to face interactions. The course ran twice (once in each semester) with very different student groups.

The second course under review is called Pedagogical Strategies for the Use of Information Technology (referred to as 817 below): it explores how information technology may best be used in teaching and learning. Most of the students in 817 had been in the first semester 801 class. One of the three lecturers is the 801 course coordinator, another is based in Melbourne and flies over for three of the four weekends.

4. THE STUDENTS

In the first semester 801 class, the 16 students included five computing practitioners, five tertiary teachers, two secondary teachers, two technical support staff, a librarian and a sales representative. Four of them already had postgraduate qualifications, another five had bachelor's degrees, a further five had diplomas at various levels and the remaining two had extensive credits towards bachelor's degrees. All had significant practical computing experience (from six to 20 years) and all but two had English as their first language.

The second semester 801 class consists of 32 students whose first language is not English. Eight students already have postgraduate qualifications, one has an undergraduate diploma and the remaining 23 have bachelor's degrees, mainly in science or engineering. Not many had more than three years practical computing experience.

The 817 class consists of four secondary teachers, three tertiary teachers and a computing practitioner. Three of them already have master's degrees, another three have bachelor's degrees, and the remaining two have diplomas. All but one have English as their first language.

5. THE 801 DISCUSSION BOARD IN SEMESTER 1

Two weeks before the first weekend meeting, the discussion board was initiated and students were invited to give some personal background and explain their interest in the course. Six students responded before the first weekend and seven more followed shortly after. Over the 20 weeks of the course active participation in the discussion board varied greatly (we can only speculate about the activities of "lurkers" - students who followed the discussions, but did not contribute).

Altogether 172 student contributions were made (an average of 11 per student). Some contributions were very brief (for example, asking for a definition, giving a URL or acknowledging a response) and some were quite extensive (for example, arguing a case or recounting an anecdote). The most active contributor (38 postings) was a computing practitioner with 22 years of experience. The next (25 postings) was a librarian. Only one student, a member of UNITEC's IT support staff, did not contribute at all. The biggest occupational group consisted of teachers (5 tertiary and 2 secondary), who might have been expected to be major contributors. In the event their contributions ranged from one posting to 15. A further 14 postings were made by the lecturer.

6. THE 801 DISCUSSION BOARD IN SEMESTER 2

Altogether 128 student contributions were made (an average of four per student). The most active contributors (a computing practitioner from India and a recent graduate from Sri Lanka) made 13 postings each and three students did not contribute at all. A further 26 postings were made by the lecturer. When compared to the first semester course, the student contributions tended to be briefer (which may reflect the language skills of the students) and the lecturer tended to respond twice as often.

7. THE 817 DISCUSSION BOARD

Altogether 101 student contributions were made (an average of 13 per student). The most active contributors (a computing practitioner and a tertiary teacher) made 30 and 29 postings respectively and one student (a secondary teacher) did not contribute at all. A further 29 postings were made by the three lecturers. When compared to the 801 classes, the contributions tended to be longer (which may reflect the language skills of the students and the nature of the subject matter) and the lecturers tended to respond more often (particularly the lecturer who only sees the students at weekends).

8. STUDENT EVALUATIONS

At the end of the first semester 801 course the students were asked to rate the usefulness of the different components of the course. When their responses were combined, scoring 1 for "not at all useful", 2 for "not very useful", 3 for "quite useful" and 4 for "very useful", the following ranking emerged:
3.8 whole class activities
3.5 assignments / internet / newspapers / clippings
3.4 journals
3.2 group work
3.1 books
2.8 discussion board / survey analysis
2.7 survey construction
It seems clear that this group of students valued their classroom interactions and various forms of print and electronic resources more highly than the electronic discussions. Comments about what they liked best included:
"Discussions - expertise of lecturer and participants"
"Group discussions and participatory nature of the course"

At the end of the second semester 801 course, more student evaluations were conducted with the following results:
3.7 internet
3.1 assignments
2.7 newspapers / clippings / journals
2.5 whole class activities
2.3 discussion board
2.2 books
2.0 group work / survey analysis
Whole class activities and group work with this class were not as lively and effective as they were with the semester 1 class (possibly because of language), so it is not surprising that they were rated lower. On the other hand, the semester 2 class rated the internet well above other resources, and it was the only component that they rated higher than the semester 1 class did.

9. CONCLUSIONS

Given that the students were busy people (many of them in full time employment), who only met as a group on eight occasions and were otherwise widely dispersed, the discussion board proved helpful in maintaining student-to-student communication between class meetings. The lecturers also used Blackboard Course Info to make electronic announcements (an average of one a week) to keep students informed (about logistics, resources and deadlines) and give general feedback about assignments. However it is clear from the student ratings and comments that they enjoyed meeting face to face and saw the electronic components of the course only as a useful support and supplement.

PREPARING TEACHERS TO COMPLEMENT MIDDLE-SCHOOL CURRICULA WITH WEB-BASED ENVIRONMENTAL HEALTH RESOURCES

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ABSTRACT

The College of Veterinary Medicine at Texas A&M University has teamed with the Center for Rural Public Health and the College of Education to develop science curriculum and teacher training for middle-schools in rural and under-served parts of Texas. Our approach is to use the World Wide Web to provide environmental health information at a middle-school level and to train teachers to complement their regular teaching with the information, learning activities, and experiments developed by our scientists. The curriculum receives on-going evaluation and revision. The program also includes in-class visits by scientists to the schools.

Completed to date are Web sites on Cell Biology, Environmental Hazards, and Water Quality. Under development are sites on Organism-level Biology and Hazard Properties, Assessment, and Remediation. Each module provides didactic information and hands-on activities for the students and extensive "teacher pages" that include lesson plan, explanation of learning activities, Internet tools for the teacher, and identification of the state learning objectives that are addressed. The Web site URL is: http:\\peer.tamu.edu

We will build on this life science core with a seven-year program to create Web modules that can help integrate environmental health science into all middle-school teaching, which in Texas includes economics, English, general science, geography, government, and history, in addition to math and science.

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RATIONALE FOR THE PROGRAM

Although Texas has received good reviews for its educational reform efforts, reform in Texas is complicated by the fact that it is such a large state with only a few major population centers. The school districts in Texas are spread over great distances and in many cases lack direct access to enriching educational opportunities that are available in large cities. Rural children in Texas encounter serious environmental health situations, but their schools are less likely than metropolitan schools to receive state-of-the-art instruction in environmental health. Enriching rural-school education via the World Wide Web seems to be an obvious and necessary need.

Educators commonly view middle school as a crucial stage in a child's education. In Texas, middle school is a turning point in the lives of rural children when they may either drop out of school or become motivated for a lifetime of learning. Given the relatively poor performance of U.S. students in science, we believed it was appropriate to focus on science. But not science as it is usually taught, which is often perceived by students to be abstract, arcane, and just plain boring. In particular, we believe that students can become more interested in science if the relevance to their daily life were more evident, as is possible with environmental health issues.

Additionally, there is a great need in Texas for teacher training in science. Only in recent years have new teacher graduates in Texas been required to have an academic major in their teaching area. It is not uncommon to find science teachers in Texas who have no science background.

We also recognized the crucial requirement of cooperation and buy-in from teachers and administrators. Therefore, we arrange for teacher training in the science issues, provide scientist visits (when invited) to schools, have advisory panels of teachers and school administrators across the state, and consult with officials of the Texas Rural Systemic Initiative and the Texas Education Agency.

The Curriculum

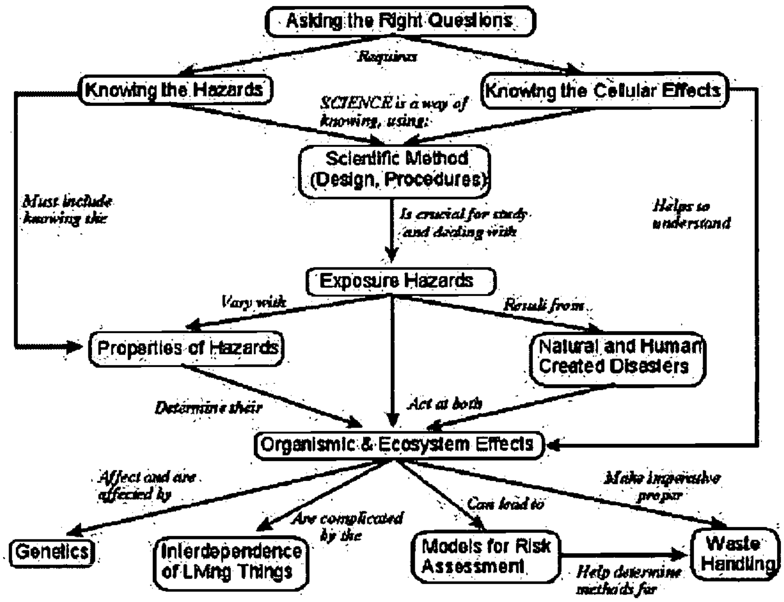
Several key features characterize our approach:

- didactic material written by scientists in coordination with curriculum designers
- instruction tied to state-mandated learning standards
- experiments and other "hands-on" activities
- scientist visits to schools
- consultation from a panel of middle-school teachers
- a computer conferencing system that supports collaborative learning and interaction among students and with professors
- comparison of pre- and post-test scores for each given module as a measure of what has been learned
- on-going evaluation of revision of the program and instructional materials

Basic Life Science Curriculum

A three-year federal grant sponsors the development of instructional material for grades 6, 7, and 8. Materials must contribute to State learning standards, known as the Texas Essential Knowledge Standards. Figure 1 shows a concept diagram that is guiding the development of the modules.

Three modules have been completed (Water Quality, Cell Biology, and Environmental Hazards)(see peer.tamu.edu). The water quality module emphasizes a series of experiments on water quality. These are supported by giving commercial water quality test kits to the schools. The cost, over $300 per kit, is borne by the grant and donors. Students perform and evaluate measurements in the following lessons: Lesson 1: mass, fluid volumes, and concentrations. Lesson 2: temperature and its effects on water quality. Lesson 3: dissolved oxygen and its effects on water quality. Lesson 4: pH and its effects on water quality. Lesson 5: nitrates and their effects on water quality.



Protein Machinery" (protein synthesis and function), and "Code and Translate Instructions" (genetics). There is also an introductory lesson on "Levels of Organization" to put things in perspective. We attempt to teach these difficult topics at the middle-school level, and feedback from the teachers so far indicates that we might have succeeded. Each unit begins with a section of "How We Find Out," which explains in simple terms the kinds of observations and experiments scientists make to learn about the cell function under consideration. Then there is a section, "What We Know" that summarizes what we know about membranes, energy production, etc.. Finally, there is a unit, "Why Does
-school children should be interested in knowing these things. Also associated with each unit are activities and experiments, short essays on common toxins that affect the cell function under consideration, and a short biography of a famous scientist, with emphasis on his/her childhood, who made major discoveries in the topic. In addition to pre- and post-quizzes, there are electronic flash-card questions using a new game-like system that we developed (Get Smart: www.foruminc.com/getsmart).

The Environmental Hazards module has five units. One, a general introduction to environmental science, explains the flow of energy from the sun through the various levels of the food chain and covers carbon cycle, nitrogen cycle and water cycle. There is also a section on the relationship of exposure, toxicity, and risk in environmental hazards. A second unit explains the rules for food safety and identifies sources of food-borne illnesses and contaminants. The third unit common covers indoor air-borne illnesses and contaminants and teaches children about outdoor air-borne illnesses and contaminants. A fourth unit teaches about the skin, and helps children learn to minimize their exposure to pesticides and herbicides and to the sun's ultraviolet rays. There is also a section on parasites. The fifth unit emphasizes good nutrition and identifies health problems that can occur through poor nutrition. Each unit has an activity that is an electronic sleuth game, "Toxic Island," in which students must solve environmental health problems.

Modules now being developed include an extension of the Hazards instruction to include chemical properties of hazards, risk assessment, and remediation, and an organism-level module oriented around the theme of what kinds of things organisms must do to survive and thrive in this world.

Integration of Life Science into All Middle School Instruction

A second grant supports a new initiative to incorporate multi-media environmental health instruction into the teaching of English, social studies, math, and general science. We hope to work with TEAMS of teachers in local schools, with the science teacher acting as a focal point to assist the other teachers in the integration process.

This curriculum will be problem based. State tests indicate that critical thinking and problem solving are common areas of weakness. We plan to hire a professional writer to create a 20 min read story line, with child characters, as they go on an imaginary journey in time or to different geographical areas. Each stop along the way constitutes a new adventure in which the children are confronted with an environmental health problem. For example, one adventure now under development is at Luxor, Egypt, where the slaves who are building the pyramids suddenly come down with a sickness characterized by vomiting and diarrhea. The science teacher would help direct students to information on food safety, water quality, and infectious disease. The math teacher might develop exercises based on the geometry of pyramid building. The social studies teacher might deal with the geography of the Nile River basin, the politics of Pharoh-dominated culture, and the life styles of Egyptian slaves. The English teacher might require additional reading or call for persuasive essays defending a particular view of the problem and its resolution.

These modules will include activities for testing, calculation, reading/writing, role playing, and development of problem-solving skills.

TEACHER TRAINING

Teachers receive training in several ways:

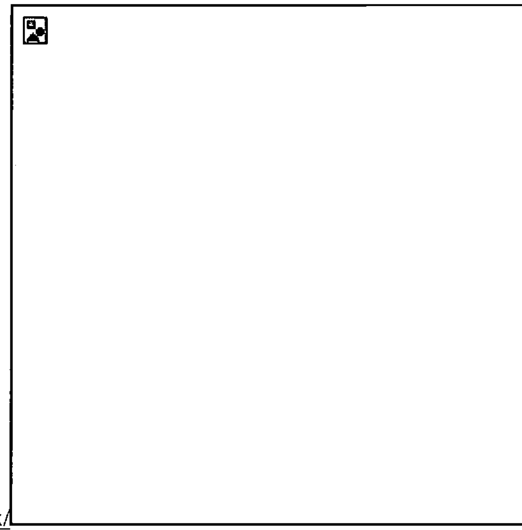
- Summer Short Course. We host a one-week intensive training session in the Summer. Teachers learn computer and Internet skills, meet the scientists and instructional designers, and learn and critique instructional materials. Teachers actually perform (and de-bug) the hands-on activities and experiments.

- Internet Conferencing with Scientists. Biographies of participating scientists are posted on the curriculum web site, and teachers can know whom to contact for questions or suggestions. A Web-based, asynchronous conferencing system, FORUM, is being developed that will allow shared editing of Web pages and in-context annotation (see www.foruminc.com for current implementation).

- Scientist Visits. Informal exchanges occur during the scientist visits to local schools.

- Teacher Pages on the Web site. Each curricular module has a set of Teacher Pages that help explain the material and show how the materials can be used. Worksheets can be downloaded for students to use in reporting their activities and experiments.

- Web-site Instructional Resources. The peer.tamu.edu site contains various links to resources on Environmental Health Science Education for teachers and students. These web sites are packed with fact-based information and fun-filled curricula. There is also a link to the TrackStar site



(http://scrtec.org/track/ http://scrtec.org/track/ enables teachers to create easy-to-use Web lessons and presentations or to use ready-to-go lessons created by other teachers.. The PEER site also links to a collection of environmental health lessons that are created by the teachers who participate in our Summer workshop.

- Curriculum Evaluation Feedback. As feedback is received from the teachers, the feedback will be shared with everyone for general dialog and debate in the FORUM conferencing system.

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Designing Activities in Networked Classrooms at the Micro, Meso, and Macro Levels

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Abstract: University- and school-based teacher educators, pre-service teachers, and educational researchers/learning scientists are seeking to develop thoughtful and effective uses of information and communication technologies (ICT) in networked classrooms across settings in Canada and elsewhere. At the micro level, they design creative, engaging, and productive online activities for collaborative learning and teaching purposes, ones increasingly focusing on knowledge building. At the meso level, they facilitate new adopters' transition to networked classrooms; once technology is in place and working, the advancement of pedagogy tends to become the object of collaborative inquiry. At the macro level, the vision of interconnected learning communities is guiding the transformative process that is underway. Design principles that were found applicable across sites and levels, and which will guide participation in the Universal Forum of Cultures' Educational Project (Barcelona, 2004), are presented.

Introduction

In 1994, the idea of computer-supported collaborative reflective practitioners inspired the design of a virtual community of support and communication for preservice teachers registered at a number of Canadian universities, located in Quebec City, Montreal, Toronto, and Vancouver. Ever since, participants have helped one another understand why and how information and communication technologies (ICT) may be used in thoughtful and effective ways. These driving questions are explored by different communities, in specific situations, and sharing research results between iterations. Communities of learners, communities of inquiry, communities of interpretation, and communities of practice all bring their contribution to the understanding of being-a-teacher-in-a-networked-world. Participants are student teachers, teachers, teacher educators, graduate students, and other educators from a number of schools, universities, and associations. This paper focuses on the design principles that were found relevant.

A Design Experiment

Our research takes place within emerging practices; we are not external observers of existing practices but, rather, we are co-engineers of practices – or "designs"– that constitute arrangements of processes, methods, and tools with which we experiment systematically (see Ann Brown's concept of "design experiments" in Brown, 1992). As such, we seek to articulate an understanding of practices around learning, inquiry, and interpretation.

Situated learning (Lave and Wenger, 1991) is central to the concept of interconnected learning communities. Lave's concept of "settings for action" (1988, p. 98), and its counterpart, "arenas of activity" helped structure the framework of inquiry: a setting is a process that occurs as the individual establishes a relation with a given arena –arenas for activity are public and durable, existing prior to individuals and, to a large extent, out of their control. The perspective adopted on the continuities and discontinuities in the dynamic relations being established at each site and between sites built on Lave's notion of continuity of activity as an "active production of the reproduction of settings, activities, and selves (1988, p.187), and on that of legitimate peripheral participation (Lave & Wenger, 1991).

The online learning environments, such as Virtual-U, eGroups, WebCT, and Knowledge Forum, bring continuity within and between sites when the same tool is used. But philosophical approaches and teaching skills as well as cultural differences (school culture, university culture, Francophone/Anglophone cultures) are also at play. The posting of artefacts in online public places and invited virtual visitations allow communities using different tools to share interrogations, resources, and research results (e.g., incoming student teachers doing virtual visits of more advanced student cohorts' discussion forums (VGroups); inservice teachers from different schools reflecting on their practices (eGroups); collaborative knowledge building is demonstrated to interested participants from other sites (Knowledge Forum). That is to say that designs of use and social designs (e.g., graduating teachers staying connected after their undergraduate studies, graduate seminars involving participants from different sites) are found important for new continuities to emerge, and create density as far as classroom, school, and wider-system renewal are concerned. What happens when classrooms get networked? How do pre-service teachers, in-service teachers, school-based and university-based teachers interact within and between sites? The relations among people, activity(ies), including resources and tools, and situation(s), as seen through themes and patterns of connection, constitute a primary focus of theoretical interest (Laferrière, Bracewell, Breuleux, and Willinsky, 1997).

Another question being studied also using a design experiment approach (Brown, 1992) is the following one: What knowledge is to be transferred in order to prepare 21st century citizens? This question entails the technical, practical, and theoretical dimensions of learning to teach collaboratively, and learning to learn, in networked classrooms, schools, and wider systems.

Inquiry and interpretation practices

In the enduring contexts of their respective "communities of practice" –and in a movement to create extensions across the traditional boundaries of these practices– educators and learning scientists in the TeleLearning Professional Development School (TL•PDS) are able to design jointly a number of inquiry projects with a fundamental focus on the question: "How can we achieve the full range of sustainable learning and teaching experiences that are relevant to our knowledge society?". Around this inquiry goal, our *communities of practice* shift to *communities of inquiry* which include principally practicing educators, teacher educators, and learning scientists (educational researchers) engaged in discussions to cultivate a common discourse and a common knowledge base on *learning* –as a socially situated and governed constructive process– and on how "technology" –as a system that includes culture and knowledge– can help us achieve superior forms of learning. In the context of this community of inquiry, many activities can occur, one of them being to engage in deliberate *interpretations*: developing and documenting socio-technical processes to identify, capture, organize, and interpret moments from the networked K-12 classroom, where advanced pedagogies, collaborative knowledge building, and technology integration are combined into emerging practices and constitute the focal point of inquiry for the participants. For instance, a range of "recording" tools and shared interpretation spaces can empower teachers to engage in digital "story-telling" within an interpretive community to capture critical events from the circumstances of practice. Technically, this involves fairly common technologies: portable notebook computers, digital video camera, video-editing software, high-speed Internet access; shared web-site, collaborative knowledge building tools. Although these technologies are not "rocket science", for our design experiment it is important to validate their ecology, to articulate their practical alignment in an authentic practice.

The teachers in that setting engage in reflective acts where recording and gathering artefacts is critical to their inquiry goals, organizing them for sustained interpretation with others (resulting in multiple diverging or converging interpretations). Practitioners as well as researchers thus are signaling to each other their emerging practices and the questions they have about them in order to engage in a process of interpretation. It is essential to understand that this interpretive project is grounded in existing networked communities of practitioners and researchers, in relation of trust, sharing common inquiry goals (such as the educators and researchers in our TL•PDS). This community of interpretation is a community whose actions are essentially about sharing experiences, making sense from the "text"[1] of experiences, and where research knowledge is brought to bear. This activity is at the intersection of, on the one hand, narrative-based reflective practice and, on the other hand, "case-studies" or case-based learning. The "story telling" is supported by digital media, the interpretation is using varied online synchronous and asynchronous tools for collaborative knowledge building. Examples of inquiries go from questions of classroom management solutions to support project-based learning in a laptop classroom, to questions about fostering specific understandings in middle-school science with the use of visualization tools, to what constitutes evidence of knowledge building. Thus, we are engineering different socio-technical designs and exploring them, in practice, in order to shape a successful "reflective practice" that takes advantage of current affordances in digital media, shared representations, and collaborative knowledge building.

A Collaborative R & D Process

Higher-thinking and social skills are associated with advanced uses of learning technologies in the classroom (Bracewell, Laferrière, Breuleux, Benoit, & Abdous, 1998). However, the networked classroom means different things to different people. For some it may mean one networked computer and a LCD projector in front of the classroom for the teacher to enhance his or her lectures. For others it may be a classroom whose members have high access to the network (intranet and/or Internet) in and/or out of its walls.

As teacher educators know, workplace contexts affect pre-service and beginning teachers' representations of their role as teachers. For instance, although on campus they may be exploring alternatives to the transmission model of teaching, a traditional school setting is likely to have a decisive influence on their behavior as student-teachers, or as beginning teachers.

The following twelve (12) design principles have progressively been found relevant for designing activities that advance the practice of teaching, and the practice of learning, in networked classrooms:

- **Ease of access.** Networked computers and online resources and tools need to be accessible without loosing too much time once basic technical skills are mastered.

- **Co-constitutionality.** The development of a socio-technical infrastructure relies first on electronic connectivity on the one hand, and on people who value collaborative learning and knowledge on the other.

- **Participatory design.** The development of networking capacity involves university-school administrators (partnerships), university- and school-based teacher educators, in-service/pre-service teachers, and K-12 learners.

- **Local grounding.** Site-based professional learning communities provide grounding. Three were established (TACT, McGill TL-PDS Net, CITE), and connected to the Knowledge Society Network (KSN). Their locus of collaborative inquiry is the networked classroom.

- **Active collaborative learning.** The networked classroom fosters active collaborative learning, rather than individual learning where students/pupils work on computers learning rote knowledge and specific skills.

- **Multi-modal social interactions.** At a local level, learners meet face-to-face, on campus or at the professional development school. Learners also meet online, pursuing locally grounded activities or geographically extended activities. See http://www.telelearning-pds.org

- **The classroom as-a-community of learners.** K-12 learners as well as pre-service and in-service teachers are learning in networked classrooms designed to become centers of inquiry

[1] the notion of "text" is here expanded to include complex digital representations and artefacts used to convey rich stories, narratives and explanations.

where people, things, and ideas are valued, and where teaching for understanding is a common goal.

- **Diversity.** Learning communities are different in their local champions, circumstances, settings, tools, artefacts, cultures, and languages (English, French and, soon, Catalan/Spanish).

- **Progressive distributed expertise.** Virtual collaborative spaces provide opportunities to share resources and expertise to solve complex and ill-structured problems.

- **Collaborative reflective teaching.** The design task is that of providing a collaborative learning environment within which problem-setting and problem-solving are carried out in relation to real classroom events.

- **Collaborative knowledge building.** This refers to the design of a rich learning context within which meaning can be negotiated and ways of understanding can emerge and evolve. Student teachers engage in designing and inventing tasks such as the organization of the networked classroom, the development of learning projects, the scaffolding of online group or classroom conversations, and the creation of case studies.

- **Interrelatedness.** Knowledge objects, events, actors, artefacts, and authors interconnect in ways that add continuity and integration to student teachers' experience as they learn to teach in networked classrooms. They add as well to the experience of practitioners' working in networked classrooms.

The design experiment is now entering a phase where issues of leadership are crucial. We are examining leadership practices that support the participation of teachers in on-line learning communities, how leaders can develop their own learning communities, and how teachers can become leaders in their school or school board related to the use of ICTs to support advanced pedagogies such as collaborative knowledge-building.

The Universal Forum of Cultures, to be held in Barcelona in 2004), provides a rare opportunity for educators to raise their sight, express their humanistic values, and exercise leadership around a productive, constructive set of activities with the aim of realizing the vision and of learning from that realization. Working and thinking together, all participating countries' educators, governments, business leaders and community groups are capable - with the present knowledge, resources and technology - of creating a community, a family of educators, with a common concern for building their education system's capacity in using information and communication technologies (ICT) properly in and out of the school classroom.

From Networked Classrooms to Interconnected Learning Communities

Electronic linkages and associated production instruments (e.g., email, web-page construction, online discussions, online data bases), constitute a powerful vector for learners to exercise the full range of democratic rights, to build and share their understandings with others so that the resulting knowledge is deeper and more robust, to make visible to themselves and to others the wealth of their cultures in ways that allow dialogues and exchanges. Thus, the leadership strategy adopted in coordinating the theme on technology of the Education Project http://www.barcelona2004.org/corporativa/projecte-educatiu/index-gb.htm, builds mostly on this dialogic perspective on new media and information technologies in learning communities, where access inside the community to resources from outside is at the same time allowing the possibility of production from within to the outside and, therefore, stimulates the engagement in responses, dialogues, exchanges, explanations, and the construction of new objects.

References

Bracewell, R., Breuleux, A., Laferrière, T., Benoit, J. et Abdous, M. (1998). The emerging contribution of online resources and tools to classroom learning and teaching. Ottawa: Rescol. Disponible à l'adresse suivante : http://www.tact.fse.ulaval.ca/ang/html/review98.html

Brown, A.L. (1992). Design experiments: Theoretical and methodological challenges in creating complex interventions in classroom settings. *The Journal of the Learning Sciences, 2*(2), 141-178.

Laferrière, T., Bracewell, R., Breuleux, A., & Willinsky, J. (1997). Patterns of connection. Paper presented at the Annual Meeting of the American Educational Research Association, April, Chicago.

Lave, J. (1988). *Cognition in practice: Mind, mathematics and culture in everyday life.* Cambridge, UK: Cambridge University Press.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation.* Cambridge, UK: Cambridge University Press.

SURVIVALIST GUIDE TO ONLINE COURSE DEVELOPMENT

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Abstract:

Online course delivery is a popular topic in educational circles today. However, little guidance is available in an introductory manner that facilitates the actual development of such courses. In this article, we will provide a systematic approach to developing online courses that will enable beginners to plan and implement an online learning experience. The framework we present involves answering a set of questions that relate to the following domains: learning, teaching, technology, design, support, management, and quality.

Introduction

Online course delivery is a popular topic in educational circles today. However, little guidance is available in an introductory manner that facilitates the actual development of such courses. In this article, we will provide a systematic approach to developing an online course that will enable beginners to plan and implement an online learning experience.

Online course delivery has become a priority at our institution, The Metropolitan State College of Denver. When the college first started putting courses online, many were developed without much thought to design and how to address student learning in the online environment. Over the past five years, however, we've learned many things about online learning and how to provide effective instruction in an online environment.

We believe the key is knowing what to consider when deciding to convert or develop a course for online delivery. A framework we use involves answering a set of questions. These questions relate to the following seven domains: learning, teaching, technology, design, support, management, and quality.

Learning

What kind of course is it? What do your students do? What do you want them to learn? What kind of investment are you looking at in terms of course materials? What performance-based expectations do you have of your students? What are you expecting your students to be able to do at the end of the course? What are the materials and activities you need to have in place to achieve these outcomes? How can these skills be taught in an online environment?

An important consideration in the development of online curriculum is determining the appropriateness of a course for this method of delivery. Consider, does the context of the course deal with a well-defined domain of knowledge, an ill-defined domain of knowledge, or a combination? Each has its own uniqueness and constraints, which will need to be addressed specifically for the online environment.

Teaching

In looking at the content you will be providing in your class, what types of materials do you want to use? Are they text-based such as textbooks or handouts? Are they visual-based such as pictures, photos, slides, graphics, or animations? Are they audio-based such as cassette tapes and sound or music files? Are they multimedia-based such as PowerPoint presentations, films, videos, or software? What materials do you expect the students to have access to?

You also need to consider the types of skills and content mastery that you are trying to achieve. How can you provide for students, in an online learning environment, the experiences they need to meet the desired objectives?

Can you create in an online learning environment a scenario where students can achieve at least equal to, or more than, what can be achieved in a traditional classroom?

Technology

Based on the teaching and learning that you want to occur, does the technology at your disposal and accessible to your students, have the capability to fulfill your expectations? In today's cyberspace reality, there are still subtle differences in computer systems, browsers, plug-ins, and reader software. Let alone, the obvious factors of Internet connection speeds and web server stability and delivery. What are the current limitations? Is your web server supported directly by the institution, a third-party, or is it out-sourced to a vendor? What are the capabilities of the system? What resources do you have at your disposal to develop the course? What is your skill level in using these resources? Does your institution provide training?

Given these considerations, what activities, materials, and resources can you provide your students so that they can meet your instructional goals and intended outcomes? In determining this, think outside of the box. How can you teach traditional skills in a non-traditional manner? For example, lecture in the classroom can be transformed to an audio- or video-streamed lecture online. Class discussion can be accomplished through chat rooms, forums, or white boards in an online environment. Cooperative learning projects and presentations that might typically occur in a classroom situation can be uploaded and made available to students in a common workspace area on the web server.

Design

Are you aware of the design elements that are critical in online instruction? Do you know how to implement the principles of visual design for maximum effectiveness? Are you aware of signs or symbols that may not be recognized, understood, or misunderstood? Are your links clearly labeled and do they serve an easily identified purpose? Is the course and its elements sequenced logically and in such a manner that scaffolds learning? Are the screens laid out in a manner where it is easy for the students to see their options and make decisions about how to navigate the course?

From a usability perspective, does the site function and operate effectively for students? Is the course designed to use bandwidth efficiently? Does the site take into account accessibility issues? What kinds of adaptations might be necessary for students with special needs?

Finally, does the course promote interactivity? While interactivity in an online course may be thought of as only occurring between instructor and student, you may want to think about how you can integrate and support interactivity between students. Including opportunities for collaboration on group discussions or projects promotes a sense of community that mitigates feelings of isolation. We have found in our experience, it is important that students feel that they are part of an extended community.

Support

In what manner is online instruction valued and supported by your institution? This includes both faculty support for development and implementation, and student support for orientation and access. Is the delivery system under your institution's control or a vendor's control? Do you have access to your course materials and email off campus? What procedures are in place for updating course materials? Can you directly update your course materials or do you have to forward changes to be uploaded by another party? Are you expected to provide technology support for your students or is there another resource available on campus or through a vendor? Does the course provide links to online resources? Are links provided where particular software or plug-ins must be downloaded? Where appropriate, are examples of previous student work made available as models? We have found that by providing a frequently asked questions page we can defer many of the common and repeated questions that come via email.

Management

Can you handle communications with students that you never see? Are you able to communicate clearly, difficult concepts, procedures, and thoughts in a format other than face-to-face? Are you willing to give the time necessary to receive and respond to emails and voice mails? Are you capable of providing your students with timely feedback concerning their performance? Are your time management skills such that you will be able to proceduralize your classes in a 24/7 learning environment? (We're not kidding.) Are you able to monitor individual student activity within the course, by tracking course logins, time online, and individual web page access? Does the course have a mechanism in which a learner can be fairly and accurately measured? What evaluation methods are possible, given the constraints of your delivery system? Have you considered performance-based evaluation measures rather than criteria-based assessments?

Quality

Does the course provide clear expectations of what the student is required to do? Does the course reflect best practices concerning design, accuracy, consistency, and usability? Are you prepared to update courses materials on a regular basis? Are you available to respond to student concerns and questions in a timely and congenial manner? Is feedback on student work provided in a timely and informative manner? Are the same standards and level of academic quality applied to the online course as to a traditional classroom? Is an appropriate online instructor evaluation form made available to students for providing feedback to the instructor and administrators?

Within a framework for analyzing course content, factors such as course structure, types of student/faculty/content interactions, learning outcomes, and support systems are essential. It is important that an online course be designed and developed in such a manner that ineffectiveness is minimized and learning is maximized.

Conclusion

In summary, asking key questions, in the domains of learning, teaching, technology, design, support, management, and quality, are crucial in determining your survival in not only developing, but teaching online courses. You must be prepared to honestly evaluate the opportunities and limitations in your unique situation. Developing online courses is not for the lazy, faint-hearted, or weak in spirit. We have found that by networking with other colleagues, collaborating, sharing, and building off of each others' skills and input, we have been able to survive so far (we think).

Support for Models of Acceptance, Adoption, and Use of Distance Education Technologies

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Abstract: The information age has led to increased use of technologies for teaching and learning. Companies, corporations, and organizations are offering courses, seminars and workshops via distance technologies. Universities and colleges need to make significant changes if they want to compete for an increasing number of students who prefer learning via distance technologies. A critical success factor becomes the acceptance, adoption, and use of distance technologies by faculty members at universities and colleges. Planning and implementing change in these institutions must consider the important stages or levels faculty must move through in order to successfully accept, adopt, and use technologies, especially distance technologies. Levels and/or stages are identified from various models, and specific support strategies are recommended to complement these developmental stages leading to acceptance, adoption, and use.

Introduction

The information age is having an impact on education and training throughout the world. We see many corporations, companies, and organizations offering courses, seminars, and workshops via distance technologies. Many use online software-based tools while others are using videotapes, CDROMs, and various teleconferencing technologies. Most corporations, companies, and organizations are offering these courses, seminars, and workshops for their own employees, in order to provide cost effective training and education. However, others exist for sole purpose of providing specialized training or education to individuals, companies, and organizations primarily for profit. Many individuals are enrolling in these courses, workshops, and seminars if they can: 1) afford them financially (or have reimbursement from employers); 2) effectively learn in a particular electronic environment; 3) find the learning valuable for their personal or professional uses. Increasingly more individuals are obtaining training or education in this manner primarily because of convenience of time and/or location. Hence, institutions of higher education really need to ask themselves some serious questions, if they want to be involved in the competition for these students. Most of the questions involve changes in philosophy (vision and mission), operations, and financial commitments.

Many issues that higher education institutions will confront, include image, resources, facilitation, support and quality, which all impact teaching/learning effectiveness. These issues, and others, could be addressed by undertaking a thorough, meaningful, strategic planning and implementation process that will bring about change. The needed changes are not always easy for administrators or faculty in higher education to accomplish. In fact, even when higher education institutions make the philosophical, operational, and financial commitments, often faculty are reluctant or resistant to become involved in using distance education technologies. Hence, we need to understand the decisions and choices faculty make, and how to incorporate the best strategies to ensure successful professional development. These strategies will enable faculty to become successful developers and implementers of distance courses.

Models of Acceptance, Adoption and Use

Faculty members regularly make choices as to the appropriate teaching strategies, materials, and instructional tools to use for their courses. Their choices about what they are currently using or doing, and what they may choose to change, are usually very personal. Personal choices often are based on things like personality type, teaching style, and preferred methods of instruction. A faculty member that is very independent, for example, may not be willing to adapt to the dependence on technology and support staff that is often needed for most effective online courses. Hall and Hord (1987) also indicate that the change process is an extremely personal experience, and how it is perceived by the individual, will strongly influence the outcome. Hence, if faculty do not see significant benefits for using technology for their courses, then they will not attempt to, make a change. The culture of an organization also influences the choices faculty make. If administrators and faculty members are very supportive and encouraging, other faculty will be more inclined to make the personal commitments to embrace and use technology in their courses. Support, encouragement, and guidance comes in many forms, but when it is combined with appropriate, ongoing professional development, it often leads to faculty acceptance, adoption, and successful use technology in their courses.

There has been significant research in the areas of Acceptance, Adoption, and Use of new innovations. Most of this traditional research can be applied to most innovations, including technology. In fact, there has actually been some specific research involving acceptance, adoption, and use of technology. Six out of the models investigated, are presented in this paper. It should be noted that some of these are based more on applied theory than on empirical research. The six models include:

- Stages of Concern (Hall & Hord, 1987)
- Stages of Change (Fossum, 1989)
- Steps in the Innovation-Decision Process (Rogers, 1995)
- Teacher's Stages of Instructional Evolution Using Technology (Dwyer et al., 1989)
- Stages of Learning/Adoption of the Internet and WWW (Sherry et al., 2000)
- Stages for Learning to Use Technology (Russell, 1996)

These models certainly have their differences, but their similarities allow us to make some interesting observations. Specific stages are listed below each of the six models:

Models not incorporating technology

Stages of Concern (Hall & Hord, 1987)	Stages of Change (Fossum, 1989)	Steps in Innovation - Decision Process (Rogers, 1995)
Awareness	Denial	Knowledge
Informational	Resistance	Persuasion
Personal	Adaptation	Decision
Management	Involvement	Implementation
Consequence		Confirmation
Collaboration		
Refocusing		

Table 1

Models incorporating technology

Teacher's Stages of Instructional Evolution Using Technology (Dwyer et al., 1991)	Stages of Learning/Adoption of the Internet and WWW (Sherry et al., 2000)	Stages for Learning to Use Technology (Russell, 1996)
Entry	Teacher as Learner	Awareness
Adoption	Teacher as Adopter	Learning the Process
Adaptation	Teacher as Reaffirmer or Rejecter	Understanding/applying the process
Appropriation	Teacher as Leader	Familiarity and confidence
Invention		Adaptation to other contexts
		Creative application to new contexts

Table 2

Analyzing the similarities of these stages will help us to understand the personal and professional changes that a faculty member will probably encounter as they use technology, particularly distance technologies. The developmental progress of any one faculty member may follow one of these models or a combination of several models. It is important to understand the progression, and to realize how the various stages or levels can and should be effectively supported in order to increase the number of faculty that will successfully embrace and use various technologies for instruction

Looking at the models listed above we observe that there is a developmental process for obtaining knowledge, skills, and experiences about an innovation, technology in this case. First, the faculty member should become **aware** of the uses and benefits of the technology through demonstrations, discussions, observations (i.e. actual distance courses) and even some hands-on sampling. These continued activities should lead to buy-in and acceptance as deemed important or valuable for them, personally and professionally. The second step should involve in-depth **learning** about how to use and integrate the technology, and what specific teaching strategies can best complement specific technologies. This step should consist of varied professional development activities, including workshops for small groups, mentoring by colleagues, assistance from technology facilitators (support staff) and/or students, and A/V resources. The third step should consist of continued practice and assistance with using various technologies, in order to gain confidence, realize success and benefits, and subsequently **adopt** the innovation. This stage should encourage faculty to start integrating some technologies into their traditional courses. The fourth step should reflect significant **involvement and implementation** through more significant integration of technologies into their traditional courses and/or developing and teaching courses predominantly using distance technologies. The fifth step should involve more regular use of various technologies, that will lead to further **empowerment** through creativity, experimentation, and application, which enhances the process or outcomes of other instructional activities. The last step should reflect continued growth and empowerment, along with participation in **leadership** activities which include beneficial mentoring and collaboration. It is important to note that faculty will have the opportunity to experience growth as they move through all of these steps, if appropriate support is provided.

Recommended Strategies to Support Developmental Stages

Support for innovations has been defined in many different ways (Havelock & Zotolow, 1995). Regarding the innovation being discussed, technology, it may involve access and/or amount and/or quality of the hardware, software, staff, other equipment, connectivity services, design/development services, technical assistance, training, mentorship, support groups, community involvement, cultural acceptance, and incentives, as examples. Recognizing the need and purpose for these support components is important. However, it is more important to see how and when these components will be needed and used. An entire infrastructure should be built which identifies policies, procedures, working relationships, and provides continual support for using technologies, specifically distance technologies, effectively and efficiently. This framework for success can be accomplished through effective planning, development, implementation, and evaluation.

When developing short-term and long-term plans, an institution should utilize appropriate individuals who can act as leaders and/or facilitators (support staff) with specific roles and responsibilities. They would insure that the following general needs would be handled effectively and efficiently: 1) Developing supportive organizational arrangements; 2) Training; 3) Consultation and reinforcement; 4) Monitoring; 5) External communications; 6) Dissemination (Hord et al., 1987). There are many strategies that could be listed under each of the categories above. Having reviewing diverse research and some practitioner experiences at some universities, the following support strategies are presented, which can lead to effectively supporting faculty as they move through various stages. These strategies pertain to many types of technologies, including distance technologies.

Institutional Leaders should :

- Develop a shared (with faculty) vision, mission, and expectations about the role of technology.
- Take opportunities (one-on-one, small group, large group gatherings) to discuss with faculty the benefits (and challenges) of using technologies in their traditional courses or fully distance courses, and to encourage them to do so.

- Take opportunities (small group and large group gatherings) to ask facilitators and/or faculty to model or demonstrate effective uses of technology used in their current courses.
- Provide faculty the time (for practice and mastery) and resources (including staff) to develop and implement distance components or entire distance delivered courses.
- Provide faculty technical assistance (staff, and/or students) and convenient access to technologies.
- Provide faculty the incentives and compensation to develop distance components or entire distance delivered courses.
- Recognize, encourage and reward accomplishments of faculty using technology.
- Establish policies and procedures in conjunction with faculty and facilitators.
- Form an ongoing Faculty/Administration Committee for planning, implementation and evaluation. This includes an action plan of Distance Education activities.
- Require facilitators and/or faculty to conduct initial and ongoing needs assessments in order to identify necessary resources, and other forms of support.
- Require facilitators and/or faculty to schedule and conduct technology training for faculty. This should be developmental, beginning with the basics of using specific technologies, and advancing to the use of teaching strategies that complement various distance technologies.
- Require facilitators and/or experienced faculty to provide mentoring for faculty.
- Require facilitators to provide faculty assistance for the design, development, and implementation of courses or course components, utilizing distance technologies.
- Require facilitators to follow-up with faculty regarding their status - progress and challenges.
- Encourage mentoring/coaching and collaborative work among faculty.
- Require facilitators and/or faculty to evaluate and update courses.
- Provide faculty and/or facilitators opportunities to discover and recommend new technologies.
- Become an active participant (with faculty) in all professional development activities.

Faculty should:

- Be flexible and willing to accept new roles and responsibilities which include: facilitator, assessor, resource broker, mediator of learning, designer, and coach (Loucks-Horsley, 1996).
- Recognize technological challenges while developing positive attitudes about using technology for teaching and learning.
- Model/demonstrate the use of technology for other faculty.
- Provide workshops for small groups of faculty members.
- Mentor and coach other faculty.
- Share successes using technology, including student projects and accomplishments.
- Participate in support groups of faculty using technology.
- Reflect on instructional activities and make improvements.
- Communicate technological needs to administrators.

Conclusion

Faculty should consider using distance technologies for two reasons: to improve the teaching and learning that takes place in their current courses; and to accommodate the personal and professional schedules of current or prospective students. The provision for appropriate faculty development, which recognizes stages or levels of guided growth, is the key to ensuring faculty acceptance, adoption, and use of distance technologies. However, it is important to recognize that professional development occurs on an ongoing basis, and that it is considered to be part of the Implementation Process. In fact, the change process that institutions and faculty must confront usually involve the stages of Initiation, Implementation, Continuation, and Outcomes (Fullan, & Stiegelbauer 1991). It is also important to keep in mind two statements from Hall and Hord (1987)

- Change is a process, not an event, and it takes time to institute change.
- Individuals must be the focus, if change is to be facilitated, and institutions will not change until their members change.

References

Dwyer, Ringstaff, and Sandholtz, (1991). Changes in Teacher's Beliefs and Practices in Technology-Rich Classrooms. *Educational Leadership, 48*(8), 45-54.

Fossum, L. (1989). *Understanding Organizational Change*. Los Altos, CA: Crisp Publications.

Fullan, M. & Stiegelbauer, S. (1991). *The New Meaning of Change* (2^{nd} ed). New York: Teachers College Press.

Hall, G.E., & Hord, S.M. (1987). *Change in Schools: Facilitating the Process*. New York, NY: State University of New York Press.

Hall, G.E. & Loucks, S.F. (1977). A Developmental Model for Determining Whether the Treatment is Actually Implemented. *American Educational Research Journal, 26* (1), 5-9.

Havelock, R.G., & Zlotolow, S. (1995). *The Change Agent's Guide*. Englewood Cliffs, NJ: Educational Technology.

Hord, S.M., Rutherford, W.L., Huling-Austin, L., & Hall, G.E. (1987). *Taking Charge of Change*. Alexandria, VA: Association for Supervision and Curriculum Development.

Loucks-Horsley, S. (1996). Professional Development for Science Education: A Critical and Immediate Challenge. *National Standards &Science Curriculum*. Dubuque, Iowa: Kendall/Hunt Publishing Company.

Rogers, E.M. (1995). *Diffusion of Innovations (4th ed.)*. New York, NY: Free Press.

Russell, A.L. (1996). *Six Stages for Learning to Use Technology*. A paper presented at the National Convention of the Association for Educational Communications and Technology. (ERIC DOCUMENT Reproduction Service No. ED 397 832).

Sherry, L., Billig, S., Tavalin, F., & Gibson, D. (2000). New Insights on Technology Adoption in Schools. *Technological Horizons in Education, 27* (7), 43-46.

Networks as Professional Development: The Case of the Andalucian Network of Trainers

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Abstract: This paper informs on the creation and development of the Andalusian Network of Trainers in Spain. The Network serves like support structure to professionals of the formation that develop their activity in Andalusia. The Network helps the trainers in its own profesional development. It favors the innovation on themes thought and developed by the own trainers. The participants are professional of the vocational education field in working contexts little ruled and dispersed geographically.

Introduction

The traditional practices of teachers professional development are at the moment in crisis. Clark (1999) referred recently to that the professional development just as it is conceived at the present time it suffers of a series of problems: Lack of appropriation on the part of the teachers of the training programs designed from outside of the professional community; training Programs based in a deficit model according to which the formation goes to" to fix" operation deficiencies, and not to promote a professional development; short term, limited thought and without vision of professional trajectory; a de-contextualized training and without answer options to the real demands; a training in that the teachers adopt a passive paper, and lastly a training more centered in the individual demands of the teachers than in the learnings that the students should carry out

Research on teacher learning has found some results that they it plows of interest to keep them in mind to plan the teacher professional development. Next we synthesize some results that they have served as base for the creation of the Andalusian Network of Trainers.

The knowledge and the beliefs are built

We have verified so much for the developed investigations as for the practical experience that the teachers, the same as other people guide their behavior starting from the knowledge and beliefs that possess. And this knowledge and beliefs begins to build a lot before the student teacher decides to be devoted professionally to the teaching. These knowledge and beliefs that the student teachers bring get when they begin their initial teacher training they affect from a direct way to the interpretation and valuation that the teachers make of the experiences of the Teacher Education Program. By the light of this statement, Putnam and Borko they end up affirming that "for pre-service teacher education, this means attending seriously to the knowledge, beliefs, and expectations that prospective teachers bring to their teacher education programs, acquired through their own experiences in schools" (p. 1236).

The knowledge is built in social interaction

One has come understanding that the training and the teacher's learning can take place, I eat up to now we have commented, in a relatively autonomous and personal way. But little by little it has gone winning land the theories that understand learning like a process that it not happens in an isolated way but inside a social space. This way, to learn how to teach should not only understand each other as an isolated phenomenon, but basically like an experience that happens in interaction with a context or atmosphere with the one that the person interacts. It is the thesis of the sociocultural focus of the learning that establishes that the individual's cognitive activity cannot be studied without keeping in mind the relational, social and cultural contexts in that it is carried out (Wertsch, 1991). This idea has been assumed by Yinger (1991) who intends to use the concept" working knowledge", to make see that the knowledge takes place in different situations. This author speaks that "we are beginning to see that the focuses and the conceptions change from the individual thing to the cooperative and community, of being centered in the information to make it in the action, from mechanics to organic, from the measuring to the narrative, from the abstraction to the concretion, from the operations to the conversations" (Yinger, 1991, p.5).

It is of great interest and projection this focus, since it shows that the unit of analysis of the process of learning how to teach is the processes of social interaction, getting the attention to the conversational analysis, so the conversation is considered the natural context in which the cognitive abilities of the fellows become stocks and they are built around the social interaction (Schubauer-Leoni and Grossen, 1993). This way, the social groups believe what one has come in calling" discursive communities" that share forms of thinking and of communicating. Communities that establish nets and that they are good to share, to exchange, to be located in the world, to receive support, etc. (Lieberman and Grolnick, 1998).

The knowledge has a situated character

Completing the previous idea, one has come advancing in understanding that the knowledge in general and the pedagogic one in particular cannot be understood to the margin of the context in which arises and to the one that is applied. McLellan (1996) affirms that the pattern of situated knowledge is based on the principle that the knowledge is located, and it is influenced fundamentally by the activity, the context and the culture in which is used (1996). It doesn't fit, therefore, to differ in a radical way the knowledge that is acquired and the context in which that knowledge is used: the knowledge on the teaching cannot memorize in independent way of the situations in those that this is used (Marx, 1998).

The knowledge is distributed

A last characteristic of the knowledge that characterizes learning how to teach, is that it doesn't reside in a single person, but rather it is distributed, among individuals, groups and symbolic and physical atmospheres (Putnam and Borko, 1997). The idea is assumed that for the development of complex tasks, and to learn how to teach evidently is it, no person possesses the entirety of knowledge and abilities in an individual way. To admit this principle takes us to understand that it is the team work what drives to a better use of the knowledge, what takes to improve the capacity of resolution of problems. The idea of the distributed knowledge has been impelled by the impact of the New Technologies, mainly Internet. The possibility that the teachers can consent geographically to knowledge and personal contacts with distant teachers, the possibility of ownership to "virtual communities" it is enlarging the possibilities of what understands each other to learn how to teach.

Networks as Professional Development

Professional Development of Trainers has traditionally allowed scope for learning between peers. Increasingly, claims have been for a training that is participatory, democratic, horizontal, and professional for teachers. In Spain, permanent seminars or work groups of teachers have been established that consider training to be a process in which the "what", the "how", and hen" of training are decided by those involved (Estebaranz, Mingorance and Marcelo, 1999).

The term network is defined as a mesh of persons connected by links around which things flow. These can be objects, work, feelings, evaluation, knowledge, prescriptions, influence and power, interconnecting most of the participants. Networks use a variety of formulas to link different people having different purposes. Various definitions of what is a network have been made. Miles (1977) defined it as "a set of nodes or points connected by lines or links. There is often the implication that various things (such as messages, objects, energy, etc.) travel along the lines, which thus serve as a channel... In social networks, the nodes are persons, groups, or organizations. The things that travel between the nodes are *socially* relevant... objects, labour, affect, evaluation, knowledge, prescription/opinion, influence and power. So, a network is a connected set of social actors exchanging socially relevant materials" (Ref. in Clark, 1988:34). Lieberman and Grolnick consider that "networks are a way of engaging school-based educators in directing their learning; allowing them to sidestep the limitations of their institutional roles, hierarchies, and geographic localization; and encouraging them to work together with many different kind of people. Participants have opportunities to grow and develop in a professional community that focuses on their own development, providing ways of learning more in keeping with their lived professional lives" (1996:8-9).

Networks are configuring a way different from relationship among the professionals. As Hargreaves affirms "in this postmodern world, many forms of knowledge are emerging as a worthwhile and legitimate in ways that challenge the epistemological superiority of the academic establishment. Strong school cultures and vibrant professional development networks create conditions where teachers can share their own practical knowledge from elsewhere" (Hargreaves, 1996,p. 119).

The bloom of the nets among professors has a lot to do with the aversion of the teachers toward the traditional activities of professional development. The popularity of the nets suggests that the teachers and trainers move away from the conventional activities of training - or they only attend them when they are required - not due to a lack of interest in the professional development but because the format of the training doesn't respond to their necessities (Lieberman and McLaughlin, 1996). But the Networks will only represent an alternative space to the traditional professional development if they promote the learning and the reflection about the daily experience. Day recently said it with the biggest clarity "by definition, networks are also a recognition that learning only from experience will limit development, and that teachers are likely to commit themselves to learning in which they have a stake and which holds personal significance for them" (Day, 1999, p. 177).

Networks have the following features. They are voluntary initiatives, democratic in origin and working, strongly committed to innovation, change and improvement. They share aims and purpose. They are formed by trainers having common characteristics (the material and type of student taught, and the type of school in which they teach). They combine cognitive, social, and emotional learning. They incorporate everyone in active participation at different levels of involvement, with a trust in principles where one can learn from others. They are open, without restriction of participation. They entail full liberty of decision on work content, working method, time, place and frequency of meetings. They create a community that discusses and learns. Leadership is shared among the various members of the network. Through differentiated consultation, the network can seek support from a wide variety of professionals.

The Andalusian Network of Trainers

In this paper we present an example of a Network that we have been developing in Andalusia (Spain) since 1997. The professionals taking part in the Andalucian Network of Trainers (RAPF) are trainers in "Vocational Training". Vocational training refers to the training that Andalucian Government offers to people that are unemployed. It pursues a formation for the employment. It is a public and free training mostly paid by funds of the European Union. The Andalusian Network of Trainers is characterized by the following features:

- Symmetry in relationships: the relationship between members of the RAPF is based on equality. They are professionals having the same status, without differences of position or power. Such condition of equality among colleagues who share and analyse the same problems determines their interaction.
- Collaboration: the aim of the RAPF is not prescriptive. Work is based on a cycle of collaborative problem-solving and agreement. Activity is not assigned from above – the members of the RAPF, via a work procedure based on different collaborative strategies, pact with management the aims, procedure, and strategies they consider appropriate and possible in accord with their situation and interests.
- The practical, committed nature and orientation of the process: the various groups of the RAPF deal with practical business and problems.
- Recognition of the knowledge held by the training professionals: the groups of the RAPF are based more on the experience and practical knowledge of their members than on scientific-technical knowledge gained in traditional training sessions.
- Immediate support in time and space: the RAPF provides closeness of service to the various constituent groups.

The trainers who take part in the RAPF have attained a certain professional level, and can

- Diagnose contextual problems: of organization, management, planning and design of training support material, etc.,
- Recognize their own deficiencies by observation and analysis of the existing social and professional context,
- Identify and find solutions to the deficiencies and problems detected, at both contextual and individual levels,

and are

- Professionals with a certain training and prior experience in the field of continuous occupational training, and/or that of adults,
- Professionals with continuing prospects, and thus with a certain level of professional stability,
- Professionals with a defined field of activity and with certain resources, such as those of learning to learn, or Internet access.

Currently, projects are set up in response to particular problems of RAPF members, rather than as solutions on offer to other groups. Furthermore, they are

- applicable to the reality of Vocational Training,
- transferable to other professional contexts,
- of high training content for the participants.

The bedrock of the RAPF is group work as an effective formula for self-training, based on the interchange of information and experiences among colleagues of the same and/or different groups, on the reading of the bibliography related with the topics of the various projects, and on the use of new resources, such as Internet, in the search for references of interest.

Each project consists of a different topic, but they have common features:

- The creation of a web page (http://prometeo.cica.es/RAPF) for each work group: the project managers offer the groups an ftp account for uploading all the information available as work progresses. This aspect is vital, in that it is an attempt to make the groups conscious of the importance of disseminating their advances during the project, and not only at its end.
- Support, and technical and methodological consultation, for each project from RAPF managers.

- Consultation and support on the use and learning of different software for the development of group work (support in the editing of web pages, instruction in ftp applications, instruction in and management of e-mail, etc.).
- Consultation on processes of innovation.
- External evaluation.

The asynchronous communication in the RAPF is, perhaps, the most remarkable thing in the project's history. The two resources currently available in the RAPF (the distribution list and the web page) are very highly valued by the members. Firstly, *the distribution list of the RAPF* (rapf@ls.cica.es) was used to create work groups with common interests. During the month before the RAPF officially began, a considerable amount of mail was received applying to form work groups. The list was also used in the resolution of doubts, requests for information, and the interchange of opinions about the various topics dealt with in the project. Secondly, *the group web pages* are a powerful resource used by the established work groups, many being of high quality (in content and design). The web page managers are available for consultation and teaching (when required) when groups are interested in incorporating this feature into their work.

The topics dealt with by the twelve work groups are

- INTERPROF: an up-to-date electronic library of complementary information for instructors.
- Guide for the management and co-ordination of socio-employment programmes in the context of Occupational Professional Training.
- Current situation of employment advice modules in Occupational Professional Training: analysis and proposals for the future.
- Strategies for the introduction of new technologies (hardware and software) in training.
- Diversification of employment advice modules.
- New employment patterns and the detection of training needs.
- Design and validation of a model to predict the effectiveness of occupational training for subjects without work experience.
- Tele-training and working from home. Analyzing the implications of employability.
- Tele-training: resources and media.
- Certification of training companies.
- Ideas and information to get me onto the employment market.

- Creation of an integrated module for the training of entrepreneurs.

References

Clark, R. (1988). School-University Relationships: An Interpretative Review. En K. Sirotnik and J. Goodlad (Eds.). *School University Partneships in action. Concepts, Cases and Concerns.* Chicago, Teacher College Press, pp. 32-65.

Estebaranz, A., Mingorance, P. y Marcelo, C. (1999): "Teachers' Work Groups as professional development : What do the teachers learn?" En *Teachers and Teaching: theory and practice.* Vol. 5, n° 1 2, pp. 153-169.

Hargreaves, A. (1996). Transforming Knowledge: Blurring the Boundaries Between Research, Policy and Practice. *Educational Evaluation and Policy Analysis*, Vo. 18, No. 2, pp. 105-122

Lieberman, A. and Grolnick, M. (1996). Networks and Reform in American Education. *Teacher College Record,* Vo. 98, No. 1, pp. 7-45

McLellan, H. (1996). Situated Learning: Multiples Perspectives. En H. McLellan (Ed.). *Situated Learning Perspectives*, New Jersey, Educational Technology Pub., pp. 5-17.

Miles, M. (1998). Finding Keys to School Change: A 40-Year Odyssey. En A. Hargreaves et al. (eds.). *International Handbook of Educational Change*, London, Kluwer, pp. 37-69.

Putnam, R. And Borko, H. (1998). Teachers Learning: Implications of New Views of Cognition. En B. Biddle et al. (Eds.). *International Handbook of Teachers and Teaching*, London, Kluwer, pp. 1223-1296.

Schubauer-Leoni, M.L. and Grossen M. (1993). Negotiating the Meaning of Questions in Didactic and Experimental Contracts. *European Journal of Psychology of Education*, Vo. 8, No. 4, pp. 451-471.

Wertsch, J. (1991). *Voices of the mind,* Cambridge, Harvard University Press.

Yinger, R. (1991). *Working Knowledge in Teaching,* paper presented at the ISATT Conference.

Managing On-Line Courses Around the World

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Abstract This article discusses the experiences of university faculty in teaching on-line courses that involve both USA and another country's (primarily third world) participation over a five-month period. Based on those experiences, and the fact that the type and manner of assistance given by the home university can be crucial to a successful program, suggestions and tips are given for faculty and technology support systems who may be contemplating teaching globally.

Global Learning

Global institutions, virtual classrooms, the race for international connectivity are all efforts to assist in maintaining a global environment where students of every age, learn about and from people of diverse backgrounds. Being exposed to people of different languages, religions and cultures create an understanding critical to maintaining and expanding our own appreciation of diversity. America's leadership in this area depends on how well we use technologies to bring a unique bonding between countries. A bonding that will bring new ideas and cultural richness to our universities and to our communities. Gaining popularity in many countries is the use of Web-based or On Line Learning. It is, for many universities, the way of the future; and with so many programs available, teaching across the continents appears to be a simple solution for bringing a sharing of cultural richness to life.

Although many university/college personnel have traveled extensively, there are additional conditions to check when courses are simultaneously delivered in The United States from foreign countries – particularly Third World Nations. Some possible barriers and concerns besides time zones include accessibility to Internet hookup. This is more of a hassle when the instructor is planning on living outside a university or business setting. Apartments, while having phone service, may not have the proper plugs, or the phones may be permanently attached without the ability to remove or plug in essential parts.

Depending upon the length of stay, we would suggest that the following questions be answered by a responsible person before leaving:

- Can I set up my computer in my flat/ dorm room or house, and how secure are the lines?
- What programs and versions of those programs I am using are being used in the visiting country?
- What assistance is there for technical problems?
- What national companies do business in the country and where are they located?
- What ISP is used – to what extent and where is contact for information on this provider?

Once the instructor feels secure about Internet hookup, there are often many bits and pieces to check. For example, in 1996, the primary author taught in the former Soviet Union for six months. She was not, at that time, teaching online, however, it was necessary to check email and to keep up with events at her home institution. The Herzen University in St. Petersburg had limited access to the Internet, and the one computer for possible use was located in the Dean's personal office. There was a choice of two providers so that part was easy and fortunately the company was not far from the flat. The cost was rather high that year, but with inflation of the Russian Ruble, it is more today. Many United States' professors work on-line and have continuous access to the Internet from our offices; however, continuing this practice in another country is not cost effective and rates become even higher. Before leaving for Russia, a magazine article discussing items needed to use existing phones plugs proved most valuable for the future. Two plugs were ordered before leaving the USA and attaching them was relatively simple, she did; however, have to purchase a new phone to use the plug.

More recently, the author had the opportunity to work in Mumbai, India for five months. This time, she was charged with teaching two regular classes at her home university from India – entirely through a web-based program. She thought she was fully prepared. A new laptop with CD and lots of memory, a university that had a small computer lab, and the knowledge that she could hook up to an ISP from her hotel room at the international YWCA gave her the confidence to proceed.

First Crisis

The first crisis was not from Indian students, but rather from students in the States who were anxious about the professor they had never seen. Before leaving she burned a CD with six guest speakers and left packets of resource materials. Students bought the CD with their textbooks. She also made sure that a former graduate student was willing to work on-line at home to put out fires. Second crisis: how does one grade papers sent in the web-based course when on-line time may be limited or spotty yet is necessary to read entries? The solution, after a couple of agonizing weeks, was to have the students send their papers for grading on regular email. That way papers could be copied into a word processing program, corrected off-line and uploaded into regular email.

The concept of working with other institutions and using global Internet access is a valuable one to be nurtured for future courses and relationships. We are just beginning to see that the possibilities are limitless, but we haven't thought out the barriers and ways to deal with them. Several mistakes were found in our thinking and manner of delivery of courses. While the mistakes appear minimal, they are, never the less, solvable mistakes; and we cannot take for granted that they will not appear the next time we visit a foreign country.

The mistakes

- Third world countries do not always have the latest versions or compatible software.
- Computer labs are not always accessible.
- People work at slower paces in some countries, and getting things done when you want them done may be next to impossible.
- The new cyber cafes may work, but lines form after 9:00 A.M. and continue into the evening. Others stand and stare at you until you decide that reading five out of 15 messages will do for the day. Patience is a virtue.
- Moving to a guesthouse is also not the answer. Reason: other guest may want to use the phone and there is only one line.

Suggestions and Tips

The following check list of needed equipment and suggestions in order to experience web-based learning with a minimum hassle may be useful.

- Laptop with enough hard drive and memory. A CD drive is added benefit.
- Cell phone with Internet capabilities (May be necessary for laptop hookup without disturbing existing lines).
- Telephone plugs indigenous to a particular country
- Back up for programs on Zip Disks
- Zip Disks and/or regular formatted disks brought from your own country (due to possibility of viruses).
- Portable Zip Drive

These are the immediate barriers, concerns and solutions for on-line teaching from foreign countries. There may be more extensive concerns in the future, or when one is going to countries other than those mentioned. The idea of using CUSEEME or like technologies may be possible, however, not all countries have satellite or phone capabilities. This is especially true in the remote rural areas.

In addition, the use of multi-media is not usually common in most areas due to cost of supplies, equipment such as overhead projectors or LCD Panels. It is highly recommended that you carry your own, if possible. One person traveling alone makes this difficult. The faculty member brought finished transparencies; plenty of formatted disks, a laptop, and portable zip drive. Although light in weight restrictions, these items became a burden as carry-on luggage. Since we weren't sure about security x-ray and whether or not the disks would be damaged, we wrapped them in foil and placed them in an easy access folder for hand checking. Sending pictures and files home was the easy part. A graduate assistant downloaded to a zip disk so there was a secure feeling on the return home. All in all, the experience can be positive with just a little forethought, planning and assistance from your home university or business.

Online Group Processing: A Qualitative Study

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Abstract: A qualitative analysis of two online groups, which occurred as part of course requirements lasting fifteen weeks, developed functional communication categories, concepts, and constructs. Examination of two student nurse groups indicated differences in student ability to use cyberspace for group decision-making. Students adapted familiar communication strategies and invented new ones to complete an action research project. The characteristics identified in this descriptive study indicate some major differences between face-to-face and online decision making groups.

A three phase research study of online asynchronous group processing conducted at Brigham Young University College of Nursing seeks to identify the elements of online communication that affect instructional design. Little fundamental research describes the development of online group norms. It may be that the asynchronous, e-mail based, problem-solving groups process decisions so differently from face-to-face groups that new definitions and process descriptions are needed. How do the unknown timing, transitions, and functions affect problem solving? A better understanding of the group process will promote adequate facilitator use, and accurate evaluations of individual and group participation (Cartwright, 2000; Diekelmann, Schulte, 2000).

Methodology

Strauss and Corbin's (Strauss, & Corbin, 1998) methods of qualitative research guided the methodology as recommended by Fisher and Hawes (1970) for the development of small group decision-making theory. The descriptive study consists of the construct, concept, and theme analysis of two sophomore student nursing groups using listserv based (automated electronic mail by subscription) discussion groups. The data sources used were demographic surveys of all participants, interviews with five participants about their experience, and electronic mail documents. Analysis of data sources concentrated on the functions, roles, relationships, transitions and timing of functions. The two groups judged by three facilitators as producing the most and least effective outcome products (research papers) were selected for initial analysis. The author chose these groups based on the assumption that most identifiable concepts would be found within the scope of the two outlying groups. Analysis of all groups thereafter verified the assumptions.

Sample

Forty-eight students, divided into six equal groups, completed a required "family project". Pairs of students visited chronically ill patients weekly. The fifteen-week project required students to communicate electronically three times a week to define the role of a "family coach" for families. Students studied the issue individually and wrote a group paper online as the product of their participatory action research. Students received letters requesting their consent and describing the research.

Analysis

Data used in phase one consisted of e-mail documents, a demographic survey, and transcribed interviews. An overview of the documents developed constructs and concepts of what was said and done in each group. All documents were then analyzed for common elements and collapsed into categories. The researcher and assistants checked coding and tallying of documents. The functions, roles, relationships, and transitions were linked to the time of occurrence. Participants completed the survey of computer use, group experience, and family nursing during the first week of the project. Interviews of five participants during and after the project sought to verify observations. Electronic mail documents were coded by sentence for function constructs.

Findings

Differences in performance were expected between the two groups studied as the facilitators had judged the groups as producing the least and most effective outcome papers. The first differences noted were the number and size of communications sent. Group one produced the least effective paper and sent 215 messages containing 420 kilobytes of information. Group two produced the most effective paper and sent 446 messages containing 1265 kilobytes of data. The facilitators sent 13 messages to group one and 35 messages to group two.

Students were females between the ages of 19 and 24 years in their first nursing class. None of them had been in a hospital setting and were not familiar with teamwork in an academic setting. Students stated they had used electronic mail between 5 and 20 times in their lives. Students reported the family project as their first experience with online learning and automated e-mail.

A five point Likert like scale measured (1=none/poor to 5=severe/excellent) perceived abilities and anxieties. Students rated their abilities to use e-mail as good and their anxiety to working on the computer for the assignment as mild. Students rated their electronic discussion group abilities as poor. Participants judged their group work anxiety levels between mild and moderate. Students were more nervous about working with families in the home setting with the average score of 2.8.

Categories and Definitions

Concept definitions and category groupings described the functional purpose of communication. Students faced three main challenges during the online decision making process: completing the task, developing and maintaining relationships, and communicating via a new technology.

The task-oriented category was the most frequently used category, while the online communication category identified the most differences between face-to-face and online group processing.

Task Oriented Category: Unlike some face-to-face studies of the past (Tuckman, 1977) where relationship maintenance was the most frequently used function, online participants spent most of their communication time on the task. Critical thinking and methods of working on the task were analyzed.

The questioning concept consisted of task and process questions and the requesting information in a statement format. For instance, "Tell me what you think" requests information in a declaration. The creative concept described the development of new thoughts and knowledge. Students most frequently used personal opinion rather than literature, teachers, and local agencies as the authoritative voice. Students tried to eliminate the number of steps in reaching consensus by making declarations that sounded like conclusions and then asking the group for validation. This eliminated a number of steps in reaching consensus. Students ignored debate strategies in favor of idea development.

Relationship Process Category: Relationship process coding identified two concept functions: development/maintenance and leadership. The softening statement construct was defined as an attempt to avoid conflict by offering remark after a strong "stinging" statement that might elicit a negative response; "...but that is just my opinion, feel free to disagree..." The most frequently used concept was validation of individuals and the group. Validation was defined as encouragement, empathy, and individual attention.

Online Communication Category: The online communication category focused on the student's use of e-mail and message construction. The study looked at how students used the subject line and reply functions, which are characteristics of the e-mail medium. Participants adapted greetings and conclusions to overcome the lack of visual cues. Students applied two other constructs to ease communication. 1) Organization elements structured the message of clarity and indicated changes in the discussion. 2) The place statement provided orientation to time, place and circumstance. Place statements indicated the situational conditions of the speaker (sender) and provided a shared understanding of where the participant began or ended a thought. The construct usually consisted of one sentence in the first or last three sentences of the message, but could constitute a small paragraph.

Use of Concepts over time: Working relationships styles seemed to form immediately with little variance until the outcome deadline approached. Stress appeared at transition points. Individuals transitioned from introductions to content production and then to solution production at different times. When upset individuals received messages that resolved their issues, the distress resolved. These findings support the work of Connie Gersick (1988, 1990) and others working on group norms (Hackman, 1990)

Discussion

Differences found between how online and face-to-face groups function could affect instructional designing. Students invented new methods of problem-solving, conflict avoidance, and idea sharing.

Task/Solution: Questioning became a strategy to avoid conflict, show openness to new ideas, request help, and explore issues. Students combined statements with requests for validation and social support. "That is my idea. What do you think?" This strategy seemed to serve for body language that conveys a willingness to listen to new ideas.

Telecommunications may deliver fast messages but cannot guarantee when the reader will read the message and reply to it. The abbreviated discussion strategy required individuals to process their ideas before placing them online. Participants presented ideas with thesis and supporting statements. Others replied with supporting opinions and amendments to the idea. No dissenting arguments were noted. When three or more supporting messages were received the group adopted the idea. The democratic abbreviated discussion style avoided conflict and promoted thorough processing of ideas before presentation. Non-supported ideas were ignored rather than debated. Students spent time and content on the majority-supported viewpoint supported. This discussion strategy required readers to read between the lines. Students side stepped the idea fine-tuning and details normally present in face-to-face communications.

Relationship Process: Students used validation more frequently than the other process constructs. Validation encouraged, comforted, praised individuals and promoted group identity. The most successful group included validation in 90% of their messages.

Online Communication Category: The online communication category produced the most differences between online and face-to-face groups. The written nature of the conversation required each contribution to begin with a name or social statement and to restart a discussion with each message instead of the flowing from one idea to the next as in face-to-face groups. Greetings served the same function as raising one's hand. Students knew each message carried a heading in the subject line but most often communicated a change in speaker within the first sentences of the message. The message opening indicated turn taking with informal group greetings like, "Hi, guys", and "Hey

Time passage from sending to receiving broke into the conversations. Readers worked hard to remember the conversation thread and formulate replies. Some participants worked to overcome feelings of disjointedness by avoiding greetings and use of the subject line. The use of a greeting and a conclusion emphasize time and distance. The absence of greetings and conclusions also occurred when the participant appeared hurried or felt strongly about the content.

The subject line was used more often than not. The subject line served several purposes but rarely acted as a "thread" (commonly used subject index). The following functions appeared in the subject line: Announcement-"deadline", group organization-"now", place statement-"today is a good day", validation-"great work", priority notice -"important", direction-"read this", greeting-"hi", and apology- "oops".

The place statement attempted to create a shared environment, act like body language, warm the environment and ground the group in a common understanding. A major difference between the findings of this study and group processing literature was the frequency of conflict. The two groups avoided conflict completely. The difference may be due to the sample of nursing students and not the technology as Tuckman found nursing students avoided conflict in face-to-face groups (1977).

Some students expressed problems with using technology for group work. Difficulties mentioned were: reaching a timely consensus, lack of non-verbal cues, delays in response time, remembering what each group member said and remembering the feelings that accompanied the messages. The lack of people in the same room contributed to a "light" feeling or lack of importance to the task solution process. Other students struggled with the weight of emotions as time passed. Immediate clarification and elaboration defuses many misunderstandings in face-to-face groups. New strategies must serve similar purposes in the online environment.

References

1. Cartwright, J. (2000)Lessons learned: Using Asynchronous computer-mediated conferencing to facilitate group discussion. Journal of Nursing Education, 39 (2) 87-90.
2. Diekelmann, N. & Schulte, H.D. (2000). Technology-based distance education and the absence of physical presence. Journal of Nursing Education, 39 (2), 51-52.
3. Fisher BA. (1970). Decision emergence: phases in group decision-making. Speech Monographs 37: 53-66.
4. Gersick, C.J.G. The students. In J.R. Hackman. (Ed.) In Groups That Work and Those That Don't. San Francisco: Jossey-Bass.
5. Gersick, C.J.G. (1988).Time and transition in work teams: Toward a new model of group development. Academy of Management Journal; 31:9-41.
6. Hackman, J.R. (Ed.). (1990). Groups that work and those that don't. San Francisco: Jossey-Bass.
7. Strauss A. Corbin J. (1998) Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory. Thousand Oaks (Calif): Sage;.
8. Tuckman BW. & Jensen. (1977). Stages of small group development revisited. Group and Organizational Studies; 2: 491-427

Innovative Teacher Education Using the Web-based Integrated Science Environment (WISE)

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Abstract: We present the design, testing, and implementation of a professional development model that uses three essential components: a successful Web-based curriculum environment (the Web-based Integrated Science Environment: WISE); a virtual community of teachers and scientists who discuss pedagogy, collaborate on curriculum design, and offer continuing support for in-service members; and virtual mentoring between new community members and veterans. The Web-based Integrated Science Environment (WISE) builds on the successes of a decade's research on the Computer as Learning Partner project. In this professional development project, we sought to combine solid pedagogy that was the result of extensive funding by the National Science Foundation, with large-scale professional development in a large teacher training institution.

Introduction

The Internet can offer new avenues to effective instruction, where students perform inquiry-based or design activities in current science topics. The challenges of incorporating these new technologies and pedagogical approaches are frequently beyond the scope of current professional development programs. It has been argued that without sufficient professional development support, the Internet will fail to fulfill the promise of supporting improved teaching (Wiesenmayer & Meadows, 1997).

The Web-based Integrated Science Environment (WISE) is a scaffolded Internet-based platform for middle and high school science activities (Slotta & Linn, 2000). These activities are designed according to the Scaffolded Knowledge Integration (Linn & Songer, 1991; Linn, 1992) theoretical framework which emerged from a decade's research in the Computer as Learning Partner (CLP) Project (Linn & Songer, 1991). In a WISE activity, students work collaboratively to utilize Web evidence during self directed, scaffolded, scientific inquiry. In one activity, students consider differing approaches to stopping the spread of malaria. In another, students compare two theories concerning the appearance of deformed frogs in American waterways.

Students navigate through activity steps in the left-hand frame of a web browser, and utilize Web Evidence in the right-hand frame. In a WISE activity, students work collaboratively to explore Web "evidence" relating to critique, comparison, or design tasks. Figure 1 shows the WISE software interface in the Deformed Frogs activity. WISE provides science teachers with a versatile technology for bringing pedagogically sound Internet-based activities into their curricula, promoting the development of integrated understanding and lifelong learning skills.

Even when presented with a tool like WISE, however, teachers require significant levels of support to adopt new pedagogical concepts and methods. For example, teachers need to understand that technology is not an end in itself, and that the Internet must be used carefully to promote constructivist learning. Also, despite great advances in the understanding of students' preconceptions and despite great advances in pedagogy that addresses how to teach to assist students' conceptual change (see Linn, 1992, Clement, 1993, Slotta and Chi, 1997, Peterson & Treagust, 1995), the majority of middle school and high school science teachers still employ more traditional approaches to teaching science. (Poole and Page, 1995) Thus, teacher professional development emerged as an essential component of the WISE Project. In order to support teachers with powerful new technology, we must help them gain new understandings about effective curriculum activities. Our WISE technology must scaffold students and teachers alike.

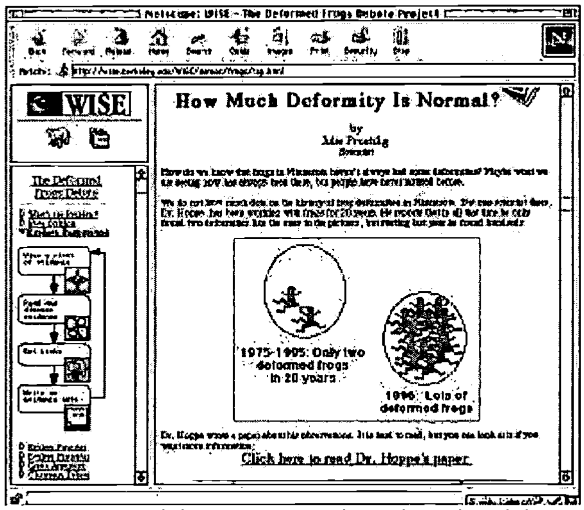

Figure 1: The WISE Deformed Frogs activity. Students navigate through activity steps in the left-hand frame, and survey Web "evidence" in the right-hand frame.

The challenges described above provided us with the incentive and opportunity to develop and test effective approaches to professional development that can respond to teachers' needs and constraints while still fostering the development of new ideas and approaches. We designed and field-tested an on-line community to help teachers learn about the WISE pedagogy and technology, for use in their own classrooms. This community was designed to be a self sustaining professional development resource for its members. We will review the design of this community, and then describe a professional development curriculum that builds on its structure to help in-service and pre-service teachers develop powerful new understanding about science pedagogy.

Design & Testing

We designed a professional development model that uses three essential components: a successful Web-based curriculum environment (WISE); a virtual community of teachers and scientists who discuss pedagogy, collaborate on curriculum design, and offer continuing support for in-service members; and virtual mentoring between new community members and veterans.

WISE Pedagogy and Curriculum

Our first objective was to help teachers learn the pedagogical principles of Scaffolded Knowledge Integration (SKI) (Linn, 1992), and understand the WISE software and curriculum. In the WISE pedagogy, students engage in the scaffolded knowledge integration format in which

- thinking is made visible,
- social supports for learning are integrated,
- accessible goals and models are provided, and
- autonomous learning is promoted.

After our teachers became comfortable with the technology and pedagogical principles, we scaffolded them in tailoring and implementing an existing WISE activity for use in their classroom. Our goal was to develop teacher training activities based on the same SKI pedagogical principles that inspire our design of the WISE student software and curriculum.

On-line Community of Practice

We designed an on-line community where teachers are engaged in an active discussion of issues concerning constructivist pedagogy, best practices, use of WISE and other technologies in their science classrooms, and development of effective curriculum activities (see figure 2). In our design, teachers can dialog with each other and with mentor teachers, scientists and educational researchers to help gain understanding of the WISE pedagogy, software, and curriculum. The on-line community also provides teachers with technology supports for adopting their own WISE activities, and supports teachers after they have completed the program.

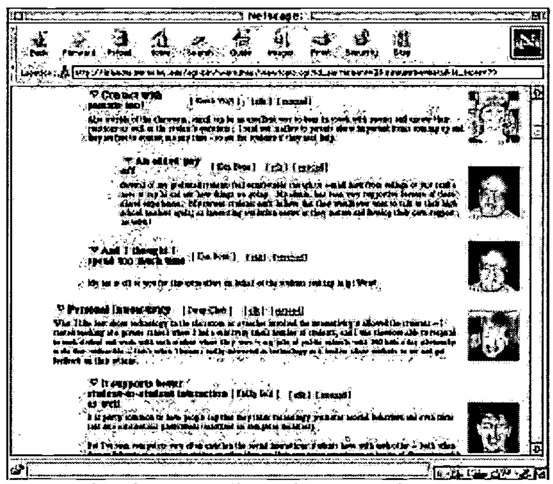

Figure 2: The on-line community electronic discussion tool, where teachers respond to one another's comments. Other tools support collaborative design.

Virtual Mentoring

Given that new teachers are greatly influenced by mentor teachers during their student-teaching and early teaching experience, a great challenge is to establish ties between new teachers and exemplary teachers. Furthermore, the amount of time that pre-service teachers are able to spend with their mentors is often very limited and comes to a definite ending. Our objective was to connect pre-service and in-service teachers with mentor teachers through a dynamic continuing virtual mentoring program as part of the on-line teacher community. Interactions would be facilitated by the on-line community, and aimed at communicating sound pedagogical approaches as well as technical expertise with WISE.

Working in Partnership to Develop the Program

Extensive development and support of the WISE environment and on-line community technology was done at the University of California, Berkeley. The environment was field tested with in-service and pre-service teachers as part of life-long learning initiatives and as part of coursework that led to the state clear teaching credential at a large university college of teacher education, California State University, San Bernardino. Our goal was to allow a significant research project (WISE) to be implemented with large numbers of pre-service and in-service teachers through an established teacher education and credentialing program. This type of partnership has the capacity to improve both the research of such environments and the implementation of critical research projects in the field with working teachers.

A Multi-dimensional Approach

Teachers who were working on their preliminary teaching credential interacted with the WISE technology and pedagogy as part of their curriculum in a secondary science methods class. Several teachers who were working on their clear teaching credential (which must be completed by teachers before they have taught with a preliminary credential for 6 years) or who were working toward a masters degree in education were exposed to the WISE technology and pedagogy as part of a Technology for Science Educators class. Select science teachers who were working on a Masters degree in Education worked within the on-line community and developed WISE activities as part of their master's degree requirements.

In the first year, all 20 teachers in the Secondary Science Methods course at California State University, San Bernardino (CSUSB), interacted with the NetCourse and were required to implement WISE in their classrooms or observe implementation in another teacher's classroom. Teachers in this class interacted with the WISE NetCourse, and joined the on-line community. They were also introduced to the WISE project by a guest lecture by the director of the WISE project from Berkeley.

During this first year, in the winter quarter, teachers interacted with WISE for approximately 8 hours, spread over the course of a 10 week quarter. Based on post survey data, there is evidence that the NetCourse showed efficacy for training and facilitating use of the WISE curriculum. Most teachers were unable to actually implement WISE in their classrooms, due to lack of access to an Internet ready computer lab classroom. Despite this, there were notable successes by individual teachers who were able to implement the innovative WISE pedagogy in their classrooms.

During the spring quarter of the first year, seven students, enrolled in a special elective course, Technology for Science Educators, engaged in the NetCourse and studied WISE. All but one of the students engaged in the WISE NetCourse. All students could access the on-line community. All students could access on-line mentors. Based on discussions that occurred in the class and based on participant email, participants were split over the efficacy of using on-line in class discussion tools when face to face discussions could be conducted instead. Many participants were hampered by lack of access to sufficient technology to implement WISE in their school setting.

We applied lessons learned in the first year to the second year's Secondary Science Methods class. Specifically, we made participation in the WISE project optional, we reduced the size of the NetCourse, and we again brought in the director of the project who spoke about WISE during one of the class sessions. In the second year, the professor teaching the Secondary Science Methods course required all students to do a professional "risk project". Students were required to implement lessons that reflected a change in how they would ordinarily teach. In the course, the professor emphasized the utility of inquiry methods for teaching science.

We encouraged the use of WISE as part of the professional risk project, a project in which students had to implement a lesson plan (or series of lesson plans) in their classroom in a new way—a way that represented significant learning on their part—a way that meant that they were taking a risk in conducting the lessons. Our intent was to bring these teachers past their comfort zone to enable significant learning concerning teaching in an inquiry manner.

Of the 20 students in the class, seven chose to engage in a modified WISE NetCourse based on interest and access to necessary resources. Several students elected to utilize WISE in their classroom in order to satisfy the requirements of the "risk project." These students were highly motivated to find out about WISE via the modified NetCourse. In this environment, all students could access on-line community. Mentoring was done on an as-needed basis via email. Several students implemented WISE in their classrooms during the academic quarter.

Assessing Our Impact

We assessed the impact of our Professional Development Program through pre- and post assessments of teacher beliefs about pedagogy, the Internet, and specific science discipline knowledge, as well as by interviews of several participants. We assessed the impact of our virtual mentoring through interviews, as well as analysis of recorded log files of community activity.

Based on exit survey data from the last 2 years of the project, it was clear that a number of students were very enthusiastic about the potential for using WISE in their classrooms. Students commented on the utility of learning about the WISE approach to teaching and learning through the on-line community. For instance, one student stated in his exit survey, "Thank you for enlightening me on this powerful and dynamic learning medium. I look forward to continuing the use of WISE in my classroom and watching this project grow and mature." A number of students have continued their participation in the WISE community, authoring innovative new curriculum units for use by other teachers. In one case, a student from the second year of the project is working with individuals in Thailand on a unit that concerns the rain forest. In another, a student from the Technology for Science Educators class co-developed, with another CSUSB student, WISE personnel and scientists, the WISE unit on how to control malaria. Two particularly notable examples of successes reveal teachers, who interacted with the WISE project through teacher education courses, each becoming teacher of the year for their school sites.

Discussion

Important ingredients for successful use of WISE in classrooms

From our ongoing analysis, we are identifying criteria that appear to be critical to successful use of the WISE materials in classrooms:

- A positive introduction (e.g., course-related, via web, via professional development, personal contacts)
- Computer and network availability with necessary technical support
- Support for pedagogy implementation (In our project, the WISE staff provided extensive support to new teachers).

Teacher involvement is critical to success of the effort

A number of the teachers either have created or are creating new WISE units in collaboration with researchers. Additionally, a number of teachers from CSUSB courses have become WISE leaders, spreading their understanding of the WISE pedagogy and Internet materials to colleagues. These mentors spearheaded in-service workshops and conference presentations. It represents a scaffolding for a vibrant, sustainable, teacher professional development community, in which science teachers are brought together to discuss and implement significant advances in the implementation of inquiry based, technology rich science pedagogy.

Future directions

Current lack access to Internet equipped laboratories has impeded implementation of WISE in many students' classrooms. Most indicated a desire to maintain contact with WISE in the future; a number of students intend to implement WISE activities in their classroom in the near future when they have access to the internet in a computer lab. This is particularly encouraging as schools race to connect to the Internet, often without a strategy for effective use of the Internet in classrooms (for a discussion of these concerns, see Barowy & Laserna, 1997; Wiesenmayer & Meadows, 1997). Given the successes experienced through this collaboration, and consistent with the current guidelines of the California Commission on Teacher Credentialing (CTC) and the National Council for Accreditation of Teacher Education (NCATE), which advocate the integration of technology into methods courses, the WISE Professional Development program has become an integral component of California State University, San Bernardino's Secondary Science Methods class. We are continuing to provide feedback to University of California, Berkeley's WISE team, to continue to enhance research and development efforts to improve science education.

References

Barowy, W. & Laserna, C. (1997). The role of the Internet in the adoption of computer modeling as legitimate high school science. *Journal of Science Education and Technology*, 6 (1), 3-13.

Clement, J. (1993). Using Bridging Analogies and Anchoring Intuitions to Deal with Students' Preconceptions in Physics. *Journal of Research in Science Teaching*, 30 (10), 1241-57.

Linn, M. C. (1992). The Computer as Learning Partner: Can Computer Tools Teach Science? In K. Sheingold, L. G. Roberts, and S. M. Malcolm (Eds.), *Technology for Teaching and Learning*. Washington, DC: American Association for the Advancement of Science.

Linn, M. C. & Songer, N. B. (1991). Cognitive and conceptual change in adolescence. *American Journal of Education,* 99 (4) 379-417.

Peterson, R. & Treagust, D. (1995). Developing Preservice Teachers' Pedagogical Reasoning Ability. *Research in Science Education*, 25 (3), 291-305.

Plummer, D.M. & Barrow, L.H. (1998). Ways to support beginning science teachers. *Journal of Science Teacher Education*, 9 (4,) 293-301.

Poole, H. & Page, J. A. (1995). *Beyond Tracking: Finding Success in Inclusive Schools*. Bloomington, IN: Phi, Delta, Kappa Educational Foundation.

Slotta, J. D. & Linn, M. C. (2000). How do students make sense of Internet resources in the science classroom? In Jacobson, M. J. & Kozma, R. (Ed.), *Learning the Sciences of the 21st Century*. Hillsdale, NJ: Lawrence Erlbaum & Associates.

Wiesenmayer, R.L. & Meadows, G.R. (1997). Addressing science teacher's initial perceptions of the classroom uses of internet and world wide web-based resource materials. *Journal of Science Education and Technology,* 6 (4) 329-335.

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Netseminars: A Strategy for Team-Based Action Research

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Abstract: Professional Development School (PDS) partnerships offer a powerful leverage point for the improvement of student learning in the K-12 sector and a unique opportunity to experiment with new forms of online learning for the adults who work in and with schools. In this paper we present lessons learned in the design and delivery of online courses to teacher educators, classroom teachers, support personnel, and student teachers associated with the Virtual Professional Development School Consortium. We describe the NetSeminar model that is evolving through this work, and consider strategies and implications for replication.

The Context

Professional Development School partnerships are sustained local collaborations between a teacher education program and one or more schools, seeking to improve student learning results by using action research to continuously improve both teacher preparation and professional development. A growing number of national organizations support the idea that PDS partnerships be used as a primary vehicle for expanding the quality and capacity of preservice and inservice programs to effectively prepare and continuously support the next generation of America's teachers (need source).

Professional Development School partnerships are fertile ground for online work. By definition, a PDS brings together higher education, the k12 sector, and their respective communities. Collaborative action research provides an effective context for bridging very different cultures and focusing on the shared interest of improved student learning. Among the sites that are truly striving to develop PDSness, there is a built-in readiness for experimentation. However, there are significant barriers to collaboration; among them time and distance – an obvious opportunity to employ computer mediated communication.

This was a central premise for the Virtual PDS Consortium, a US Department of Education funded Technology Innovation Challenge Grant involving 30 Professional Development Schools in nine states (need source). Begun in 1998, and coordinated by the National Institute for Community Innovation (NICI), the five-year project was conceived to help K-12 school-based teams learn together while working together to create a technology-enriched learning environment in a professional development school.

The goals of the Virtual PDS Consortium's online efforts are to facilitate communication with and among the sites and to deliver formal learning opportunities in support of PDS development and technology integration. The Challenge Grant included funding for the development of four online courses to be delivered in sequence: 1) Using Data, 2) Technology Applications, 3) Technology Planning, and 4) Professional Development Planning. The strategy underpinning this sequence was to put the initial emphasis on the examination of local K-16 data related to student learning, and to use these findings as a basis for selecting technology applications with the greatest potential to affect desired improvements. Similarly, each subsequent course is intended to build on the previous offering, leading to a high-quality professional development program for each PDS.

The online environment for the Virtual PDS Consortium is Vista Compass, a Web-based application built on the metaphor of a campus. Compass runs on a Lotus Domino platform that integrates registration, transcript and billing information, self-service applications, as well as tools to control the security, organization and customization of services. Of primary interest to NICI and the VPDSC was the flexibility to configure private space, group space, and course space in virtually limitless permutations and combinations, as well as the potential to plug in additional applications, i.e. chats, audio, streaming video.

The first online offering was called the "*Using Data Netcourse*." Some 200 participants signed up for the course. A Lead Instructor was responsible for designing the assignments and marking up the documents for presentation in the course space, pacing the course via mailing list, troubleshooting local problems through local Data Contacts, and addressing individual participant needs by way of phone and email. Eight Data Mentors served as assistant instructors; each assigned to clusters of sites. Experts in professional development were assigned as critical friends to each of the 30 PDS sites. The goal was to provide a small expert-to-participant ratio. In short, a substantial amount of resource was invested to produce and facilitate the netcourse.

The *Using Data NetCourse* was structured in a series of "sessions" following the outline of a textbook that had been selected by an advisory group. Participants were expected to reflect on the textbook readings, compare with local practice (in consultation with colleagues, if possible), report to the large group, and engage in class discussion. It operated on a schedule independent of participant's learning or productivity. In week three, for example, participants were expected to be reading Chapter 2 and commenting on Data in the Change Process. Unfortunately, we encountered a series of technical and logistical crises, so that by the third week we had lost over half of the participants. The 12-week course was extended for an extra month to accommodate the survivors.

Lessons Learned

Direct feedback from the participants and data provided by the external evaluator (through surveys and site visits) were used to draw lessons from the first course:

- Missing Participants – individuals who were not able to access the site and had no technical support to work through access issues, were lost before the course even started.
- Missing Textbooks - sites/individuals who either did not order the textbook in a timely fashion or fell victim to cumbersome requisition procedures, were operating in the dark.
- Overwhelmed Participants – those with little or no experience with web browsers, group space, or course environments felt overwhelmed by the campus and its many features. Threaded discussion was also problematic for many.

- Campus Configuration Confusion – we learned, after the fact, that participants had been registered varied permissions and services – for many the instructions did not match the tools.
- Missing Mentors & Experts – some of the mentors and many of the staff developers were also challenged by the virtual campus.
- Inundated Instructor – the sheer number of participants and the volume of technical assistance needs left little time for the instructor to attend to those who were navigating the campus well for the first three weeks of the course.
- Expectation Variation – many participants came to the course expecting to learn about data use in their respective classrooms, rather than data use targeted to school improvement. Others were frustrated by the constructivist orientation.
- Disappointing Discussion – it was difficult to get participants to comment on each other's reports and reflections. Most of the interaction was between instructors and participants.

In spite of the impediments, there were many bright spots. One site in particular served as our shining example. Interestingly, it was not the most technically advanced site; rather the star PDS was in a high-need school with very limited technology. Most of the ten participants who signed up for the course had very limited computer experience and had never worked online. To assure success in the course they agreed to work as a team. They held weekly meetings to discuss the readings and improve their skills navigating the campus. They used their online group space to plan agendas, discuss the readings, and prepare assignments. They took turns presenting their findings, conclusions, and questions to the in the course space. Their final project was a collaboratively developed data plan keyed to the school improvement plan that they co-presented to the entire school.

The Data Contact was instrumental in this success. She participated in the course, served as team leader and tech support person, and communicated regularly with the course instructor to offer feedback and clarify course expectations, and to get help with technical issues.

The success of this one team was mirrored in findings from participant surveys conducted by the outside evaluator. The strongest indicators of engagement in the course were related to local support, the degree to which they participated as a team, and the linkages to school-wide goals.

Based on these findings, we made a number of changes in the second online offering. Most importantly, we changed the name to the "Technology Applications ***NetSeminar.***" We offered a pre-course orientation with a special effort to attract participants with little or no virtual campus experience. The seminar began with a self-assessment and a round of introductions. There was no textbook; rather, sites were asked to acquire copies of ISTE standards to be used as a reference. All required readings were provided online. The online activities were designed for groups – with the initial set of assignments for school-based teams, and moving to virtual inquiry groups formed during the netseminar around the specific, individual interests of the participants.

The *Technology Applications NetSeminar* was led by a Facilitator and two Instructors. The Instructors were responsible for course content and resources, enabling the Facilitator to concentrate on the flow of week-by-week activities. The pace of the course, instead of being driven by coverage of material, was driven by a set of team-based products, which could be addressed when appropriate. At each stage of the seminar, only those documents and tools needed for the assigned work were visible to the participants.

The *Technology Applications NetSeminar* presented new challenges, mostly related to the fact that we attempted to run the seminar through the summer months. It had the effect of negating the expectation that participants from each site would work as a team. Except that the same site that had been the shining star in the first course made the extra effort to get together over the summer. Once again, informal feedback and participant surveys reinforced the importance of local support, team participation, and the linkages to school-wide goals.

To assure that all sites were prepared to engage in future courses, the third course (technology planning) was put on hold and resources were diverted to assist all PDS sites had fully-developed local action plans and technology plans.

The NetSeminar Model

Even as we proceed with the first sequence of courses, we are incorporating the learnings and retooling the courses. We have updated the Using Data NetSeminar. Figure 1 (below) represents the latest version:

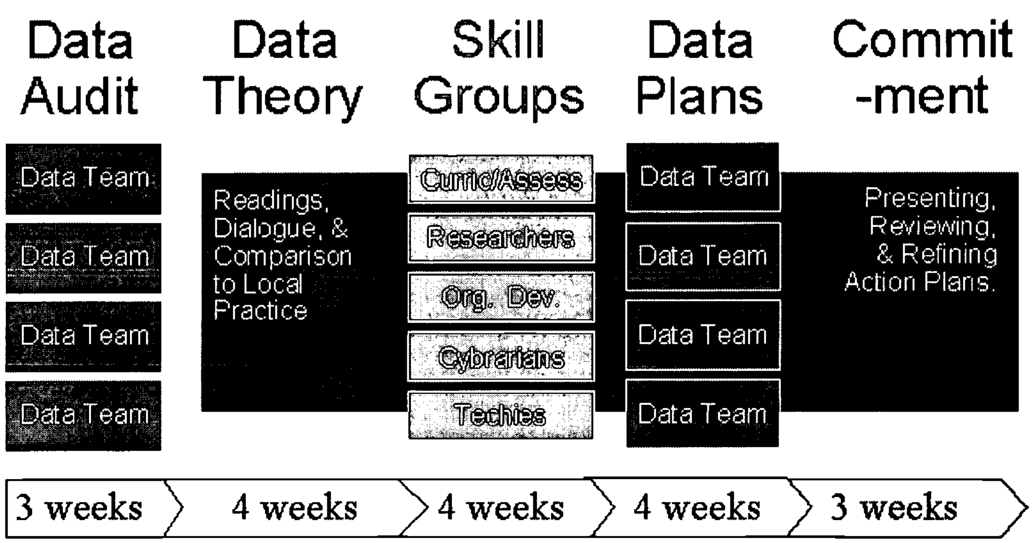

figure 1.

Data Audit - Data Teams (a minimum of 5 members) from participating schools are provided Group Spaces to serve as home base for their work. A series of questions will be presented to assist teams in the collection of 'legacy data' related to their school improvement priorities. The data audit activities also serve as an orientation to Group Space and the Campus *(approx time frame = 3 weeks).*

Data Theory - participants download and read selected materials from the website. Instructors will lead participants to an understanding of frames for data use and strategies for measuring equity. Outcome of this work will be reflective essays comparing ideal to local practice *(approx time frame = 4 weeks).* Note: the graphic shows the large group conversation continuing in the background through phases 3 & 4, i.e. skill group and data planning are the main focus; however, there will be some reporting and comparing of experience in the large group.

Skill Groups - Participants self-select into skill groups: Curriculum & Assessment, Action Research, Organizational Developers, Cybrarians, and Techies (the reason for requiring that each Data Team will have at least 5 members). Each Skill Group will focus a set of skills/strategies that will become part of a comprehensive plan for engaging colleagues in data-driven school improvement *(approx time frame = 4 weeks).*

Data Planning - Data Teams will apply what they have learned through the audits, readings, discussions, and skill groups to develop tentative data plans. Note some teams will be developing plans from scratch - others will be developing upgrades to existing plans *(approx time frame = 4 weeks).*

Presentations & Commitments - Data Teams will "present" their data plans for review by their virtual colleagues. Data Teams will consider the feedback and develop action plans for securing local support *(approx time frame = 3 weeks).*

Strategies and Implications for Replication

The Virtual PDS represents a rich laboratory for the development of online learning. The personal and institutional commitments made to the project with the extra incentive of the outside funding produces a community willing to experiment and to tolerate errors and omissions. As long as we can sustain the partnership, we have a grace period to continue the experiment.

While we focus on the experiment, we are also mindful of a growing market, among all K-12 schools, for online delivery of learning opportunities for preservice and inservice teachers and the other adults who work in and with schools. The recruitment and retention of a quality workforce in the face of shortages is on the radar screen of ever greater numbers of policy makers across the political spectrum. Meanwhile, the accountability movement continues to gather steam - placing schools and school leaders under greater pressure to more effectively serve ever more diverse student populations and to achieve higher standards. Schools & districts are becoming more selective about professional development and demanding services that can be delivered on-site in the context of school improvement priorities.

As K-12 schools get ever closer to the goal of universal Internet access schools and teachers and other school personnel are less bound by time and distance – they will seek out online resources that best meet their professional development and school improvement needs. Increasingly, it is a buyer's market.

For both practical and pedagogical reasons, the response from higher education cannot be limited to mere translation of existing courses to make them available to schools. Stand-alone netcourses are not responsive to schools, nor can they exploit the richly integrative possibilities of Web technology. An effective response requires tools, strategies, and skills that create constructivist, problem-solving, and collaborative learning environments.

The Virtual PDS Consortium experience suggests that the "netseminar" is a responsive and effective model for meeting the emerging demand for online learning in the K-16 market. Whereas a traditional "course" is structured around a pre-determined set of concepts, knowledge, and skills delivered by an expert to the learner; the seminar format begins with the knowledge, skills, and needs that the participants bring to the group setting. In the seminar, peer-to-peer interaction is essential and central to the learning experience, while the existing knowledge base provides a framework and reference points for the conversation.

Ultimately, we believe that the netseminar is a temporary and transitional strategy that will give way to even more responsive systems. We envision a future in which each individual has access to tools and resources for a truly personalized learning plan, and the capacity to link and interact with peers, mentors, work groups, as well as vast databases and libraries. Our commitment to work with PDS partnerships is built on a belief that the most effective strategy for transforming education is to begin with the learning needs of the adults in the system.

Our experience with netseminar development is currently limited to the 30 Virtual PDS Consortium partnerships. At times progress feels painfully slow as vision and potential outstrip practice. We assume that there are many other examples of online experiments among the 500 plus PDS partnerships that presently exist. We see a great need to develop to create forums to support continuous inquiry across initiatives as a means to accelerate the constructing of new knowledge and to facilitate school transformation. We welcome invitations to partner in such efforts.

Facilitators' Perspectives on Using Electronic Communication Channels to Build and Manage Relationships with Virtual Team Members

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Abstract
The use of virtual teams in all areas of education is growing. They can form critical parts of distance education programs, collaborative research projects and joint-management schemes. Research shows that the development of personal relationships between team members is an important factor in effective working relationships in virtual teams. This paper reports part of a grounded action research study of seven virtual team facilitators in New Zealand. It will specifically look at how virtual team facilitators use electronic communication channels to build relationships with their virtual team members. The findings suggest that some electronic channels are more effective than others in building relationships and conclude that facilitators need to strategically use the channels available to them to effectively build relationships.

Introduction

This paper seeks to contribute to the general field of virtual teams by looking at how virtual team facilitators use electronic communication channels to build and manage relationships with their team members. Virtual teams can be defined as temporary, culturally diverse, geographically dispersed, electronically linked workgroups. Virtual teams may communicate and work synchronously or asynchronously through such technologies as electronic mail, bulletin boards, audio/video/data conferencing, automated workflow, online chat, electronic voting and collaborative writing (Coleman 1997). Virtual teams are playing an increasingly important role in organizational life and can offer organizations, including educational institutions, the flexibility to remain competitive. The benefits of virtual teams, particularly relevant in the areas of research and teaching, include reductions in costs and risks and expanded access to expertise and knowledge (Lewis 1998).

O'Hara-Devereaux & Johanson (1994) define facilitation as "the art of helping people navigate the processes that lead to agreed-upon objectives in a way that encourages universal participation and productivity", and place process facilitation skills as some of the most crucial for managing and leading global teams. Virtual team facilitators are often the center of a virtual team. They must be able to manage the whole spectrum of communication strategies via new technologies, as well as human and social processes.

Most of the extant research on virtual teams has been anecdotal and descriptive with little in the way of systematic, empirical research (Furst et al. 1999). This is particularly true when virtual team facilitators are the main focus of study. Although the importance of facilitators in virtual teams is noted in the literature (Kimball 1997; O'Hara-Devereaux & Johanson 1994), and suggestions for facilitating virtual teams are enumerated, no systematic research where the facilitator of virtual teams is the primary focus of study has been located. Nunamaker et al. (1999 p27) state that, "little research has yet been undertaken to understand and improve the process of distributed facilitation." This paper seeks to address some of these gaps.

Communication Channels in Virtual Teams

Technological infrastructure can strongly impact virtual team effectiveness in ways that a facilitator may or may not be able to effectively manage. For the smaller organizations, financial limitations are often a significant factor in the communication resources virtual teams have at their disposal. In global virtual teams, there may be significant problems with access to technology due to underdeveloped national infrastructure or the high cost of broadband internet connections. Software and hardware compatibility among team members is another issue that can affect the choice of communication channels.

However, while electronic communication channels support the networked organization by providing tools to solve collaboration oriented problems, Coleman (1997) warns that focussing only on technical issues can lead to expensive failures, while focussing on the people and al issues dramatically increases the possibility of success. al policies or the lack of them can impact the effectiveness of virtual teams. Many companies have no formal company or HR policies on virtual teams. Virtual teams are often formed on an as-needed, ad-hoc basis. Another issue that can be a factor is team member competence in using various technologies. This may be an al training issue, but in some cases it may be a member-selection issue (Jarvenpaa et al. 1998) as some people may have a psychological dislike for certain communication channels (Warkentin et al. 1997). Another one of these important "people" issues, is relationship building.

Stronger relational links have been associated with higher task performance (Warkentin & Beranek 1999) and the effectiveness of information exchange (Warkentin et al. 1997). According to Lau et al. (2000), effective communication is the key to successful virtual teams, and one of the keys to effective communication is how well team members are able to build and maintain their personal relationships. Kimball (2000) states, "the purpose of building and maintaining relationships in teams is to ensure that individuals develop at least enough harmony to be able to get their group work done". Building relationships with virtual team members is clearly of fundamental importance to a virtual team facilitator. According to Walther & Burgoon (1992), strong relational links are associated with enhanced creativity and motivation, increased morale, better decisions and fewer process losses. Research shows it is easier to complete relationship-building activities in a face-to-face context than in a strictly virtual one (Warkentin et al. 1997). This may in part be explained by media richness theory, which explains that the lack of contextual cues and timeliness of feedback inherent in computer-mediated communication can negatively affect the building of relationship links (Daft et al. 1987).

Research has found that computer-mediated teams do share relational information and are likely to develop relational links over time (Warkentin et al. 1997). However, since many virtual teams are project or deadline driven, there may not be the opportunity to allow relationships to develop over time. The idea of "swift trust", put forth by Jarvenpaa et al. (1998), describes how virtual team members may be able to accomplish tasks without first having developed relationships. This rational perspective centers on the view of "calculus of self interest" (ibid), which weigh the cost and benefits of certain courses of action between team members. If team members feel confident there will be a "payoff" for co-operating with and trusting virtual team members than they will do so. However, such trust appears to be very fragile and temporal.

In the following section, a methodology that generated data relevant to the question of how virtual team facilitators develop relationships with their team members is discussed.

Study Methodology

Because virtual teams are a new form of highly dynamic and ambiguous collaborative interaction, a major challenge of this study was the need to generate relevant data and analyse it in an appropriate manner. To achieve this, a research framework involving a training program format was instituted loosely based on methods already developed in action research, with data collection and analysis based on grounded theory methodology (Glaser & Strauss 1967; Strauss & Corbin 1990). This linking of these two research methodologies has been called grounded action research (Baskerville & Pries-Heje 1999).

The intent of this training program was three-fold: to generate interest and incentive for would-be participants, to give participants information and skills to initiate and facilitate their own virtual teams, and to generate data for analysis. After being recruited, participants were interviewed to determine their prior experience with virtual teams and their perceived needs and concerns in implementing and facilitating their own virtual team. The researcher then developed a ten-week training program to meet these needs. A pilot program and two subsequent training programs were held. As the participants took part in the training programs, each participant planned for, or actually initiated and facilitated a virtual team within their own organizational context. Data was collected from 1998 -2000 and came from face to face and telephone interviews, group discussions and e-mail correspondences. Some of the most significant concepts and their relationships to emerge from the data revolve around how facilitators use electronic communication channels to build relationships with their virtual team members, and this is the subject of this paper.

Results

Although the range of participants, their organizational contexts, virtual team lifecycles and virtual team tasks were varied, the data revealed a common concern among the facilitators as they went about the initiation and facilitation of their virtual teams. This concern has to do with building and managing virtual team relationships using electronic communication channels. According to the facilitators, the development of personal relationships between themselves and team members is an important prerequisite in establishing and maintaining virtual working relationships. What follows are descriptions and discussion of how the facilitators used the communication channels available to them to build relationships with their virtual team members.

Although face-to-face communication is clearly not an electronic communication channel, most of the facilitators in this study believe that face to face meetings, preferably at the formation of the virtual team, are the most effective way to build personal relationships. Why they feel this way is instructive, because in many cases they are seeking to emulate the relationship building processes and results of face to face meetings in their electronic communications. According to the participants, face to face meetings give facilitators the opportunity to understand individual team member communication styles and personal and professional motivations, making it easier to then move into virtual working relationships. One facilitator explains it this way,

> You can find out what motivates them, what makes them tick. That's what I think forms part of my thoughts on why you need to meet face to face. You may get a much richer sense of what is important to the person. I would find it much easier to say over a beer what is important to me then in a chat room.

Face to face meetings also allow a deeper kind of rapport, or trust to develop. For some of the facilitators, relationship building is a prerequisite to a working relationship, and face-to-face contact is an essential part of relationship building. In these cases facilitators can only use electronic communication channels after they have developed personal relationships. However, the facilitators working exclusively through electronic communication channels had to strategize ways to build relationships through the electronic channels they had available to them.

The facilitators see e-mail as the basis of their virtual teams' deliberations, effectively linking their distributed teams (Kettinger & Grover 1997), but they are unlikely to agree with Finholt's & Sproull's (1990) contention that e-mail can enable a team to create and sustain its identity without a shared physical setting, at least not by itself. The facilitators see e-mail as a channel more suitable for communicating information and coordinating projects than for building relationships. According to the facilitators the advantages of e-mail - being a universal platform, cost effective, generally accessible, easily learned, offering succinct messaging and the ability to send attachments quickly and efficiently - often carry a down side that on several occasions threatened to derail the facilitators' virtual teams.

One facilitator, who did not make any special effort to build a personal relationship with his team members before commencing a work relationship, relied almost totally on e-mail in his communications with team members. Because this facilitator is very comfortable using e-mail, he made the assumption that his team members were as well. This led to some serious miscommunications. In one instance he made an ironic comment in an e-mail that gave great offense to the team member, who was also the client. In another e-mail the team member "buried" a serious concern in an e-mail with a dozen other points. The facilitator overlooked the point, the significance of which became apparent only at the end of the team project. This problem concerns the low context text-based nature of e-mail, which requires the writer to clearly articulate the intended message (Bames & Greller 1994). If the client had mentioned his concern in a face to face meeting, the facilitator would have picked it up. The facilitator explains,

> He did mention his misgivings in the first instance, but he did not put it out there very strongly and I dismissed it. In a face-to-face situation I would have picked up the nonverbal cues how stressed he was about the whole thing. But as a throwaway line in an e-mail on 10 different subjects....

Another important issue in virtual teams is the timely response of team members to internal communications. Kettinger & Grover (1997) noted that a significant feature of e-mail is that both the sender and recipient can control the timing of their portion of the communication. The facilitators in this study have clear expectations that e-mail, as well as other communication messages such as voice mail, will be replied to in a prompt manner. They believe that a lack of timeliness can lead to poor communication, the creation of ill will, and an undermining of relationships. Two facilitators sometimes felt a loss of control when using e-mail. They felt they were at the "mercy" of the recipient. When e-mail went unanswered for some time, they had to fall back on telephone calls to try and establish a direct link and rebuild relationships if necessary.

The telephone seems to be an old reliable standby for facilitators when it comes to building relationships with virtual team members. It is apparently more comfortable to use this channel when getting to know people. With the use of the phone being second nature, the facilitators feel that they can pick up paralinguistic clues from their team members, which can assist in relationship building (Perey 1997). Phone calls are often used at the formation of a virtual team in order to get know some one quickly. One facilitator found these initial phone calls useful for "groundbreaking types of conversations". She explains, "with a phone call I can get a feeling for them and they can get a feeling for me."

Picking up the phone may seem the obvious solution in getting to know team members when working virtually, but for some of the facilitators it is problematic. One facilitator, who owns a global consulting company, finds international telephone calls a major expense. He has resisted using them as a means to build relationships with clients and consultants, although he realizes that he needs to do something to strengthen team relationships. He generally uses phone calls to initiate business relationships, but believes the time and expense to use phone calls to build relationships is not practical. This facilitator feels quite awkward calling people he is involved with professionally to "chat about life the universe and everything". He explained these are busy people and when you use electronic channels it is expected that you will "get down to business".

However, this particular facilitator, who relies heavily on e-mail and synchronous text chat programs to communicate with his team, experienced a number of miscommunications with a team member that he attributed to a lack of prior relationship building. He realizes he is going to have to make a serious effort in the future to get to get to know his team members better before settling into work relationships. Although his organization is in tight financial circumstances he is now willing to invest in some "upfront" phone calls as an 'investment" in relationship building.

One of the most interesting findings in this study was the way facilitators used internet-based messaging and chat programs such as ICQ to set up opportunities for informal, spontaneous communication between facilitators and team members. ICQ is free software that allows its users to know when (in this case) virtual team members anywhere in the world are connected to the internet. It then allows one member to contact another directly and to open up a chat box to hold synchronous typed conversations. Two facilitators looked to ICQ to build personal relationships in their teams. By its nature, ICQ can lead to spontaneous, informal conversations between team members that the facilitators believe can help to strengthen relationships. For one facilitator, with no opportunity for face-to-face meetings, the informality and spontaneity engendered by the use of ICQ was an important relationship building channel, which complemented the more task-oriented e-mail channel. He actively encouraged the downloading of ICQ as one of his first actions in the initiation of his virtual team. He explains his motives,

> The idea of ICQ was not as a group meeting thing, but to get some conversations going between the people in the group. And if they were using ICQ properly they would know when anybody else in the group was online. In fact the few conversations with people I had who were on line at the time were more time of day conversations, how are you type, not about anything substantial. But the thought was and it may well bear fruit in the longer term, was that if everybody was on ICQ and if we kept going with this process than the opportunity was there for people to talk privately. And I felt the ICQ thing could provide the corridor type of relationship where tasks can progress without the use of planned meetings.

This use of ICQ mirrors suggestions made by Kraut et al. (1993) that informal encounters create a common context and perspective that support group work. ICQ may facilitate socialization processes that allow team members and facilitators to participate in activities happening at the 'backstage' (Goffman 1990), where they can exchange feelings and emotions thus building and maintaining relationships and minimizing feelings of isolation that can lead to reduced intrinsic involvement in the team (Finholt & Sproull 1990).

Desktop videoconferencing is another channel that holds great promise for the facilitators in this study. They believe that "eyeing" people is an important part of relationship building, particularly when the only alternative is e-mail or synchronous text-based meetings. Videoconferencing has been in use since the early 1960's (Perey 1997), but in the past it was expensive and the quality was not good. However new internet-based desktop videoconferencing technology is bringing the cost down, although the quality and reliability of internet-based transmissions are often poor.

Most of the facilitators are very interested in incorporating Netmeeting, a free software program by Microsoft and one of the most common desktop applications, into their virtual teams and some experimented with it during the training program sessions. In desktop videoconferencing, they see a low-cost virtual communication channel that could provide a workable alternative to face to face meetings. Netmeeting, for example, allows two people anywhere in the world to see and hear each other. It also allows team members to share and work on documents. One facilitator believed that setting up an internet-based video conferencing communication channel with an overseas branch office would build personal relationships resulting in greater personal trust between geographically separated organizational members thus strengthening the organization as a whole. As he explains,

> I don't mean trust in a professional level of trust, but just getting to know the person, building a relationship with Graham in Melbourne. To my mind, that's the key output or objective of a lot of this.

Lau et al. (1999) argue videoconferencing can enhance social relationships by putting a face to the name. Perey (1997) states conscious and unconscious communications supported by two-way video can build and nurture relationships. . However, a recent study looking of the effects of desktop videoconferencing on improving trust relations in virtual teamworking projects (Nandakuhmar 2000) suggest information and communication technologies, such as Netmeeting, appear to be inadequate for building "trust relations", primarily because they do not support 'backstage' access, normally found in face-to-face environments. In any case, the use of internet-based video conferencing communication is still problematic, as access to sufficient and reliable bandwidth is a significant barrier to many potential users.

Conclusion

Successful virtual teams often use different technologies to enhance the breadth and depth of their communication (Lau et al. 1999). Facilitators in this study realize that they would have been unable to operate virtual teams and accomplish their project tasks without electronic communication channels. At the same time they understand that the use of these channels as the main working communication channels in their virtual teams would be problematic, without having first established personal relationships with team members. The development of personal relationships, according to one facilitator, would make the building of a team "culture of cooperation" more likely. In order to build relationships, facilitators need to strategically use the communication channels they have available to them.

This study finds that when face-to-face meetings are not an option, virtual team facilitators can effectively use electronic communication channels, particularly some of the more familiar or higher-context virtual channels such as the telephone or desktop video conferencing to build relationships with team members. ICQ also seems to hold some promise as an "backdoor" channel that may encourage informal communication and relationship building. The key challenge for virtual team facilitators is to make a conscious and concerted effort, which can be termed facilitator strategies, to develop personal relationships with team members through the use of available communication channels (Figure 1).

Figure 1: Relationship Building in Virtual Teams

Available Electronic Communication Channels	+	Facilitator Strategies	⇨	Relationship Building

Facilitator strategies will include the selection and use of appropriate communication channels and appropriate message content. The level of relationship between the facilitator and team members necessary to accomplish the team's task is one of the key determining factors in creating a facilitator's strategy. Other important factors in determining facilitator strategies, some of which are alluded to in this paper, include issues concerning team member selection and training, organizational and HR policies, as well as the team's desired task outcomes and cultural biases toward communication channels particularly in global, multicultural virtual teams.

REFERENCES

Baskerville, R. & Pries-Heje, J. (1999). "Grounded action research: a method for understanding IT in practice." Accounting Management and Information Technologies **9**: 1-23.

Coleman, D. (1997). Groupware: Collaborative Strategies for Corporate LANS and Intranets. New Jersey, Prentice Hall.

Daft, R. L., Lengel, R.H. & Trevino, L.K. (1987). "Message Equivocality, media selection and manager performance." Management Information Systems Quarterly **11**: 335-368.

Finholt, T. & Sproull, L.S. (1990). "Electronic groups at work." al Science **1**: 41-61.

Furst, S., Blackburn, R & Rosen, B (1999). "Virtual team effectiveness: a proposed research agenda." Information Systems Journal 9(4): 249-269.

Glaser, B. & Strauss., A.L. (1967). The Discovery of Grounded Theory: Strategies for qualitative research. New York, Aldine De Gruyter.

Jarvenpaa, S. L., Knoll, K. & Leidner, D.E. (1998). "Is anybody out there? Antecedents of trust in global virtual teams,." Journal of Management Information Systems **14**(4): 29-64.

Kettinger, W. J. & Grover, V. (1997). "The use of computer-mediated communication in an interal context." Decision Sciences **28**(3): 513-555.

Kimball, L. (2000). Boundaryless Facilitation [web page] http://www.tmn.com/~lisa/bnd2.htm.Accessed 26 October, **2000**.

Lau F, Sarker S and Sahay S. On managing virtual teams. Healthcare Information Management Communications Canada Vol 14(2):46-53; May 2000.

Lewis, R. (1998). "Membership and management of a 'virtual' team: the perspective of a research manager." R & D Management **28**(1): 5-12.

Nunamaker, J., Briggs, R, Mittleman, D & Vogel, D (1999). Lessons from a dozen years of group support systems research: a discussion of lab and field findings [web page] http://www.ventana.com/dozen.pdf. Accessed 26 October, **2000**.

O'Hara-Devereaux, M. & Johansen, R. (1994). Global Work: Bridging distance, culture and time. Jossey-Bass Publishers.

Perey, C. (1997). Desktop Videoconferencing. Groupware: Collaborative Strategies for Corporate LANS and Intranets. D. Coleman. Upper Saddle River,, Prentice Hall.

Strauss, A. L. & Corbin., J. (1990). Basics of Qualitative Research: Grounded theory procedures and techniques. Newbury Park, Sage Publications.

Walther, J. & Burgoon, J.K. (1992). "Relational communication in computer-mediated interaction." Human Communication Research **19**: 50-88.

Warkentin, M. & Beranek, P.M. (1999). "Training to improve virtual team communication." Information Systems Journal **9**: 271-289.

Warkentin, M. E., Sayeed,L., & Hightower, R. (1997). "Virtual teams versus face-to-face teams: an exploratory study of a web-based conference system." Decision Sciences **28**: 975-996.

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Silk Purses out of Pigs' Ears: The Conversion of Reluctant or Intimidated Students (Especially Teachers) into Keen Users of The Internet in Education

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Abstract: If 'the internet in education' is framed and conducted strategically with at least a little insight rather than in an *ad hoc* way, then learners will be more likely to not only forgive you but even thank you for guiding them through the inevitable stage of temporary frustration to the initial steps of self-empowerment. The paper outlines an integrated approach which would not only encourage but actually serve to 'convert' reluctant learners into actual keen users: (a) as a theorization of the presenters' own experiences with teacher education courses; (b) in terms of simple activities involving, say, information literacy and web design linked together to produce an initiatory 'aha' effect of seeing underlying or generic connections between a variety of internet skills, processes and potential educational applications; and (c) with an appreciation of how even 'difficult' students can be most impressive if allowed initiative with their own learning. The paper will further discuss three *practical stages* in the process of 'internet in education' conversion which also constitute *key principles* of an integrated theoretical framework.

Introduction: the transition from old to new learning

There are many human transitions and life experiences where reasoning by reflection or through discussion with others is not enough if a person is to effectively respond to new or inevitable challenges and develop changed habits and practices. For many in the electronic age – especially those who grew up accustomed to books and mere machines – the computer with its various additional networking and multimedia functions represents one exemplary instance where people often need help to individually tackle and overcome underlying fears and critical thresholds in order to proceed confidently in life. Fine ideas about the possibilities and potentials of fundamental new media of human communication and knowledge are not sufficient also. Many people need to be *converted* (not just *convinced*) through progressive and purposeful stages of first-hand practical experience also. On the other hand, young 'internet-savvy' kids today are almost instinctively aware of and easily converted to the attractions and possibilities represented by interactive electronic media. However, those brought up to feel very much at home in the digital age with all its multimedia seductions may well have an increasingly greater need to be converted rather to some of the enduring human needs and possibilities of education exemplified by or mediated through spoken and written words. The discussion below is thus ultimately concerned with the convergent problem of getting any student (including older, parental, and especial teacher learners) interested, excited, and personally engaged with both the process of learning and the use of new technologies – that is, is concerned with the dialogue between *old* and *new* ways in which young and old students alike learn to productively interact with a changing world.

This paper further represents a distilling of the presenters' personal experiences over several years in terms of a similar reflective inquiry into the problem of integrating computers and the internet more effectively in teacher education courses. Taking the path that such courses really need to have some degree of practical grounding to have any significant degree of applied or even critical integrity, both presenters have come to appreciate that the path towards a more integrated and effective approach towards Information and Communication Technologies (ICTs) in formal teacher education especially is: (a) somewhat similar across different cultural contexts; and also, (b) recapitulates the inevitable learning stages navigated by individual learners of new electronic literacies and technologies. Various innovations help to make this less intimidating and frustrating, and more effective - for instance, the provision of needed support and resources, the 'grounding' of learning and assessment in terms of activities and reflections through electronic portfolios, and allowing an overlap between learner's *utilitarian reasons* and *personal motivations* (i.e. work and pleasure) for using various programs and functions. Beyond this, however, there has been a strong sense of how students generally have viewed such courses in retrospect as a 'journey' of engagement initial fears and frustrations - where an engagement with initial fears should give way to a sense of renewed confidence as well as to the excitement of new worlds of possibility.

Most salutary have been the examples of how some of the initially frustrated and intimidated students went on to become some of the biggest success stories in these courses. Of course, we were only too well aware that this was largely their own doing, and also that particular students were exceptional in that they were able to transform initial skepticism into effective practice because they were critically reflective but still sufficiently open to new possibilities. But the question both of us asked when starting new jobs and assigned to teach an introductory ICT skills together was this: if we could only identify more effectively some of the key principles of a successful ICT learning process exemplified by those exceptional students, then we might also develop courses which integrate ICTs more effectively. In the process of attempting to do this in terms of connecting the *macro* and *micro* levels of an integrated framework then, we came to appreciate more fully that this is above all else a process of 'conversion' in which the stages of developing ICT *competency* involve a transition across a threshold of 'temporary frustrations'. Prior to learner conversion, teachers face an uphill struggle against the inertia of initial frustration and general boredom or reluctance. Following conversion, learners become intrinsically motivated by the very nature of a new, powerful, and exciting medium. Enthusiastic learners allow teachers to focus more on designs for applied and higher-order learning (i.e. teaching in the timeless sense of the term), rather than just perpetually getting to 'first base' in the learning process.

Why reluctant or intimidated users of computers and the internet need to be 'converted' in a practical way

Anyone attempting to integrate ICTs in their learning or teaching is up against more than just a simple fear of computers – as pervasive and intimidating as that might be. Indeed, those reluctant to enter the digital age have perhaps not been intimidated so much by computers or the internet specifically, but possibly more by how the social and educational implications of computer networking and associated multimedia have tended to be viewed and discussed in polarized terms of either *positive potentials* or *negative dangers* – with little room for *balanced* or well-informed discussion. Like other technological 'breakthroughs' before, various programs and functions of the internet are regularly and uncritically lauded in a way which may ironically reinforce a general sense of passivity, superficial understanding, and an attachment to old ways of practice. Many people set up an endless cycle of unrealistic expectation and subsequent disappointment by projecting onto the latest new technological tool or concept their secret wish for a 'magic bullet' which would allow them to passively master wonderful new skills and functions without having to get their own hands on the keyboard, without progressively developing a basic ICT competency in terms of thinking about relevant or possible applications. The uncritically optimistic embracing of new ICTs in general as a prescription for future education is often pursued with little understanding of what is needed for effective integration, and in a way which may devalue enduring notions and objectives of education held by parents and teachers. Conversely, an uncritical pessimism which is so quick to point out these faults is not only often blind to valid future possibilities but tends to romanticize and gloss over the existing faults of formal education as a context for learning.

Similar contradictions and ambivalence are evident at the 'micro' level of individuals attempting to become technologically literate and to integrate ICTs into their learning or work, and into their everyday generally. In other words, new technologies represent a useful focus for understanding that what people *say* and *do* is not always consistent – even when people are sincere and well-intentioned. To put it another way, many people are not fully aware of their own underlying preconceptions and prejudices about ICTs (Richards, in press). This includes optimists as well as pessimists. The naively optimistic learner who dares to undertake an unrealistic or overly-ambitious use of computers or the internet for whatever purpose may experience the kinds of initial frustration and failure which results in them becoming the kind of cynical pessimist who is equally closed off from further progress and a balanced appreciation of possibilities and potential applications. In short, naïvely optimistic and cynically pessimistic approaches to IT in education specifically and society generally both tend to reinforce a vicious circle. Thus the rhetorical polarization between optimistic and pessimistic perspectives at the *macro* level of policy, theory, and mere rhetoric often translates into self-fulfilling prophecies of initial failure and disillusioned expectations at the *micro* level of hands-on practices and specific learning objectives.

As already indicated, mere 'intellectual conversion' is not enough to effectively learn to use computers and the internet. Perhaps one of the main reasons why teachers often lag behind parents, policymakers, and others who increasingly subscribe with enthusiasm to a future digital paradigm of education is possibly that they realize better than anyone else how much damage can be done if this is not done well and in a truly integrated way. Teachers inevitably have first-hand experience of the pressures and dilemmas of what might be referred to as the 'macro-micro gap' or 'missing link' between forward-thinking policies and well-intentioned theories on one hand, and specific requirements for across the curriculum integration and hands-on learning on the other (i.e. between *thinking* and *doing*, and also educational *content* and the learning *process*). They are expected to respond to new policy directives for ICT integration in education and somehow translate these into integrated practices of teaching and learning. Although most teachers are quite aware of the increasing and inevitable importance of the internet for the future, many are simply unable to overcome subconscious resistances and rationalizations to become effective ICT learners themselves, let alone provide learning environments for their students to do this. People who are keen users of the internet are more likely to have become so through the self-taught approach (otherwise known as the 'trial and error' or even 'sink or swim' method), often with the informal assistance of friends, rather than through formal training, structured courses, and designated support.

In other words, there tends to be a great gap between *self-learning* and *formal education* when it comes to ICTs. For most people the 'conversion' to ICT competency is a relatively *ad hoc* process driven more by accidental needs or unspoken desires than a visionary plan. However, if ICTs are not integrated into education effectively then teachers are failing to harness or 'convert' the power, the excitement, and the applied possibilities of a new medium which can open up new worlds of possibility for learners (Richards, 1999, 2000). A younger generation of students tend to find the world of the internet and interactive multimedia exciting in contrast to the traditional focus on content knowledge in schools. Those teachers who completely ignore or arbitrarily dismiss the world of the internet and interactive multimedia in contrast to the traditional focus on content knowledge in schools will only reinforce young learners' sense of boredom and even resistance in relation to 'old' notions of education. They will also lose any remaining 'connection' with their younger students. Young learners will inevitably interpret such reluctance and even antagonism towards digital media as some sort of signal that their teachers are not really interested in them or their learning – reinforcing a cultural gap between formal education and popular everyday contexts of informal learning. In contrast, strategic teachers do not resist or oppose ICTs generally, but attempt to harness student interests in new media and convert this into productive applications and many of the educational values of 'old' learning.

The conversion of reluctant or intimidated students (especially teachers) into keen users of Information and Communication Technologies (ICTs)

The term *conversion* is often used to refer to the process by which an external agent directly effects a fundamental transformation in somebody or something (e.g. In the sense that a priest or politician might convert someone else to a religious or ideological point of view, or that an alchemist or scientist seek to transform a physical substance into another form). It is used here rather in the two related senses of : (a) a general harnessing of student interest in the internet for learning purposes; and (b) a more specific but still indirect framing of the student learning process. In the general sense, this is really more a facilitation of the learners' -conversion' from reluctant or intimidate student to keen user of the ICTs as suggested earlier, akin to the notion of a journey that is its own destination. The idea of *conversion* used here is thus also an adaptation of the anthropologist Victor Turner's (1967) notion that learning can be transformed by the liminal dimensions of undergoing a symbolic journey to achieve knowledge grounded in practical experience. The discussion below will thus revolve around the idea that the design of a course structure can always be further refined, and that learning environments for integrating ICTs in education can always be made more effective. Such an idea reflects some underlying principles of transformation which are not simply accidental but represent transferable principles. In terms of an earlier distinction between the process of *self-learning* and *formal course provision*, it represents a kind of 'middle path' between theory and practice which embraces both intellectual and practical conversion.

The three sub-sections below represent three *practical stages* in the process of 'internet in education' conversion, as well as constituting *key principles* of an integrated theoretical framework. The first section - setting the stage for transformation - discusses the 'cultural' as well as technological requirements for designing learning environments: requirements which are relevant to the changing role of teachers in the internet age, and will also appropriately encourage, support, and guide learners to venture out of existing 'comfort zones' into the realm of that which is new, unfamiliar, or undergoing change. The second section will discuss the convergent stage of an initial 'aha' effect experienced by learners within an integrated framework as they begin to see the connections between internet skills and programs, experience a provisional sense of accomplishment, effective interaction, and appreciate new media possibilities. In the third section, the paper discusses the ongoing conversion progress in terms of a generic 'internet literacy' geared for across the curriculum applications, and also the progressive and productive links made between personal and academic learning objectives.

Designing the context of conversion -

An effective learning environment for ICTs in education requires both indirect and direct elements of design and development which together constitute a 'middle path' between a flexible self-learning process and the formal structure which integrates various elements in relation to the specific context at hand. The *indirect* requirements for this simply relate to the various ways in which students can be encouraged to feel more relaxed, confident, and interested about learning to use ICTs for educational purposes. In other words, a *strategic* rather than *ad hoc* approach attempts to take an integrated approach towards the use of ICTs in education in terms of the following different elements: the provision of better support or safety nets for individual learners; customization of courses in terms of greater relevance to immediate needs or personal interests; a focus on transferable generic skills and applied orientation rather than on skills in a vacuum; and a more integrated approach to the connections between content and process, learning and assessment, etc.

The more *direct* elements of IT integration relate to a basic *activity-reflection cycle* at both the macro and micro level of student learning. At the micro level, this cycle refers to the use of specific learning activities to ground reflective knowledge in hands-on practice and also familiarize students with various programs and skills in terms of an applied focus. Of course, the specific design of any course which attempts to effectively integrate ICTs would be dependent on its overall context, purpose and structure. As an organizing strategy of learning and assessment at the macro level, the activity-reflection cycle represents an integrated approach to not only using ICTs in education but using them as general tools for more effective learning. Mention was made earlier to how such an approach can go beyond a mere 'skills acquisition' approach to also focus on both indirect and direct requirements of *attitude* and *application* in the use of ICTs in education. Lending itself to concepts of *project-based learning* and *electronic portfolios* (i.e. as specific learning and assessment tools), an 'activity-reflection' approach allows a teacher or designer of learning to distinguish in practice between mere competency and higher-order stages and levels of learning using ICTs. Representing a *strategic* approach which contrasts with a merely *ad hoc* one of 'just-in-time' planning, it provides a more effective context for reconciling *general* and *specific* learning objectives on one hand, and the often contradictory educational imperatives of *content* and *process* on the other.

Above all else, a strategic approach to using ICTs in education aims to get students to link up their 'thinking' and 'doing', to become more effective reflective practitioners, and to ground their conceptual and content learning in actual contexts of practice and process. In contrast to the traditional classroom, the internet is a relatively 'authentic' learning resource for various 'generic skills' which involve the accessing of information, communication, and interactive learning. It encourages actual as well as hypothetical exercises in cooperative or independent problem-solving – as policymakers and other academic advocates are aware, a natural vehicle for collaborative, independent, and life-long learning. In contrast to written or print media, its facility for self-expression and publication (eg. student assignments developed as webpages for a potential audience beyond the teacher, or perhaps as online interactions with other classrooms or learning communities) represents a most powerful and motivating culmination of the learning process. The key to integrating the internet and associated electronic multimedia in education, and using ICTs to transform education generally, thus lies at the intersection between personal motivation and potential utilitarian or work purposes. To see a connection and make this link also requires a conversion or transformation in thinking and perception from traditional modes of education.

The initial act or stage of conversion

The realization of creative or critical insight has perhaps most appropriately been referred to as the 'aha' effect (Koestler, 1989). It is thus a useful term to refer to how the transformation of bored or resistant users of the internet and computers generally in education into keen users often involve a change of perception and thinking. For some people, the transition from seeing mere data, skills and machine parts in a reductionist way to appreciating the internet as the media of a new paradigm of human literacy and learning will be gradual process of realization with a particular stage of conversion – for others, especially the most reluctant, intimidated or resistant generally, it can be an instantaneous act of transformation. The act or stage of conversion was linked above to two related 'missing links': firstly, the problem of linking macro and micro levels of educational design by teachers; secondly, the issue of linking student thinking and doing. As a convergent dilemma, *conversion* may thus be identified here as either an abrupt or gradual resolution to the threshold or predicament of temporary frustration involved when people attempt to learn and use new technologies. In other words, the need for conversion to the educational possibilities of the internet and associated multimedia is, in varying degrees, for everyone a general stage of engagement with a new mode of human literacy which is recapitulated every time a new skill or program is encountered or even applied in a different context. Just as there are those who can master specific skills but still not see overall applications, there are also many people who will not be motivated, confident or even intellectually convinced to undertake even basic skill acquisition until they can see the greater context or picture of relevance – a vision of potential applications and possible needs.

The key point of this paper is that the process by which exceptional individual learners in particular informally overcome their initial frustrations and get converted to internet literacy might be structured into formal course provision and education generally much more effectively as a strategic design rather than merely ad hoc happening for all learners. Top-down educational policies for general ICTs integration also require the more informal, bottom-up, and 'cultural' elements of effective specific or micro integration as indicated above, at the contextual levels of actual resourcing rather than merely hypothetical access, and in terms of actual learning and assessment practices as well as direct connections to subject-specific curricula. Effective course design will become easier when a critical threshold of internet and digital literacy is achieved by teachers and learners alike. In two related presentations at this conference, we have discussed in more specific detail how the initial conversion of an entire class of reluctant or intimidated learners might be achieved in an introductory internet skills course which capitalize on how many of the basic functions of the graphic interface for computers and the internet are similar for different programs, and also involve a range of transferable skills. Such courses provide an exemplary focus for the process by which ICTs might be integrated generally across the curriculum in terms of developing applied thinking in initial familiarization activities – an orientation grounded in transferable skills and knowledge in relation to generic or typical computer and internet programs. To have enduring effect, any initial act or stage of conversion into the future possibilities and requirements of ICTs in education needs to be grounded in actual practice to some degree and also transformed into a habitual yet confident and flexible practice (i.e. an ongoing or regular 'literacy'). It is one thing to have an insight into new possibilities; another to translate this into regular practice. 'Conversion' is thus an ongoing process beyond an initial act or stage.

The ongoing process of conversion

This is a stage where provisional insights begin to be transformed into new habits or changed practices, and initial excitement is converted into the quiet confidence of a grounded reflective practice. In terms of the typical opposition between naïve enthusiasm and cynical resistance to ICTs in education outlined earlier, it represents substantial progress along a 'middle path' often represented as a kind of journey by students. The 'creative integration' of ICTs in education has been usefully recognized as the culmination of a series of learning stages proceeding from initial skill acquisition to eventual applications (Somekh, 1998). However, like other similar models, Somekh's stages represent a somewhat linear progression which does not do justice to the challenge of crossing the 'threshold of temporary frustrations' as it has been identified here in relation to the learning of ICTs and new technologies.

The concept of conversion was invoked in order to describe and discuss how the 'critical point' of a transition from basic ICT competency into effectively integrated and applicable knowledge is as much an attitudinal and even cognitive transformation as a process of sufficient skill acquisition. This is the key challenge for an ongoing process of conversion. Just as conventional models of computer education have tended to emphasize the acquisition of skills within a vacuum, so too many teachers make the opposite 'error' of focusing on the extent to which ICTs might be directly relevant to the teaching and learning of subject-specific content. An inadvertent result of this 'add-on' approach is that an opposition is implicitly set up for many students between the exciting medium of the internet with all its popular cultural associations on one hand, and a growing perception of content learning in subjects like history and mathematics especially as boring or even irrelevant in comparison on the other. The concept of a threshold of conversion in the learning and use of ICTs in education provides a focus for teachers to conceptually as well as practically overcome a sense of entrapment in a series of related self-defeating binary oppositions in education: for instance, naively enthusiastic *vs* cynically resistant perspectives, content *vs* process objectives, personal *vs* utilitarian interests, and generic *vs* specific skill acquisition. Instead of having to merely theorize the great gap between initial skill acquisition and eventual mastery of this as applied knowledge, teachers should be able to focus on making practical connections and themselves crossing the critical threshold of 'temporary frustrations'. Put simply, teachers would be well advised to: (a) focus more on generic skills of learning with ICTs than either specific skills or content knowledge *per se*; and (b) to begin courses with introductory activities which aim to connect with student immediate interests and needs, and later develop the course in a way which can be more directly related to higher-order knowledge applications of ICTs.

Teachers are often resistant because of a perception that ICTs represent a threat to the integrity of their subject as a specialist curricula. Such teachers would find that ICTs encourage the kind of generic learning and literacy skills which have specific application to different subject areas as well as cross-disciplinary approaches to knowledge in the applied sense. At this point it should become easier for educators to appreciate how and understand why ICTs are not really a threat to the educational profession and the traditional roles of the teacher. Rather, used effectively, they may provide the means for allowing some negative roles (e.g. mere information or skill-in-a-vacuum transmitter, discipline provider, and child-minder) to become less burdensome. Conversely they offer potential to encourage teachers to design contexts of learning which encourage collaborative and independent learning, critical and creative thinking, and collective and individual self-knowledge.

Conclusion: Educational implications of a conversion model?

Perhaps the most well-known model of education as a process of conversion is still the Socratric questioning technique as a method to lead students into making transformative connections between knowledge and ignorance, as well as thinking and doing. Socrates' view of the teacher as a kind of 'mid-wife' facilitating the birth of new knowledge in students has particular relevance for the integration of IT in education. In contrast to the traditional 'transmission' models of education (i.e. where the authoritative teacher transmits 'knowledge' to passive and empty-minded students) and associated theories of learning such as behaviorism, many recent and influential theorists have emphasized the constructivist implications of ICTs in education (e.g. Jonassen, Peck , & Wilson, 1999). The 'conversion' model of learning with technology advocated here embraces many of the principles of constructivism but goes beyond this approach in two important senses: (a) it recognizes learning with ICTs in terms of crossing or overcoming a threshold of 'temporary frustrations' which delineates initial skill acquisition and attitudonal polarization or ambivalence on one hand, and the applied knowledge of grounded reflective practice on the other; (b) it emphasizes the still important role of the teacher as a designer, modeler, and facilitator of effective learning environments and learner conversion.

The conversion model outlined above derived from initial efforts to reconstruct formal ICT course design in terms of key 'self-learning' stages discerned in learners who exemplified the transition from reluctant or intimidated learners to confident computer-literate or 'internet-savvy' practitioners. These students were able to bridge the gap between *thinking* and *doing* (also personal interest and utilitarian purposes) in terms of a conversion effect which was built on the crucial interplay of effective attitude and sufficient skill acquisition. Likewise, the integration of ICTs in formal education requires an interdependent framework of technological and human resources, curriculum and pedagogy, and learning and assessment which addresses the 'macro-micro gap' in a strategic rather than a merely ad hoc way – the crucial interplay of top-down imperatives of policy, theory, and rhetoric on one hand, and hands-on practices or specific learning objectives on the other . Thus, the key stages of educational conversion (i.e. relevant context preceding initial and ongoing transformations of the link between thinking and doing) also constitute key principles of an integrated approach to ICTs in education – the design of effective learning environments and processes, the facilitation of an initial 'aha' effect where learners begin to see new connections and applied possibilities, and the ongoing conversion progress in terms of an across-the-curriculum ICT 'literacy'.

References

Koestler, A. (1989) *The Act of Creation*, London: Arkana.

Jonassen, D., Peck, K. & Wilson, B. (1999) *Learning with Technology: A constructivist perspective*, Upper Saddle River, N.J.: Merrill.

Richards, C. & Nason, R. (1999) Prerequisite principles for integrating (not just 'tacking-technologies in the curricula of tertiary education large classes, *ASCILITE 99: Responding to diversity*, ed. J. Winn, refereed proceedings, Australasian Society for Computers in Learning in Tertiary Education, http://www.ascilite.org.au/conferences/brisbane99/papers/papers.htm

Richards, C. (2000) Hypermedia, internet communications, and the challenging of refining literacy in the electronic age, *Language Learning and Technology*, 4(2), http://llt.msu.edu/

Richards, C. (in press) 'Researching the "organising metaphors" which inform teachers' use of *Perspectives on Computer Interactions- A multidisciplinary reader*, ed. M.Chaib, Lund, Sweden: Studentlitteratur.

Somekh, B. (1998) Supporting information and communication technology innovations in higher education. *Journal of Information Technology for Teacher Education*, 7(1), 11-31.

Turner, V. (1967) *The Forrest of Symbols*, Ithaca, N.J.:Cornell University Press.

A Rubric for Assessing the Interactive Qualities of Distance Learning Courses: Results from Faculty and Student Feedback

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Abstract: Results of studies of distance learning courses indicate that interactive qualities seem to be a major factor in determining course quality as reflected in student performance, grades, and course satisfaction. That is, the more interactive the course, the more effective it is. However, the field reflects considerable disagreement on what these interactive qualities are and how they should be assessed. This paper offers a rubric to help instructors begin to identify and self-assess these qualities in ways that assist them in improving their distance courses. Included in this paper are: an explanation of rubrics and their uses; a review of literature related to interactive qualities that led to identifying elements for the rubric; a discussion of methods used to gather feedback and revise the interactive qualities rubric draft; and a copy of the revised rubric itself.

Introduction

Distance learning research literature supports the observation that a primary factor shaping course quality and effectiveness is the amount of interaction in the course (Fulford & Zhang 1993; Klesius, Homan, & Thompson 1997; Zhang & Fulford 1994; Smith 1996; Zirkin & Sumler 1995). Zirkin and Sumler found that interaction seemed to have an impact on students' achievement, as well as their satisfaction: "The weight of evidence from the research reviewed was that increased student involvement by immediate interaction resulted in increased learning as reflected by test performance, grades, and student satisfaction" (p. 101).

However, there seems great variation in what faculty and students view as "interactive qualities." In order to clarify the role of this important factor and encourage faculty to make their distance courses more interactive, the authors decided to design a rubric for faculty to use to determine the degree of interactive qualities in their own distance learning courses (Roblyer & Ekhaml 2000). Such a tool, based on information obtained from a review and analysis of a considerable body of literature and research on this topic, was seen as an ideal mechanism for focusing the attention of distance learning instructors on the importance of interactive qualities and the elements that might contribute to them.

What is a Rubric and How Can it Help?

Rubrics are assessment tools that have seen increasing application in technology applications, especially in problem-based, constructivist environments (Jonassen, Peck, & Wilson 1999). Jonassen, et al. say that a rubric has come to be defined in education as "a tool used for assessing complex performance" (p. 221) in a way that gives input and feedback to help improve the performance. A rubric consists of a set of elements that describe the performance together with a scale (e. g., 1-5 points) based on levels of performance for each element.

Malone, Malm, Loren, Nay, Oliver, Saunders, and Thompson, (1997, October) point out that both students and faculty have additional responsibilities in a distance environment. Faculty must alter both course design and teaching strategies to take advantage of technologies and assure maximum interaction. But they say that students must assume more responsibility for their learning taking the initiative for requesting clarification and feedback to make up for the immediacy offered by face-to-face formats. Malone et al., cite the need for well-researched criteria to help faculty know what they are aiming for when they evaluate the effectiveness of their distance courses. Thus, an interactive qualities rubric may address a need that currently is unmet. If effectively done, a rubric that presented such criteria could help develop distance learning as an effective instructional delivery format.

How Do We Define "Interactive Qualities" in Distance Learning?

As a first step toward identifying qualities and activities that would enhance distance learning courses and that could be assessed in a rubric, the authors reviewed definitions of terms used in the research literature related to interaction. We found not only one word but two: "interaction" and "interactivity." Also, we discovered some consensus and some areas of disagreement in defining and using these terms.

Based on their review of literature, Gilbert and Moore (1998) define interactivity on computer-mediated instruction as a reciprocal exchange between the technology and the learner, a process that he says is referred to as "feedback." Gilbert and Moore use the terms "interaction" and interactivity" interchangeably. However, Wagner (1994, 1997) draws a sharp distinction between the terms. Like Gilbert and Moore, she says that "interaction" is an interplay and exchange in which individuals and groups influence one another. Thus, interaction is when there are "reciprocal events requiring two objects and two actions (p. 20). On the other hand, she says "interactivity" seems to have emerged y for establishing connections from point-to-point … in realtime" (p. 20). Thus, interaction focuses on people's behaviors, while interactivity focuses on characteristics of the technology systems.

This distinction may add precision to our efforts at assessing distance learning courses, but it is evident that both qualities are necessary to achieve the aspects students find so desirable and that appear to be major contributors to course effectiveness. Also, it is clear there is a close relationship between these qualities; one cannot exist without the other. Technologies that allow high INTERACTIVITY seem necessary to allow high person-to-person, person-to-group, and person-to-system INTERACTION.

Can Distance Learning Offer Enough Interactive Qualities?

It should be noted that the literature in this area reveals some doubts among students and faculty that distance learning ever can have the degree of interaction possible in a non-distance environment. For example, a study by Smith (1996) found that about 30% of the nearly 400 respondents to a survey about distance learning options would never choose DL because they felt that it could never provide the qualities they desire in a face-to-face course. However, studies such as one by Miller and Webster (1997) have found no significant difference in assessments of interaction between students in a synchronous (face-to-face) and asynchronous courses. Horn (1994) and Hirumi and Bermudez (1996) are among those who find that, with proper instructional design, distance courses actually can be more interactive than traditional, face-to-face ones, providing more personal and timely feedback to meet students' needs than is possible in large, lecture hall-type face-to-face courses.

Elements of Interactive Qualities in Distance Learning Courses

Variable #1: Social and Rapport-building Activities

Gilbert and Moore (1998) and Wolcott (1996) note that establishing rapport and collaboration among class members and between class members and instructor is an important role the instructor must undertake in a distance course. They find that interaction in distance courses can have either social and instructional aims. Gilbert and Moore (1998) feel that both purposes are valid and, indeed, necessary, noting that social rapport and increased collaboration can lead to greater levels of interaction related to course content which, in turn, can promote instructional goals and increase learning.

Variable #2: Instructional Designs for Learning

Distance learning studies indicate that effective distance courses are ones in which the instructor promotes interaction in ways that encourage reflection and discussion on course topics and concepts. Much of the literature in this area focuses on instructional designs to increase this kind of participation and feedback (Roblyer & Ekhaml 1999). The focus of this dimension seems to be on increasing not only the number of interactions but the number of people involved in them. For example, having students present and discuss small group results with the class is perceived as a better design than merely having students do small group work and present to the instructor.

Variable #3: Levels of Interactivity of Technology Resources

Many authors describe that various technologies can be used to encourage and facilitate interaction. Recognizing that certain technological capabilities make it easier to encourage interaction, the rubric presented here uses Wagner's (1994, 1997) definition of interactivity as the innate capability of the technology to promote interaction. Desktop videoconferencing (Edmonds 1996) and web-based resources (Hughes and Hewson 1998) currently enjoy increasing popularity. However, it should be noted that equally important to the innate capabilities of technology resources are the techniques, designs, and methods used to take full advantage of them (Kimeldorf 1995)

Variable #4: Impact of Interactive Qualities as Reflected in Learner Behaviors

The last dimension involved in assessing interactive qualities of courses seems the one most often neglected: the impact on learners. McHenry and Bozik (1997) point out that students respond to effectively (or ineffectively) designed distance courses with observable behaviors. This dimension evidences itself most often in students' increased or decreased willingness to use the various technology resources (e. g., chat features, microphones), to collaborate with other students, to take responsibility for requesting needed information from the instructor, and to initiate and participate in class discussions and other activities. Thus, instructors can tell if their designs are working if, by the end of the course, students show increased willingness to participate and initiate interactions.

Methodology Used to Develop and Revise the Rubric

After the four elements were identified, the rubric was developed by creating a 1-5 scale with descriptions of levels of performance for each element. A checklist for evaluating the usefulness of the rubric was developed based on criteria for effective rubrics in described by Jonassen, Peck, & Wilson (1999, p. 225). This rubric evaluation checklist is shown in Figure 1.

Instructors and students who are currently involved in distance courses at the University of West Georgia were asked to use the checklist to review the rubric and give their feedback on aspects that should be revised to make the rubric more useful. Some 35 instructors and students responded with comments and suggestions, and the rubric was revised based on their feedback.

Elements: Comprehensiveness – Are all of the important elements of "interactive qualities" identified?

______ Important elements are missing. Please list: ______________________________
______ All important elements are all identified.

Elements: Unidimensionality – Are all elements reduced to their most basic components, or do they represent two or more factors that are better addressed separately?

______ Elements should be broken down further. Please list: ____________________
______ Elements are uni-dimensional. They cannot be broken down further.

Ratings: Distinctiveness – Do ratings represent clearly different categories, or is there overlap or ambiguity?

______ The descriptions for the 1-5 ratings of one or more elements overlap. Please tell which:
______ There is no overlap. Ratings for each element are distinct from one another.

Ratings: Comprehensiveness – Are the correct number of ratings present?

______ Five points are *not enough* or *too many* for the rubric scale. Please tell which: ________
______ Five points is the correct number to cover the range of interactive qualities.

Clarity – The extent to which distance instructors and students will understand the rubric.

______ Instructor and students will not understand some terms. Please identify: ____________
______ Instructor and students will understand all terms

Figure 1. Checklist for Evaluating Interactive Qualities Rubric Draft

Revised Rubric: Current and Future Uses

The revised rubric is shown in Figure 2. For this rubric to be most useful to distance instructors, they must first have read the descriptions of the elements and be acquainted with the definitions and, ideally, the uses of the technology resources described.

This rubric is viewed as one of many tools that could help improve the quality of distance learning courses in ways that make them more responsive to student needs. Plans are underway to do additional formative evaluations and revisions of this instrument to increase its usefulness as a self-assessment tool for instructors of distance courses.

RUBRIC DIRECTIONS: The rubric shown below has four (4) separate elements that contribute to a course's level of interaction and interactivity. For each of these four elements, circle a description below it that applies best to your course. After reviewing all elements and circling the appropriate level, add up the points to determine the course's level of interactive qualities (e.g., low, moderate, or high)

Low interactive qualities	**1 - 7 points**
Moderate interactive qualities	**8 -14 points**
High interactive qualities	**15-20 points**

Scale (see points below)	**Element #1 Social Rapport-building Activities Created by the Instructor**	**Element #2 Instructional Designs for Learning Created by the Instructor**	**Element #3 Levels of Interactivity of Technology Resources**	**Element #4 Impact of Interactive Qualities as Reflected in Learner Response**
Few interactive qualities (1 point)	The instructor does not encourage students to get to know one another on a personal basis. No activities require social interaction, or are limited to brief introductions at the beginning of the course.	Instructional activities do not require two-way interaction between instructor and students; they call for one-way delivery of information (e. g., instructor lectures, text delivery).	Fax, web, or other technology resource allows one-way (instructor to student) delivery of information (text and/or graphics).	By the end of the course, all students in the class are interacting with instructor and other students *only* when required.
Minimum interactive qualities (2 points each)	In addition to brief introductions, the instructor provides for one other exchange of personal information among students, e.g., written bio of personal background and experiences.	Instructional activities require students to communicate with the instructor on an individual basis only (e. g., asking/responding to instructor questions).	E-mail, listserv, bulletin board or other technology resource allows two-way, asynchronous exchanges of information (text and/or graphics).	By the end of the course, between 20-25% of students in the class are initiating interaction with the instructor and other students on a voluntary basis (i.e., other than when required).
Moderate interactive qualities (3 points each)	In addition to providing for exchanges of personal information among students, the instructor provides at least one other in-class	In addition to the requiring students to communicate with the instructor, instructional activities require students to work with one another (e. g., in pairs or small	In addition to technologies used for two-way asynchronous exchanges of text information, chatroom or other technology allows synchronous	By the end of the course, between 25-50% of students in the class are initiating interaction with the instructor and other students on a voluntary basis

	activity designed to increase social rapport among students.	groups) and share results within their pairs/groups.	exchanges of written information.	(i.e., other than when required).
Above average interactive qualities (4 points each)	In addition to providing for exchanges of personal information among students, the instructor provides several other in-class activities designed to increase social rapport among students.	In addition to the requiring students to communicate with the instructor, instructional activities require students to work with one another (e. g., in pairs or small groups) and share results with one another and the rest of the class.	In addition to technologies used for two-way, asynchronous exchanges of text information, additional technologies (e. g., teleconferencing) allow one-way visual and two-way voice communications between instructor and students.	By the end of the course, between 50-75% of students in the class are initiating interaction with the instructor and other students on a voluntary basis (i.e., other than when required).
High level of interactive qualities (5 points each)	In addition to providing for exchanges of personal information among students, the instructor provides a variety of in-class and outside-class activities designed to increase social rapport among students.	In addition to the requiring students to communicate with the instructor, instructional activities require students to work with one another (e. g., in pairs or small groups) and outside experts and share results with one another and the rest of the class.	In addition to technologies to allow two-way exchanges of text information, visual technologies such as two-way video or videoconferencing technologies allow synchronous voice & visual communications between instructor and students and among students.	By the end of the course, over 75% of students in the class are initiating interaction with the instructor and other students on a voluntary basis (i.e., other than when required).
Total for each:	**______ pts.**	**______ pts.**	**______ pts.**	**______ pts.**
Total overall:	**_____ pts.**			

Figure 2. Rubric for Assessing Interactive Qualities of Distance Learning Courses

References

Edmonds, R. (1996, July). *Distance teaching with a vision.* Paper presented at the Biennial Conference of the Australian Society for Educational Technology, Melbourne.

Futuristic Strategies for Designing and Implementing World Wide Web Presentations

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This presentation is designed for people who intend to create and implement pages for the World Wide Web. The techniques and methods presented can be applied not only to create an informative, engaging presentation but also to maintain such a presentation. Emphasis will be placed on four key players involved in the design process: presenters, information stewards, designers, and Web site users. Techniques and methods that lead participants step by step from conception of a project through successful design will be presented.

Online Resources for ESL/EFL Teachers and Students: An Approach to Organization and Structure

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This paper discusses the structure and organization of ESL websites and online educational resources. The design, implementation and initial evaluation of the online teaching/learning resource system that is provided through the Distance Education ESL Endorsement Program's (DEEEP) website are presented here.

Introduction

With the rapid and massive transformation of global informational resources into electronic format and their easy accessibility through the Internet, the daily growing number of users begins to feel overwhelmed with the abundance of information on the Web on any imaginable topic. We now face an increasingly complicated and time-consuming problem of searching and selecting specific information, and we need high-quality, relevant pages in response to a particular need for certain information. We are now in a paradoxical situation in the online education: the more information opportunities we obtain through the Internet, the more difficult it becomes to make use of them. This problem urgently calls for two important solutions: first, to rationalize the Internet navigation through developing new search engines, and second, to effectively organize the online resources and websites themselves, particularly those that offer special information and services. The group of authors under a collective name Members of the Clever Project in their article Hypersearching the Web (1999) focus on the first issue.

To a great extent this issue concerns web-based educational and professional development sites. It is evident that the outcomes of Internet teaching/learning resources' use and online education in general to a great extent depend on the efficiency of their search and selection, on the one hand, and on the relevancy and structure of informational resources that should be available in a "well-organized form" (Romiszovski 1997, 27), on the other. We would like to share our approach to the second issue of organizing and structuring the educational resources using our experience in creating the DEEEP website. DEEEP (Distance Education ESL Endorsement Program) is essentially a professional development program for the teachers of English as a Second Language (ESL) in Utah.

What are the Educational Resources?

educational resources" (ER) itself that, in our understanding, means *an organized and structured collection of relevant information, texts, courseware, and other educational materials available in various formats and used for teaching, training and learning*. As we deal with the online ER here, it is presumed that they all exist in electronic formats allowing them to be transmitted through the Web, so we also use the term "*electronic educational resources*" (EER). We feel that in dealing with the current phase of EER development it is premature to talk about a system of online resources, however it might be a goal in developing an individual resource database. Anyway, it is essential that this collection is organized in some rational way to provide an easy and efficient access to all the resources. The structure of the ER has to reflect its purpose: is it for teachers or learners; is it offered through a college or a business website; is it used to provide accredited distance education, some stand-alone web-based courses or other educational services (e.g. texts, exercises and advice for independent learners), or does it serve as a students' resource facility developed by a school to provide in this way online support for traditional campus-based, face-to-face education; is it an organized and well-structured system or just a random assortment of various materials for self-education; is it maintained by an organization or an individual enthusiast; and finally, is it comprehensive (inclusive) and self-sufficient or just a liaison listing the links to other sites.

Resources Online

In (Members of the Clever Project 1999, 54) the authors single out two types of Web pages: 'authorities' and 'hubs', the former being the best sources of information on a particular topic, the latter collections of links to those locations. This is a general subcategorization of the websites that reflects the major distinction between them. Our research of online ESL/EFL resources showed that all existing websites that contain EER can be divided into 3 groups depending on the scope of educational services they offer, and their inclusiveness: 1) *comprehensive* – provide a whole range of educational products and services, from online courses to related links (e.g. ENGLISHTOWN, GlobalEnglish, Peak English, English Online at The New School, etc.); 2) *supportive* – offer a variety of educational products and services, like materials for teaching/learning, chat, links, etc. (e.g., Dave's ESL Café, NETEACH-L, The Linguistic Funland, ESL House, etc.); however, they do not support any regular established training and follow-up; 3) *intermediary* or *liaison* – only point out to the sites that are associated with the topic and give their links to them (e.g. TESL/TEFL/TESOL/ESL/EFL/ESOL Links, US State Department's Office of English Language Programs, etc.). As we have discovered, very few sites offer online courses, some provide materials for reading, writing, grammar, vocabulary, pronunciation and other skills development, as well as relevant links. A few sites provide a communicative function offering Bulletin/Message Boards, discussion, or chat (e.g. Dave's ESL Café, SUNY Gopher). There are also promotional sites that advertise their products but do not offer any online materials or support (e.g. World English). It takes time for the user to get oriented in this immense and unstable sea of information, for you do not know which site offers what you need, or what information is reliable and what materials are of good quality; sometimes the information and links on the site are not well organized, often some links quoted by the sites are already dead, etc.

It becomes more urgent that the sites need to be updated and evaluated (Kirk, 1996). There are two most ordinarily used criteria for evaluating the site: the number of hits, and the number of references to the site. An expert evaluation approach can also be used: a group of experts may be asked to evaluate the organization, structure, content and format of the websites in each specific area, e.g. ESL/EFL links may be checked once in a while (once a year?) and the results of such an evaluation will be made public thus serving as a guide in the multitude of Web sites. The question is, who will be able to undertake such a venture?

Clear information representation in the website and easy access to the resources facilitate the user's ability to find and process the available information and materials. The degree to which the user/teacher can access and manipulate those resources should be increased through better structuring and organization.

As the majority of websites are designed for the random individual users, its structure is determined by the willingness and capability of the designers to cover as many topics and items as possible. The ensuing effect is the overloading of the home page. The overload, naturally, hinders the effectiveness of the search, evaluation and use of the resources. The specialized sites that provide certain services, e.g. accredited training and learner support, are more narrow and focused.

A typical ESL website includes, as our analysis shows, the following components:

Schools: universities and colleges offering ESL programs
Organizations: professional or other organizations
Distance Learning (classes): complete courses, separate lessons and various materials for learning
Resources (teacher's and/or learner's): lesson plans, activities, exercises, texts, poems, dialogues, songs, idioms, slang, quizzes, games, tapes, videos
News: news, announcements, newsletters, e-magazines, current events and happenings, and conferences
Communication facility: bulletin board, (discussion) forum, chat, message exchange, mailing list, teacher/student email

Books section: online libraries, bookstores, publishers, books, textbooks, journals, articles and papers
Support: help (center), guides, hints, tips, advice, FAQ's
Relevant links (classified or unorganized)
Technology: web page creation tips, recommended authoring software, multimedia, programs to download or order
Some sites also give ESL/EFL job search tips and links

As we can see, these areas tend to cover all the issues that an ESL teacher might be interested in. However, few websites provide EER for the ESL teachers' professional development (PD) and full-scope support for classroom practices.

Distance Education ESL Endorsement Program (DEEEP)

The DEEEP program was developed in 1998 as a partnership project among the University of Utah and the six biggest Utah school districts. The purpose of DEEEP is to prepare teachers of all levels (elementary, middle and high) and school administrators to address the needs of the ESL students in their class. These needs stem from the increasing cultural diversity in Utah, which mirrors the processes going on around the USA that are brought about by intensive immigration from various countries. The program offers a choice of two lines: a Master's Degree in either Education or Linguistics and/or an ESL Endorsement. The implementation objectives were to use distance education technology to deliver the program to the sites at local schools, and a collaborative model involving university faculty, school administrators and K-12 teachers in the program design, course development, program management and decision-making.

DEEEP currently offers two PD formats: a three-year program consisting of 8 courses in Education and Linguistics that apply to both a Master's Degrees and Endorsement, and an Endorsement program of two years that consists of five courses: Issues and Research in Multicultural Education, L2 Methodology, Content Based Language Teaching, Minority Languages' Issues in Education, and Materials Development and Practicum. We are presently developing a one-year endorsement program that will include extensive online support. DEEEP is evolving from a traditional "hands-on", one-time training program with tentative technology use into a continuous, Web-based, multifunctional, in-service professional development and support system based on contemporary technologies.

DEEEP Website Organization and Structure

In 2000, DEEEP developed and put online its website. It was designed as an online teachers' continuous professional development and support system that would offer two major types of ER for the teachers enrolled in this program:

1. Resources in ESL/bilingual issues (based on the DEEEP curriculum and courses, and also using outside sources) that can be used in a face-to-face workshop-type facilitator-supported group training and for individual learning through the Internet as a professional development resource.
2. Resources for the teachers' classroom activities.

The structure of the website is determined by its goals. We realized that the teachers in the DEEEP program needed the following:

- Information about the Program
- Access to the courses, course materials and instructor
- Support of their teaching practices in the classroom.

The structure and organization of the DEEEP website meets these needs. It contains information about the Program, about the courses offered for the ESL Endorsement and Masters' Programs (Virtual Campus), the Teachers' Resource Online Library (TROL), a News and Events section, and a Help Desk. The Program part also displays the syllabi, course and reading materials. TROL offers materials for teachers to use in the classroom: curriculum, lesson plans, texts, activities, support materials, and useful links to Utah organizations and institutions (Utah State Office of Education and school districts' websites, and similar programs) The Web site also will provide an opportunity for student communication and collaborative activities. As continuous methodological support is essential for the practicing teacher who may be faced with a complicated situation in the classroom, we plan to develop an automatic Teachers' Expert and Support System (TESS) that would offer the teachers professional advice and practical recommendations for their work. The ultimate goal is to develop a fully Web-based Distance PDS system that can serve both the DEEEP students and the local community of teachers who are not enrolled in the DEEEP program. DEEEP courses will be offered online only to the registered DEEEP students, whereas other resources will be free for anybody.

In the first stage (June – August, 2000) we developed the DEEEP website informational structure. In the second stage (September 2000 – May 2001) we are filling it with content and resources. DEEEP Website address: www.gse.utah.edu/DEEEP

DEEEP Online Educational Resource System

TROL is an essential part of the DEEEP Website. It is organized so as to provide maximum support for the teacher in search of the needed materials, information and advice.

There are various formats of the online resource organization: menu, table, scroll, map or chart. One of the most efficient, in our view, is the hierarchical organization of the resource website: from the more general topics to the more concrete. In the development of the DEEEP website we applied this principle: The first level was presented on the home page - we had only seven main items in the menu that hyperlinked to the chapter homepages (second level). Each chapter had its own menu that took the user to the third level where, actually, the access to the materials proper started. However, we found out that we needed the fourth level that provided the necessary detailing of the materials. From each page of the subsequent level the user can return to the previous level as well as to the main homepage.

Here is the chat of the DEEEP EER system that is intended primarily for the schoolteachers who need support in solving ESL problems. We named it TROL (Teachers' Resource Online Library). Students can find the resources for themselves there as well.

TROL

		Teacher's Site		**Student' s Site**	
Professional Development		**Teaching Resources**		**Learning Resources**	
1. PD Programs & courses	**Self-study materials**	**Curriculum & lesson plans**	**Teaching materials**	**Online courses**	**Self-study materials**
2. Reference materials	**Expert support**	**Reference materials**	**Expert support**	**Reference materials**	
			TESS	**Live Expert**	
3. Communication)		**Communication**		**Communication**	

There are 2 major parts in this system: the *Teacher's* and the *Student's*. The former is divided into two chapters: *Professional Development Resources* and *Teaching Resources*, the latter contains *Learning Resources*. Each of the three chapters has an index page.

The contents of each chapter have three levels: 1. *resources* (programs/courses and materials for teaching or self-study), 2. *support* (reference) level and 3. *communications* level (BBs, discussions, chat and conferencing),

The *Teachers'* support level also includes *Expert* modules that havve two implementation forms: an automatic expert system TESS and live expert service. Other *Reference* modules include encyclopedias, dictionaries, links to other reference sites and materials, etc.

Each individual part is a module of the system. The modules and items within them can be hyperlinked and be used for creating new structures. This assures structural flexibility of EER and their more efficient use.

Organization of the Resources

The resources in this website are organized around several principles, the major one being adherence to the core curriculum, then content areas, levels, structure of the resources, and their format.

The ESL ER offered through this website are divides into two parts:

ESL Issues

Across the Content Area | *Language*

Content Area Issues and Strategies (Math, Science, Lang. Arts, Soc. Studies)	*Linguistic Issues and Strategies*	*Cultural Issues and Strategies*

The teachers' and students' EER are structured in this way:

Teachers'	Students'
1. Curriculum	
2. Lesson plans	
3. Teaching materials	Learning materials
4. Classroom activities	Home assignments and tasks
5. Support materials	Support materials
6. Lesson organization and management	Tips for self-study

Each material is ranged according to six different levels of education: K-3, 4-6, 7-9,10-12, college, other.

All the EER in TROL are arranged according to the following major formats:

- Text-based Materials:
  - Textbooks
  - Other (texts, poems, songs' lyrics, tongue-twisters, idioms, etc.)

- Audio-based Materials:
  - Audio courses
  - Other (phonograms of the texts, dialogues, poems, songs, etc.)

- Video-based Materials:
  - Video courses
  - Other (video clips, movies, documentary, etc.)

- Computer-based Materials:
  - Computer courses
  - Other (computer games, learning programs, software for teaching/learning, etc.)

- Web-based materials:
  - Distance courses
  - Other (online teaching and learning materials)

The materials in each group may also include activities and tasks (problems, exercises, cases, etc.), and reference materials (encyclopedias, dictionaries, reference books, etc.)

Evaluation

As the DEEEP website and TROL are still in the developmental stage, we have not yet been able to evaluate them. However, based on the feedback from the DEEEP facilitators and students, as well as from the colleagues, we have grounds to believe that this organization and structure of the online ER will be advantageous to the users – schoolteachers who need continuous, updated, effective pedagogical resources for their productive classroom activities and professional growth.

References

Kirk, E. (Last modified 1/04/2000) Evaluating Information Found on the Internet. Milton's Web Home Page. http://milton.msc.jhu.edu:8001/research/education/net.html

Members of the Clever Project (1999) Hypersearching the Web. *Scientific American*, June, 54-60.

Romiszovski, A. (1997) Web-Based Distance Learning and Teaching: Revolutionary Invention or Reaction to Necessity? *Web-Based Instruction*. Ed. By Badrul H. Khan. Educational Technology Publications, Inc. Englewood Cliffs, NJ, 21-40.

Serdiukov, P. (1999) Design of a Distance System for Professional ESL Teachers' Support. *Proceedings of ED-MEDIA 99 World Conference on Educational Media, Multimedia, Hypermedia & Telecommunications*. Seattle, 1494-95.

Telementoring Beginning Teacher Researchers

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Abstract: This study examines the daily processes that occurred as a telementor worked with a group of beginning high school teachers on their classroom inquiry projects. It outlines the basic issues that were confronted during this project: motivation and involvement, what kinds of advice to give, which tools to use, and how to help teachers find answers within themselves. This study contributes to the knowledge base concerning the issues that telementors might face and suggests further areas that might be explored.

Introduction

Qualitative forms of classroom-based inquiry such as teacher research (http://gse.gmu.edu/research/tr/) have been gaining credibility and popularity among educational practitioners. With the development of new technological tools, we now have additional opportunities to begin linking teacher researchers together across distance and time (Shafer, 1999). At this juncture, it is important to look closely and carefully at what actually happens when experienced teacher researchers mentor beginning teacher researchers. How might the work of beginning teacher researchers and the school-based change initiatives they are exploring be supported?

During the 1999-2000 school year, I served as the university-based mentor for the George Mason University Language Minority Teacher Induction Project (LMTIP). Along with two school-based teacher mentors, we supported a group of seven beginning teachers who taught in a high school in the District of Columbia. During the first half of the school year, the teacher mentors focused on building community among the group of new teachers. They gave advice and support on how to navigate the bureaucratic processes and daily routines of their school. During the second half of the year, the focus of the group shifted to classroom inquiry projects.

Induction training that involves classroom-based inquiry projects is important because as Brown, Collins, & Duguid (1989) point out

> the activity in which knowledge is developed and deployed, it is now argued, is not separable from or ancillary to learning and cognition. Nor it is neutral. Rather, it is an integral part of what is learned. Situations might be said to co-produce knowledge through learning and activity. Learning and cognition, it now possible to argue, are fundamentally situated (Brown, Collins, & Duguid, 1989, p. 32).

One of the goals of the LMTIP was to find ways to help beginning teachers develop connections among the theory they had learned in their graduate coursework and the practical realities they faced each day as they taught.

Besides supporting the two teacher mentors as they worked with their group, my role (or so I thought) was to my six years of experience conducting teacher research as a classroom teacher as I worked directly with the teachers as they conducted their classroom inquiry projects. However, because of scheduling conflicts, I could not attend every one of the bi-weekly meetings at the school. I needed to find an alternative solution for mentoring the teachers.

The study

While I had read descriptions regarding others' attempts at telementoring such as Spitzer, Wedding, & DiMauro (1994), I still was not sure how the process might unfold for me. I decided to do my own inquiry project on my experiences, using the teacher research process to do a study on my experience.

As part of this study, I looked at my research question from several angles, collected data and reflected on that data, and triangulated it with others' perspectives and a variety of evidence (MacLean & Mohr, 1999). As a result of the first casting of my research question, the layers within it were

First question cycle

I. **What** happens when teachers use email to talk about their teacher research projects?
II. **How do** teachers get motivated to use email to talk about their teacher research projects?
III. **What** kinds of email conversations (or events in their lives) lead teachers to use email to talk about their teacher research projects?

As the project developed, I recast my question to examine it from a different angle:

I. **What** happens when I give advice to teachers on how to do classroom inquiry projects?
II. **How** do teachers use that advice?
III. **What** kinds of advice are more effective?

At the end of these two question cycles, I poured all of the written data (51 emails from the researcher; 38 email replies back; and 18 journal entries) into NVivo, a qualitative software program, and analyzed it for underlying patterns. I used coding analysis and connecting analysis techniques (Maxwell, 1996) to organize my data into chunks of text that contained recurring themes and to look for the connections among those themes. The four topics that emerged during this analysis centered the following themes:

- **Motivation and involvement**
- **Advice**
- **Tools**
- **The validation of the production of local knowledge**

Findings

Motivation and involvement

When I had first suggested to the seven teachers that I wanted to try to use email to help them with their projects, they had responded enthusiastically. I divided the teachers into three groups of two, two and three teachers. I hoped that by using groups, they would be under less individual pressure to respond to every one of my emails if their schedules became too hectic. I chose email because I wanted to use a communication tool that would be part of their daily routines—and since most of them check their email every day or so, it seemed that there would a higher likelihood of them using it.

I began by sending out regular emails to each group every Wednesday and Saturday. Yet after a month, I had grown frustrated and worried over the fact that I was only getting sporadic replies. I became worried that, if this trend continued, their projects might progress so slowly that they would not have explored their questions enough to be able to write about them at the end of the school year.

Several factors may have played a part in the initial low level of involvement. First of all, teaching is quite time-intensive and demanding. One teacher finished one of his emails, commenting, "Right now I am blank again. Talk about being fried. My brain does not want to function anymore." Another factor may have been that the teachers were getting enough support from the face-to-face (F2F) bi-weekly meetings. Those meetings had both oral and written sharing times. It may have been easier to not participate as much in less contextually-rich interactions such as email when it is easier to get a higher-context interactions in a F2F meeting. The added task of writing emails to me may have been one more task to add to their already-too-full lists of things To-Do.

Perhaps the beginning teachers had too many options for support? Perhaps it was easier to focus more on participating in the F2F on-site meetings than doing the online activity? In this light, the online support I offered may have been a bit superfluous. One important aspect of online telementoring is to find out what kinds of on-site support might also be occurring.

In the end, what seemed to motivate the teachers to contact me and spend more time on their projects was the final deadline. In June, they would need to submit and share their final project at a conference with the fifty other teachers who were part of the LMTIP. In mid-March, Rob captured this sentiment when he ended his email with the comment, "I feel my clock ticking..."

Yet what *did* work well with the telementoring approach that I was using? When I looked more closely the teachers' response rates, I found that, except for one of the seven teachers, I was only getting scattered responses to my emails. Why were any of the teachers writing back to me?

One teacher's reply showed one of the advantages of using email. For him, it was a private way to ask additional questions. Rafael began one of his emails with the following paragraph:

> Date: Mon, 7 Feb 2000 18:40:55 -0800 (PST)
>
> Well, here goes nothing. I am still unsure about what my research question should be or should focus on. To be perfectly honest, I don't know what I am doing at all. I was feeling a little embarrassed to bring this up with the entire group. Currently there are some issues occupying my mind....

In this regard, it seems that the choice of communicating via email seemed much more useful because it was more private than, for example, using an asynchronous discussion board.

Advice

Yet, Rafael's response rate was intermittent. One other teacher, Naomi, corresponded with me regularly. What was she doing in her emails? Naomi seemed to approach her inquiry project differently than the others. When she began her project, she did not begin by focusing as much on the steps of the research process. Instead she spent more time reflecting on what was happening in her classroom. It seemed that she used her emails as part of an ongoing dialog with Rob, the other teacher who was part of her email triad, and myself. As she talked to us, her emails seemed to be a way that she could *give advice to herself.*

> Date: Wed, 23 Feb 2000 20:00:46 –0500
> Hi all -
>
> I think I may have found something. There is one student I have in my Intermediate ESL Reading Development class. She is always there (good attendance) and participates, and adds to discussions, and seems to genuinely try hard, but she is very disorganized, and often fails to complete and turn in assignments, although she seems to know the information. I noticed her good intentions but extremely messy backpack and papers. Her papers from her different classes were sort of wrinkled and crammed together in various spiral (without pockets) notebooks. She rarely knew where any specific paper or assignment was. When her name has come up with at least one of her other teachers (and I know the others so I can talk with them), he rather shook his head with half a chuckle and half a moan and said, "Oh yes, ________. I know her.... I would be interested to see if helping her (and some peer tutoring) be more organized would make a difference in her performance and achievement overall. I have helped similar students get organized once and then usually not checked on them again. I wonder if some one on one attention and consistent help with organization and study skills can help her (and students like her) in my class and across the board. I could check in with her teachers from last semester, look at her grades and progress reports, and also speak with and check in with her teachers from this semester (and that way measure progress), and perhaps make contact with the family. I have just seen so many people say (about other similar students) that it does or doesn't make a difference to work with and pay attention to these things.
>
> So, that is what has grabbed me - it grabbed me before I even considered it for a research project. What do you think.
> Later,
> Naomi

When I compared her final project to the Teacher Research Continuum Ratings Scale (Shafer, 2000), it seemed that the reflective writing Naomi had done had helped her to reexamine the assumptions she held about her teaching practices—one of the key aspects of qualitative classroom inquiry.

However, in retrospect , I can see that the advice that I offered on the actual steps of the research process was not clear enough. Before my study had begun, I had assumed that it would be important for me to provide technical advice on how to actually do some of the techniques related to teacher research. I also wanted to give real-life examples of how to conduct an inquiry project. At this point, I wondered if the examples I used from my own parallel project to exemplify the steps were helpful insights or just a distraction to them? So often, a mentor's first impulse is to tell his/her own story rather than focusing on the other's story first and foremost. That seems to be what I had done. At the end of this study, several teachers told me that my initial technical advice about how to cast a question and collect data on it had been helpful and interesting, but that it was too indirect in how it was delivered.

Tools

When I had begun this study, I had assumed that I would be able to help these new teachers just by using email. However, when I gave a survey to the teachers as part of my data collection, Rob commented that "the emails need to feel more like a dialogue." Bakhtin (1986) suggested that no utterance comes from out of the void, but relates to that which came before it (Bakhtin, 1986). Cobi, one of the teacher mentors, built on this idea when he made the following observation in an email to me. All of these comments helped open my eyes to the importance of these dialogs.

> Date: Sun, 20 Feb 2000 09:08:09 EST
>
> You say [in the email you wrote last time] that e-mail is a lot more conducive to thinking. I suppose that conversations are more spontaneous and interactive and less reflective, but people are also talking to themselves in those conversations as much as they are talking to the others in the room -- just as we are when we e-mail. It's always interesting to see people's wheels turning as they consider new ideas in the conversations.

The advice that Naomi was giving herself did not take place in a void, but was situated within an ongoing conversation. The challenge for was to tap into the dialogs that were taking place at the school and continue them in our email conversations.

Both comments led me to reexamine my use of email as my primary communication tool. It left me too far out of the loop. It occurred to me that I needed to offer the teachers many different kinds of tools and interactions, not to limit myself to one style. At this point in the study, I began to explore the kinds of tools and interactions that might support the development of these dialogues.

In light of what I was learning about the power of giving advice to one's self in order to reveal one's assumptions and the importance of situating this advice within a dialog, I began look for other kinds of strategies that might offer these two elements. I attended a presentation by Marino Alvarez of Tennesee State University. He described how he was using concept maps as part of the Explorers of the Universe Project. University-based researchers were holding asynchronous dialogs with high school students in order to help them to organize their own thinking for their high school science research projects (Alvarez, Burks, Sotoohi, King, Hulan, & Graham, 2000).

I wondered whether I might use concept maps in a synchronous interaction, as part of individual, F2F conferences? During the conferences I would use guiding questions that focused on the teachers' assumptions about their teaching practices. As the teachers talked about their projects, I would record and map out what they said. Afterwards we would both go over the map and try to draw connections between the assumptions and the instructional practices that they were putting into practice—both of which they had just described to me. My taking over the writing aspect of the task, I would free up the teachers to think and speak about their question—and still be able give them record of what they had said when we were done.

As these individual conferences progressed, I noticed how different they were from the asynchronous interactions we had conducted via email. On April 13, I wrote

> I realized that when we're doing these F2F synchronous conferences, we needed to *hear* the sound of each other's voices and have super-fast writing tools. I wrote so quickly across each page as they each were talking. There was also a strong emotional component to these conferences. We had the ability to look at each other directly and read facial cues. We had access to 3-D supplies to support the conversation.... The technology just is not there yet. For now, I would need F2F meetings to get this rich type of exchange.

Even a chat room exchange would not have captured the energy or layers of information that exchanged during our meetings. For the time being, online synchronous interactions still do not reach the depth of F2F synchronous interactions and therefore, limit the amount of information and context that is available to the participants. Written dialogue does not offer the free flow of thought or interplay that oral dialogues have. There seemed to be a strong affective quality to our conferences. One teacher, My-Ling, later used what we discussed during her project as the central frame for her final written project (George Mason University Language Minority Teacher Induction Project, 2000).

Advice (revisited)

I looked more closely at the advice that My-Ling had given herself during our conference. It seems that the F2F synchronous meeting was useful to her because, as she was describing her project to me, she was showing changes in the underlying feelings and assumptions that she held about her instructional practices. She demonstrated emotions such as frustration, confusion, surprise, and happiness during our talk together. Looking back, I can see that there was much more of an affective (AHA!) component in our F2F conference than in our email exchanges.

My-Ling described how surprised she felt when realized that she was spending so much time on making her math lessons fit the progressive methodologies that she had learned as part of her teacher preparation program, when, in contrast, her immigrant students kept telling her that they were more comfortable with, what she described as, traditional forms of instruction. She wondered if she had been asking them to make too big of a cultural leap too soon after their arrivals to the United States. As we went over her map, she saw how her underlying beliefs were telling her one thing, while her students were telling her another thing. In the end, she decided give her students more of a balance between traditional and progressive styles of instruction so that the students might use learning styles that fit their cultural backgrounds and gradually acculturate themselves to the more progressive forms of instruction that they might meet later on in the mainstream classroom (Delpit, 1988).

Validating the production of local knowledge

When I began this study, I assumed that the teachers would quickly take to the idea of searching for their own answers to their problems. Throughout my study is seemed that the teachers were having difficulty accessing their own prior knowledge regarding the instructional challenges they faced.

It seems that, from the very start of the project, the beginning teachers saw knowledge and expertise as residing in others or in research books and articles, but not as much in themselves. Granted, they were new to the profession, yet I found it interesting to listen and watch as they used the dialogs that they had with the teacher mentors, each other, and myself to reveal to themselves how they might approach their instructional problems. I recorded one example of this in my journal in mid-April.

> During our conference, Hans commented, "I need some articles." "Why?" I asked him. "What specific things that you've seen in your classroom do you want to check out?" "Well, I need to find which strategies I should use..." he replied. Then he proceeded to recount all of the strategies he remembered from his coursework at a local university. "I might use this strategy or I could use that
> do you need more articles for when you've got the stuff in your head? You just need to organize it and then try it out to see if it works." "That's the next step?" he asked. "That's the next step," I replied. "What do you think you might do tomorrow?"

Conclusion

I learned during this project that, even before direct advice on the steps in the research process can be followed, it is important for teachers to either write or talk reflectively about their questions and to begin identifying their underlying assumptions regarding classroom instructional practices. In the future, I would like to look more closely at how to effectively use online communication to convey the actual steps of casting questions, gathering data, triangulating evidence and other technical aspects of teacher research. Beyond that, it seems that the reflective dialogs we held as they focused on classroom inquiry projects were useful in helping the teachers to make connections between theory and practice—at the same time as they also helped teachers to think more for themselves.

In the future, I would also like to explore how to combine asynchronous and synchronous tools to get the best of both of these types of interactions. As Dede & Kremer (1999) point out, most subject matter has the potential to be understood better with a mixture of media. Perhaps we are limiting ourselves when we use one medium. Perhaps, we might use synchronous interactions to get those synergistic leaps of thought and to increase motivation, while using asynchronous interactions to promote reflection and to fit in with teachers' busy schedules. Because the telementor cannot always have the luxury of F2F communication, more research needs to be on how to expand our repertoire of communication tools.

References

Alvarez, M., Burks, G., Sotoohi, G., King, T, Hulan, B., & Graham, A. (2000). Students creating their own thinking-learning contexts. New Orleans, Louisiana: Paper presented at the American Education Research Association Annual Meeting. Additional information on this project available WWW: http://explorers.tsuniv.edu/concept.asp.

Bakhtin, M. (1986). *Speech genres and other late essays.* (C. Emerson & M. Holquist, Eds.; V.W. McGee, Trans.) Austin, Texas: University of Texas Press.

Brown, J, Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Education Researcher, January February*, 32-42.

Dede, C. & Kremer, A. (1999). Increasing student participation via multiple interactive media. Available WWW: http://www.doiiit.gmu.edu/Archives/feb98/cdede.htm.

Delpit, L. (1988). The silenced dialogue: Power and pedagogy in educating other people's children. *Harvard Educational Review,* 58, 280-298.

George Mason University Language Minority Teacher Induction Project. (2000). *From concept to practice: Beginning teachers' reflections on language minority education, Volume III.* Fairfax, Virginia: George Mason University Graduate School of Education.

MacLean, M. & Mohr, M. (1999). *Teacher-researchers at work.* Berkely, California: The National Writing Project.

Maxwell, J. (1996). *Qualitative research design: An interactive approach.* Thousand Oaks, California: Sage Publications.

Shafer, L. (1999). Creating an electronically-based teacher research knowledge network: EDIT 895 Project #2. George Mason University: Unpublished paper.

Shafer, L. (2000). Teacher research continuum chart. George Mason University. Available WWW: http://gse.gmu.edu/research/tr/TRprofessional.shtml

Spitzer, W., Wedding, K., & DiMauro, V. (1994). Fostering reflective dialogs. Available WWW: http://www.terc.edu/papers/labnet/Guide/Fostering_Refl_Dialogues.html.

From Email to Virtual Reality: An Online Master's of Education in Educational Technology that Models Interaction

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Abstract: This paper addresses how Northern Arizona University (NAU), an institution that serves mostly rural students in Arizona, created and implemented a totally online Master's of Education in Educational Technology degree that is based on the constructivist theory, promotes and fosters interaction among students, between student and instructor, and between student and content. A discussion of the fourth type of interaction, interaction with the technology interface, is also addressed. Finally, the authors talk about how Active Worlds, a three-dimensional, virtual reality environment that allows interaction, is built into the master's program.

Introduction

The last two decades of human history have seen technological advancements with no parallel in previous years. Telecommunications, especially the Internet, have changed the way people do businesses, have leisure activities, and attend to schools. Global networks link millions of users around the planet, and the rate of adoption is growing dramatically (Harasim, 1993). New distance education degrees that use only the World Wide Web as the interface of delivery are flourishing everywhere. In fact, many institutions fear that they will be extinct if they do not offer web-based distance education courses (Roblyer, 1999). This paper addresses how Northern Arizona University (NAU), an institution that serves mostly rural students in Arizona, created and implemented a Master's of Education in Educational Technology degree that is not only totally web based, but that uses cutting edge technology to promote and foster interaction.

Background Information

The Master's of Education in Educational Technology (MED Tech) aims to prepare technology forerunners in PK-12 schools who will (a) exhibit instructional leadership and model the integration of computers and related technologies throughout the curriculum, (b) implement effective solutions to instructional challenges including the design and development of instructional materials, and (c) identify, select, install, maintain, and manage computing hardware and software. Because the mission of this degree is to prepare classrooms teachers to view technology as an integral part of their teaching, focus groups and numerous discussions were held to (a) identify the philosophical framework that would drive the degree, (b) agree on different strands that would run across courses and which would give unity to the program, (c) develop new curricula, (d) get approvals that ranged from in-house committees to the Arizona Board of Regents, and (e) adopt the appropriate interface for the web courses that would ensure not only the seamless delivery of the program, but that would foster interaction among students, between student and instructor, and between student and content.

Review of Literature

As the Internet becomes commonplace, the "school without walls" has slowly emerged and is claiming its niche among the brick and mortar schools in the American educational system. In this kind of school, learning takes place anytime and anywhere when resources found at home, museums, libraries, and universities are woven together to connect learners that collaborate in distinctive new ways to form a community of learners (Spindler, 1995) joined not by geographical location but by common interests. As a consequence, the use of the Internet as a learning space has revolutionized distance education in higher education (Abrahamson, 1998). The segment of the population that embraces online distance education is largely composed of people who need to go back to school either to retrain or to keep abreast with changes in their professions, and classroom teachers are no exception. However, teachers need not only the knowledge base to integrate technology, but apprenticeship experiences that will build their confidence in technology use. To achieve that goal, special care was put to address the different types of interaction that research suggests are best practices in distance learning.

Moore (1989) described three desirable types of interaction in a distance learning setting: (a) learner-learner interaction, (b) learner-instructor interaction, and (c) learner-content interaction. The result of all of these types of interaction is the sharing of ideas, concepts and valuable feedback. The implication for educational practice is that collaboration and group interaction should be actively supported to promote learning (Teles, 1993). To support such interaction, each course in the MED Tech program has the following components: a web site for course content, personal email capabilities, course listserv that sends messages to all class members at the same time, bulletin boards, and chat rooms. Although all tools overlap in their target interactions, it can be said that bulletin boards and chat rooms support the student-student interaction, personal email and listserv the student-instructor interaction, and the web site for the courses the student-content interaction.

Yet, there is a fourth type of interaction in distance-learning environments: the technology interface for course delivery. As Norman (1993) discussed, technologies are never neutral. They impede some actions and aid others. Hillman, Willis, & Gunawardena (1994) explained that learners also interact with the technology through the course delivery interface. The MED Tech uses *Course Tools in a Box, WebCT,* and *Blackboard* as the technology interface. In *WebCT* and *Blackboard*, students use the bulletin board to discuss readings and post assignments, chat rooms to discuss and agree on group work assignments, have synchronous communication with the instructor during virtual office hours, and as a forum for guest speakers for the course. Quoting Norman (1993), we can say "appropriate tools are designed by starting off with human needs, working with those who will be using the tools to fashion them into the most effective instruments for the task. Above all, such tools allow people to be in control: This is an appropriate use of an appropriate technology" (p.252).

Virtual Reality

As part of promoting interaction in the MED Tech courses, yet another avenue for interaction has been added to the program. *Active Worlds,* from Eduserve, is a three-dimensional world that takes interaction a step closer to reality. In this graphic-rich, game-like world, students can walk, talk, wave, and even dance. To perform all these activities, the students choose an avatar. An avatar is a graphic representation of the person and it can be human-like, insect-like, alien-like, or any other form that the creator of the world wishes to design. With a fair amount of sophistication, the student can even create his/her own avatar and add the features he would idealistically have. There are perceived advantages and disadvantages to this medium, though. Some researchers state that working in three-dimensional worlds makes it easier for students to interact with one another and brings a human touch to the distance learning experience, while others argue that this type of interaction is too much of a distraction for a student (Young, 2000). One thing is certain: these three-dimensional worlds are on the cutting edge of technology and there are no studies that report on the perceptions, consequences, and advantages of using them. All what is learned in these first endeavors will constitute the seed for future research.

Conclusion

Web-based instruction is still a new field and much needs to be researched to understand its intended and unintended consequences. Although many degrees that use the World Wide Web have flourished, not all of them take this endeavor seriously enough to have the same or more rigor and interaction than a face-to-face learning experience. The Master's of Education in Educational Technology from NAU has been designed to address interaction at all levels. Because technology is not neutral, special attention has been put on using interfaces that are aligned with the program's goals. Lastly, the use of virtual reality for interaction brings a new dimension to this degree and opens the door for unforeseen possibilities in the arena of distance learning.

References

Abrahamson, C. E. (1998). Issues in interactive communication in distance education. *College Student Journal, 32*(1), 33-43.

Harasim, L. M. (1993). Networlds: Networks as social space. In L. M. Harasim (Ed.), *Global networks: Computers and international communication,* 15-34. Cambridge, MA: The MIT Press.

Harris, J. B. (1994). Telecommunications training by immersion: University courses online. *Machine-Mediated Learning, 4*(2&3), 177-185.

Hillman, D. C., Willis, D. J., & Gunawardena, C. (1994). Learner-interface interaction in distance education: An extension of contemporary models and strategies for practitioners. *The American Journal of Distance Education, 8*(2), 30-42.

Klinger, T. H., & Connet, M.R. (1992). Designing distance learning courses for critical thinking. *T H E Journal, 20*(3), 87-90.

Moore, M. G. (1989). Three types of interaction. *The American Journal of Distance Education. 3*(2), 1-6.

Norman, D. A. (1993). *Things that make us smart.* New York: Addison-Wesley.

Roblyer, M.D. (1999). Is choice important in distance learning? A study of student motives for taking Internet-based courses at the high school and community college levels. *Journal of Research on Computing in Education, 32*(1), 157-172.

Spindler, M. (1995). Shaping a community of learners. *T H E Journal, 23*(2), 6.

Teles, L. (1993). Cognitive apprenticeship on global networks. In L. M. Harasim (Ed.), *Global networks: Computers and international communication.* (pp. 271-281) Cambridge, MA: The MIT Press.

Young, J. R. (2000, October 6). Virtual reality on a desktop hailed as new tool in distance education. *The Chronicle of Higher Education.* [Online]. Available: http://chronicle.com/free/v47/i06/06a04301.htm (retrieved on October 7, 2000).

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Current work with advanced Internet Applications in K-12 classrooms, including GIS, Internet delivered video and interactive quiz units along with new reports on advanced Teacher Technology skills training. .

The Education Technology Revolution Challenge

The American education system is in the midst of a challenging revolution as it steps from the 20th century chalk and blackboard environment to the 21st century multi-media electronic networking environment. This transformation has created new teacher professional development needs, and presents new innovative content delivery opportunities. To successfully make this transformation from the blackboard to the electronic classroom, **the national education community must now challenge technology to deliver on its promise of redefining American education practices.**

What is now most needed are new innovative teacher training programs that do much, much more than merely show a teacher 'how' to use a computer   this new style of teacher education will help teachers **experience the WHY and the empowering WOW** that educational technology can deliver. This training is not about hardware or software, it is about real applications for the technology on a daily basis in the classroom. And it is fostered most effectively in new innovative distance learning communities that involve teachers, students, and parents in rewarding demonstrations of real, tangible improvements in learning ... and in teaching.

To win this 21st century education technology revolution, schools must now learn to integrate technology literacy skills right into the very fabric of the classroom teaching and learning environment.

We would like to review the **CAMP INTERNET Distance Learning Consortium** as an active
case study of an empowering
Technology Integration Solution

Camp Internet is an innovative project-based teacher technology training and content delivery program that addresses the technology revolution challenge. The Camp program puts Internet-based technology to work to bring motivating reading, science, math, and social studies learning experiences right into the classroom every day, every week, all school year long. The Camp has been successfully training teachers and delivering innovative online content and hands-on projects in California classrooms for since 1994, and has been honored to gain recognition from the Smithsonian Innovation Network, the California Dept of Education Technology Literacy Challenge Grant program, and the USDA Rural Utilities Service Distance Learning and Telemedicine Program.

From a single schoolhouse in a rural community, to large urban districts such as the Los Angeles Unified School District, Camp Internet is demonstrating new ways to integrate technology into the classroom and the community. Currently serving over 4,000 4th to 12th grade students and 15 USDA assigned cities in California (where Camp is made available both in public schools, libraries and afterschool programs).

Camp Internet recognizes the larger, historical significance of this point in the history of American education. This is the juncture when educators deserve to demand that the online technology finally PROVE itself as a learning tool unmatched by traditional print, television, or even earlier computer media. The Camp's consortia of teachers, researchers, and educators are working to develop and deliver a live and online training program, one that establishes a new methodology for promoting teacher skill development and paves the way for the actual integration of the 21st century learning tools right into the very fabric of the classroom.

Camp Internet's greatest strength is that it combines live teacher training with immediate, tangible online classroom applications. This methodology stimulates the teacher's professional empowerment, fosters higher student academic achievement, and helps build supportive parent involvement.

The Camp's distinctive training and content delivery methodology serves as a catalyst that empowers teachers to discover new and *more rewarding uses* for computers in their classrooms by focusing their training goals on highly motivating curriculum enhancement content. At Camp, mastering hardware and software is the not the ultimate goal. Experiencing positive new ways of learning and teaching in a supportive distance learning community is the goal.

We will look at four primary components of the Camp Internet project:

1) Teacher Training
2) Development and selection of curriculum enhancement materials which work easily in nearly every classroom
3) Application of video and gis technologies
4) Creation of a Community of Teachers involved in a shared education and learning process

Let's begin by looking at the Camp Internet Teacher Training program. Designed to empower teachers with new and essential Technology Literacy skills the program works with teachers from throughout California.

Participants attend a 4 day intensive training program . Teachers, Librarians and technology staff work in the lab and in the field.

In the lab Teachers learn to use the video and video chatrooms within Camp by taking part in daily chats with subject specialists who will come online later in the year to work with the teachers classroom in live chat sessions for the whole class. They also learn to use the special online quiz units, the Internet delivered video and audio units which support each study area and they learn to develop web sites for their classroom, web sites which will become part of the upcoming years learning record.

In the lab Teachers begin to review important skills necessary for their students in the coming year on Camp Internet. One of these skills is Dialog. The ability of students to come into a chatroom with a subject specialists (we call them "Trail Guides" but they are University Professors, staff from federal and state agencies, marine scientists and many more, see http://www.rain.org/chats to view the archive), ask meaningful questions and then respond or make use of the answer to their question is important. We have noted over the past five years a continued need to give students the skills necessary to absorb and remember what they do online in a distance learning classroom. Teaching this skill in classic Dialog provides a framework for the students. They enter the chat sessions prepared and come away from the sessions with field reports that reflect actual learning.

After spending a day in the lab Teachers take part in a fieldtrip where they receive instruction in the use of GPS and GIS tools. Camp Internet provides a special Internet Map Server for classrooms to use to develop local gps/gis projects. They visit local Chumash Indian preserves, a Natural History Museum and NOAA's Channel Islands National Marine Sanctuary. At these sites they meet some of the people who will serve as "trail guides" during the coming year.

Following the days field trip teachers prepare Field Reports. These become the first of their many field reports to be filed with Camp Internet as they progess through the year. Digital camers, gps units and computer resources are provided to make it possible for each teacher to experience authoring an online report.

Following the four day intensive training participants take part in monthly online continuing education sessions to expand on what was learned during the training session. This guarantees that along with working with Camp Internet in their classroom daily teachers receive special attention every month to support their technology learning. The in-service online training sessions are archived and have become a source of continuing education for teachers working with technology in the classroom.

After training comes the issue of content to be delivered in the classroom. Camp Internet, http://www.rain.org/campinternet, has been in development since 1994. The Camp has received the Smithsonian Institution Technology Innovation award, two AOL Community Education awards and is currently funded through four USDA Rural Utilities Service distance learning grants and a California Department of Education Technology Literacy grant program. Camp Internet also works with many school districts through private subscription. Los Angeles Unified School District draws on Camp Internet for both classroom content and teacher training.

The Camp Internet curriculum enhancement materials are designed around an "Expedition" model. Content is created through multi-agency data exchange, drawing on content from federal, state and regional agencies. The Expedtions cover curriculum ares from literature and art to science and history.

Interactive quiz and field report activities take place daily via the Internet. Classrooms meet with a "Trail Guide" once a week to explore that weeks study units. The Camp Internet content is designed to work within classroom curriculum requirements. Study units are timed and adjusted to work with both 9 and 12 month school year cycles.

Special GIS and database servers provide students with unique tools for creating journals, building gis datasets and establishing multiple classroom learning projects which can take place via the web site with geographically distance classrooms.

Teachers receive special instruction, if desired, in the use of GIS as a classroom "knowledge management" tool. We have see the introduction of GIS to have a significant impact on science learning as well as student involvement through special projects.

Teachers receive ongoing support, throughout the year. Monthly chat sessions are held with groups of teachers. During their intensive training teachers studing similar units of Camp Internet are teamed up with an alumni (a teacher with a year or more experience working with Camp Internet) as the Team Leader for each team. These groups get together once a month online, meeting with Camp staff and with each other.

We have see from this the beginning of an effective framework for creating "Communities" of educators who are able to work together to expand skills and resources. Camp now has three years of archived sessions that are beginning to provide valuable assessment data. It is our feeling that the Internet provides an essential bridge, linking teachers and other knowledge specialists, together, regardless of location. We have seen this linking lead to teachers teaching each other and helping to empower one another as they take on the complex task of incorporating new technologies into their classrooms.

One of the reasons Camp Internet is funded by USDA RUS as well as Department of Education is because of the significant role 'community' and 'family' level education plays in the design of the Camp Internet program. We recognize the necessity to create online learning centers and curriculum enhancement tools that can be used to create cross-generational learning, to work effectively with highly at-risk students and families as well as directly in the classroom.

Classrooms are assisted in establishing monthly Parent nights. On these nights special interactive activities take place that allow parents to see and experience some of what their students are experiencing in their classrooms. Tremendous results have been see over the past two years with these parent nights leading to a very positive assessment.

Special units of Camp Internet are designed to work with afterschool and library environments. We have found ways to incorporate life long learning content into the Camp program which permit it to be useful in the larger community setting as well as classroom. We have seen students meet at their public library to go online and complete a Camp Internet assignment.

With the millions of dollars being invested for hardware and connectivity in schools across the country, it is now time to demonstrate real, concrete methodologies that integrate technology as a core classroom tool, and that challenge teachers to use the technology to make significant improvements in how they teach core curriculum subjects. Technology holds tempting promise as a trainer-to-teacher, teacher-to-student, and school-to-community education reform vehicle. The Camp Internet project is demonstrating a training and content delivery methodology that helps teachers succeed in making technology deliver on its promise to transform the American classroom environment.

Camp Internet can be visited at http://www.rain.org/campinternet. Use the guest i.d. of : campdemo and the password: islbcsw to visit the special parts of Camp Internet.

Designing & evaluating a powerful online environment to support teachers to integrate ICT into the curriculum.

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Abstract:
Traditional ICT courses for teachers cover the basic skills of operating hardware devices or the key features of software applications, and may provide some examples of appropriate classroom use. Such courses rarely have lasting impact. The knowledge and skills gained on the course are soon forgotten as other priorities take precedence in teachers' working lives.

The programme we, the Scottish Teacher Education Consortium, have developed as an approved provider for the New Opportunities Fund (NOF) Training for Teachers Programme in Scotland is designed for lasting impact. It uses the technology it seeks to promote and is capable of delivery online via our website, with accompanying printed and CD-based resources to offer flexibility in the mode of delivery.

It teaches about appropriate classroom uses of ICT through case studies[1] based on the Scottish primary curriculum, and is designed to engage teachers in problem solving & reflective engagement with issues. The course activities support teachers to integrate ICT systematically into their practice. It is needs driven and differentiated – ICT skills are learned and practised in meaningful contexts, as and when required.

We have developed a metacognitively rich learning environment. Teachers are prompted to identify their learning needs and review their progress regularly, and this process culminates in the development of a personal forward plan. There is strong scaffolding for inexperienced users of ICT, and the potential of the technology to engender collaboration is fully exploited.

The evaluation framework uses teachers' self-assessments and samples teachers' portfolios of evidence accumulated over the course. There are end of unit and end of course evaluations completed by participants online. Focus group discussions and interviews with tutors, participants and others with a locus in the training will supplement this evidence. The first evaluation of the course will soon be completed.

Background

NGfL and the NOF training for teachers

The *National Grid for Learning (NGfL)* is both a structure of educationally valuable content on the Internet, and a programme for developing the means to access this content in schools and elsewhere (DfEE, 1998). Part of the UK Government's commitment to schools is to ensure that serving teachers feel confident and are competent to teach using ICT in the curriculum. The funding to support the training of serving teachers is £230m nationally, with £23m of this going to Scotland. This is available through lottery funding (specifically the *New Opportunities Fund* (NOF)), the timescale being from Spring 1999 until 2002.

The main aim of the training is to raise the standard of pupils' achievements by increasing the expertise of serving teachers in the use of ICT in subject teaching. Two of its key features are a focus on the knowledge, understanding and skills necessary to make decisions about the effective use of ICT in the classroom, and the integration of training in ICT skills with training in the use of ICT in their subject (for primary teachers, this is in Mathematics, English Language and Environmental Studies). At the end of their training teachers will develop an action plan for their future professional development in the use of ICT.

Schools can choose from a range of approved training providers, and a national quality assurance framework is in place. The training is voluntary and is it is suggested that, where possible, it should take place in the classroom so that teachers can try things out as they learn (this will also minimize any disruption to pupils' learning resulting from teachers being released during the school day to attend courses held centrally).

Two criteria must be fulfilled by the school before training can be embarked upon:

- it should have an ICT strategy in place, covering, for example, its policy on protecting pupils from on-line access to undesirable materials;
- it should have an adequate level of hardware available for staff to benefit from the training.

Expected outcomes of the training

The expected outcomes of the training are categorized under five headings:

Working creatively with ICT
Evaluating & selecting ICT resources
Monitoring, evaluating and assessing teaching and learning
Developing ICT capabilities
Technical skills and applications

This categorization is not intended as a teaching order, and it is suggested that the approach should be integrative across these elements. Forty-six competences are specified, for example, in the category of *Working creatively with ICT*:

Have an understanding of the potential, benefits and limitations of ICT to support a range of different teaching and learning strategies:

- *with individual pupils, groups and whole classes;*
- *with a range of abilities, age ranges, subjects and levels as appropriate.*

The following advice is given to schools on the teaching approach (NOF, 2000):

[1] *ICT in Context: Classroom Case Studies*, produced by the Scottish Interactive Technology Centre (SITC) and the Scottish CCC. Also a set of case studies of ICT use in primary schools developed by the STEC team.

Appropriate ICT skills and knowledge are best developed in relation to a 'real' task which motivates the learner. As a consequence of using ICT in a meaningful way the learner will be encouraged to extend their skills and knowledge in relation to more challenging tasks and ideas.

Investment in infrastructure

Separate funding has been made available by the Government for schools to purchase new ICT equipment. Investment in training should follow closely on investment in equipment. By 2002, the ratio of pupils to modem computers should be established at 15:1 in primaries and 5:1 in secondaries.

Current research findings on ICT in Scottish schools

Stark & Simpson *et al.* (2000, a & b) have conducted a national survey with Scottish teachers and ICT coordinators, designed to elicit their perceptions of ICT in schools, experiences with ICT and ICT skills, and to provide baseline data on the impact of national ICT initiatives. Their general impression was,

> *... of professionals who recognise the importance and potential of ICT as a tool to enhance many aspects of their professional duties, but who were finding difficulty in securing the equipment conveniently within their workplace, and in finding time to acquire the knowledge, practise the skills and integrate the beneficial outcomes into their already complex routines and crowded timetables.*

They found that the uses of ICT associated with electronic communications were not well established in primary schools, for example, only 10% of those sampled were securing opportunities for pupils and teachers to access curriculum materials directly from the WWW, and only 6% were establishing collaborative projects with pupils in other schools using ICT.

The positive benefits cited by the respondents included improved motivation, enhanced learning and teaching, improved communications & access to information, improved efficiency and promotion of independence.

Need for lasting impact

A key consideration is sustainability in relation to both infrastructure and appropriate use being made of ICT in the classroom which keeps pace with the developments in the technology and emerging good practice.

Pedagogical considerations

Infusing ICT into classroom practice

An approach which infuses ICT into classroom practice is clearly called for. In some classroom activities the primary purpose will be to teach the subject content using ICT as a tool, in others the primary purpose will be to teach about ICT using a meaningful curricular context. Many classroom activities will combine the two purposes, attempting to strike a good balance between achieving content-related and ICT-related objectives. We encourage participants to be clear about the purposes of any classroom-based ICT activities, to specify the objectives clearly in advance (both content- and ICT-related), and to monitor the achievement of the specified objectives.

Fostering understanding

It is important to foster teachers' understanding of the potential and limitations of ICT as a tool for learning and teaching; an approach which focuses on skills acquisition alone is inadequate. The course activities create varied contexts for performances of understanding (Perkins & Blythe, 1994, Gardner, 1993) to be demonstrated by participants. Opportunities for shared understandings to emerge are created through collaboration on tasks both within the school setting and between participants in different schools, the sharing of ideas and solutions, and exchange of feedback. These are prompted by the course activities and supported by online tutoring (see Figure 1 below for two examples of activities involving peer interaction).

Task 9:

Preferably with a colleague, make a checklist of up to ten key factors to consider when assessing the suitability of software for classroom use.

Send this list to other participants in your tutorial group.

In the light of any feedback and suggestions from other course participants, revise your list of factors.

Use this fresh list to create a "Software Review Template". Use your template to evaluate an item of software.

Task 10:

Whenever the opportunity next arises, observe a group of pupils closely as they engage in joint planning and carry out an ICT activity. Try to intervene as little as possible.

When the activity is finished, ask the pupils to review the activity.

Were you surprised by anything you observed? How well did your observations tie in with those of the pupils?

Share your findings with others in your tutorial group (outline the context first).

Figure 1: Two examples of tasks involving peer interaction.

Reflective engagement with issues enables teachers to develop deeper understandings and thus to reach insightful decisions about when and when not to use ICT in the classroom and how to use it effectively. The issues range widely, from safe use of the Internet, selection of ICT resources, arranging fair access for pupils to equipment and teacher support, to how teachers can best develop their own ICT competency. Case studies in which school managers, teachers and pupils discuss the issues and relate their practices provide a good stimulus for reflection and discussion (see Figure 2 below).

Task 5:
Lydia Catto is the Headteacher of Forthill Primary School in Broughty Ferry. Click on the picture icon below to hear Lydia's advice on developing ICT competence.
What is your approach to developing ICT competence?

Developing ICT competence

Figure 2: A task designed to prompt reflection on issues.

Creating a metacognitively rich learning environment

How to promote self-awareness and self-regulation of the learning process was a key consideration. If this is not developed, and teachers are totally reliant on others to call the next steps, how can they then develop and adapt their practices to take account of advances in the technology, and how can they find creative solutions to the problems and challenges they face day-to-day when attempting to integrate the technology effectively into their classrooms?

Nisbet and Shucksmith (1984, 1986) propose combining direct teaching, modelling of solution processes and developing metacognition as an effective way to improve children's capacity to think and work strategically. The approach can also be applied to teacher's learning about ICT, to improve their capacity to think and work strategically. The key point about direct teaching is that any procedures must not be taught as tricks to cope with specific tasks: teaching must stress the potential for transfer rather than being mechanistic. Modelling involves the teacher (or tutor) sharing with students how his or her own learning, the task and the learning context influence performance. Students should also be allowed to explore their own metacognitive knowledge by discussion and exposure to a variety of contexts or circumstances where it is called into play.

Prompting participants to reflect on their own learning is a key feature of our training. We ask participants to conduct a systematic review at the end of each study unit, by:

- assessing their progress towards specific learning goals;
- planning any further work that is necessary to achieve these goals;
- identifying any problems encountered with the work;
- continuing to review their learning priorities.

Provision of effective scaffolding

Teachers are all at different stages in terms of their use of ICT in the classroom and their understanding of its potential and limitations. For those with the least experience, effective scaffolding must be provided to ensure that they can engage fully with the course activities and gain the necessary experience and insights. This was a key consideration when designing the architecture of our website on which the course materials are mounted. Teachers are learning about the technology through using it within our course, and lack of familiarity should not create an artificial barrier to learning.

One important method of scaffolding within our course is to take participants systematically through the processes of orienting themselves to the task demands and the situation, planning, implementing, assessing & evaluating, leading to application within three different curricular areas and synthesis of the performance of these processes within a 'mini project'. This approach is mirrored in our course structure (see figure 3):

Tutorial units

Unit 1 – Orientation
Unit 2 – Planning to use ICT
Unit 3 – Implementing ICT
Unit 4 – Assessing and Evaluating using ICT
Unit 5 – Using ICT in English Language 5-14
Unit 6 – Using ICT in Mathematics 5-14
Unit 7 – Using ICT in Environmental Studies 5-14
Unit 8 – Mini Project
Unit 9 – Personal Forward Plan

Figure 3: Course unit titles.

This is a problem solving methodology which has its basis in Polya's (1948) four stage model of problem solving – understand the problem, make a plan, carry out your plan and review your solution.

Another method is through an ongoing process of needs analysis, which begins prior to participants embarking on the first course unit and uses an online questionnaire. Teachers update their learning priorities regularly as each unit is completed.

Promoting ownership of the learning process

The course is needs driven – participants must reach decisions about the appropriate next steps in learning for them, with the tutor providing guidance if this is sought. The following two short extracts from the materials illustrate the approach (figure 4):

Unit 1: Orientation

If you don't feel very confident yet about using the Internet, there is an online workshop to do. First of all, find out which browser program you are using and make sure you can go online. Then click on the picture (or icon) below to do the workshop. To get back to this page when you have finished, close the workshop window.

SUPERHIGHWAYS FOR SCOTTISH SCHOOLS

Unit 8: Mini Project

Putting ideas into practice

Essentially, this unit is intended to support you to put into practice some of the ideas and approaches you have met on this course within the context of an ICT activity chosen by you. The tasks in this unit are intended to provide a structure to guide your thinking and actions.

This ICT activity should be selected to make a positive contribution to learning and teaching within your classroom or school, **and** to provide a context for developing your ICT competence.

The scope of the activity is not restricted to one involving your pupils directly. It could instead relate to a whole school ICT issue, such as developing the school's website or mapping the school's existing ICT curriculum to the new guidelines on ICT 5-14.

Figure 4: Illustrating the 'needs driven' philosophy of the course.

This approach promotes active learning and should therefore better ensure that teachers feel ownership of their work to integrate ICT into classroom and school practices. If this becomes established, the prospects for lasting impact are much brighter.

Promoting collaborative & situated learning

The role of collaboration to enable participants to develop shared understandings and to support each other's learning has already been discussed. Many of the course activities relate to actual practices and procedures within the participant's school or local authority (for example, examining school policies or creating a framework for progression in pupils' ICT knowledge and skills) and therefore learning is situated in an authentic context.

Key features of the delivery

Establishing partnership arrangements with local authorities & schools

The course delivery operates through a partnership model, for example, the course tutors may be drawn from schools or from a pool of ICT coordinators within a local authority. Responsibility for the quality of provision remains however with us, the approved provider.

Mixed mode & mixed media

The course can be delivered entirely online, in mixed mode (part face-to-face, part distance) or as a traditional taught course. It uses online resources (our website and external websites), and CD-ROM and printed resources which echo the resources mounted on the website, although for certain activities participants require to be online.

Flexibility

Flexibility is a key consideration for any course aimed at practising teachers. Teachers need to be able to work in different settings and sometimes in short bursts of activity, and at a pace which takes account of their other working commitments. The mixed-mode, mixed-media format should help deliver flexibility, for example, some of the work can be done using the printed resources when teachers do not have access to a computer, or using the CD-ROM when there is no Internet connection. A set of *Record of Work* resources, containing checklists, a diary format, and notes pages listing the tasks, activities & key teaching points, enable teachers to keep track of their progress more easily.

Encompasses NOF teacher competences & specified curricular areas

The forty-six competences referred to in the *Background* section of this paper were carefully mapped onto our nine course units, grouped and conflated, and restated in more direct language as *Purposes* and *Main Aspects of Content* (see figure 5):

Unit 2: Planning to use ICT

Purposes

To enable you to...

- identify when ICT can support learning and plan pupil activities which are stimulating and challenging;
- select appropriate ICT resources;
- decide on teaching strategies and classroom management, ensuring safe use of ICT within your classroom;
- develop your pupils' ICT capabilities.

Main aspects of content

1. Supporting learning and planning pupil activities which involve ICT

You need to look for opportunities to integrate ICT into your teaching.

You need to design learning activities which are appropriate for all of your pupils including those with SEN.

You need to ensure that any learning activities are stimulating and challenging, and encourage pupils to generate their own ideas.

2. ...

Figure 5: Purposes & Main Aspects of Content (from Unit 2 on Planning to use ICT).

Links to Scottish 5-14 national curricular guidelines

There are currently national curriculum guidelines covering ICT (draft), and Mathematics, English Language and Environmental Studies, for pupils aged five to fourteen, which provide reference points for any pupil activities within our course.

The draft ICT guidelines identify seven process oriented ICT strands, as follows:

using the technology
creating and presenting
collecting and analysing information
searching and researching
communicating and collaborating
controlling and modelling
developing informed attitudes.

Evaluation framework

The evaluation framework will use teachers' self-assessments, evaluations of the course units, a sample of their portfolios of evidence, and interview discussions with a sample of tutors, participants and others. A national quality assurance framework is in place.

Teachers' self-assessments

In their self-assessments teachers will have indicated the extent to which each main aspect of the content within a unit has been overtaken and if they plan to do any further work on it (see figure 6).

1a. Look for opportunities to integrate ICT into your teaching plan.

completely overtaken	☐
partially overtaken	☐
not yet overtaken	☐

Comment:

I plan to do further work on this.	☐
I do not plan to do further work.	☐

Notes:

Figure 6: Teachers' self-assessments.

They will have appraised their progress towards personally determined learning goals and perhaps substituted others.

Portfolios

The portfolios should contain resources that teachers have gathered from classroom-based ICT activities (such as examples of pupils' work, teaching plans and worksheets) as well as a written or word-processed record of their responses to the activities and tasks built into the course.

Unit & end of course evaluations (online questionnaires) completed by participants

The end of unit evaluations range across many aspects of the learning environment and learning activities, covering the following areas: interest, relevance, level of demand, clarity of instructions and ease of navigation, time spent on studying, quality of online tutor support, collaboration and communication with colleagues, skills learned, use made of the resources on our website, and overall rating. In addition, the end of unit course evaluation asks:

> Overall, how well did the course address your learning needs in relation to ICT use in the classroom?
> How much do you feel your pupils benefited from any classroom-based ICT activities stimulated by the course?
> Finally, if you have any specific recommendations on how the course could be improved, please indicate these below.

This data will be held on a central database, collated and communicated to tutors and the course design team.

Focus group discussions & interviews

Focus group discussions and interviews will allow a more in-depth exploration of issues and problems, and increase the range of perspectives contributing towards the evaluation. The findings from these sources will supplement other findings and will enable the data to be triangulated.

Implications

Need for greater realism in national planning

It has become very apparent from the slow rate of uptake of the training that it is very difficult to reconcile a voluntary programme of training, which may require teachers to study in their own time, with the requirement for them to overtake a very extensive set of competences. There does not seem to be any easy way to resolve this difficulty unless there is a further injection of funding to provide cover costs for schools to release teachers to study during the school day and/or the competences are revised. Furthermore, the extensive nature of the competences is likely to discourage those teachers who are already technophobic, and may result in a 'surface skim' for those who do opt into the training, rather than any serious engagement with the key issues and the development of real competence with using the technology in the classroom. Not all of the defined competences are of central importance to using ICT effectively in the classroom, and this makes it harder for teachers to discern where their real efforts should be directed. As Gardner (1993) would say, less is more!

Need for better coordination of major educational initiatives

While uptake of the NOF training has been slow in the primary sector, it has been virtually at a standstill in the secondary sector. The implementation of a major curricular reform, *Higher Still*, which affects all S5 and S6 pupils and all secondary teachers, is bound to have had a major impact on teachers' willingness to undertake the NOF training.

While investment in training should follow closely on investment in equipment, this has not in fact occurred in many local authorities. The roll-out of the infrastructure has been too slow, and consequently there is no online access, or only very limited access, for many teachers.

Potential for uneven & fragmented experiences & outcomes

Variability in the format, content and quality of the training offered by different approved providers (some, for example, do not use the technology itself as a delivery medium and some do not address the NOF competences fully), and the uneven situation with regards to technical infrastructure, may result in very uneven outcomes nationally.

The focus on how ICT can contribute effectively to learning & teaching will be sharpened

On a positive note, the NOF framework has shifted the focus on from the technology itself towards appropriate use of the technology, properly integrated into the curriculum and supporting teachers in their day-to-day role.

References

ICT in Context http://sitc.education.ed.ac.uk/case_studies/intro.htm Methodology http://sitc.education.ed.ac.uk/methodology/present/tvdkintro.htm

DfEE (1998) *Open for learning, open for business. Summary: The Government's National Grid for Learning Challenge.* http://www.ngfl.gov.uk

Gardner, H. (1993) Educating for understanding. *The American School Board Journal*, 180 (7), 20–24.

NOF (2000) *ICT Training for Teachers and School Librarians: Information for Schools.* www.nof.org.uk

Nisbet, J. and Shucksmith, J. (1984) *The Seventh Sense* (Edinburgh: The Scottish Council for Research in Education).

Nisbet, J. and Shucksmith, J. (1986) *Learning Strategies* (London: Routledge Education Books).

Perkins, D. and Blythe, T. (1994) Putting understanding up front. *Educational Leadership*, 51 (5), 4–7.

Polya, G. (1948) *How to solve it* (Princeton, New Jersey: Princeton University Press).

Stark, R,, Simpson, M. (2000) *et al.* a *The Impact of ICT Initiatives in Scottish Schools. Full report.* Glasgow: University of Strathclyde

Stark, R,, Simpson, M. (2000) *et al.(b) The Impact of ICT Initiatives.* Interchange 63 Scottish Executive Education Department

Guiding Collaboration to Enhance Procedural Learning

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Abstract: Learning in collaboration has numerous advantages. However, sometimesSituations that damage collaboration arise. This is the case for instance, when students divert their attention from the learning situation at and for a long period of time. New technology can be used to detect and avoid some of these situations that hamper learning in a group. This work focuses on a specific problem "inefficient conversations". The paper proposes the use of a virtual agent to control and guide the students' conversations when learning a procedural subject, namely programming. The virtual agent can play a role similar to that of a human monitor with the additional advantage of being always available.

Why is learning to program so difficult?

Programming is a discipline difficult to teach and to learn. Last year of the 339 students who registered to our University's introductory programming course only 131 students presented the final exam, and only 90 of them passed. Programming is a complex skill to learn where even languages designed for the novice such as Basic and Pascal contain many traps for the unwary (du Boulay, 1986). This discipline is complex to learn for two main reasons:

- Programming involves a great variety of subtasks and types of specialised knowledge that are necessary to perform effectively (Pennington & Grabowski, 1990).
- Programming is a procedural discipline which must be "learned by doing". Many students are not used to work in this manner.

Programming differs from other neighbour domains such as mathematics or physics in two ways. First, there are no everyday intellectual activities that can form the basis for the spontaneous construction of mental models of programming concepts such as recursion or variables. Secondly, programming requires of a physical machine whose functioning may not be transparent to the learner (Rogalski & Samurçay, 1990).

Learning to program in any language is not an easy task and programming teachers are well aware of the myriad difficulties that beset beginners (du Boulay, 1986; Rogalski & Samurçay, 1990). Additionally, programming is also a complex subject to teach, in programming there are many abstract concepts like recursion or data structures, and it is difficult to find clear examples to illustrate some of these concepts. Pedagogical strategies advice teaching using real-life examples to make it easier for students to remember and understand them. In programming to explain the abstract concepts with examples based on the real life is very difficult.

New technology can be used to help students develop new skills, such as the abilities necessary to become a good programmer. Students can be assisted by providing them with computerised aids that are designed specifically for the novice (Smith & Webb, 1999). Many systems have been developed to teach programming. It is interesting to note that although novice programmers normally prefer work in labs where they can ask their doubts and get advice from other fellow students, none of these systems were designed to support collaborative learning.

We have developed a system aimed at assisting students learning to program in a collaborative environment. However, although collaborative learning offers many advantages (see Johnson, Johnson & Smith, 1991; Dillenbourg et al., 1996; Dillenbourg, 1999) sometimes situations that damage collaboration arise. An example is "inefficient conversations". We call "inefficient conversations" to those conversations that are not related to the problem at hand and that distract the student's attention. This paper proposes the use of a virtual student or agent to control this negative situation. The contents of this paper are organised as follows, section two describes current tools designed to teach computer programming, section three presents HabiPro a collaborative system designed to train students in programming, this section also describes an experiment performed with HabiPro. Inefficient conversations were detected in this experiment. Section four proposes adding a simulated student to HabiPro in order to control students' interaction and to avoid "inefficient conversations. In the last section, conclusions and future work are presented.

Current Tools for Learning Programming

Several systems have been developed to assist the teaching and learning of computer programming. Frequently, however, these tools are based on an advanced understanding of the language, and they are not really useful to train novices. The next paragraphs describe the main features of four programs designed to teach programming or help students to debug their programs.

Lisp Tutor (Anderson & Reiser, 1985) was built around a model-tracing paradigm. That is, the tutor has built into it an ideal student model, a production –system model of the different ways in which a student should write LISP code, that follows along with the actual student coding a function. Each production corresponds to the student either typing or planning a portion of the function. When the student deviates from the correct solution path, the tutor gives specific feedback and requires the student to try again (from the most recent production firing, not from the beginning of the function). Student errors that have such remediation are referred to as diagnosed bugs.

If the tutor does not recognise a student's input as correct or as a bug, the tutor displays "I don't understand that" and asks the student to try again. These errors, student inputs for which no feedback exists, are referred to as undiagnosed bugs. After entering two undiagnosed errors for a particular input, the student is given the answer that the tutor expected (via the ideal student model) and an explanation of why the answer is correct. Students may also obtain a particular answer and an explanation of the answer at any time while coding a function by pressing an explain key. In sum, there are four actions a student may take that are relevant to each coding-production: entering a correct answer, entering a diagnosed error, entering an undiagnosed error, and typing pressing the explain key. The tutor records each student interaction in terms of the productions that can be expected, the student's input, and the tutor's response.

PROUST (Johnson, 1985) uses an intention-based approach to identify and explain bugs written by beginning programmers. It is an on-line aid for novice programmers. PROUST has been designed to operate in an ordinary interactive environment. The students edit and compile their programs; whenever a program passes through the compiler without errors, it is automatically passed over to PROUST before it is executed. PROUST then analyses the program for non-syntactic bugs.

For each programming problem that the students are assigned, a problem description is prepared, using a special problem description language. Currently these problem descriptions cannot be developed by the course instructor, but must instead be prepared by someone who is familiar with PROUST's knowledge base. The problem descriptions are collected into a library. When the student submits a program for analysis, PROUST retrieves the corresponding problem description from the library. Using the problem description as a guide, PROUST determines what exactly the student's program is intended to do, and how it was intended to do it, identifying bugs in the process. For each bug in the program, PROUST determines where possible what the probable cause is, and uses this information in describing the bug to the student. If the bug was due to a misconception, then PROUST describes the misconception in English.

Proust and Lisp Tutor have two different approaches to automated feedback. The Lisp Tutor 'watches' the student as s/he writes the program and intervenes as soon as the student types in some incorrect code. Conversely, Proust takes a complete (syntactically correct) program and suggest correction to it (Bental, 1995).

Ceilidh (Benford et al, 1993) is a framework which provides computer-based support for course administration and the teaching of computer programming. Ceilidh has the ability to assess student's programs, to provide feedback on their programs and to provide on-line assistance when the student asks for help. In Ceilidh, interactive tutorial help is provided via electronic mail to a human tutor.

Ceilidh environment have been developed to teach languages including C, C++, Pascal and SML (a functional programming language similar to LISP).

Ceilidh presents one exercise to the students. It also presents a file containing a framework for the code. The student edits the framework file to complete the functions. The student can then elect to run the functions s/he has written on tests of the students' own devising and on pre-set test data. When the student is satisfied with the exercise, s/he can elect to submit the program to Ceilidh for assessment. Ceilidh assigns a mark to the program and informs the student. Each student can see the marks s/he has achieved and if the student is unhappy with the mark can ask for help from a human tutor by sending electronic mail from within Ceilidh.

Ceilidh's assessment is based largely on the correct compilation and on dynamic testing. Some marks are also awarded for the style of the program (absence of redundant, correct type signature with each function).

Marking is only of limited use as feedback. If a program does not compile Ceilidh does not offer any extra help.

SOLVEIT (Deek, 1997) combines the process and the tools to support the functionality of a traditional programming environment with a battery of utilities used in problem solving and program development. It provides an intuitive graphical environment complemented by online help and enforces a structured methodology. SOLVEIT consists of six stages. The first three stages are problem-solving stages and the next three are program development stages. SOLVEIT guides the student through a linear process of problem solving.

When people begin to learn programming, apart from reading a book about the language that they are using, and attending courses, if they have access to the Internet, they might join mailing lists, or news and work groups where they can ask question or advice from other programmers. Thus, the students look for the experience and collaboration of other people. This suggests that in programming learning collaborative techniques are often used because students join together to write programs and to take advice about their doubts in a spontaneous and natural way.

Stacey (1995) explained that a tip to debug programs is to request help from other students or teachers. Many times the bug might be a simple spelling mistake, but the psychological set (the phenomenon of seeing what you expect to see) or psychological distance (the ease with which two items can be differentiated) phenomenon prevent us from finding the mistake. On the other hand, other student or teacher can detect the mistake with a quick look at the program as Gerald Weinberg (1998) observed "the human eye has an almost infinite capacity for not seeing what it does not want to see... Programmers, if left to their own devices, will ignore the most glaring errors- errors that anyone can see in an instant. Unfortunately, only Ceilidh allows students to contact other people, in this case a person with more experience, the teacher. In this way students can request advice to the teacher or show him/her their programs.

The next section describes HabiPro (from the Spanish "*Habi*tos de *Pro*gramación"), a collaborative and distributive system designed to help novice students develop good programming habits.

A *Collaborative* System to Learn Programming: HabiPro

HabiPro is a collaborative learning system aimed at helping novice students develop good programming skills. The application was designed to support collaborative learning because of two main reasons: Firstly, when novice students begin to program they usually make several mistakes in their programs. However, it is often difficult for students to find their own mistakes (similarly, when a person writes a paper it is often difficult for him/her to find their own errors). Because of this, in many cases, students prefer to program at laboratories where there are other fellow students working on similar problems. This way they can discuss doubts, interchange ideas or ask for help to find the mistake/s that prevents the program from working correctly. This fact shows that collaboration can be of great help when students begin to create their first programs. Students can learn through the mistakes that their fellow students have made, students are also more motivated to work than when they are programming alone. The second motivation for the system to be collaborative, is of a social nature: Professional programmers usually work in groups, quality control techniques, such as code peer review, for instance, are recognised to be very effective practices. So, it is convenient for students to become accustomed to work in a collaborative environment from the beginning. In this way, they can also learn social skills necessary for their professional development.

Use of HabiPro: HabiPro has three main windows; the chat window, the work window, and the answer window. The chat window enables students to discuss how to solve the problem. The work window displays the problem to be solved. In the answer window students write the possible solutions to the problem. To work with

HabiPro at least two students have to be connected, each student works from a computer and of course, students are able to stay in different geography locations. Each student can write his/her proposal of solution in the answer window, learners have to reach an agreement about the correct solution. HabiPro has a help system that offers two choices, clues and counterexamples.

In order to test HabiPro, an experiment was carried out. Students divided into groups of different sizes were asked to solve the same set of exercises. Each group member used a computer and could communicate with his/her peers via the chat. The chat conversations were stored. Analysing the conversations it was observed that in many cases students talk about topics that were not relate to the exercises, for instance they talked about the football match that they saw the day before. When this type of conversation was brief, it presented no problem, rather, it could even be advantageous in some occasions because it helps to relax the environment and makes students more confortable with the group. But if these interactions continue for a long time they may be prejudicial to the learning process. As Sipusic et al. (1999) claims more interaction among participants in a collaborative learning group would be beneficial for learning, however one exception is if the discourse is mostly off-topic and detracts from the time and effort devoted to learning.

The students were asked to complete a questionnaire after they finished the exercise. To the question: "Do you think that you have learnt more working in a group than working alone?" a majority of students (80%) answered positively, a minority (5%) answered that they did not know it, and the rest of students (15%) answered negatively. Students had to give an explanation to their answers. Most student who said that they did not learn more working in a group complain about the few motivation that their groupmates had, and in many cases (76%) they commented that their fellow students wasted a lot of time talking about other topics.

It is interesting to note that the problem detected "inefficient conversations" is not produced by technology factors, this situation also arises in collaborative leaning without computer. The question is can new technology avoid or decrease the adverse effects of this situation?

Can a Virtual Agent Avoid Inefficient Conversations?

When a teacher monitors a group's activities, students seldom talk about other topics not related to the task at hand and normally they are more concentrated. The presence of a coach or teacher who controls and directs the group can avoid several problems that arise in a group (see Katz & O'Donnell, 1999).

In order to measure the degree in which a monitor influences group dynamics a second experiment was performed. In this case each group included a teacher acting as a moderator. The moderator's task was to intervene when students began to talk about topics not related to the problem, with comments meant to motivate students to continue solving the exercises, such as: "Come on, let's finish the exercises and we can talk after that about this", or giving a clue such as "I think that the solution is 0,2,4". This technique improved the results and students solved more exercises (average of 3.6 exercises more) and used less time than when no moderator was used. The technique of adding a monitor was really useful but it is inconvenient when there are many groups, since it requires one teacher for each group. In order to solve this problem, we decided to implement a virtual student to play the roll of the moderator.

Virtual students or simulated students have already been used in collaborative environment (see Ayala & Yano, 1995; Inaba & Okamoto, 1997). The next paragraphs explain several advantages of using virtual students in collaborative systems.

- A simulated student can play a role that fosters learning. For instance, Webb (1989) found that learning correlated more with the number of times a student answered a question of another student than with the number of times a student asked a question. Suppose one of the students in a pair learning situation is a simulated student. It could ask questions to the human student. Answering the questions should increase student's learning.

- In traditional collaborative work when a teacher has placed students in a group and given them a task, there is little control over the group's interactions because the teacher can only spend a fraction of his/her time with that group. On the other hand, with a simulated student as part of the group, all kinds of pedagogically beneficial interactions can be staged from within the group itself- thought provoking questions can be asked, taciturn students can be prodded to speak, bad ideas can be questioned, small slips can be caught before they have serious consequences, attention can be directed away from areas that are already mastered and onto areas where students are ripe to learn (VanhLenh, Ohlsson & Nason 1994).

- A simulated student has an additional advantage over a real student: a second knowledge: the expert knowledge base. When deciding how to act, it refers both to its "own" knowledge base and to this expert knowledge base. This expertise is necessary for the teacher when he or she guides a small group, so it should be necessary for the simulated student as well. The lack of such expertise in a group composed only of human students dooms it to be less effective than one with a simulated student, in principle at least (Webb, 1989).

A virtual student can also monitor the group and correct misunderstandings or detect miscommunications. Another important advantage is that each group may have a simulated student. This simulated student is available at any time, so students do not need to worry about whether or not someone else is connected is or if the partner is busy.

A virtual student acting as a moderator is even better than a teacher, because when students work with a teacher they often feel more pressure and they are not so comfortable as in a student-only working group. The virtual student can have other additional functions, for instance, to propose a new course of action when the group is stuck. In this case, students can discuss the proposal and reflect on it obtaining significant learning. On the other hand, when a teacher proposes a solution, usually, students do not doubt the information and believe it without reflecting on it. For the virtual agent to act efficiently, it needs information about the group with which it interacts. Two resources are mainly used by the virtual agent to obtain information: First, a group model where the learning evolution and some social aspects of the group are represented. And second, the group's conversations from which the topic of discussion can be inferred. The system has a database containing the words that students normally use to solve the problems. When the system finds in a conversation a word that does not belong to this database, it check if this word belongs to a second database which contains words related to playful conversations. The words are divided in different groups, depending on the group to which the word belongs, the simulated student uses different motivation techniques. If the word is not found in the second database the virtual agent asks a question in order to assess the progress of the conversation.

Conclusions and Future Work

Collaboration can be very useful in procedural learning, more concretely in programming, but sometimes when people collaborate situations arise that hinder collaboration. For example, when some group members begin to talk about topics that are not related to the problem at hand. This paper proposes to use a virtual student which monitors the group's conversation and acts when "inefficient conversations" are detected.

In order to test the efficiency of the virtual student we are designing an experiment to test whether the agent correctly detects "inefficient conversations", how may times they are corrected, and most importantly, if students learn more by using the new version of HabiPro. This last aspect is the most important one since the goal of CSCL is to improve students' learning, so our main goal is not to design a perfect virtual student but for students to learn more or faster using it.

References

Anderson, J.R., & Reiser, B.J (1985). The LISP tutor. *BYTE*, pp, 159-175. Brown, J.S. and Van Lehn,K. (1980). Repair theory: A generative theory of bugs in procedural skills. Cognitive Science, 4, 379-426.

Ayala, G & Yano, Y. 1995. "Interacting with a Mediator Agent in Collaborative Learning Environments". In Symbiosis of Human and Artifact: Future Computing and Design for Human-Computer Interaction, 20ª, Anzai, A, Ogawa,K., and Mori, H. (Eds). Advances in Human Factors/Ergonomic. Elsevier Science Publishers, pags: 895-900.

Benford, S.D., Burke, E., Foxley, E., Gutteridge, N.H., & Zin, A.M., (1993). Ceilidh: A course administration and marking system. In Proceedings of *the International Conference on Computer Based Learning in Science* .

Bental, D.(1995). 'Why Doesn't My Program Work?' Requirements for Automated Analysis of Novices' Computer Programs. *Workshop on Automated Understanding of (Novice) Programs*. World Conference on AI and Education. Washington, USA.

du Boulay, B., (1986). Some Difficulties of Learning to Program. In *Journal of Educational Computing Research*, Vol 2 (1), pp 57-73.

Deek, F.P. (1997). An Integrated Environment for Problem Solving and Program Development. PhD thesis. Department of Computer and Information Science. Faculty of New Jersey.

Dillenbourg, P., Baker, M., Blaye, A. & O'Malley, C. (1996). The Evolution of Research on Collaborative Learning. In P. Reiman & H. Spada (Eds.), *Learning in Humans and Machines: Towards an Intediscipoinary Learning Science* (pp. 189-211). Oxford: Pergamon.

Dillenbourg, P. (1999). Introduction: What Do You Mean By "Collaborative Learning"?. Dillenbourg (Ed.). *Collaborative Learning Cognitive and Computational Approaches*. Elsevier Science.

Johnson, W.L (1985). Intention-based Diagnosis of Errors in Novice Programs. PhD Thesis. Dept of CS. Yale University, New Haven.

Johnson, D.W., Johnson, R.T., & Smith, K.A. (1991). Cooperative Learning: Increasing College Faculty Instructional Productivity. *ASHE-FRICD Higher Education Report 4*. Washington, D.C.: School of Education and Human Development, George Washington University.

Inaba, A., & Okamoto, T.(1997). The Intelligent Discussion Coordinating System for Effective Collaborative Learning. Workshop Artificial Intelligence in Education, pp 26-33.

Katz, S., & O'Donell, G. (1999). The Cognitive Skill of Coaching Collaboration. In *Prooceedings of Computer Support for Collaborative Learning*. (CSCL'99). Christopher Hoadley, Jeremy Roschelle (Eds.). Stanford University, Palo Alto, California. December, pp 291-299.

Pennington, N., & Grabowski, B. (1990). The Tasks of Programming. In *Psychology of Programming*. Hoc, J.-M., Green, T.R.G., Samurçay, R., and Gilmore, D. J. (Eds.). Academic Press.

Rogalski, J., & Samurçay, R. (1990). Acquisition of Programming Knowledge and Skills, in Psychology of Programming Hoc; J.-M, Green, T.R.G., Samurçay, R., and Gilmore D.J (Eds.), 1990. Academic Press

Sipusic, M.J., Pannoni, R., Smith, R.B., Dutra, J.,Gibbons, J.F., & Sutherland, R.W. (1999). Virtual Collaborative Learning. Technical Report TR-99-72. Sun Microsystems.

Smith, P.A., & Webb G. F. Evaluation of Low-Level Program Visualisation for Teaching Novice C Programmers. In proceedings of *ICCE'99, 7th International Conference on Computers in Education*. Chiba, Japan, November, 1999.

Stacey. D., (1995). Debugging. http://hebb.cis.uoguelph.ca/~dave/27320/testing.debug.html.

VanLehn, K., Ohlsson, S., & Nason, R. (1994). Applications of Simulated Students: An Exploration. *Journal of Artificial Intelligence in Education*, 5(2), 135-175.

Weinberg, G. M. (1998). *The Psychology of Computer Programming*. Silver Anniversary Edition, Dorset House, New York.

Webb, N. (1989). Peer Interaction and Learning in Small Groups. *International Journal of Educational Research*, 13, 21-40.

Technology Training: HOST Model

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Abstract: Educators continue to experiment with different technology training of teachers for more effective models, turning to the internet and instructional software tools in order to create an educational environment that supports the knowledge and skill-building approaches to learning. This paper intends to share the successful technology training experience of inservice teachers and educators of preservice teachers using video instruction and Internet as delivery tools. We intend to share our resources for those who are interested in self training and those who are in charge of technology training in their staff development program

It has been almost two decades since microcomputers were introduced into public schools. Many school districts have spent millions of dollars to purchase hardware, software, and to connect classrooms with the World Wide Web. However, we continue to see misuse and under utilization of educational technology; teachers continue to struggle to master the core technical skills and are struggling in their search for effective and beneficial ways in which to use technology (Clouse & Alexander, 1997).

Educators need to get beyond perceptions that the World Wide Web is merely a communication medium for Email, for not only is it a vast global knowledge base for document distribution, it has significant and proven benefits when used as an instructional tool that reinforces effective and interactive learning. Internet technologies empower the teacher to create a global learning environment, as well as a virtual educational setting that transcends traditional boundaries. Teachers now have a treasure chest of information tools, resources and growing experience in their use with which to reinvigorate the educational process for themselves and their students.

The adoption of compressed digital video makes full interaction possible between the instructions and the learners (Garland, 1999-2000). With occasional human facilitation and reinforcement, this has created a learner-centered environment in which learning can occur at different times and in different places, as well as at different paces according to each individual's special needs (Locatis &Weisberg, 1997). We believe that specially designed instruction utilizing digital video clips and the Internet as delivery tools give learners increased control over the pace of their own learning. All too often, however, technology training emphasizes discrete skills development, ignoring application or practices that enable users to gain an understanding of the relation between the training and its use in the classroom. Therefore, the learners are discouraged to continue to increase the application their skills and knowledge gained through a particular training session. In fact, many training models fail to make the transition between the training and the classroom implementation. Traditional training has usually taken the form of providing information that may or may not be relevant to the end user

Our technology-training program utilizing the HOST Model (Holton Online Staff Training Model) was conceived with the intention of making the training highly meaningful and personalized to each individual teacher, with emphasis on the learning process and end products rather than on discrete skills.

Teachers were given multimedia instructions to help them attain a mastery of a specified set of skills directly related to the end products. The instructions were designed in a progressive way that mastery of one set of skills leads naturally to instruction of the next set of skills. The skills were organized according to their complexity moving from easy to intermediate to difficult. This is derived from the objectives for the training, the delineation of content, and the creation of activities for practice. The training model was based on the principle that everyone has the opportunity and ability to achieve a certain level of complexity, and therefore assists the teachers in building their interest in classroom implementation of technology, as well as the confidence in being able to do so. The possibility of instantaneous publishing to a worldwide audience has had an energizing effect on the teachers, resulting in greatly enhanced motivation to continue learning new skills, and thereby improving their final products.

The fact that educators do not feel that they have the necessary technological to transform the educational process is due, in part, to the ineffectiveness of past staff development activities based on outdated training models. In response to that, Holton USD 336 created a new Web site http://www.holton.k12.ks.us/training designed to help individual institutions improve their staff development activities based on what shall be referred to as the HOST model. All video instructions on this site are freeware and may be downloaded and saved to any computer. With the support of TLCF and Educate America grant funds, in the fall of 1997, a technology training model called HOST was developed by a team of educators in Holton district USD 336. In the fall of 1998, Holton USD 336 received a TLCF Professional Development Grant for nearly $50,000. Through this award, the district developed an innovative staff development web site that was used for teacher training (for 1998 staff members).

Web-based training video clips are used in the HOST model to explain various concepts and skills. Because of the multimedia capabilities of these videos, the user is able to use all their learning channels to master and apply the concepts. Users have no limit to the number of times they may want to repeat the original task they are facing, which helps them not only to better understand the nature of the task, it provides ample opportunity to achieve a deeper learning of the necessary skills to complete the task. Throughout the training, concepts are introduced slowly and they are built linearly on one another, from simple to complex. All activities have been designed to correspond to the district goals, and participants have received training matched to their own pace of learning through the training on the web. The training material is available for teachers to access from school or at home to provide continuous learning opportunities even after the initial training. The overarching goal of any HOST model training is to move participant teachers a step forward in technology implementation in their respective classrooms.

Prior to each training of the two workshops, every participant was asked to fill out a profile to self evaluate their technical skills in the areas of operating systems, word-processing, graphic editing and presentation tools. When they finished the formal training, they were asked to answer the same questions to reevaluate their knowledge and skills. Their self-evaluations were then used to measure the learning outcomes. Ninety-eight teachers participated in the first workshop, sixty-two responded to both pre- and post-evaluation questions. The pre-evaluation results showed that among those responded, the average was 48.2%, and the post-evaluation average was 72.1%, among which the highest percentage was 35 and the lowest was 0. The difference between the pre-evaluation and the post-evaluation in the first workshop was very obvious. In the second workshop, which was held during two consecutive Saturdays in March, 1999, there were 51 teachers and seven college professors participating. In this case, everyone responded to the profile questions regarding the basic knowledge and skills of utilizing Internet technology in their teaching, pre-evaluation averaged 20%, while post-evaluation averaged 82%, which shows a very significant average improvement.

The workshop finished with teachers sharing their final products with the group. It was obvious that these teachers showed great interest in creating instructional materials on the Internet and the Internet was a great place for learning and sharing. (Please checkout the following URL to see some of the projects.) Overall the workshop was a success. All the participants felt that they had gained a lot of knowledge and skills through hand-on experience. We hope that this model will contribute to the course of technology training of teachers.

References

Clouse & Alexander, (1997-98). Classrooms of the 21st Century: Teacher competence, confidence and collaboration, *Journal of Educational Technology Systems* 26 (2) 97-111.

Garland, V. (1999-2000). Improving computer skills in colleges of education. *Journal of Educational Technology Systems*, 28(1) 59-66.

Locatis, C. & Weisberg, M. (1997). Distributed learning and the Internet. *Contemporary Education*, 68(2), 100-103.

TELECOMMUNICATIONS: PRESERVICE APPLICATIONS

Section Editor:
Trudy Abramson, *Nova Southeastern University*

The overview paragraphs have been organized by the last name of the first author. As the reader moves from paper to paper in this section, it is important to remember that a uniformity of nomenclature in preservice teacher education does not exist. There is general agreement about foundation courses (beginning) and methods courses (usually intermediate). However, practicum may be part of a methods course or may be the student teaching experience. Usually, practicum is something that takes place in a school under the supervision of a classroom teacher and a college professor. Field experiences may occur anywhere in the teacher preparation sequence. In some places, preservice teachers are undergraduates; in others, they are post-baccalaureate. Each presenter group will define its own circumstances. Each presentation combines the use of electronic technology and preservice teacher education.

Structuring electronic portfolios using web-based document management

Eric Aplyn and Carl Hoagland of the University of Missouri at St. Louis discuss solutions they are framing to overcome barriers to institutional implementation of electronic portfolios. This will be a discussion of a work-in-progress. The authors are devlopng experiemental portfolios with a web-based knowledge-sharing technology developed by Xerox Corpostation canned DocuShare. The presentation will conclude with a full group discussion about the broader issues associated with institutional and regional implementation of electronic portfolios.

Links to the classroom: Technology in early field experience for elementary social studies

Linda Bennett, University of Missouri at Columbia, presents a paper describing the outcome of her research. The questions she answers are: Did prospective teachers use the Internet to reflect on teaching? How did the prospective teachers use online journals and summative writing to reflect on technology and teaching?

Factors that promote and inhibit discourse with preservice teachers on a non-restrictive, public web-based forum

Alec Bodzin, Lehigh University, reports on an investigation of asynchronous communication factors that influence the electronic interactions of preservice science teachers. The students were able to access the SciTeach Forum from home, the university and the school in which they were based. The research question was: How does the medium promote or inhibit online discussion?

Impact of asynchronous discussion on preservice teacher education practicum experiences

Aaron Doering, Marc Johnson, and Sara Dexter, all of the University of Minnesota, address one facet of their PT3 grant, Ed-U-Tech. The players in the online discussions that are the focus of their presentation were college instructors of the methods course, preservice teachers, the middle school cooperating teacher and the middle school pupils. The presentation will detail ways in which the technology has assisted the preservice teachers to conceptualize their future roles as teacher and how the technology enhances the learning process.

Telementoring to improve literacy: Preservice students as online mentors to K-12 students

Melanie Goldman, Boston College, will conduct a roundtable discussion on the use of Internet-based mentoring and the teaching of writing. At one end are the K-12 students who write to the student teachers at the other end. Through online exchange, the preservice teachers interact directly with school-based children and improve their own writing as they provide guidance. The school children gain audience for their work and personal coaches as they learn to write.

Preservice teacher education and the Internet: Expanding perspectives toward a profession

Jennifer Gramling and Jamie Nelson, both of University of Tennessee, will present research gathered during the use of an online course management system (CMS) to supplement classroom instruction in a preservice teacher education class. The course title is Introduction to

Instructional Computing. The CMS used was Blackboard's CourseInfo.

Regional list servers as a means of peer support for an online learning community

John Green, The Open Polytechnic of New Zealand, describes a process in which regional list servers were introduced to support the online classroom. The objective was to create small, supportive groups on online learners within a large online class. Whereas a chat is real time, a list server is asynchronous and peer support may be built at a less furious pace. The presentation will discuss organization, people, implementation and results.

Going the distance: Developing guidelines for the creation of online courses

Norma Henderson and LaMont Johnson, both of University of Nevada at Reno, will present standard criteria to guide the development of a quality online course. They will discuss a brief study whose results prompted the guidelines.

Umm.. I don't think its working: Why our class-to-class E-mail exchange didn't work (and what can be done to fix it)

Lauren McClanahan, Ohio State University and Linda Clady, Westerville City Schools, paired undergraduate teacher education students with middle school students in an E-mail writing project. This presentation traces their experiences.

Student perceptions of the value of online instruction

Barbara McKenzie, Elizabeth Bennett, Nancy Mims and Tom Davidson, all of the State University of West Georgia, will discuss their use of WebCT, a distance delivery system. Their remarks will encompass student reactions, WebCT tools, the impacts on learning and recommendations for change.

Connecting trainee teachers and school mentors with university educators via MultiPoint Desktop Video Conferencing (MDVC): The Singapore experience

Swee-Ngoh Moo, Foong-Lin Angela Wong, Leslie Sharpe, and Lachland Crawford are all from the National Institute of Education, Nanyang Technical University, Singapore. This presentation will describe the technology and the pedagogy using a state of the art video conferencing system. The pedagogic aspect relates to the added value to the curriculum of preservice teachers and will focus largely on the quality of the practicum (student-teaching) experience.

The study of the impact of learners, learning interactions on web-based tutorial program, to satisfaction on the use of web for educational purposes and academic achievement

Jaitip Na-songkhla, Chulalongkorn University, Thailand, will describe the use of a web-based tutorial as a classroom supplement in a freshman-level course, Foundations of Computer for Education. A wide range of participatory activities were provided and participation was encouraged. Feedback questionnaires were administered and analyzed. Results will be shared.

Research and development on practicum training system for preservice teacher education using Internet in Nara University of Education

Wakio Oyanagi, Nara University of Education, Japan, will present research dealing with the development and evaluation of a system to improve teaching practice using the Internet. The questions explored relate to the practicum in teacher training. Specifically, the Internet is used by the preservice teachers for reflection on observation practice, lecture and practicum.

Compressed video technology, innovative teaching and realistic experiences: Recommendations for CVT Usage

Gary Rosenthal, Nicholls State University, Barlow Soper, Louisiana Tech University, Lamar Wilkinson, Louisiana Tech University and James Barr, Nicholls State University. This presentation explores the implementation of compressed video teaching (CVT) at a number of universities in Louisiana. This technology allows remote students to see and hear everything that is occurring in each classroom. The presentation will be largely a "lessons learned" recounting and recommendation to new users of the system.

The Imfundo project: ICT in teacher education in developing countries

Michelle Selinger, Cisco Systems, UK, describes the technology and professional development program in which ICT was used to enhance distance education in underdeveloped countries. She will explain the problems facing teacher training in remote areas such as the sub-Sahara and the ways in which electronic technologies are being used to support teacher preparation programs.

The handheld web: Using mobile wireless technologies to enhance teacher professional development

Paul Shotsberger, University of North Carolina at Wilmington, discusses use of this new digital technology to connect preservice and inservice teacher training. He will describe a project that infused technology into the undergraduate curriculum for preservice mathematics teachers, while strengthening the relationships between his university and its partnering public schools.

Preservice teacher education: Electronic/ distance

Leon Wickham, Massey University, New Zealand, will review the ways in which his university met the challenge for delivering teacher education to those who were unable to attend a traditional program. This alternate teacher education program delivers instruction through the media of the postal system and the World Wide Web.

Issues in structuring long-term electronic portfolios with web-based document management tools

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At the College of Education of the University of Missouri – St. Louis, we have set out to look for solutions to 3 major barriers we found to institutional implementation of electronic portfolios:

- Fear of being evaluated on visual elements rather than on content,
- No obvious common software platform for portfolio development
- Evaluation and management difficulties with typical storage and software technologies

As a way of overcoming these barriers, we are developing experimental portfolios with a web-based knowledge sharing technology developed by Xerox Corporation. Similar products are available from other software developers with varying costs and varying capabilities. We will provide an overview of our work to date, provide our research on other technologies with similar capabilities, and hope to launch a discussion that explores the broader issues associated with institutional and regional implementation of electronic portfolios using this strategy. One primary concern is the need to address inter-institutional standards, particularly for 2-year to 4-year college transitions and transitions to long-term professional development. Other key issues include student/faculty trust, usability and stability, long-term management, security, and ownership of portfolios.

Links to the Classroom: Technology in Early Field Experience for Elementary Social Studies

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Abstract: This paper describes a model for integrating technology into early field experiences. The focus of the paper is on what technologies were used and how prospective teachers utilized technology in early field experience. Two recommendations are for diverse models of integrating technology into field experience are developed and those diverse strategies for integrating technology into social studies are designed.

Introduction

What do prospective elementary teachers need to know about technology and how should they utilize technology in teaching social studies in the elementary schools? To address these questions, the International Society of Technology in Education (ISTE) developed profiles for preparing tomorrow's teachers to use technology (2000). ISTE stated six performance profiles for the professional preparation of prospective teachers. The performances are:

(1) technology operations and concepts
(2) planning and designing learning environments and experiences,
(3) teaching, learning, and the curriculum,
(4) assessment and evaluation,
(5) productivity and professional practice, and
(6) social, ethical, legal, and human issues.

Technology is a powerful tool for prospective teachers to communicate and develop knowledge, skills and attitudes about teaching. Students can use electronic communication tools, Internet resources, and multimedia documents to research information, develop inquiry skills, or discuss diverse viewpoints. Communication tools can link professionals, educators, and prospective teachers interested in social studies. Through technological methods such as these a community of learners can be developed (White, 1996). Projects can be developed for prospective teachers to work collaboratively on computer-mediated technologies in the social studies classroom.

As a new resource for education, technology has influenced the nature of teacher education. This study describes how technology was used in an early field experience taken in conjunction with an elementary social studies methods course.

Research Questions

(1) Did prospective teachers use technology in early field experience?
(2) What technologies did the prospective teachers use to teach social studies?
(3) How did the prospective teachers use technology to teach social studies?

Methodology

Participants

There were twenty-one undergraduate students. All the students were in the first semester of their senior year. Two students were males. The minority participants included one African American student and one Hispanic student.

The students were enrolled in the Social Studies in the Elementary School course and corresponding field experience. The course is a required three-semester hour course for undergraduate elementary teacher education students at a large regional university. The field experience is a required two-semester hour course in which the students are in an elementary classroom from forty to sixty hours during the term.

The location of the field experience was Parkade Elementary School in Columbia, MO. The field experiences were in three fourth grade and four fifth grade eMINTS (enhance Missouri's Instructional Networked Teaching) classrooms. Classrooms are networked, teachers are trained, and each classroom contains a SMART board. The classrooms have between one to four to one to two computers to student ratio. The cooperating teacher, three undergraduate field experience students and approximately twenty elementary students work as a team to apply technology while learning social studies.

The MU Partnership for Preparing Tomorrow's Teachers To Use Technology (PT3) Grant http://www.coe.missouri.edu/~pttut/ provided support for the technology at the university. The Navigator@Parkade and eMINTS (http://emints.more.net/info/central/classpages.htm) provided the technology support for the elementary school.

Data Collection

During the fall term of 2000, data were collected using online journals, final reflective papers, interviews, observations, e-mail messages, self-evaluations by prospective teachers, and cooperating teacher evaluations about the field experience and the use of technology. The researcher periodically visited the classrooms and discussed the progress of the project. There were group meetings for the classroom teachers and prospective teachers at the beginning and end of the field experience. The researcher corresponded through e-mail with individuals and groups of prospective teachers and classroom teachers throughout the field experience.

Findings

Technology Expectations

The performance expectations for prospective teachers in the project were:

- Use e-mail, a class discussion list, and online forms
- Design and implement a WebQuest in the classroom
- Design a concept web using Inspiration on a social studies theme
- Design units of study and lessons, which infuse technology into the curriculum
- Building a technology resource list for the social studies curriculum
- Teach the unit in a local elementary school

Technologies Used

The technologies used in the elementary classroom were determined by what had been purchased in the grants. The university and the elementary school had access to very compatible hardware and software. The grants supported hardware, Microsoft Office, and Internet connections. Technologies used in the classroom included but were not are limited to the following:

- SMART board (interactive white board)
- Computer stations for small groups for elementary students (1 to 2 ratio)
- Microsoft Office
- Webquest (http://edweb.sdsu.edu/webquest/webquest.html)
- TrackStar (http://scrtec.org/track)
- Inspiration (http://www.inspiration.com/)

- Online forms (http://www.coe.missouri.edu/~esse/reflective.html)
- Web searches and links to web sites
- Electronic communication tools
- Courseinfo web site
- Digital cameras
- Multi-media software such as PowerPoint.

Integration of Technology into Social Studies Instruction

The prospective teachers were required to write and implement a social studies unit that integrated technology. The fourth and fifth grade classroom teachers selected the following units for the prospective teachers to teach: The Land and Its People (The United States and Australia), The Oregon Trail, The 2000 Election, Missouri Government, and Colonial America. These are typical units taught in fourth and fifth grade classrooms and the classroom teachers provided a lot of print resources for the prospective teachers to use in planning and implementing the lessons. The new aspect of the lessons would be the use of technology.

The SMART board, PowerPoint, and Web sites were used on a regular basis in the lessons taught by the prospective teachers. For example, the SMART board was use to brainstorm ideas, post information, interact with Web sites, and present projects. The prospective teachers designed WebQuests (http://edweb.sdsu.edu/webquest/webquest.html) for the elementary students to complete a task using selected web sites. TrackStar (http://scrtec.org/track) is a web site that provides a form for teachers to develop a lesson or list of related web sites for students to search.

The lessons included opportunities for elementary students to use technology. Primarily, the Internet was used by the elementary students to complete a task with one or more specific web sites as a resource for information. Typically, PowerPoint was used by the elementary students to developed presentations to demonstrate what they had learned.

The prospective teachers to brainstorm the content for the unit used Inspiration. I am unaware of the Inspiration being used in instruction. It is the only software that was used in the university course that is not in the elementary classroom. The prospective teachers could have downloaded the software but did not. The software has been ordered for the elementary classrooms.

Technology for Course work

The university courses were web-assisted and all assignments were on a Courseinfo web site. The prospective teachers used technology to complete the assignments for the university courses. The primary objective for the elementary social studies methods course was to write the social studies unit.

The online forms were used to complete a weekly reflective journal on the field experience. Electronic communication tools were used to share ideas among the prospective teacher, university instructor and classroom teacher. The prospective teachers shared concerns and gave ideas on how to use technology to teach social studies lessons in an elementary school.

Summary of Technology Use

The prospective teacher, classroom teacher, and elementary student used technology to plan, implement, and assess the social studies unit the university student was teaching in the elementary classroom. It is difficult to generalize the locus of control in the use of technology. Within each classroom the prospective teacher, classroom teachers and the elementary students determined the use of technology. If any one of the individuals had an interest or need to use technology then they did. In most cases, the opportunities to use the technology were open to anyone.

During the lessons taught by prospective teachers, technology was used in every lesson I observed. Technology was used either by the prospective teacher to introduce the lesson or by the elementary students to complete a task.

Through observations, the researcher made several generalizations about technology in the fourth and fifth grade classrooms. The hardware and the software on the student computer stations functioned without glitches and technical difficulties were not discussed. I observed on one occasion a teacher came from another classroom to help students scan an image into PowerPoint.

Each prospective teacher had some prior technology experience during their professional education course and self selected projects. The SMART boards were a new piece of technology for everyone in the classroom so some students were nervous about using it. Training sessions to learn the technology were set up at the university as needed. Students prefer for the sessions to be conducted using the elementary school equipment.

Recommendations

Based on this study, the following recommendations are made for the integration of technology into early field experience.

- Provide training for the prospective teachers on the use of technology and design social studies lessons during the first few weeks of the semester before going to the elementary classroom
- Video taping or teleconferencing to show models for integrating technology into social studies curriculum
- Develop a personal target to learn and effectively use 2 to 3 technology tools in teaching social studies and conduct a follow-up review on the success of the implementation plan
- Use other aspects of Microsoft Office such as Excel to graph and chart social studies data
- Provide access to technology at the university to that found in the elementary classroom (SMART board and Inspiration)
- A balanced distribution of old pedagogy (worksheets) and new technology strategies (inquiry).
- Sufficient time to plan for the infusion of technology into the social studies curriculum.

Closing Comments

The findings of the study begin to document the rewards and challenges for infusing technology in field experiences. It was the first attempt at having prospective teachers in a rich technology environment for field experiences and having prospective teachers implement a social studies unit with technology. I feel this experience is the beginning of a partnership for using technology in field experiences to enhance social studies in the elementary classrooms. One prospective teacher stated: "I wanted to let you all know that this is the best field experience I have ever had in my teacher preparation."

Conclusions

The shift in the pedagogical infusion of technology is key to the success of early field experiences in teacher education. As instructors, classroom teachers and prospective teachers make use of technology as an integral component of their daily life, we can discover new methods for infusing technology into the elementary social studies classroom. Through the technology links of early field experiences prospective teachers, classroom teachers, and elementary students can grow together, learn from each other, and develop models for infusing technology into elementary school social studies.

References

The International Society of Technology in Education, (2000). Foundations standards for all teachers [On-line]. Available http://www.iste.org/Standards/index.html

National Council for the Social Studies. (1997). National council for the social studies standards for social studies teachers. Washington DC: Author.

The National Council for the Accreditation of Teacher Education (1999) Technology and the new professional teacher: Preparing for the 21st century classroom [On-line] Available: http://www.ncate.org/accred/projects/tech/tech-21.htm.

The National Council for the Social Studies (1999). Program standards for teachers of social studies [On-line] Available: http://www.socialstudies.org/standards/teachers/ncate.html.

Office of Technology Assessment. (1995). Teachers & technology: Making the connection. Washington DC: U.S. Government Printing Office.

White, C. (1996). Relevant social studies education: Integrating technology and constructivism. Journal of Technology and Teacher Education 4(1), 69-76.

Factors That Promote and Inhibit Discourse With Preservice Teachers on a Non-Restrictive, Public Web-Based Forum

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Abstract This study investigated asynchronous communication factors that influence the discourse of preservice science teachers on a non-restrictive, public Web-based forum. Salient elements that promoted discourse among the participants included the level of interest in a topic, the immediate relevancy of a topic to a participant at a particular time, and interpersonal factors among participants. Limitations using asynchronous communication perceived by preservice teachers included receiving feedback too late to be of use and issues pertaining to the absence of visual cues during discourse exchanges. The linear, temporal interface of the Web-based forum appeared to be a factor that limited the depth of the discussion.

Telecommunication networks are transforming higher education. Recent developments in computer telecommunications technology have emerged as a means for providing support to beginning teachers. University teacher educators can continue to provide preservice teacher training with electronic networks when students are at remote student teaching placements. A fundamental advantage of computer networking is the flexibility it offers. Geographical and time constraints are overcome because messages can be sent at any time of the day and from any place. Electronic communication can provide a communication bridge that increases the frequency of interactions among student teachers and university personnel (Thomas, Clift, & Sugimoto, 1996). The fact that the network is available 24 hours a day is a strength only this technology can offer. In addition, combining the network with good on-site support greatly improves the quality of supervision in teacher training (Casey & Vogt, 1994).

As Web-based learning tools proliferate in higher education settings, there is a need for focused research on how such technology augments and redefines academic learning environments (Koschmann, Myers, Feltovitch, & Barrows, 1994). Since the World Wide Web is accessible to preservice teachers at home, at the university, and in their student teaching placements, it is important that research be conducted to evaluate the impact of preservice teachers' use of Web-based forums, as well as their perceptions of dialoguing with the aid of this new technology tool.

Purpose

The purpose of this study was to investigate asynchronous communication factors that influence the discourse of preservice science teachers on a non-restrictive, public Web-based forum. The following two research questions were investigated:

1. What differences do preservice teachers perceive between Web-based asynchronous communication and face-to-face-communication?
2. How does the asynchronous Web-based medium promote or inhibit online discussion?

Methodology

The participants in this study were composed of 32 prospective secondary school science teachers enrolled in the Professional Semester at North Carolina State University. This consisted of Methods of Teaching Science, Instructional Materials in Science, Seminar in Science Education, and Student Teaching. Twenty-one participants were female and 11 participants were male. The age of the students ranged from 21-26 years with a mean age of 22.3 years and a median age of 22. The students' initial telecommunication expertise and comfort level ranged from those with little experience and comfort using e-mail and the World Wide Web to those who felt very comfortable and used telecommunications on a daily basis. Most students (n=23) reported that they were not confident using a Web-based forum. Only four students had some type of previous experience using a Bulletin Board System (BBS), online chat, Web-based forum, or other electronic conferencing system.

The participants had completed the majority of their academic requirements for a Bachelor of Science degree in Science Education with 10 students concentrating in biological sciences, 10 in physical science, and 12 in middle school science and math. Students were on campus daily for course instruction during the first five weeks of the semester. All high school science preservice teachers (n=20) attended the Instructional Materials in Science course for two hours per day during these five weeks. These students were divided into different Methods of Teaching Science courses based on their science concentration area. These courses were instructed by science education faculty members other than those who taught the Instructional Materials in Science course. The 12 middle school preservice teachers were instructed in separate instructional materials and methods courses than the high school preservice teachers.

Students were on campus daily for course instruction during the first five weeks of the semester. For the following ten weeks, each student was assigned to a public school in a school district near the university for a student teacher internship.

Context

In order to examine the potential benefits of preservice science teachers engaging in an electronic professional community of science teachers on the World Wide Web, a public Web-based forum called the SciTeach Forum (http://www.ncsu.edu/sciteach) was constructed in July 1997. The SciTeach Forum was placed in the context of a large public science education Web site. The SciTeach Forum serves as an online support network for both inservice and preservice science educators.

The SciTeach Forum was designed to be a place where science teachers share ideas, reflections, and conversations on teaching and implementation of technology in the classroom and other instructional pedagogy, while also providing support for each other as members of an electronic professional community. The SciTeach Forum was designed with NetForum software. NetForum is a Web based group communication and collaboration system provided by the University of Wisconsin Biomedical Computing Group. The program is written in Perl and works on any UNIX-based system with Perl 4.0.1.8 or later that supports CGI subdirectories. Forums are organized into discussion topics and messages. A simple, intuitive toolbar allows user access to NetForum features. Forums can be created and managed by "forum owners" with the administrative tools via the World Wide Web. Forum topics and messages can also be edited via the administrative tools. Forum owners can customize many of a forum's features and can add html codes into the headers and footers of each of the forum's web pages.

The NetForum software was selected to create the SciTeach Forum because it was available at no monetary cost since our institution has a site license to use the software. Another reason to use the NetForum software for this project is ease of use. In addition, the software allows the users to initially structure the discussion topics on the forum in any order. The software also enables any user to add a new discussion topic to the forum. Within each topic area, a user can post a new message, reply to a message, or reply to a reply of a message. When users first enter a topic area, they are presented with a list of message and reply titles. Each message and reply title displays the author of the message and the date the message was posted on to the forum. Message threads are displayed in a temporal sequence with the most recent message listed at the top of the screen. Each message and reply title is a hypertext link. The user clicks on a message or reply title to view the posted message. The software also enables the user to read an entire thread of successive replies to the original message.

The SciTeach Forum can be accessed by anyone with a connection to the World Wide Web. A special e-mail account or password is not a requirement to read forum messages or post messages to the forum. Unlike other previous studies involving preservice teachers using telecommunications during their student teaching semester, there was no additional funding to equip the preservice science teachers with laptop computers and telephone modems (Bull, Harris, Lloyd, and Short, 1989; Casey, 1994; Loiselle, Dupuy-Walker, Gingras, and Gagnon, 1996; Merseth, 1991; Schlagal, Trathen, and Blanton, 1996; Thomas et al., 1996; Thompson and Hamilton, 1991; Waugh, 1996; White, 1997; Zimmerman and Greene, 1998). We assumed that at least one computer in the school where a student teacher would be placed during the student teaching internship would have online access to the World Wide Web. Each school did have access to a networked computer. However, eight students were unable to access that computer during their internships.

The SciTeach Forum contains discussion topics relating to teaching science content, incorporating instructional technology into the curriculum, and topics relating to teaching pedagogy in general.

The preservice high school science teachers were introduced to the SciTeach Forum during the first on-campus day of their Instructional Materials in Science course during the Fall 1998 semester. The preservice middle school science and math teachers were introduced to the SciTeach Forum during the fourth on-campus day of their Methods in Science and Math course. Each student was instructed how to use the SciTeach forum in class and required to post a message on the forum to introduce themselves in the "Preservice Science Teachers" discussion topic area. As part of the required course work, each student was required to post two messages to the SciTeach Forum for the entire semester each week. Of these two postings, one posting each week was required to be placed into the "Critical Incidents in the Science Classroom" topic. Critical incidents are defined as an event which confronts teachers and makes them decide on a course of action which involves some kind of explanation of the scientific enterprise (Nott & Wellington, 1995). The following is an example of a critical incident:

You are doing another inquiry lab. As you walk around the room you notice several students off task. You move more closely to observe them and to get them back on task. A student says to you, "This is dumb! You could just simply tell us the answer and how to do the lab. We'd learn the material more quickly and get to new things." What kinds of things would you say and do at this point?

The majority of the instructor-posted critical incidents placed on the forum adhered to Nott and Wellington's definition. A few of the critical incidents posted involved non-specific science pedagogy issues that could apply to any preservice teacher. These included issues such as covering all course objectives for the "end of the -teacher/cooperating teacher relationship.

The preservice teachers, four science education faculty members, six science education graduate students, and eight persons unassociated with the university participated in the forum discourse during the semester. The forum was monitored regularly by two university instructors of the Instructional Materials in Science course. At the beginning of the semester, an invitation was circulated to each science education faculty member and selected graduate students to participate in the forum discourse. An e-mail list was established to notify participating faculty members and graduate students of forum messages posted by the preservice teachers pertaining to specific concerns of their internships.

Data Collection

A survey was administered to each subject at the end of their student teaching semester. The survey consisted of open-ended questions, Likert-type attitudinal questions, and multiple choice type questions designed to identify the preservice science teachers' perceptions and attitudes regarding their experience interacting with a Web-based forum during their student teaching internship.

Nine interviews were conducted from a stratified random sample of preservice science teachers. Preservice teachers were stratified based on their methods course. Three subjects were interviewed from each of the 3 different methods courses. The interviews addressed the participant's experience, attitude, and perceptions with using the Web-based forum during the 5 weeks of on-campus course work and during their student teaching internship. Three interviews were conducted during the second week of the participants' student teaching internship and six interviews were conducted during the week following the end of the participants' student teaching internships. Interviews were recorded using audio tape and then transcribed by the researcher.

Findings and Discussion

Promoting Discussion

An assortment of factors appeared to promote discourse among the participants. The level of interest in a topic appears to be an essential factor in promoting discussion. The immediate relevancy of a topic to a participant at a particular time is also an influential element to the depth of the dialogue. Furthermore, interpersonal factors among participants were salient elements in promoting discourse. The participants were a group of preservice teachers experiencing similar situations during their student teaching internships. As the participants encountered similar classroom management and discipline problems, they used the forum to share and discuss their related situations.

Discussion of controversial topics also increased the depth of the forum dialogue. As one interview participant stated,

"When you get fired up about something and you're really interested and passionate in an idea, I think you are going to talk about it more than if you just feel so-so about it. If you're not real sure how you feel then you are not going to respond as much. But if you know what you're thinking, then you're going to talk a lot more.

On the forum, participants expressed their personal opinions and views in discussions involving ethical issues. Throughout the discourse and in the participants' interviews, several critical incidents in science teaching were referred to as "touchy" or controversial issues. These participants perceived discussing controversial issues as getting them "fired up". Furthermore, they were interested in hearing what their peers thought or how they would react to a given situation. In the discourse, participants explained and defended their moral positions and beliefs. Some participants also said they were more willing to contribute to the discussion of sensitive issues than to other topics.

The forum promoted discussion by allowing one access to others' perspectives. It allowed for different opinions to be analyzed and agreed with or argued against. For students who were isolated in their student teaching placements, the forum promoted discussion just by being there. The forum provided a place where isolated student teachers could share and discuss their teaching experiences.

Inhibiting Discussion

The interface of the Web-based forum appeared to be a factor that limited the depth of discussion on the forum. Replies to posted messages are organized temporally with the newest reply at the bottom of the message thread. This mirrors the organization of a bulletin board system. Users could also read an entire thread of successive replies to an initial message. In this manner, an entire thread resembled a face-to-face conversation. However, the nature of communicating asynchronously in a temporal, linear manner was sometimes perceived as restricting the discourse. An interviewed participant stated:

"It's not an immediate dialogue. Its put a question up there or a problem up there and somebody replies back and you read it whenever you get to a computer. It's not a constant dialogue. It's not back and forth, back and forth, back and forth. It's a posting, then a reply. That's it. Because it's not immediate, you can't really challenge it or ask more questions or ask to go into further detail. Not the way it was set up. I guess you could e-mail that person and ask them. But as far as the forum went, it wasn't set up

The nature of asynchronous communication does not promote an immediate back-and-forth dialogue that is often required by a person to get the specific type of feedback one is looking for. When one engages in face-to-face conversation, the nature of the communication is often a continuous process. The forum interface does promote a reply, but not a "back and forth, back and forth" discussion. A natural flow of conversation is not easily achieved when participants access the forum on a weekly basis. Participants viewed the forum's linear structure as impeding the flexibility of the communication because they could not place their replies directly to specific messages in a thread.

A large number of participants responding to the same critical incident appeared to cause a saturation effect in the discourse. In many of the message threads, after half of the students responded, the responses began to "sound along the same lines". One participant shared her insight to this phenomenon:

"I think people will wait to see other people respond to it. And then pull their responses up on the screen and be like okay, this look good. I'll type that down as well. Versus sitting down and really thinking about the incident and being like, well, this is the way that I would handle it, let me see someone else's view, but this is the way I'm going to handle it. Versus comparing and contrasting, they'll just take the easy route out and write just what someone else has or type out what someone else has."

Some participants read the postings of others and then contributed to the dialogue by restating previous ideas by adding "a new twist" to the discourse. In some cases, the participants responded to a critical incident without reading the responses of others. However, this was not the case for all participant postings in the latter stages of the thread. There were students who often posted toward the end of a message thread with a reflective posting that built on the ideas of others. In order to reduce this saturation effect, one might want to consider reducing the number of participants responding to a critical incident, or have a group of students adopt different thinking-related roles in their response to the discourse generated in a critical incident thread. These roles could include a "devil's advocate", speculator, brainstormer, optimist, pessimist, or judge. Even though we structured critical incidents with dialogue prompts to intentionally promote discussion of science-specific pedagogy, it appears that more structure is required in order to facilitate large group discussions on the Web.

Conclusions

The findings in this study illustrate a variety of factors that influenced the discourse of preservice science teachers using an asynchronous, non-restrictive public Web-based forum. The asynchronous nature of the Web-based forum allows preservice teachers to communicate in a reflective online community at their convenience. Many of the message threads that occurred on the forum were topics that were not part of the preservice teachers' in-class instruction. The forum offered new opportunities for participants to discuss and reflect on classroom issues that were directly relevant to their student teaching experiences. Our findings also revealed there are some constraints and limitations with using asynchronous communication with preservice teachers. These include receiving feedback too late to be of use and issues pertaining to the absence of visual cues during discourse exchanges. Moreover, if we expect preservice teachers to use telecommunications tools to engage in reflective communities of practice, then it is important that time is provided in their daily routine to use these tools to reflect on their practice.

The conventional rules of communication change in the online medium. Non-facial communication issues are intrinsic to this situation. Communication exchange is not guaranteed among all participants since participants can chose selectively which postings to read or not to read. Most participants (n=28) stated that they read messages posted on the forum by scanning the content for issues of interest, while disregarding messages or skimming others. One participant stated that he usually skimmed through messages and read only those posted by peers from his methods class. Furthermore, the comfort level with the Web-based medium itself might be a factor to how students communicate with each other. In Web-based communication, there are no personal nuances such as facial expressions or hand gestures, which accompany the dialogue. Since the forum provides a means to communicate asynchronously, it permits the more timid and reflective learners in a group a chance to participate in the discussion more than they might in a face-to-face conversation. The structure of the forum also enables each participant the opportunity to have time to reflect on what has been said, think critically, and then respond.

With many asynchronous conferencing software packages available to more research needs to be conducted to determine the most appropriate design structure to use with a public, non-restrictive asynchronous Web-based forum. Ease of use with respect to the design structure is an important factor to consider. Most asynchronous conferencing software packages use either a linear or hierarchical tree structure. Linear structures add a reply in a temporal manner to the end of a linear chain of messages. A hierarchical tree structure allows a user to attach a response directly to any message. This allows a discussion to potentially branch out infinitely. The linear structure is simpler to navigate and more closely resembles a face-to-face conversation. However, some of our participants felt frustrated with the lack of flexibility in the linear structure and wished the forum provided a hierarchical tree structure. Although we view the linear structure as easier to navigate, some participants still experienced difficulty locating older messages threads on the SciTeach Forum.

Conferencing in delayed-time versus real-time with preservice teachers placed in remote geographical internships remains an issue to be further explored. A disadvantage some participants perceived with using asynchronous communication was that they did not receive immediate feedback to problems they were experiencing in their classrooms. This situation exists because immediate feedback can only be provided if the participants of the Web-based community read and respond to each new forum posting on a daily basis and are provided with easy access to the network. Using synchronous communication with preservice teachers could provide for immediate feedback to problems and concerns they experience in their classrooms. Furthermore, a synchronous environment would enable participants to participate in a dialogue which more resembles a face-to-face interaction. We believe that the logistics of coordinating synchronous communication with our participants would have been extremely difficult given the resources in their school placements and their schedules. Unless provisions could be made to ensure each participant has access to a networked computer and busy schedules could be coordinated, engaging preservice teachers in synchronous communication would not be feasible.

We have just embarked on a journey to understand how preservice teachers use asynchronous communications in a public, non-restrictive Web-based forum. We are learning how the structure of a Web-based medium promotes learning in a social context. As higher education continues to integrate Web-based tools into teaching pedagogy, it is important that we continue to analyze and research the mechanisms that facilitate learning online. Given our results, we plan to continue to use public, non-restrictive Web-based forums with our preservice science teachers. In the forthcoming semester, we will include another cohort of preservice science teachers from a different university to actively participate in the forum. We plan to have groups of students adopt different thinking-related roles in their response to the discourse generated in the critical incident in science teaching threads. These roles will include a "devil's advocate," speculator, brainstormer, optimist, pessimist, and judge. We will also post four different critical incidents in science teaching each week to the forum instead of one per week to see if this reduces the saturation effect that appeared in the discourse during this study. As a result of this research, we are continuing to understand how preservice science teachers communicate with their peers and instructors from remote locations using the World Wide Web to develop into a community network of practice.

References

Bull, G., Harris, J., Lloyd, J., & Short, J. (1989). The electronic academic village. Journal of Teacher Education, 40 (4), 27-31.

Casey, J. M. (1994). TeacherNet: Student teachers travel the information highway. Journal of Computing in Teacher Education, 11 (1), 8-11.

Casey, J. M., & Vogt, M. E. (1994). TeacherNet: the wave of the future...toward a national network of educators. Technology and Teacher Education Annual. Charlottesville, VA: Association for the Advancement of Computing in Education (AACE).

Koschmann, T. D., Myers, A. C. Feltovitch, P. J., & Barrows, H.S. (1994). Using technology to assist in realizing effective learning and instruction: A principled approach to the use of computers in collaborative learning. Journal of Learning Sciences, 3 (3), 219-225.

Loiselle, J., Dupuy-Walker, L., Gingras, J., & Gagnon, M. (1996). Analyzing and supporting preservice teachers' practice using computer mediated communication. In Technology and Teacher Education Annual, Proceedings of the International Conference of the Society for Information Technology and Teacher Education (SITE). Phoenix, AZ.

Merseth, K. K. (1991). Supporting beginning teachers with computer networks. Journal of Teacher Education, 42, (2), 140-147.

Nott, M., & Wellington, J. (1995). Critical incidents in the science classroom and the nature of science. School Science Review, 76 (276), 41-46.

Schlagal, B., Trathen, W., & Blanton, W. (1996). Structuring telecommunications to create instructional conversations about student teaching. Journal of Teacher Education, 47 (3), 175-183.

Thompson, A. D., & Hamilton, J. (1991). Patterns of use of an electronic communication network for student teachers and first year teachers. ERIC Document Reproduction Service No. ED 334 180.

Thomas, L., Clift, R., & Sugimoto, T. (1996). Telecommunications, student teaching, and methods instruction: An exploratory investigation. Journal of Teacher Education, 47 (3), 165-174.

Waugh, M. (1996). Group interaction and student questioning patterns in an instructional telecommunications course for teachers. Journal of Computers in Mathematics and Science Teaching, 15 (4), 353-382.

White, C.S. (1997). Bringing preservice teachers online. In P. Martorella (Eds). Interactive technologies and the social studies: Emerging issues and applications (pp.27-56). New York: Stat
Ee University of New York Press.

Zimmerman, S.O., & Greene, M.W. (1998). A five-year chronicle: Using technology in a teacher education program. In Technology and Teacher Education Annual, Proceedings of the International Conference of the Society for Information Technology and Teacher Education (SITE). Washington, DC.

Impact of Asynchronous Discussion on a Preservice Teacher Education Practicum Experience

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Abstract: Teacher education programs have long recognized that in order to develop their pedagogical capacity, pre-service teachers must have teaching experiences and interactions with students during their program of preparation. At the University of Minnesota we implemented the use of web-based asynchronous discussion areas to increase the quality and quantity of English education initial licensure program students' interactions with middle school students during a practicum experience. We describe here the necessary coordination and communication among methods and technology course faculty, technical support personnel, and the cooperating middle school teacher in identifying and implementing this technological support to a collaborative project. We also describe the preservice teachers' positive and negative impressions of this mode of communication.

Introduction

Teacher education programs have long recognized that in order to develop their pedagogical capacity, pre-service teachers must have teaching experiences and interactions with students during their program of preparation. This fall the English Education licensure program at the University of Minnesota implemented the use of web-based asynchronous discussion areas to increase the quality and quantity of pre-service teacher and student interactions during a practicum experience.

The use of these discussion areas is part of a larger effort in our College of Education and Human Development to integrate technology into our teaching methods courses. Through our Ed-U-Tech project, a Preparing Tomorrow's Teachers to Use Technology (PT3) grant from the U.S. Department of Education, faculty in fifteen content areas in which we license teachers are learning about educational technology and creating teaching materials to support its integration. The methods instructors and technology course instructor are working together to successfully model the integration of technology. These efforts provide opportunities for pre-service teachers to use technology as an instructional tool and receive feedback on those efforts.

Telementoring through Asynchronous Discussion Boards

As part of the reading and writing methods courses, the English education cohort (34 post-baccalaureate students) had a practicum in a middle school centered on a co-inquiry project that required the college and K12 students to write together in multiple genres. Each pre-service teacher was teamed with four students with whom they discussed the topic of their inquiry, relevant sources of information on it, the revision of their writing products, and generally just got to know one another. But, communication was a challenge because our pre-service teachers couldn't always be at the school during the English class period of their assigned students. We needed a mode of communication that could support our pre-service teachers' interactions with students. We turned to web-based discussion areas for our solution, a method the Ed-U-Tech project had already successfully used as a part of our project's outreach efforts.

Technical Contexts of K-12 Public Schools and Universities

When deciding the method of communication, the technical contexts of both the K12 public school and the university were taken into account. All of the preservice teachers had email accounts, but because of privacy issues and the school's Internet use policy, students in the middle school weren't allowed to use email at school. In addition to preparing for the cooperation with the methods and foundation's technology course at the university, even if the use of an email account was acceptable, the cooperating teacher would have had to work on setting up individual emails for each middle school student adding an additional burden.

Efficient use of time was an important factor when deciding the use of the technology. The middle school students only met with the preservice teachers twice a week. They needed more frequent and in-depth communication in order to complete an entire multimedia project. The asynchronous discussion boards would allow the middle school students and preservice teachers to post and/or answer questions when they had time, whether in class or at home.

Supervision of the exchanges was also considered in the selection of this communication method. This project was new for the methods instructors, cooperating teacher, preservice teachers and middle school students. Therefore, the ability to oversee and reflect on the communication that was taking place was very important. The asynchronous discussion board allowed all people involved in the project to simply go to the web site and view the conversations that were taking place between the preservice teachers and the middle school students.

The Benefits and Drawback of Asynchronous Discussion

We sent an email to all 34 pre-service teachers who participated in this project. Twenty-five of the 34 students responded to the following three questions: a) How did the ability to post and receive messages via the Internet impact the learning and/or teaching process with your middle school students?; b) How did the ability to post and receive messages via the Internet impact the mentoring process with your middle school students?; and c) How did the communication between you and the crosswinds students enhance your final multi-genre project? We grouped similar comments and then categorized them as generally positive or negative

Benefits

The benefits of this activity were: a) the students were able to get to know their cooperating preservice teacher much better before and during the project; b) the students and preservice teachers were able to share the content of their final project with each other on a regular basis; and c) the preservice teachers and the middle school students have become more confident in their use of technology.

After a one-time face-to-face meeting they began to communicate with one another online. The middle school students were able to ask general questions of the preservice teacher with whom they would be working the entire semester. This also gave the preservice teacher the same opportunity to get to know the middle school student better and their interests, which was important as their first task was to determine the theme of their project. A preservice teacher commented that the middle school students were "at more ease asking questions and obviously weren't so nervous" as they had been when they met each other in person. He commented that the students would ask questions about "how old we were and why we were deciding to become a teacher."

The ability to have and maintain a mentor-student relationship was also very valuable. A preservice teacher said, "using the Internet site with my students was a great way to maintain a mentor-student relationship. When students were allowed access time to the web site, I received a number of messages from all of my students

The preservice teacher and K12 students readily shared the content of the multi-genre project throughout the semester. Most beneficial was the ease with which they could share relevant web sites, ask questions, and receive responses at any time throughout the semester. A preservice teacher commented that "it was extremely helpful to be able to send students URL sites on the web that would help them to locate information about the person we had chosen to do our report on for the multi-genre project. Then students could easily access these sites by just clicking on the address. This eliminated a great deal of unnecessary confusion."

The asynchronous discussion web site greatly eased the process writing the bibliography for the final project. All the sites the preservice teachers and middle school students had previously visited were already stored on the asynchronous web site, so they could easily write down the author, title, URL and other information necessary for completing the final project.

All of the preservice teachers questioned about the project experience, including the use of the asynchronous discussion board, felt it helped them to increase their overall technology ability A few who resisted this mode of communication at the beginning commented that they found how much of an asset it was to use with their students and therefore were motivated to use it. They also commented that the both they and the middle school students "were actually able to see how communication over the Internet could be of value to the classroom."

"Drawback"

Only one drawback resonated throughout the experience: computer access for the middle school students. The preservice teachers wished that the students could have had daily computer lab time to check the discussion board and reply or post as necessary. The preservice teachers commented that the "majority" of the students did not have access at home and relied completely on the school for access. The preservice teachers identified this as the only real drawback of the entire collaborative, technology-enhanced project. As one preservice teacher commented, "The potential was amazing, the reality disappointing. Students simply didn't have enough time in the computer labs to respond."

Conclusion

This multi-genre writing, multimedia, co-inquiry project produced successful end products. The middle school students gained experience in writing in a variety of genres, communicating through multiple media, and using education technology to do so. Likewise, the pre-service teachers developed their skills in these same areas. More importantly for our pre-service teachers they gained teaching experience and had a chance to interact with students while in the role of the teacher. This mode of telecommunication facilitated increased social and substantive interactions between the middle school students and the pre-service teachers from the beginning to the end of the project. We caution that computer access on both sides of the partnership is key to communication via asynchronous discussion. Once that is overcome, as this paper reports the potential benefits are many. With successful planning and implementation, asynchronous communication can be a successful tool for increasing the quality and quantity of preservice teachers' interactions with K12 students during a practicum experience.

Regional List Servers as a Means of Peer Support for an On-Line Learning Community

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Abstract: This paper describes an on-going experience of using regional list servers to provide peer support to an on-line learning community of 248 students already using an electronic forum to study by distance. A regional list server is a list server providing peer support to students in a specific geographic region. Fifteen list servers were used for the course.

List servers with a large number of students have the problem that if even a small number post messages the list participants have too many messages to digest. Students have commented that they prefer to work in smaller groups. Regional list servers provide students with a more intimate experience and reduced message load. The underlying principles are discussed and an explanation is given of how the interactions on the 15 list servers are stimulated and monitored.

Introduction

The creation of a community spirit is an essential prerequisite for success when using an electronic forum (Hiltz 1998) (Anderson 1998). Without this feeling of camaraderie people feel inhibited from posting for fear of looking foolish, or from responding to postings for fear of being branded a "tall poppy" or know-it-all. Speaking up in small class or posting in a small electronic communication space seems much easier because the participants develop relationships and trust with the others in the class. In previous work with an electronic forum (Green & Eves 2000) students commented that smaller workgroups would allow them to get to know the others with whom they were working. In an effort to provide this more intimate space, several regional list servers based on the regions of New Zealand were created. It was hoped that the relationships and the peer support network that developed would increase the rate of participation in the Delphi forum (Delphi), our virtual classroom. We were also interested to see how students would respond to the increasingly varied means of student-student communication at their disposal. A major benefit envisaged was that the smaller population would reduce the information overload that can occur in list servers with larger populations.

The Open Polytechnic of New Zealand is the largest provider of open and distance education in New Zealand. The majority of teaching is done by distance. The students described in this paper were studying a Computer Concepts paper that is a compulsory part of the National Diploma in Business course and approximately equivalent to first year degree level. Most students are adults in their late 20's to early thirties approximately two-thirds female and mainly Pakeha (non-Maori). The Maori were the first people to settle in New Zealand, those not of Maori descent are termed Pakeha. The majority of students on the course had little experience of using a computer for anything more than word processing. A small number used e-mail regularly. Very few had experience of using Internet forums, list servers or on-line chats.

Method

The postings of students were monitored over a period of 17 weeks. The list server chosen was Listbot (Listbot). Listbot is a free service provided by Microsoft on the Internet. The site allows the creation of list servers for either announcements (one to many) or discussion (many to many). There appears to be no limit on the number of lists that an owner can operate. The on-line creation of a fully working list server takes less than five minutes which includes selecting any information that you wish the list server to gather on registration. Each list server gathers demographic information when the student subscribes as requested by the list owner. Thirteen list servers were set up based on the New Zealand regions. Two list servers based on ethnicity/language were set up with the intention of supporting those students whose second language is English in the believe that they could get additional peer support in their first language. These list servers supported Maori and Chinese students.

Students are not spread evenly across New Zealand but tend to be concentrated in the main population centres two thirds of which are in the North Island. The mountainous South Island, often called the Mainland has less than 1 million people. It was estimated that a group of around 5 students would be able to form a viable and cohesive group. During the first two weeks of the course it was essential to support single students and encourage them to subscribe to one neighbouring list server if students numbers were low in their area. This also increases the cross fertilisation of the groups without destroying the intimate sense of the space.

Marketing the list servers

The regional list servers were marketed in our electronic forum (Delphi) and by mail before the start of the course. In addition whenever communicating with students by phone, fax, e-mail, or during weekly on-line chat sessions on the forum, students were reminded of the importance of using their regional list server. The functions of the various means of communication were described to the students as follows in order to help them understand how to use the various tools:

"The forum is our electronic classroom; it is necessarily formal and tightly controlled. It is your place to ask questions, to get guidance how to get started on a particular activity in the course and the place to find and receive answers. It is your frequently asked questions resource. It is not a place to have personal conversations."

"The on-line chat is your student common room, bar or seminar room, it is informal and uncontrolled. It is the place to meet up and talk about the course, what's on TV, to gain motivation and direction, and generally get to know your classmates. Brief personal conversations are acceptable but remember it's one-to-many, so try and follow the threads of the conversations that will be fast and furious!"

"The regional list servers are like inviting people into your home to study with you. It's quick, simple, informal and direct. The e-mail you will receive will be from an individual, but everyone on the list will receive the same e-mail. It's the equivalent of a small study group without the hassles of having to travel. People on your list server may be your close or distant neighbours, we encourage you to also use it to arrange social events and form study groups."

Monitoring the List Servers

The list owner is automatically subscribed to each list server. This could potentially result in information overload for the tutor even though the tutor role in a peer support network is more for policing than for interaction. In order to control the flow of e-mail, a series of rules were set up in the tutor's e-mail client, Outlook 2000, to direct the mail to a series of folders, each named after the respective list server. To ease tutor communication with the list servers a personal distribution list was also created. This provided the students with a small intimate view of their list server, whereas the tutor had an overview of the activities taking place in every list server. The tutor could address the whole class, a regional group, or an individual. It was considered important that the data for this study was gathered automatically to enable the tutor to concentrate on the tasks of motivating and directing the students in the forum. A weekly e-mail report from each list server informed the tutor who has subscribed or if anyone had unsubscribed. E-mail from the groups was archived both on the tutor's computer and in the archives of the list servers.

Results

We selected four regional list servers out of the 15 to analyse. The two largest urban list servers based on the Auckland and Wellington regions contained 23 and 31 students respectively. The two rural list servers selected were based on the Bay of Plenty and Waikato regions and contained 7 and 9 students respectively. It should be noted that although well promoted the two list servers set up to allow ethnic students to discuss ideas in their own language were barely used. Both Maori and Chinese students participated fully in the regional list servers and ignored the option of using their own language even with the opportunity of support by a Chinese-speaking staff member.

Some questions

1. Do students have preferred learning partners with whom they communicate on a regular basis?

Students were asked to identify themselves by posting an introduction to the list server in the first few weeks of the course. In larger list servers students had more potential partners than in smaller list servers. However the data below shows that in larger list servers more than 50% of students select just two partners with whom to discuss issues with. In smaller list servers most students make contact all the other students. Students either posted messages to everyone (shown as 'All' below) or addressed the message to a specific individual. The number of messages posted to their first and subsequent partners were summed and expressed as a percentage of the total number of subscribed students. The percentages shown would have been higher if expressed as a percentage of the active students. People talk to more people in smaller list servers than in larger list servers.

List Server	Number of students subscribed	Number of active students	Number of students posting to All (Average number of messages)	% with 1 partner (Average messages)	% with 2 partners	% with 3 partners	% with 4 partners	% with 5 partners
Auckland	23	20	19 (3.47)	60.9 (2.21)	52.2 (2.42)	26.1 (2.00)	26.1 (1.5)	21.7 (1.4)
Wellington	31	22	19 (3.9)	54.8 (2.24)	38.7 (1.17)	25.8 (1.38)	16.1 (2.0)	12.9 (1.0)
Bay of Plenty	7	7	7 (8.29)	85.7 (2.17)	85.7 (2.0)	85.7 (1.5)	28.6 (1.5)	28.6 (1.5)
Waikato	9	7	7 (13.43)	77.8 (4.86)	66.7 (5.67)	66.7 (5.0)	66.7 (5.0)	44.4 (5.0)

Figure 1 – A comparison of the rates of posting and the number of partners in large and small list server populations

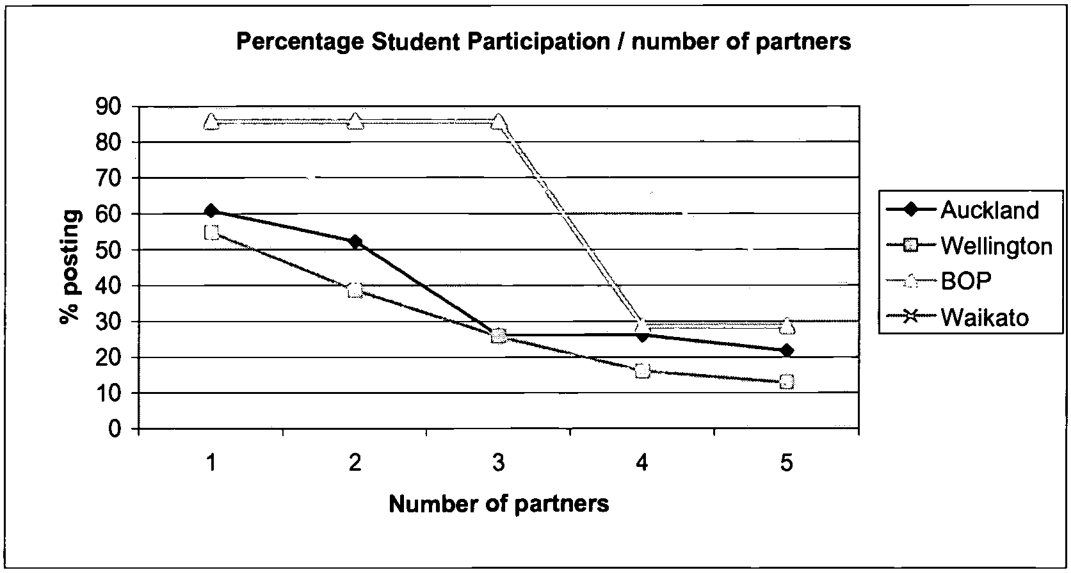

Figure 2 – A graph of the percentage of students posting against the number of partners

2. Do larger populations produce more postings per capita than smaller populations?

It might be expected that the number of interactions would be greater in a larger population due to the greater range of opinions and personalities. This does not appear to be the case. The Bay of Plenty and Waikato list servers received 127 and 287 postings respectively from an active student body of just 7 students each. Auckland and Wellington received only 215 and 202 from 20 and 22 active students respectively. Waikato students posted an average of 41 messages each, compared with Auckland's average of just 10.

3. Is there an optimum size for a list server population?

When size of list server population is graphed against the average per capita posting for each list server over the period of study, a peak is seen around 9 participants. It is suggested that this optimum figure could rise if a group functions for a longer period of time and more people come to recognise each other as individuals. Self disclosure, the divulging of personal information, is a key element in raising the level of participation. Those individuals who expressed themselves more fully had more contacts and a greater number of partners than those who merely asked for and exchanged information.

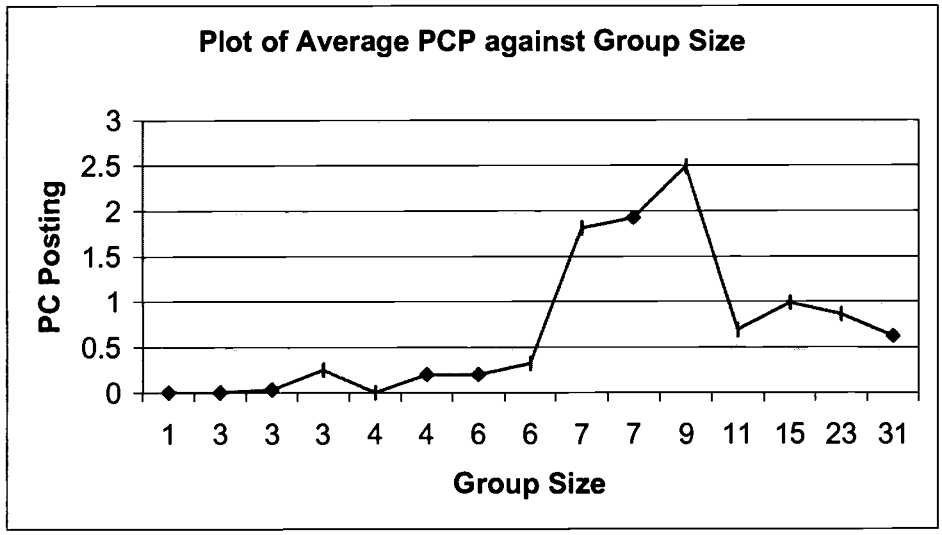

Figure 3 - Graph of the average per capita posting against the list server population size, over the period of study

4. Is there a difference in use of the list servers in urban and rural areas?

In the Wellington central business district, which is compact compared to the sprawling Auckland central business district, the list servers were used to arrange face to face study groups which met at weekends and during lunchtimes. This was entirely due to the response of one individual to a tutor suggestion. The posting rates described above was measured before these groups formed and do not account for the differences in posting. No organised groups formed in Auckland though some students did pair up occasionally. The data shows that the regional list servers were used much more in the rural areas, probably due to the distances between students.

5. Is there a relationship between the number of messages a student posts and their success on the course?

Certainly most successful students are students with postings in the high 30's, however several low posters also obtained good results in the assessment and several high posters received lower scores. It is not possible to ignore the fact that everyone received the messages whether they actively participated or not. There is no obvious relationship between posting rate and success on the course.

6. Does increased peer support result in success for all on the list server?

There was no clear difference in the percentage of students on the list servers achieving A+, A or C grades and those who chose not to be on the list servers. A larger sample of students may show that those with an intermediate skill level of B+ or B may improve their achievement by interaction with and observation of higher scoring students.

7. ***Does increased peer support result in increased retentions?***

There was no apparent difference between the retention rates of the trimester with added peer support by list server and the previous one without this support. Loss of students is almost always due to personal problems with work or home life rather than any course related issues.

Conclusion

The main conclusions of this study are as follows:

1) Students post more messages per capita in list servers with smaller populations.
2) The optimum size of a list server population in terms of the number of postings per student appears to be 9.
3) Students in list servers with small populations had more partners with whom they corresponded regularly than list servers with large populations.
4) Most students had only two regular partners in a list server with around 20 active posters.
5) There were insufficient numbers to determine if there was a relationship between being in the list server and success on the course.
6) Retention rate was not affected by having peer support.
7) Posting rate is an unreliable indicator of future success on the course.
8) Receiving peer support does not appear to influence the percentage of students achieving grades A+, A or C but it is felt that a further study may demonstrate that intermediate students may benefit from interaction with higher scoring students.

References

Anderson M. (1998). Critical elements of an Internet based asynchronous distance education course. *Journal of Educational Technology Systems*, 26(4), 383-388.

Delphi Forums. Available at http://www.delphi.com [November 2000]

Green J, Eves C (2000). On-line teaching using an electronic forum in distance education. 13th Annual Conference of the National Advisory Committee on Computing Qualifications. Wellington. 127 – 132.

Hiltz S. (1998). Invited address "Web 98" Orlando Florida November 1998. Available at http://eies.njit.edu/~hiltz/ [November 2000]

Listbot. Microsoft bCentral Listbot. Available at http://www.listbot.com [November 2000]

Going the Distance: Developing Guidelines for the Creation of Online Courses

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Abstract: This paper reports preliminary findings of a study assessing the quality of existing online courses at five Internet sites including three university institutions, and two commercial sites that provide software packages for educational online course development. This study was performed in two graduate-level information technology in education courses. Findings indicated that, overall, students were dissatisfied with the quality of online courses available. In fact, this study indicated that many of the purported online courses were merely traditional course syllabi placed online, or traditional correspondence courses where the study materials are obtained online. Suggested guidelines for the development of an online course include: a comprehensive description of the course, including purpose and objectives; time required to complete the course; tuition costs; grading policy; accreditation/degree fulfillment; prerequisites, including technology skills; minimum system requirements; and testimonials. Also important is inclusion of a brief demonstration of a course module for student evaluation prior to registration.

Introduction

Educational headlines today proclaim both the successes and failures of using technology and the World Wide Web in the form of online courses for distance education. Indeed, there are many advantages and disadvantages to the escalating wave of online courses offered through the World Wide Web. Strong supporters of online instruction cite positive effects such as ease of accessibility to students in rural areas, students with disabilities, and students with busy work schedules. Those who question the use of online instruction cite increases in student attrition rates, tuition costs, and time management requirements. However, these stances are meaningless unless online courses are developed using standard criteria that ensure a quality product (Harris, 2000). Although there are no ideal rules that encompass every situation (Carr-Chellman & Duchastel, 2000), basic guidelines should be developed and implemented (Madden, 1999). These basic guidelines will assist instructors in the development of their own online courses. For the purpose of this paper, distance education via online instruction was defined as the ability to complete course work through the use of a personal computer only. That is, the student would never have to attend classes in a traditional classroom setting for lectures or exams, and would have the capability to interact with the instructor and fellow classmates via the computer. We acknowledge that other valid combinations of distance education exist that include various combinations of traditional classroom activities enhanced or supplemented by Internet resources, but for our purposes we identify those as Web-enhanced instruction as opposed to online instruction. Material for traditional correspondence courses may be placed online, but if they do not include interaction between the instructor and the student, or among students, we also identify them as Web-enhanced instruction. The purpose of this paper is to present suggested guidelines for developing an online course.

The Study

Web sites promoting distance education instruction via online courses were selected for evaluation during the fall semester 2000. Twenty-five graduate students enrolled in information technology in education courses evaluated 125 online courses located at five different Web sites. A six-point Likert scale (*Very Strongly Disagree; Strongly Disagree; Disagree; Agree; Strongly Agree; Very Strongly Agree*) was used to rate the following ten categories:

1. General appeal (Web page design, ease of use, clear instructions)
2. Quality (overall assessment)
3. Online and offline activities (bulletin board discussion, video presentations, readings)
4. Interactivity (ability to interact with instructor and/or classmates)
5. Asynchronicity (chat room, real-time discussion groups)
6. Accreditation (credit toward degree, licensure, certificate)
7. Advantages over traditional classroom
8. Advantages over traditional correspondence course
9. Potential (degree to which this site would successfully qualify as an online course)
10. Technical problems (navigation, ease of use, time spent, system requirements)

Students were encouraged to evaluate subjects of interest to them. Subjects varied across the spectrum from Introductory Statistics to Japanese. Students also recorded the amount of time they spent attempting to retrieve basic information about each online course evaluated, and noted any technical difficulties.

Results

An analysis of these evaluations showed that of the five Web sites evaluated, three received an overall rating of 3 (*Disagree*) on the six-point Likert-scale, and the remaining two received an overall rating of 4 (*Agree*). The students spent an average of 45 minutes per course to evaluate the ten categories listed. They expressed disappointment that many of the purported online courses were simply traditional course syllabi placed online, or traditional correspondence courses where the study materials are obtained online. In fact, for many of the online courses, students were still required to attend class on campus. Another common issue students reported was the inability to preview the course, and for many courses, even a syllabus before registration. They noted that when considering a course on campus, most would investigate the merits of both the course and instructor through peer discussion before committing the time and money. However, there was little opportunity for students to do so for most online courses.

Conclusion

Suggested guidelines for the development of an online course include: a comprehensive description of the course, including purpose and objectives; time required to complete the course; tuition costs; grading policy; accreditation/degree fulfillment; prerequisites, including technology skills; minimum system requirements; and testimonials. Also important is the inclusion of a brief demonstration of a course module for student evaluation prior to registration. This should demonstrate the integration of course materials and instruction with the student's technology capabilities. Distance education is an important component of our society today. It is hoped that these preliminary findings will further the research associated with the advancement of standardized guidelines in the development of online courses for distance education, and thereby benefit student, instructor, and institution.

References

Carr-Chellman, A., & Duchastel, P. (2000). The ideal online course. *British Journal of Educational Technology, 31*,(3), 229-241.

Harris, J. (2000). Design and development of online courses. In G. Kearsley, (Ed.), *Online Education: Learning and Teaching in Cyberspace* (pp.93-107). Belmont, CA:Wadsworth/Thomson Learning.

Madden, D. (1999). 17 elements of good online courses. Honolulu Community College. Retrieved November 30, 2000 from the World Wide Web: *http://www.hcc.hawaii.edu/intranet/committees/FacDevCom/guidebk/online/web-elem.htm*

Umm...I Don't Think it's Working: Why our Class-to-Class E-mail Exchange Didn't Work (and What can be Done to Fix it)

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Abstract: Last spring, my teacher education students and I decided to partner with a local middle school via the Internet. Since my college students were in the process of learning how to be English teachers, and the middle school students needed help with their writing, the match seemed to be perfect and beneficial to both parties. However, the technology, rather than being an invisible vehicle for communication, got in the way. The middle school teacher and I, try as we might, had many difficulties with not only scheduling, but also utilizing the technology itself. While we still feel that our project was worthwhile, there are many changes that we will make before attempting another e-mail project in the future. This paper addresses those changes.

Introduction

I knew that we were in trouble from day one. For the past few weeks, Linda and I had been discussing connecting our two classes via the Internet. My undergraduate pre-English education students were to act as a "real" audience to critique her eighth-grader's creative writing. In theory, it was a wonderful idea. Much research has indicated that providing an authentic audience for students can help to raise not only their level of motivation for writing tasks, but their technical skill as well (Hawisher, 1992; Citrino & Gentry, 1999). The Internet, and e-mail in particular, provided the perfect medium for transferring large amounts of text in a timely fashion, much faster than relying on old-fashioned "snail mail." Plus, Linda's students were eager to use the computer to type and send their stories. At the same time, my undergraduates were eager to get their hands on "real" student writing, the kinds of writing to which they were training to devote their professional careers.

The Initial Project Goals

The students registered in my Introduction to English Education course last spring came to me with varying undergraduate backgrounds, but all hoped to apply to the following year's Master of Education program in English. All were eager to get their hands on "real" student writing. It was one thing, we agreed, to read about helping students to become better writers, but quite another to actually put our words and thoughts to action. My students were aware that technology in the secondary school classroom is here to stay, and most had little to no experience in how to integrate that technology successfully into the existing curriculum. By engaging in this project, my students would see how Linda, a classroom teacher, would use technology to connect to them, pre-English education majors, for mutual gain. The goals for my students were simple: once their middle school partner sent them a piece of writing, they were to read it carefully and offer praise for what was done well and suggestions for improving what still needed work. They were told to look not only for the obvious, surface-level errors with punctuation and spelling, but also ways to improve the overall tone or feel of the piece. Once comments had been made, an e-mail containing the middle school student's writing and the college student's response was sent via attachment to Linda's account. We decided that there needed to be a bottleneck at some point to monitor what was being sent back and forth to avoid any inappropriate comments from taking place. Also, to insure anonymity, student initials were used in lieu of full names.

What Worked

In some cases, middle school papers that were sent to my student's personal e-mail accounts via attachments actually arrived intact. When that happened, it was joyous! My students were amazed at the quality of the writing being sent and were eager to bring in their partner's work to share with the whole class. One of my students was stunned at the level of vocabulary her partner was using, incorporating words such as "chasm" and "oblique" into their story. I found that I had to allow some time during each class for my students to share what they had received, and discuss with their peers (and future colleagues) how best to respond. The excitement upon receiving their partner's work was palpable and contagious.

As the project progressed, I also sensed my students paying closer attention to reading assignments that focused on assessing student writing. No longer complacent receivers of information, my students now had a context within which to work and respond to the textbook. Issues such as "teaching grammar in context" and "self-selected topics" became real, as well as how to allow for such creativity when standardized testing requires many teachers to use highly prescriptive styles of writing. Issues that once seemed distant were now very relevant, and my students simply couldn't get enough!

What Didn't

As happy as some of my students were when they first began to receive e-mails from their partners, others were frustrated. For some, attachments were unable to be opened due to differing platforms. What could be easily opened by some computers appeared as cryptic code to others.

For the first exchange, Linda had to physically carry hard copies of her student's work to my classroom. For technical reasons on their part, Linda's students were unable to send all of the papers to their assigned partners via the Internet. Rather than waste any more time, Linda felt it necessary to "get the ball rolling" by bringing the papers to us. Strike one. Our hope was to involve as little paper as possible, fully utilizing the technology with which we were so eager to engage. However, both sides were getting antsy, and hard copies of student work were better than no student work at all.

On the university side, questions arose as to the most efficient way to comment on student work. Since cyberspace precluded physically writing comments in the margins, my students found themselves commenting in narrative form to what they were reading. It was difficult for them to say, "Notice that in paragraph three, second sentence, you use the incorrect form of 'there.'" Comments such as this were tedious. Strike two.

My students and I also determined that scheduling conflicts played a major part in the failure of this project. First, the project was started in April. For my students, a new quarter was underway, but for Linda's middle school students, the year was winding down to a close. I felt that it was much easier for my students and me to stay focused in the absence of end of grade testing, activities, and general lethargy that tends to set in at the end of a long school year. Second, while my students had just returned from their spring vacation, Linda's students were eagerly anticipating theirs. I have no doubt that starting a major project such as this with spring break mere weeks away was difficult for Linda and her students. Strike three. Future projects will address topics such as choice of platform, utilizing comment tabs, and taking into account scheduling issues *prior* to the project's start date.

References

Citrino, A. & Gentry, B. (1999). Beet farmers, bombs from Baghdad, and the northern lights: Crossing cultures, sharing stories. In T. Howard & C. Benson (Eds.) *Electronic Networks: Crossing boundaries, creating communities* (Pp. 112-132). Portsmouth, NH: Boynton/Cook Publishers.

Hawisher, G. (1992). Electronic meetings of the minds: Research, electronic conferences, and composition studies. In G. Hawisher & P. LeBlanc (Eds.) *Re-imagining computers and composition: Teaching and research in the virtual age* (Pp. 81-101). Portsmouth, NH: Heinemann.

Students Perceptions of the Value of On-Line Instruction

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Abstract: This paper explored college students' basic perceptions of WebCT on-line instruction, focusing on why students chose or did not choose to use this format, tools and activities preferred, and if this format should be continued. The findings revealed that students did not use on-line instruction due to lack of computer access. Students who chose to use WebCT did so to access course materials and for e-mail connectivity reasons. Tools and activities preferred were accessing class materials and posting to the bulletin board. The majority of the participants indicated that on-line courses should be continued.

Introduction

Online web based education is escalating at higher education institutions across the nation (Kearsley, 2000; Khan, 1999; Piccano, 2001). Today, students often have the opportunity to pick the way they would like to take courses, with possibilities including traditional face-to-face formats or some form of distance technology. Students also have the option of choosing to attend colleges or universities that offer courses in a format that matches their life style and learning preferences. Learning online, however, is much different than learning in a traditional classroom. Students must be more independent, be self-starters, have basic computing skills, and be disciplined with their time management skills. They need to be taught a new set of study skills if learning is going to be effective and meaningful to them in this type of environment. (Kearsley, 2000; Williams, 2000).

Background Literature

Research examining why students elect not to use distance learning has identified several factors. These have included: the significant decrease in face-to-face interaction between the instructor and students in class; difficulty in participating in an on-line class with having access to a computer and basic computer literacy skills; changes required by the student to participate in the class using a distance format; lack of time to complete the course; lack of technical assistance when needed as computer related problems emerge; and lack of the time to complete Internet searches for the class (Berge, 2000; McKenzie & Davidson, 2000, O'Malley, 1999; Roblyer & Guarino, 1999; Weber & Schoon, 1998).

Research on why students choose distance technologies for instruction is not extensive. However, it is becoming an increasingly important area of interest as new and emerging types of distance technologies are being used with greater frequency in higher education institutions and business and industry. Several factors emerged from studies that have been completed: distance classes were convenient, matched students' schedules better than the more traditional face-to-face classes; saved students time; and provided collaborative opportunities (Barron & Lyskawa, 1998; Berge, 1998; Klesius; Homan and Thompson, 1997; McKenzie & Davidson, 2000; O'Malley, 1999; Roblyer & Guarino, 1999; Rose & Collison, 1997; Stokeband & Althoff, 1977).

Purpose and Rationale

This study had several purposes. The first was to identify whether students would choose to access supplemental course materials provided on WebCT, and the reasons why they did or did not use WebCT. The second purpose was to identify whether students felt their use of WebCT enhanced the course, and if so which tools and activities they found the most useful. The third purpose was to determine if WebCT should be continued with these courses in the future. The information collected will provide formative information for future decision making in planning, implementing, and evaluating WebCT courses.

Methods

Participants

The participants in this study consisted of students in seven classes, both undergraduate and graduate levels, taught by the same instructor during the 1999-2000 academic year. All of the classes used WebCT as a course supplement. The same course tools and activities were used as consistently as possible by the instructor.

Courses

During the 1999-2000 academic year the instructor had a joint appointment with two departments, the Physical Education Department and the Media and Instructional Technology Department. To collect a greater range of information on student perceptions of distance technology and whether students would choose to use this format if available, the instructor conducted a yearlong study. In the fall of 1999, students enrolled in two undergraduate classes in Physical Education Department (Health and Wellness and Introduction to Sports Management) were given a class that was enhanced by WebCT. During the spring of 2000 two undergraduate courses in the Physical Education (Curriculum and Instruction in Physical Education and Supervision) and one graduate class in the Media Department (Videotape Production and Utilization) were also provided an on-line enhanced course along with the traditional face-to-face instruction. Two graduate media classes were added to the study during the summer of 2000 (Administration of School Library Media Programs and Instructional Technology). Students were given on-line instruction through WebCT and encouraged to take advantage of the various tools and activities provided.

Instrument

After reviewing the literature and talking with distance experts, the research team designed a one-page survey to collect preliminary data about student perceptions on the use of WebCT. The questionnaire consisted of both closed and open-ended questions. The closed-ended questions focused on student demographic data including student grade level, prior experience with WebCT, whether WebCT had been used in class, and whether WebCT had enhanced the class. Five open-ended questions were designed to collect information on student views of WebCT. These were: Why did you not choose to use WebCT? Why did you use WebCT? What WebCT tools did you find the most helpful? What WebCT activities did you like the most? Should WebCT be continued as a tool for teaching and learning in this course? Why or why not?

Before the instrument was administered it was pilot tested by a committee of distance experts. They were asked to review the instrument and add or delete anything they felt was necessary. Suggested modifications were made before the questionnaire was distributed.

Data Collection Procedures

On the last day of each class the instructor distributed and collected the surveys. Students were asked to respond to the survey and write their names on the back for extra credit. They were informed the data would be kept confidential and used to assist in future on-line course decision making. The vast majority of the students, approximately, 98%, chose to participate in the study.

The closed-ended questions were analyzed using the Advanced Statistical Package for the Social Sciences (SPSS). In addition to frequency distributions, some of the data was analyzed using non-parametric statistics. Chi square tests were run to determine if relationships existed between WebCT use and selected categorical variables such as gender, student's grade level, content area, and prior experience with WebCT.

The research team performed a content analysis on the open-ended questions. Student responses to each of the open-ended questions were typed and collated into a data report. Responses were read multiple times by two members of the review team who have an extensive background in content analysis. Categories were extracted and agreed upon by the two reviewers from the reports for each of the research questions. The reviewers then individually reread the reports and coded the responses into the appropriate category. Several content checks were done to ensure content reliability. The reports were read and statements that did not relate to the question were thrown out. Second, an intraclass correlation was computed to estimate interrater reliability, r = .86

Data Analysis and Results

Of the 161 students participating in this study, 93.2% (N=150) of the students chose to access and use WebCT course materials. Only eleven students chose not to participate in the on-line web based instruction. Their reasons for not participating fell into two major catergories: (1) difficulty locating a computer to get on-line with to access the course (N=4) and (2) technical difficulties when trying to access the class website (N=3). Other reasons cited were personal in nature; some students felt they learned more in class when they took notes while listening to the instructor talk (N=2), and one student did not have the time to learn the basics of navigating on-line web to access an on-line course (N=1).

Little relationship was discovered between student demographic factors and their use of WebCT. The majority of males and females used the online course materials, and no statistically significant gender differences (for p=.005) were found for WebCT use (see Table 1).

	Gender		
WebCT Use	Female	Male	Total
Used WebCT	82	68	150
Did not use WebCT	4	7	11
Total	86	75	161
Chi-Square	$X^2 = 1.333$, p=.248		

Table 1: Use of WebCT Materials, Student Gender and Content Area

While 100% of the Media/Technology students accessed the WebCT materials and only 90% of the Physical Education students used WebCT, these differences were also not statistically significant (for p=.005). These results are reported in Table 2.

	Student Content Area		
WebCT Use	PE	Media	Total

Used WebCT	98	52	150
Did not use WebCT	11	0	11
Total	109	52	161
Chi-Square	X^2=5.633, p=.018		

Table 2: Use of WebCT Materials and Student Content Area

There was also no statistically significant relationship between student's grade level or prior experience with WebCT and their use of the supplementary WebCT course materials. A few freshmen, sophomores, and juniors chose not to use WebCT materials, but all seniors and graduate students accessed the course materials (see Table 3).

WebCT Use	Student Grade Level					Total
	Freshman	Sophomore	Junior	Senior	Graduate	
Used WebCT	12	19	34	28	57	150
Did not use WebCT	2	2	7	0	0	11
Total	14	21	41	28	57	161
Chi-Square	X^2 = 14.449, p=.006					

Table 3: Use of WebCT Materials and Student Grade Level

Generally, students who chose not to use WebCT had never been in a class that used WebCT, or had been in 5 or more classes that used WebCT (see Table 4).

WebCT Use	Number of Courses with WebCT Components Taken Prior to This Course						Total
	0	1	2	3	4	5 or more	
Used WebCT	44	50	18	10	7	21	150
Did not use WebCT	7	2	0	0	0	2	11
Total	51	52	18	10	7	23	161
Chi-Square	X^2 = 7.228, p=.204						

Table 4: Use of WebCT Materials and Prior WebCT Experience

Of the 150 students who used WebCT, 94% indicated that using the online materials enhanced the face-to-face instruction. The main reasons students used the online course components were the ease of accessibility WebCT provided to course materials, the convenience it provided for communicating with the instructor and other class members on a regular basis, and it saved them time.

The type of on-line tools preferred by students were: class notes (N=120), bulletin board (N=93), e-mail (N=55), and the class calendar listing weekly course activities (N=26). Students indicated they liked to participate in a variety of activities on WebCT. The five most popular were: posting information on the bulletin board (N=44), accessing course notes (N=24), taking exams on-line (N=13), completing extra credit assignments that were made available on-line (N=9), e-mailing the instructor (N=6), and e-mailing other class members as needed (N=6). Table 5 summarizes the content analysis.

Rank	Reason	N
1	The on-line learning component of the course provided quick access to course information	62
2	Communication between the instructor and students in class was enhanced through e-mail and bulletin board connectivity.	42
3	On-line instruction was convenient and saved students time (i.e., sending attachments instead of driving to campus to turn in assignments, having class on-line	31

	rather than face-to-face meetings on campus)	
4	The instructor required students to participate in WebCT as part of class	30
5	On-line instruction provided students with course notes so they could spend more time listening to information presented in class.	8
6	On-line instruction provided an environment that encouraged students to explore and collect new and recent information in their area of study.	5
7	On-line instruction fostered an environment that urged students to share information with their peers.	5

Table 5: Reasons Students Chose to Participate in Web Based On-Line Instruction

When asked if on-line courses should be continued, the overwhelming majority said "yes". One hundred and fifty five of the 161 respondents (98.7%) who completed this survey felt on-line instruction should be ongoing. Reasons students cited for supporting continuation of on-line course components included the ease of obtaining course materials at any time from any place, course organization and its helpfulness to student learning, and enhanced communication between the student and instructor. Table 6 summarizes these findings.

Rank	Reason	N
1	Students have easy access to class materials any time	32
2	The web based on-line environment organizes course materials in a meaningful way, using a variety of tools, making it helpful in enhancing student learning	23
3	Communication between the instructor and students is enhanced	23
4	On-line learning is convenient and saves students time	23
5	Sharing of ideas is promoted in the on-line environment through the use of the bulletin board, e-mail, chatrooms.	12
6	Student computer and technical skills are enhanced through taking an on-line course	6

Table 6: Reasons Web Based On-Line Instruction Should be Continued

Conclusions and Future Directions

The overwhelmingly positive response students exhibited to the use of WebCT as a course supplement suggests that online course components are a valuable educational resource -- even when the primary mode of instruction is face-to-face. It is encouraging that almost all students chose to use the online resource, regardless of gender, grade level, area of study, or prior WebCT experience. However, the fact that some students did not use WebCT because they lacked computer access suggests that the digital divide will continue to be a factor for some students, and may limit the number of students who choose to engage in totally online courses. Colleges and universities must take this into consideration and provide computer access for students who may not have the means to acquire computers and Internet access individually. Other students indicated technical problems prevented them from using the WebCT course materials. Providing round the clock help-desk support can help students with personal hardware and software problems, but institutions also have a responsibility to assure that web servers are reliable and accessible at all times.

The online course components rated highly by students, specifically ease of access to materials and increased communication opportunities with the students and instructor, offer the potential to strengthen all instruction regardless of course delivery format. Posting course materials helps students discern course organization, and can help them organize their own study strategies. And, as a number of students noted, being able to download course notes from the Web frees them to listen more closely in class. However, for students who learn through the process of taking notes overreliance on posted notes may actually be a detriment. One possible solution to this quandary is posting an outline of course lecture materials prior to class. Students can download this material, and elaborate on the outline notes as the instructor covers the material. The communication tools, email, bulletin board, and chat, provide great support for student collaboration outside class and strengthen the development of true learning communities.

This study provides an initial look into why students use online course materials and what barriers discourage them from using those resources. However, this study was limited to students in two content fields at one university. Additional research should be done to determine if these findings are generalizable.

References

Berge, Z. I. (1998). Barriers to online teaching in post-secondary institutions: Can policy changes fix it? *Online Journal of Distance Learning Administration* 1(2), Summer 1998(On-line), http://www.westga.edu/~Berge12.html

Kearsley, G. (2000). *Online education.* Belmont, CA: Wadsworth, Thompson Learning, Inc.

Khan, B.H. (1999). *Web-based instruction.* Englewood Cliffs, NJ: Educational Technology Publications.

McKenzie, B. & Davidson, T (2000) Motivating reluctant students to use WebCt. *Distance Learning Administration Annual & Conference Proceedings– 2000.* Callaway Gardens, GA:, 75-79.

O'Malley, J. (1999). Students perceptions of distance learning, online learning, and the traditional classroom. *Online Journal of Distance Learning Administration,* 2 (4), Winter (On-line), http://www.westga.edu/~distance/omalley24.html

Phipps, R., & Merisotis, J. (1999). *What's the difference: A review of contemporary research on the effectiveness of distance learning in higher education.* Washington, D.C.: The Institute for Higher Education Policy.

Piccano, A.G. (2001). *Distance learning: Making connections across virtual space and time.* Merrill Prentice Hall, Columbus: OH

Roblyer, M.D. & Guarino, A. (1999). Factors influencing student choice of distance learning or face-to-face course delivery. *Journal of Research in Education*, 9(1), 1-2.

Rose, R.M. & Collison, G. (1997). A comparison between web-based and notes-based professional development netcourse delivery. *Technology and Teacher Education Annual – 1997*, 151-154.

Stockkband, W. & Althoff, C. (1997). Graduate degrees: The time is now, the place is anywhere. *Society for Information Technology and Teacher Education Annual – 1997*, 163-165.

Williams, P. (2000). Making informed decisions about staffing and training: Roles and competencies for distance education programs in higher education. *Distance Learning Administration Annual & Conference Proceedings 2000*, 107-108, Callaway Gardens, GA.

Connecting Trainee Teachers and School Mentors with University Educators via Multipoint Desktop Video Conferencing (MDVC) : The Singapore Experience

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Abstract: Computer video conferencing as a computer-supported collaborative learning (CSCL) technology brings learners closer to real-world environments and it provides increasing opportunities for learners to share experiences across time and space. This paper describes how multipoint desktop video conferencing (MDVC) is used in pre-service teacher education programs in Singapore to add value to the practicum. It enhances the professional development of trainee teachers and teacher mentors by allowing them to share ideas, experiences and resources in teaching and mentoring in real time with an audience wider than the schools where they teach.

Introduction

The Multipoint Desktop Video Conferencing (MDVC) project at the National Institute of Education (NIE), Singapore, was launched in 1999. It explored the use of this new communications technology as part of initial teacher training at the NIE. It built on the high speed, broadband, island-wide ATM network, known as SingaporeONE which enabled schools and NIE to hold good quality MDVC conferences using ordinary desktop computers with ADSL telephone lines. Hence, the potential of MDVC in connecting people at different locations for discussions in real time was realised.

The project has two main objectives. The first is technical and developmental in nature, involving the practical feasibility of putting into place a reliable MDVC system that fully exploits existing technologies. The second objective is pedagogic in focus and is concerned with establishing how MDVC can add value to the professional preparation of NIE's trainee teachers, especially in the practicum component of the training programme. These objectives were achieved within two parts of the project - the 'Pre-Service Study' and the 'Mentor Study'.

This paper will document the development of this project and its current status, and present findings from studies made of the participants (trainee teachers and teacher mentors). It will discuss how these will help in moving the project forward, as well as the potential of MDVC in enhancing collaboration among trainee teachers, teacher mentors and university supervisors, thus adding value to the practicum experience for all.

The Organisational and Technical Aspects of the MDVC Project

The project uses the White Pine CU-SeeMe Meeting Point server and end-user hardware and software. Schools involved in the project and NIE are linked to the project server over the SingaporeONE broadband network by ADSL telephone lines. It is possible to hold conferences with up to six participants, with adequate frame rates and smooth audio. Typical conferences last an hour or more. To achieve this quality of transmission, it had been necessary to agree on common settings for the CU-SeeMe software and to engage the help of the technical assistants from the schools both in maintaining the school equipment and in providing assistance to conference users.

With regards to the organisational aspects, it became clear from feedback from conference participants that MDVC conferences needed to be structured. Each conference group was allocated a time slot and members were told to join the conference at that same time each week. In addition, a conference programme with a clear agenda relating to different aspects of teaching/teacher mentoring for each session was drawn up.

The Pre-Service Study

In the pre-service study, MDVC was used to link trainee teachers who were undergoing their practicum in different schools with each other and with the NIE supervisors/researchers. Throughout the duration of the practicum, the supervisors/researchers held regular time-tabled discussions with the trainee teachers regarding school attachment issues. In this part of the project, MDVC was used to :

- enable the trainee teachers to hold private discussions on matters relating to their practicum;
- help the trainee teachers to discuss practicum matters with members of the research team/NIE supervisors;
- collect basic quantitative and qualitative data related to the technical and pedagogic aspects of conferencing.

Feedback from Trainee Teachers using the MDVC System

Responses from the trainee teachers were positive. Through these MDVC conferences they were able to discuss their practicum experiences with fellow trainees from different schools during the practicum period. They reported that a) they all experienced a wide range of problems; b) the common problems encountered were similar; c) it was helpful to talk to other trainees via MDVC; d) they felt less isolated; e) they were able to implement some of the ideas shared during MDVC; and f) they would be willing to have MDVC sessions again.

The Mentor Study

The second part of this project, the Mentor Study, used MDVC to link together the School Coordinating Mentors (SCMs) in eight secondary schools. The SCM is a new role for senior teachers in schools. SCMs are required to oversee the management of the practicum in their respective schools. As the tasks and responsibilities presented new challenges to these teacher mentors they would benefit from networking with each other and with the NIE researcher via MDVC. To date, one batch of SCMs have used the technology for this purpose during a 9-week practicum period. They have been able to :

- share information on school-based mentoring programmes, and discuss the issues and problems;
- discuss and share case studies of teacher mentees, and the frustrations and rewards of mentoring.

Feedback from School Coordinating Mentors (SCM) using the MDVC System

The SCMs reported that a) they felt positive about having the MDVC; b) they gained a much clearer understanding of their SCM role; c) they valued the networking opportunities provided and found the discussions very helpful; d) their confidence was increased, and professional development and effectiveness enhanced; and that e) their trainee teachers and cooperating teachers also benefited from these gains.

Recent Developments

In the current phase of the MDVC project the researchers are exploring the feasibility of combining MDVC and the streaming of digital video clips made by conference participants of aspects of their classroom teaching. These clips are transferred electronically from the schools to NIE using the File Transfer Protocol (FTP). At NIE these are edited and placed in a password-protected area of the project WebPage on the project's video server. Trainees then video stream the clips and discuss them as part of their MDVC conferences. The SCMs during their own MDVC conferences will also make use of these video clips as a basis for discussing lesson observation issues.

Discussion and Conclusion

The purpose of our project is to investigate whether and, if so, to what extent MDVC can improve the quality of the practicum. Thus our motivation as educators lies less in the technology itself and more in its pedagogic potential. Findings from the piloting phase have shown that MDVC conference participants were positive about their MDVC experiences. The benefits gained have added value to their practicum experiences and helped improve the quality of teacher preparation for them. Our particular interest is in how the MDVC technology can be further harnessed so that it will make a significant difference in reshaping teacher education, and education in general.

LEARNING INTERACTIONS OF A WEB-BASED TUTORIAL PROGRAM AND THE IMPACT ON LEARNERS: THE USE OF THE WEB FOR EDUCATIONAL PURPOSES

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Abstract: Web-based Tutorial program was developed to serve as a supplementary classroom activities for freshman in Foundations of Computer for Education class. The program consisted of two types of learning interactions: human-to-computer interaction and human-to-human interaction. Online materials, lecture notes, recommended reading, and review tests were identified as human-to-computer learning interaction; whereas, human-to-human interaction was set up in form of learning activities for students via web-board, chat forum, and e-mail. The research was aimed at describing the relationship between two types of learning interactions, learners' factors (cognitive, affective and social culture domain) and learners' satisfaction to the use of the web as a learning tool. Artifacts were recorded. At the end of the semester, questionnaires were distributed to students. 130 questionnaires were completed. Among three types of motivation (task value, intrinsic, and extrinsic motivation), task value had a significant correlation with students' satisfaction to the use of web.

Overview

Web is an innovative educational communication channel underlining a concept of learning alone with others. Learners must take their roles as activators constructing their own knowledge as well as contributing to others. In multi-nation virtual atmosphere, however, researches found Asian learners are mostly take their participation less than their counterparts. Presently, educational materials available on web are not pertinent to Thai context and no study has been conducted for how Thai students learn on web environment.

Web-based Tutorial program, then, was developed to serve as supplementary classroom activities for freshman in Foundations of Computer for Education class'1999. Basically, learning activities in the web were arranged via two concepts: Human-to-computer and Human-to-human Interaction. Online materials, lecture notes, recommended reading, and review tests were identified as human-to-computer learning interaction; whereas, human-to-human interaction was set up in form of learning activities for students via web-board, chat forum, and e-mail.

The study

The research was aimed at describing the relationship between learners' factors --cognitive, affective, and classroom culture domain--, and learners' satisfaction to the use of the web as a learning tool in two types of learning interactions (human-to-computer and human-to-human interaction). Students responded to the questionnaire before they were introduced to the web. During the semester, students were strongly encouraged to use the web. Artifacts were collected. At the end of the semester, questionnaires were again distributed to students. 130 questionnaires were completed.

The results showed that there was a significant difference between students' feeling about making use of web for educational and general purposes. Students inclined to the use of web for general purposes. They tended to be satisfied with the human-to-computer interaction type when using the web tool. In classroom, however, students tended to prefer their learning with groups to learning by themselves. Among cognitive domain (prior knowledge about computer skill), three types of motivation (task value, intrinsic, and extrinsic motivation), and classroom culture (study alone and with group); task value had a significant correlation with students' satisfaction to the use of web. Finally, statistics did not show a significant correlation between academic achievement and other variables.

Learning with web is still a new learning phenomenon for Thai students. Students felt that web was not for learning but for entertaining. Students passively used web for educational purposes. They appreciated the web for its delivering class materials. They tended to be satisfied with the web, when they realized the value of web in accomplishing their learning task (Velayo, 1994). Students participated in activities on web chat and web board for the main reason of completing class assignment rather than for their own wishes.

Furthermore, the study found that students' classroom culture inclined to be group learning, which should be able to be supported by human-to-human interaction via web. However, the study showed students' satisfaction to the web in human-to-computer interaction type instead of human-to-human type. This probably happened because students did not comprehend the application of web learning tool. They did not realize an educational potential of the web. The web was used as a passive media delivering necessary contents for their examination. Learning on the web is more than pre-instruction or content-based learning programs. Web is a value added of computer network capacity. Sharing sources of knowledge and learning interaction among users can be made to happen in online environment. During this early stage of adoption, Thai instructors who wish to integrate web to classrooms not only be careful in learning activities design, they must be aware of preparing their Students to develop set of skills in acquiring information, generating, and synthesizing their knowledge with others.

Conclusion

In order to defuse the web technology as a learning tool, policy makers and instructors should shift the focus from students' technical training about web to educational aspect. The usefulness of the web could occur only when students become active learners: interact with educational contents and collaboratively learn with others via the web. When students realize how to make use of web as a learning tool and optimize its educational benefits by acting as active receptors and contributors; web increases its educational benefits and Thai scholars network will be expanded. The diffusion of such type of communication technology as web for learning will possibly grow in exponential rate (Rogers, 1995).

References

Rogers, E.M. (1995). *Diffusion of innovations.*, NY: The free Press

Velayo, R.S. (1994). Learner cognitive-motivational characteristics and perceptions of computer conferencing use. *International Journal of Instructional Media*, 21 (4), 279-93

Compressed Video Technology and Innovative Teaching: Insight and Realistic Experiences of CVT Usage

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Abstract: Compressed video teaching with the VTEL TC2000©, teleteaching system, is a promising new technology that offers the opportunity to effectively teach a large number of students at both local and remote sites. With compressed video technology, the televised image and sounds of an on-campus course (lecture, discussion, and audio-visual teaching aids) are sent to compressed video classrooms at other locations, while the images and sounds of remote students simultaneously return to the on-campus classroom. Image and sound quality with this technology are excellent but (as with any new technology) effective pedagogy requires understanding the medium, prediction of pitfalls, and modifications in teaching techniques. The presentation will offer insights into effective compressed video teaching based upon the first-hand experiences of teachers who have presented compressed video, as well as technicians and directors who lay the groundwork for such courses

Introduction

College administrators, faculty, and students are justifiably excited about the wealth of new teaching technologies that promise a revolution in pedagogy. Our colleagues often report being introduced to these technologies with either a "panacea" or "avoiding doomsday" scenario. In the "panacea" scenario, technology solves all of the ills of collegiate teaching ("it will increase your teaching effectiveness at least 100%"). In the "avoiding doomsday" scenario, faculty members are warned to "use ITT or lose it!" In this world view, ITT (Innovative Teaching Technology) is characterized as eventually populating the world with Disney©-spawned mechano-profs, lecturing remote students on-demand via the internet; and the "it" being lost, is "our jobs" if our University is not in the vanguard of such techno-wizardry.

CVT is one of the most innovative of the new technologies. Our presentation is designed to cut through the hype and explore the implementation and growing pains of Compressed Video Teaching (CVT) at a number of universities in Louisiana. The capabilities of CVT vary, but at a minimum CVT allows two-way simultaneous audio and visual communication between on- and off-campus classrooms. CVT also allows teachers to transmit any audio-visual materials (computer displays, overheads, video-clips, etc.) to remote sites. Thus, Local/Remote students see and hear everything going on in each classroom, for better or worse, much like a large single classroom.

This presentation concentrates on recommendations to teachers, administrators, and support personnel concerning what we have found to be effective and ineffective CVT practices, and strengths and concerns unique to this medium. The paper will begin with a brief method section that describes the equipment in a typical CVT classroom, and what it does. It continues with recommendations based upon CVT teachers and technicians' training and experiences, as well as the relevant literature. Advice will be presented in two subsections, one for faculty and another for administrators and technicians.

Method

Materials

The VTEL TC2000© System. The VTEL permits real-time two-way audio-visual (AV) communication between teachers and students at the local and remote sites, and provides an alternative AV source to send high-quality video (tapes, DVDs, CDs), computer animation, still-frame pictures, and/or sounds to remote locations (VTEL Corp., 1999). The picture and sound quality at both local and remote sites is equal to very good cable television. It should be noted that while an alternative video source is transmitting to remote sites, remote students can hear (but not see) the professors or their classmates at the Local Site, though the local site's view of remote classes is uninterrupted.

VTEL sites. The cost for each VTEL site varies depending upon the number of students per classroom and how much extra equipment is purchased beyond minimal requirements. To illustrate, total equipment costs for the least expensive site of which we are aware was $8,000, most sites range in price from approximately $14,000 to $18,000.

The Nicholls State site cost $28,000, was designed for 20 students and included the following major equipment: (a) the VTEL TC2000 Base System video conferencing equipment, with dual monitors, a Pentium based PC with CD ROM, and proprietary software plus one Sony© Pan Tilt Zoom (PTZ) camera, (b) one Cameraman© Presenter Camera System (capable of automatically focusing on the student at an "open" desk microphone, (c) ten Cameraman© Push to Talk desk microphones for the above, (d) two additional Sony© PTZ cameras (capable of panning throughout the room), (e) a Canon© Video Overhead Projector/Graphic Tablet Display, (f) two Boston Acoustic© speakers, (g) a wireless lapel microphone (for the professor), (h) four Sony© (35 in) screen monitors to display the alternative video source and remote class, (i) an additional Pentium II ©computer with CD ROM (this allows the professor independent control audiovisuals), (j) VHS and Beta videotape players, (k) an electronic whiteboard (capable of displaying dry erase markings on the remote monitors), (l) a 35mm Ectographic© slide projector, (m) wiring and remodeling. Naturally, these expenses are in addition to usual teaching furnishings, such as: podia, desks, tables, and chairs. In addition, the VTEL TC2000 system requires that the local and remote CVT classrooms be connected to each other by dedicated coaxial cable. The cost of cabling must be factored in as well.

It should be noted that often funding for remote sites may be provided or offset by other agencies or institutions which house the remote site (e.g. school systems, hospitals, civic organizations) which are eager to become part a CVT network. In Louisiana most CVT classrooms can be connected with each other.

A diagram of the local site is presented as Figure A. At Nicholls State, a director in the AV room has "input control", determining whether an image of the teacher, alternative input, etc. is sent to a monitor. At other universities, teachers may control the cameras/inputs.

Courses, Faculty, and the Director. The authors and their colleagues have taught a variety of graduate (Advanced Child and Adolescent Psychology, Introduction to Educational Research) and undergraduate (Introduction to Sociology, Basic Algebra, Basic English) courses via CVT at Nicholls State University and the University of New Orleans. All are senior faculty with a minimum of ten years teaching experience. The training of the Director, varied from a Ph.D. in Mass Communications to an undergraduate student majoring in Mass Communications.

Discussion

Recommendations to CVT Teachers

The primary lesson that the current authors have learned about CVT instruction can be summarized as follows: "the same things that make a face-to-face lecture clear, informative, and engaging will make a CVT lecture clear, informative, and engaging". Students and Directors agree that if teachers come into the CVT classrooms and read their lectures into cameras, students will react by tuning out and turning off. The following are some things we suggest to avoid this.

Point 1. Vary the pace, activity, content, and focus of class. Remember is "variety is the spice of life." Change the various aspects of presentation to maintain interest. Avoid becoming a dreaded, 50-minute, talking head. Even the most diehard lecturers among us (CV'Teers) learned to vary the speed of presentation, move about the room, intersperse facts and theories with puns, jokes, songs, overheads (e.g. PowerPoints©), cartoons, and animations. On the subject of sights and sounds, our mass communications co-author constantly reminded the CV'Teers that CV is an AUDIOVISUAL medium, and that to be effective we had to engage our audiences' eyes, ears, and bodies. Too much of even a good thing (films, discussions, questions or even jokes) may become tedious. The current generation grew up watching MTV© and the like; they know what TV is supposed to look like, and make no mistake about it, they perceive CVT as TV! Bore them and they will tune you out! Even those of us learning to use the medium did so from time to time when presentations dragged.

Point 2. Please release me, let me go, cause I'm preparing CVT! It takes a lot of time to prepare for a CVT course, and professors should ask for release time. CV teachers cannot merely use their old lectures with this medium. The necessary changes involve a substantial time investment. CV teachers have to learn the equipment, this takes time. They have to optimize their presentations for CVT, this takes time. They have to create new materials, this takes time. They have to teach much larger classes, this takes time. CV teachers should get release time to prep each course.

Point 3. Have a director if possible; every TV show does. One of the advantages for those who taught at Nicholls was the presence of multiple cameras, so that what was on the screen (both local and remote) varied. The Director changed the camera feed as interest waned, focused and tracked presenters as they marched around the room, showed students who were "nodding off", "excited", or "making faces". We simply could not fall back into the talking heads mode even if we wanted.

All of the faculty who teach CV classes who were fortunate enough to have a Director, swear by them. They relieve the CV'Teers from having a "second ball in the air", teaching plus having to control camera/video feeds. We owe no small measure of our CVT success to the Directors who Nicholls State provided; and while many CVT setups make the presenter direct, this is a mistake and detracts from optimal CV instruction.

Point 4. Engage your audience. Captain Picard said it best; when he looked at the helmsmen and said "engage" (this is a S.T.T.N.G. geek test). Among the best CVT moments the first author had was when he asked members of the audience to stand and sing with him during a developmental lecture. It worked because it required students to be active and it brought the presenter and class together as a group. Student's stood (altering their posture and perspective) and followed a bouncing ball PowerPoint© presentation of the lyrics (varying the focus), sang (varying the activity), and loved it!

We are not suggesting CVT operettas, but professors must ask students things, hand them something (for Remote students you will have to plan ahead), have them move about, participate in class demonstrations, have them occasionally do something aside from listening. Active learning beats passive hands down. Passivity causes brain lock and robs both Local and Remote students of the opportunity to feel a part of the group. Remember, more than ever, you are entertaining, like it or not. That is what everyone is accustomed to watching on the tube.

Point 5. Dramatize. Have you ever listened to a professionally recorded novel on audiotape? If not, think of the last play you saw. Attention is best maintained when the presentation is made dynamic and real. Varying ones tone of voice, rate of speech, and general demeanor may do this. Gesture, move, and act. Not only does this maintain attention; it forces students to follow presenters as they move literally and figuratively.

Point 6. Never forget you are teaching ALL students in class - local and remote. Remote students are at a distinct disadvantage if the CV'Teer forgets to acknowledge students' existence at least every few minutes. It is especially good to learn their names and CV'Teers often should scan Remote Class's faces on the monitors. Remote student's only grip on the presentation is through the sounds and pictures emanating from the TVs. The grip is tenuous at best. Therefore, the CVT professor must remember to look directly at the camera as often as possible, not talk to the board, ask students questions, elicit comments and opinions, and encourage students to discuss with each other at both local and remote sites. Discussions are excellent. But try to avoid the development of a we (local) versus them (remote) mindset. We also suggest that professors deliver at least one presentation during the semester from each remote site. In-class student projects can also facilitate group involvement.

Point 7. Check both local and remote students for "fisheyes." Fisheyes appear on recently deceased halibuts after about two hours on ice. In humans they denote a lack of understanding or interest. Fisheyes staring at you are bad! An excellent way to avoid fisheyes is through organization and clarity. In service of this end, a co-author belatedly outlined his materials and presented them via overheads. But even with an outline certain rules have to be followed. Too many PowerPoint presentations make Jack or Jacqueline a dull teacher. Alternatives to lecturing do not relieve one of the responsibility to being the prime source of information. We know a professor who colleagues refer to as "Cecil B. de teacher" because of overuse of film clips.

Visuals should enhance the points made, not make them. They must remain teaching aides or adjuncts, not be mistaken for actual teaching. Avoid the curse of the "disembodied narrator" who becomes a spirit voice behind too many visual aides. This brings us to the next key to clarity, make sure the audience can read each overhead from every point in the local and remote rooms. Ways to facilitate this include presenting only key themes and ideas, and not trying to present verbatim lectures; clarity is often synonymous with brevity. Use short, telegraphic-style clauses and try to follow the "one slide - one or two points" rule, more points should equal more slides. The teacher is there to elaborate. Next, use a legible font of appropriate size on a clear background. If in doubt use too large a font, not too small. Certain fonts and background colors do not work at all. One must experiment in an actual projection setting before deciding on ones' usual slide design. However, occasionally by altering fonts and/or backgrounds, students may be surprised and interest piqued. Dramatic color or font may be used as isolated instances, but remember to present the same information immediately following in the more legible format. Check VISUAL and AUDIO clarity before beginning, and check them from all points in the local room. Assure that the same is done at all remote sites.

Point 8. If presenting outlines or graphics, always provide hardcopies. The best way to handle any visuals in a presentation is to provide reduced copies (three or four slides to a page) to local and remote students before commencing. We prefer to hand out such materials immediately before class so students do not lose them. Again, this requires planning for the remote sites. If students do not get copies and are not told that they have copies, they will try to compulsively write down every word on each overhead and avoid engaging their brains throughout the class.

Point 9. Plan and prepare, plan and prepare. Teaching Remote students necessitates a high degree of pre-planning, more than the typical class, and not only with respect to distributing handouts, but also the administration of tests and quizzes. Before and/or after class conferences with students can be problematic if the CV link to the remote site is turned on immediately before class and off immediately after class. Planning for this and other contingencies makes for a better class. Alternative methods for teacher to student contact are essential.

Check with a technician or director whether or not the VTEL and peripherals can do what you want. Time after time, when CV'Teers encountered problems, they had stretched the envelope with an untried peripheral or program. For example, one CV'teer stored a complex animation on a Zip© (100-megabyte high capacity) disk when there was no such drive installed on the computer; another, prepared a series of Macintosh© slides for a Windows©-based computer; and yet another tried to install new software onto a hard disk with no space left.

Point 10. Plan for disasters and have backup. What can go wrong, will go wrong, this is sometimes called the Titanic principle. Anticipating problems before they occur is better than trying to solve them afterwards. Imagine a planned PowerPoint© presentation but the computer or the program failed. It has happened. In one instance, the computer gen-lock which converts screen images to TV signals malfunctioned. Having backup (handouts of the overheads) saved the day. Consider what would happen if you lost audio to remote sites? Have a BIG magic marker and newsprint pad ready to write messages that they can see on the monitors. Know the phone number of the site. Know the closest phone on which you can call them long distance.

While the VTEL's have performed flawlessly since their installation, all has not always been rosy in technoland. CVT teachers have to have a working knowledge of the VTEL TC2000 and its' peripheral equipment and programs. This is critical if there is no Director. Backup plans for equipment failure must be decided on in advance. For example, on the first night of one class, the site was disabled when an oversized (jumbo) shrimp truck cut the coaxial cable.

Potential for problems increase with presenter's desire to use more VTEL features and peripherals. To illustrate, one of the authors prepared a PowerPoint presentation on spurious correlation. The two-minute presentation took approximately four hours to prepare, integrating animation with a sound track. While the presentation worked perfectly on the home computer, the Microsoft© computer audio program was out of date and could not processes the required audio format. The animation ran great, but totally devoid of sound. The presenter chose to hum the tune and provide the required audio as the silent animation crossed the screen. This could have been avoided if the author had heeded the Titanic principle.

Point 11. Practice, practice, practice. Not only are these the directions to Carnegie Hall, but to effective CVT presentations as well. It is essential to actually try out all aspects of the presentation in advance at the local site. Whenever new hardware or software is utilized, preparations should include a dry run without students. This dry run should take place long before class, while professors still have time to fix any difficulties. Only in this way can the presenter develop competence and skill with this promising new technology.

The above points are by no means an exhaustive list of everything teachers need to know about CV instruction. But we will follow some of the advice given in our Point 7 "clarity is often synonymous with brevity" and address some recommendations to administrators/technicians planning to introduce CVT to their campuses.

Recommendations to Administrators and CVT Technicians

Administrators and CVT Technicians are often concerned with different aspects of CVT technology than teachers. Bearing this in mind we offer the following points for consideration.

Point 1. Plan, plan, everywhere a plan, and remember there is life after installation. Implementing even a minimal CVT setup involves YEARS (yes, YEARS) of planning. It has been our experience that universities plan for some of the things but forget others. Some universities are very good at getting equipment, but have no coherent plan how the equipment will be used. Planning is necessary for implementation and hardware issues like: (a) securing the funding; (b) selecting the sites (issues of availability versus potential audiences will have to be addressed), and equipment; (c) purchasing equipment (cost/benefit analysis and compatibility issues come to the fore); d) construction and installation (where will the equipment fit, soundproofing, accessibility); and e) debugging.

Planning is also necessary for: (a) which courses will be CV'ed, (graduate--fewer students but more dollars per student or undergraduate--larger potential population, but fewer dollars per student); (b) which professors will be selected (we suggest the best, most innovative and motivated teachers); (c) how teachers will be trained to use the equipment (this becomes especially important without a Director and we definitely advise against sink or swim, on-the-job-training); (d) if CVT doubles professors' workload, will they receive additional pay; (e) advertising that a course is available remotely; (f) who will manage the remote sites (if the door is locked who should the students go to); (g) how will professors physically get materials to remote students? The above is by no means an exhaustive list, but we believe we have made our point.

We would suggest that one person with adequate training oversee the process, rather than a committee. At Nicholls we have been fortunate to have a mass communications professor with a fundamental understanding of the media in charge, he and other involved faculty and staff have made CVT a success. But even with these resources there have been bumps in the road. Another good idea is to contact other universities and agencies already utilizing CVT and ask them for their assistance and suggestions. The Nicholls site was built in cooperation with a VTEL reseller, Contact persons for the reseller are presented as Appendix B.

Point 2. It takes money to make money. Any ongoing project involves continuing costs. Often universities implement new technologies for financial rewards. After CV is purchased, administrators may expect money to start rolling in. In fact, almost all technologies (computers included) have a start-up period when the university is actually losing money. People have to become accustomed to the equipment before it is used efficiently; but with proper PLANNING and implementation, this period can be minimized. CVT if effectively managed should be more than self-supporting; it should turn a profit.

Conclusion

Is teaching by compressed video a panacea, or does it signal doomsday? As with most technologies, the answer is neither. Our own doomsday scenario consists of the following: without support, understanding, and nurturing from all sides (administrators, faculty, and students) CVT technology will not succeed. If it fails however, it does not signal doomsday, the students just won't take the courses. A bad CVT course, just like a bad regular course won't make. Any tragedy lies is the wasted potential of the medium.

We are convinced that with planning and vision, CVT will emerge as a beneficial new way to teach. The basic value of CVT is that professors can to teach students material they could not previously. CVT decreases the hassle of being a student. It offers easier access to courses and less travel time. CVT decreases the hassle of being an administrator. It offers the possibility of combining sites to "bring" more students into the classroom, and can ease scheduling. The true value of CVT however, may be that it forces professors to reform some tied old teaching strategies and begin to innovate.

References

VTEL Corporation. (1999). TC2000 Large Group Conferencing System [Brochure]. Available http://www.vtel.com/products/esa/tc 2000.htm

The Imfundo Project: ICT in teacher education in developing countries

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Currently 130 million children across the world do not go to school. In many developing counties those that do attend school often leave functionally illiterate. Many teachers on sub-Sahara Africa are dying of HIV/AIDS, and in the worst cases more teachers are dying than are being trained and recruited. UK Prime Minister, Tony Blair launched the Imfundo project in April 2000 and gave the team six months to find ways to support the international quest for universal primary education by 2015 using educational technology. The decision was taken to focus on teacher education as the most effective way to improve both access to education and the quality of that education. This paper describes the project's findings to date and describes one of the pilot projects.

Introduction

Well over 100 million children throughout the developing world do not attend school. While some regions including Latin America, the Caribbean and East Asia are on course to achieving universal access to primary education, other parts of the world are slipping behind. The problem is particularly marked in sub-Saharan Africa, where the number of children not in school is increasing. In1998 this figure was 42 million of whom 56% were girls. The Imfundo project was set up in March 2000 following a meeting in London between Tony Blair, the UK Prime Minister and John Chambers, President of Cisco Systems to consider how information and communication technology can be used to support education, particularly teacher training, in developing countries and be supported through a public-private partnership,

A project team was set up at the beginning of May led by the Prime Minister's private secretary for economic affairs; myself a specialist in the use of ICT in education, seconded to the project by Cisco Systems; a wireless communication expert from Marconi Communications; a business development manager from Virgin Direct, and three other members from the UK Department for International Development (DFID). The remit of the Imfundo Project was to concentrate on basic education, while supporting other forms of education and training only where it had a knock-on benefit for basic education (e.g. teacher training). In order not to increase the digital divide the project considered the way in which support can be provided for the education of marginalised communities and those who and have poor access to education, including those in rural areas and women.

The team chose to focus on teacher training, since HIV/AIDS is decimating the teaching profession across Africa. The number of teachers trained in sub-Saharan Africa will have to increase substantially if:

- primary and secondary gross enrolment rates are to increase from around 50% today to100% by 2015 (the year designated for the achievement of international targets)
- class sizes are to come down from around 50
- the loss of teachers to HIV/AIDS is to be offset by training new teachers

The international development targets mention the quality of education, but do not give it sufficient emphasis. Two thirds of children who go to school in sub-Saharan Africa leave school illiterate. About half of teachers in developing countries are unqualified in terms of their own country's formal standards for teachers' education. Teaching methods are often antiquated with an overemphasis on rote learning, and too little learner-centred, outcome based. Another source of improvement is in the quality of educational management. Imfundo will address both these issues.

The Project tasks

Imfundo was tasked to identify ways in which ICT could be used effectively to provide large numbers of new well-trained teachers, as well as developing the quality of teaching through extensive part time professional development programmes. This can only be achieved through high volume distance learning materials. There is neither the human or physical capacity to bring teachers out of schools into teacher training institutions, nor to substantially increase the number if initial teacher training places. Distance learning enhanced through ICT may be the only effective solution in terms of costs and scalability. Distance education for professional development offers a way to enhance the skills of teachers, to promote new pedagogies, facilitate the introduction of new curricula, and to support teachers, while leaving the teacher in the classroom to teach lessons.

However both computers and Internet access are relatively expensive in developing countries, compared to alternative uses for that expenditure, such as more teachers and books. This is both because of relatively high communications costs in developing countries, heavy duties on imports of computers and related resources, and more importantly, because the cost of labour, including teachers, is much lower. The improvement in quality of primary and secondary education resulting from their use would need to be significant to justify the cost of their use in classrooms.

Therefore, although the remit was to explore new technologies, the project team took the view that radio is currently the most cost effective ICT for enhancing the quality of education in the classroom. Radio remains the most widespread and accessible ICT in Africa. In some countries it has near universal penetration. The costs of producing educational material for radio are one tenth of the costs of producing material for television, which has much lower coverage and is more expensive to access. This will change as prices of technology and Internet access fall as they have done in developed countries. Therefore the team explored the use of radio in conjunction with newer technologies.

Establishing teacher resource centres

In many African countries, our research indicated that it was possible to establish teacher resource centres in market towns, where there might typically be, but not always, access to power and telecommunications, which could be equipped with computers and Internet access. Teachers from the surrounding areas could then visit the resource centre from time to time (e.g. once per fortnight in term time) to collect materials and interact with other learners and the tutor.

There is not a straight choice between using new and old technologies in distance education for teachers. For example, where teachers were supported through resource centres, it would be possible to use radio for delivery of some of the training materials in schools, such as radio programmes that encourage teachers to engage learners more actively. Teachers would visit the resource centres from time to time to interact with others, watch videos or use interactive programmes delivered over the internet, collect new reading materials, etc. Imfundo are not aware of any teacher education programme that combines new and old technologies in this way, but it appears to have potential.

More work also needs to be undertaken on the opportunities for regional initiatives, to share technology, curriculum and infrastructure, across a number of countries. For example, it is significantly cheaper to adapt curriculum materials that have been produced in a neighbouring country than it is to start from scratch.

Infrastructure

However many of the areas in which we are considering equipping teacher resource centres lack the infrastructure to support the use of ICT. Some have either no or unreliable electricity supplies and poor telecommunications facilities. Telephone call charges and ISP access are prohibitively expensive so any possibility of sustainability at the end of the funding period is seriously reduced. Wireless technology offers a cheaper solution while also arguing for deregulation on satellite communication. In some countries satellite technology can only be used to access resources and no uplink is permitted. Solar power can solve electricity issues, and as prices fall it is becoming a realistic power source . Indeed a private ISP in the Gambia powers 6 servers and over 30 computers on solar power and to date has never lost its connection. Additionally it appears that developing countries pay a high price for access to the internet. Developing countries who want to connect to the global Internet backbone must pay for the full costs of the international leased line to the country providing the hub. (More than 90 per cent of international IP connectivity passes through North America.) Once a leased line is established, traffic passes in both directions, benefiting the customers of the hub country as well as the developing country, though the costs are borne primarily by the latter. These higher costs are passed on to customers. The net cash flow is from the developing South to the developed North.

Costs of PCs are also high with high tariffs on the import of computer equipment. Therefore the sustainability of any project is difficult to foresee. One solution Imfundo was investigating was the dual use of teacher centres, either as business training centres, or for the delivery of other government services, such as training of health workers or agricultural extension workers, or the provision of women's services, so that the costs can be shared across a number of public and private services. Such centres can also facilitate e-commerce, by selling locally produced goods (notably agricultural produce, but also artisan goods) and cutting out the middlemen, or by buying products through the Internet for sale locally. Different pricing structures would need to be established for business and educational uses.

Pilot projects

Imfundo is setting up a number of pilot projects set within sector wide approaches to education and therefore in close co-operation with Ministries of Education. The projects will test some of the educational ideas being developed about distance learning as an effective method of supporting both initial and inservice teacher training, and explore how the local and international private sector can help support the sustainability of the infrastructures required. The projects currently being discussed and explored are:

- Teacher training centres for the inservice training of 1000 secondary school teachers who have little more than secondary education themselves. Here distance learning materials will be developed and delivered through the traditional channels of video, audio and text and also through the Internet and facilitating the use of electronic forums;

- Equipping 2 or 3 rural primary schools with Internet connectivity to 3 computers to help in a new distance learning programme for pre-service primary teachers;

- An informal city learning centre to provide education for those children who cannot go to schools because of severe overcrowding caused by urban drift and to train teachers in this sector;

- Linking a teacher training college or regional resource centres to a network which will enable distance learning materials to be sent to the centres and making it easier for teachers to access training on a part time basis. (Often attending training is prohibitive as it means long journeys and time away from families and other responsibilities).

Details of one of the pilot projects

Rwanda was ravaged by civil war in 1994 that led to the loss of huge numbers of teachers. The shortfall was made up by a large number of unqualified teachers who were drafted in and comprising of people who have no more than secondary education themselves, and a few not having even completed that. An emergency short training programme on teaching methodologies was mounted in programmes of up to five days, but this was inadequate to meet their full training needs. This measure was less than sufficient for teachers to gain appropriate skills but all that could be done in a time when the priority was to rehabilitate and refurbish schools so that children could return to school with sufficient teachers to teach them.

Therefore there is a pressing need to develop both content knowledge and professional capability. In addition the number of secondary schools is rapidly increasing. Class size is usually around 40-50 but in some schools it can be nearer 70. 16% of children go to secondary school and this number is intended to rise to 20%. Teachers can not be taken out of school in large numbers for the extensive training programme that is required. In reality this should be at the very least a three year, full-time training programme and certainly equivalent to a pre-service programme in both subject knowledge and pedagogy. Removing teachers from the classroom for this length of time is unworkable and the teacher training institutions would have neither the physical capacity nor the human resources to train such large numbers.

It seems that distance education is the only feasible alternative, with teachers training while still teaching. The benefits would be to keep them in classrooms while undergoing training so school attendance targets could be maintained and it would allow teachers to put new ideas into practice so integrating theory and practice. A number of initiatives have been put into place in order to sensitise and develop the possibilities for the success of the programme. These included visits to head teachers and local education officers and identification of training centres in regional centres throughout the country that have telephone access and an adequate power supply. There are plans to staff these centres with a well-qualified teacher as a tutor and with an administrative assistant.

Head teachers have been made aware of the need to give teachers undergoing the training extra time to study by, for example, allocating them smaller workloads, exempting them from evening and weekend duties, and granting loans to purchase transport (bicycles or motorcycles) to support their travel to training centres. Part-time study for further qualification is becoming an accepted aspect of further education in this country so there is a firm belief that there will be heavy demand for these courses. Another problem the country faces is the capacity to develop distance learning resources. The initial costs of setting up such programmes are high compared to traditional courses, and there is lack of expertise in developing distance learning materials. This problem has been solved through donor funding to bring in distance learning expertise and a number of subject experts from other countries for a fixed time period to develop the materials and to train existing staff at the teacher training institution.

As in many developing countries the costs of books and other resources is high, and maintaining up to date libraries is expensive. Postal deliveries are unreliable or take a long time, so the exchange of assignments and materials would be slow and would also make student progress slow. Tutors based in regional centres would have to be expert in all secondary subject areas if they were required to support all students and any extra support from the central teacher training institution would be restricted to phone calls and post. Telephone lines are limited with very few lines available outside the country's capital.

ICT as a solution

A range of new and old technologies could help. Internet connectivity in each of the regional centres would provide teachers in training and the regional tutors with fast access to the central teacher training institution. Here subject specialists could respond in electronic discussion forums to questions posted by tutors or trainees; extra materials could be supplied digitally for printing at the local centre; and some interactive internet based resources could also be accessed by teachers after school and weekends, at times to suit them. Video materials could be sent via a satellite link or on videocassette; and up to date resources could also be accessed through the Internet.

Imfundo is currently in discussion with the Kigali Institute of Education to help them refurbish the identified centres, install a small computer network in each centre, employ technical support and to help integrate ICT into the programme. Imfundo are enlisting the support of the ShoMa foundation in South Africa to set up some Internet based activities to complement and extend the paper and video based materials, and will also make use of the Resource Bank to support the setting up of a computer conferencing system. The ShoMa project is already proving successful in using the Internet to train teachers in South Africa.

Details of the training

It is planned to integrate a modified version of the ShoMa materials into the programme, and Imfundo have facilitated personnel from ShoMa to work with the teacher training institution. The training will start at diploma level and develop to degree level as resources become available and teachers become accustomed to improving their skills through distance learning. Modules will develop knowledge in two subjects and in pedagogical skills, and will be based on the new four year full- time initial teacher training course that is currently in its third year of operation at the teacher training institution.

The original plan was to train 1000 students per year over 5 years but after further discussions it has been decided to roll out the programme more slowly opening two centres in January 2001, training between 50 and 100 teachers in each location. The training centres will come on stream in a phased progression and will be open six days a week, and there will be organised weekend and evening sessions as well as opportunities for teachers to drop in and use the facilities. Residential summer schools will be run of approximately two to three weeks duration in four identified locations across the country.

Sustainability

Technology is expensive, and even in developed countries the costs of maintaining and updating ICT is of concern. In developing countries, issues of sustainability have to be addressed not only in terms of the maintenance and renewal of equipment, but also in the provision of spare parts, qualified engineers and trained personnel to troubleshoot minor issues and train users. Many development projects have failed once funding has ceased because long term sustainability was not taken into account.

The ResourceBank is one way in which sustainability can be addressed. The international private sector are being asked to give support in terms of reduced costs for or donations of equipment, software etc, or to provide personnel to train local people or to project manage the establishment of the centres. Local private companies have been invited to make use of the spare capacity of teacher training centres to run basic ICT skills and adult literacy courses, and small businesses are to be encouraged to make use of the facilities for their own work at a small charge. In other words these teacher training centres will aim to double up as multi-purpose community centres. The development of the ResourceBank is discussed later.

The KnowledgeBank

Additionally Imfundo have established a web based KnowledgeBank (http://www.imfundo.org) to provide analysis in the form of twenty to thirty short papers about the issues facing ICT and education in developing countries. The Imfundo KnowledgeBank will be an accessible, wide-ranging analysis of the opportunities for the use of ICT in education in developing countries, to be drawn on by anyone involved in this work. The KnowledgeBank will be continuously improved and updated in the light of experience and comments, and summarised in a report to which will be published in paper form. This data will enable all stakeholders and experts in each field to review and comment on it, and papers will be amended where necessary to reflect those comments, and updated in the light of the Imfundo pilot project experience.

The ResourceBank

Our contacts with the international private sector suggest a widespread willingness to contribute time, resources and materials to education in developing countries, often on a concessionary basis. Therefore Imfundo has begun the process of establishing a ResourceBank of expertise and commitments from the private sector. Although companies have a range of motives for contributing to education in developing countries, few have the opportunity to make a contribution. Most companies do not have resources or expertise for project identification, or for working with recipient governments to identify how their expertise might contribute to strategic improvements in the education system. For most companies, an unaffordable large-scale effort would be needed to design and negotiate a project, and then to manage it.

The proposed ResourceBank is intended to facilitate private sector contributions and Imfundo will establish a database of pledges from the private sector. These might be pledges of expertise and time, of kit, software, content or of intellectual property. Imfundo will then work with donors and recipient governments to identify projects that support the education reform strategy and are cost effective. As the projects are developed and implemented, Imfundo will then draw down the private sector commitments, by asking the company to provide the resources they have pledged.

An aim of the ResourceBank is to provide a mechanism for partnership between the public and private sectors. For the recipient government and donor agency, it offers security that projects will be designed to deliver education and development goals, and will not be technology led. For the companies who contribute to the ResourceBank, it offers an opportunity to become involved in education in developing countries, without having to take on the task of project identification and negotiations with government.

It is important that donors Western private industry and government activities do not crowd out the activities of the local private sector (e.g. by undercutting the private sector provision of internet cafes or business bureaux). Imfundo and the Western private sector will work with the local private sector to provide support and assist with capacity building. Whilst 'bridging the digital divide' is not a direct concern of Imfundo, it would be foolish to ignore the synergies where they are of obvious connection and benefit. Successful collaborations with the local private sector are one of the best ways of ensuring sustainability.

The future of Imfundo

At the end of six months the Imfundo team have reached the conclusion that educational technology does have a significant role to play in distance education of teachers and in information management in the education system; and that the private sector can make a positive contribution, and would welcome the establishment of an organisation which coordinated and channeled their resources into development-led, sustainable activities.

Over the next five years Imfundo will be developed as a centre of excellence in distance education of teachers, continuing professional development and in the management of information in education. The aim will be to use technology to *train* teachers, not simply to teach teachers *about* technology and *how* to use it in their teaching. Imfundo will be available as a resource centre for the Department for International Development regional offices, for other donors, for the private sector and for developing country partners. It will assist with project identification, design, monitoring and evaluation. Imfundo will specialise in drawing in the resources and expertise of the private sector, and analysing the opportunities for using ICT. This will include the management of a ResourceBank of private sector and civil society partners who are willing to provide expertise and resources on a concessionary basis. It will not fund the implementation of projects directly, though it will meet its own costs, and it will have a small fund for the identification and design of project proposals.

The Handheld Web: Using Mobile Wireless Technologies to Enhance Teacher Professional Development

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Abstract: The project described in this paper represents an effort to more thoroughly infuse technology into the undergraduate curriculum for prospective mathematics teachers, while strengthening the relationships that already exist between the University of North Carolina at Wilmington and its partnership public schools. A key component of the project involves the use of Jornada 720 Handheld PC devices and supporting equipment/access, including a mobile telephone. This technology adds a new dimension to just-in-time training and support by allowing preservice and inservice mathematics teachers to be literally anywhere and receive information, collaboration and support using Web resources. The initiative represents a unique field application of mobile technology that has the potential to benefit not only universities and their students, but regional schools, teachers and their students as well.

Background

After approximately ten years of innovation and development, the World Wide Web seems to have thoroughly pervaded U.S. society. Most Americans use the Internet daily to stay in touch with family and friends; colleges and universities have included instituting Web-based courses among their mission goals; top business priorities involve establishing and enhancing customer services on the Web; and television and other media are replete with Web addresses and Web enhancements for their programming and advertisements. It is difficult to imagine how the Web could become more integral to our daily lives. Yet, it appears that the next revolution is right around the corner, and this technological transformation has the potential to fundamentally change the way Web-based instruction and training is done.

Mobile wireless technologies are not particularly new. We have had cell phones with us throughout the 1990s, and whereas they might at first have seemed only a luxury or a novelty, in this decade they are viewed as more of an accessory and a necessity. An important change in mobile communications took place in the late 1990s with the introduction of digital (as opposed to analog) transmission technologies. Though a quiet innovation at first, with only a few companies such as Nokia taking advantage of the new capabilities, it is becoming apparent that two-way digital services may be the "next big thing" in wireless communications (AT&T 2000). This is because digital wireless can transmit not only voice but also data, and it is wireless data that many believe will be the dominant form of Internet communication within the next five to ten years (Lewis 2000).

A critical issue for teacher education today centers on the relationship, or lack thereof, between preservice and inservice teacher education. There often is little attempt to make the connection between preservice and inservice training, even though there exist many common needs. Partnership efforts such as Professional Development Schools (PDS) are one means of addressing this shortcoming. Additionally, advances in technology offer new opportunities for collaboration among preservice and inservice teachers. Specifically, novice and experienced teachers can both benefit from using the information and communication resources of the World Wide Web. An abundance of useful information related to curriculum and pedagogy is easily accessible for classroom planning and implementation. In addition, numerous opportunities exist for interacting online with other educators who have common concerns about important education-related issues. This kind of interaction benefits preservice teachers by supporting the development of concepts and skills, while inservice teachers profit from multiple perspectives and continued opportunities for professional growth. The Web provides a flexible means of training that can be adapted to demanding work or student schedules for both of these groups of educators.

The author teaches undergraduate secondary mathematics methods courses at the University of North Carolina at Wilmington (UNCW), which employ the Web extensively as a tool for research, investigation and collaboration. In addition, over the past five years the author has directed a program of Web-based professional development for inservice teachers (Shotsberger 1999). Being "wired" has given both preservice and inservice teachers access to a world of information and interaction that was unheard of ten years ago, eliminating some, but not all, of the physical isolation barriers common to the profession.

Whereas the term "just-in-time" is used to describe this kind of computer supported learning, the truth is that even as physical walls are being removed between teachers, time constraints remain a huge barrier to collaboration. The causes of this roadblock range from limited availability of network connections at the schools to the problem of scheduling collaborative meetings within the constraints of a full teaching schedule (even at the same school).

We are now beginning to see programs targeting the constraints of time and place in teacher education. The present initiative was inspired in part by the LIVE Project, a three-year effort spearheaded by the Media Education Centre of the Department of Teacher Education at the University of Helsinki, Finland (Nummi, Ristola, Ronka & Sariola 1999). From the beginning, the LIVE Project has incorporated mobile wireless technologies to create open and flexible learning environments for preservice and inservice teachers and their students. Project researchers have found that teachers regularly choose to employ a range of communications technologies, sometimes simultaneously, including telephone, e-mail, fax and conferencing. Thus, a key aspect of establishing highly interactive, mobile learning environments is offering flexibility in terms of how to communicate, as well as intentionally honing participant skills in obtaining, managing and communicating information and ideas. Results of the LIVE Project have led its researchers to wonder aloud: "Is the future of teacher education in digital nomadism?" (p. 1092).

The Project

The present project represents an effort to more thoroughly infuse technology into the undergraduate curriculum for prospective mathematics teachers, while strengthening the relationships that already exist between the University of North Carolina at Wilmington (UNCW) and its partnership public schools. A key component of the project involves the use of Jornada 720 Handheld PC devices (Fig. 1) and supporting equipment/access, including a mobile telephone. This technology adds a new dimension to just-in-time training and support by allowing preservice and inservice mathematics teachers to be literally anywhere and receive information, collaboration and support using Web resources. The initiative represents a unique field application of mobile technology, in the spirit of the LIVE Project, which has the potential to benefit not only universities and their students, but regional schools, teachers and their students as well.

Figure 1: The Hewlett-Packard Jornada 720 Handheld PC

The Handheld PCs were purchased through an on-campus grant program during fall semester 2000. The devices are being loaned out to secondary mathematics interns from January through May, 2001. Training will be conducted in January regarding the functions and capabilities of the technology for research, communication and reflection. Partnership teachers who express an interest in having another student intern assigned to them the following year will be allowed to keep the devices past May, 2001. In addition to the collection of evidence of use such as chat transcripts and messages posted on a discussion board, preservice and inservice teachers will be requested to keep an ongoing log during the spring semester of when, how, and for what length of time the Handheld PCs were utilized. Additionally, a survey will be given to each participant at the end of the semester to assess their overall impressions of the impact the technology had on their professional lives. Feedback from the logs and surveys will be used with the following year's secondary mathematics interns to better adapt the technology to their needs. The SITE 2001 presentation will include initial results from the project.

Anticipated Outcomes

The Jornada 720 Handheld PC includes a full keyboard, Microsoft Office productivity software, a Web browser capable of handling HTML 3.2 and Javascript, handwriting-recognition software and the capability for recording short voice messages. These features expand a teacher's options for research, collaboration, record keeping and documentation, both in and out of class. It has long been lamented by the education community that teachers generally do not produce written or even oral records of the strategies they employ in the classroom. Handheld devices could give teachers a highly portable way of documenting the results of implementation, which could then be shared with colleagues face-to-face, in a chat, on a discussion board, or as a Web page.

For student interns and their partnership teachers in older school buildings where classroom wired network connections and telephone lines do not exist, or in the situations where these teachers "float" from class to class and do not have permanent room assignments, the capability of communicating via wireless devices provides an excellent way for them to stay in touch with colleagues and parents. Teachers no longer need to wait for access to a limited number of telephones or computers with an Internet connection. The realities of wireless data coverage in southeastern North Carolina are that an Internet-ready mobile phone is required in order to establish a reasonably fast wireless connection (56K) for the Handheld PC. This arrangement, while somewhat cumbersome, provides a very flexible platform to teachers, allowing them to research Web resources or contact parents or absent students at any time of the day. This combination of technologies also enhance Web-based professional development by giving teachers immediate (as opposed to delayed) access to other interns and partnership teachers by communicating asynchronously (message board), synchronously (chat), and by voice. A particular concern during spring semester 2001 is that one of the interns will be the only mathematics placement at a high school that is approximately 60 miles from all other placement schools. In that situation, mobile wireless technology will be a lifeline for ensuring that the single placement does not become isolated and discouraged in the absence of peer interaction.

In southeastern North Carolina, the majority of high schools are on a block schedule system consisting of four 90-minute periods. With fewer and longer periods, teachers have greater opportunity to collaborate with colleagues who have the same planning period. Unfortunately for teachers at smaller or rural schools, there may be only one or two teachers from the same discipline available for collaboration at any given time. Participants from different schools who possess wireless devices could notify colleagues of their availability to chat synchronously online, and if the chat is text-based, the transcript could become part of an archive asynchronously accessible by all partnership participants. With the added capability of surfing the Web while conducting a chat, these teachers would be able to jointly plan lessons that incorporate Web resources and that profit from the experiences and insights of a larger pool of practicing teachers. This would be especially beneficial for preservice teachers, who often only have their partnership teachers with whom they can collaborate on a consistent basis.

Ultimately what is desired is a comprehensive understanding of how teachers employ this kind of technology on a daily basis and of the potential for the technology to transform classroom practice. Teachers generally do not lack for ideas of how to use technology such as the Web in their planning and teaching – they are constantly exposed to new practices through attendance at workshops and conferences. Rather, they suffer from an inability to implement new approaches due to a restrictive environment that is too often technology-weak. Nonetheless, the question of how extensively teachers will employ wireless technology placed in their hands is an open one. It is likely that some uses for this technology cannot be anticipated prior to implementation. Will the Handheld PC be used in place of the desktop computer, or simply as a supplement? Which features of the Handheld PC will prove most useful? Will the mobile phone be used simply for routine calls, or will teachers take advantage of paging and messaging features for contacting colleagues? A primary feature of the project, then, will be negotiations between the participants and the technology, which will likely produce a number of unanticipated but desirable results along with the intended outcomes.

References

AT&T (2000). Delivering: AT&T Annual Report 1999.

Lewis, T. (2000). Tracking the 'anywhere, anytime' inflection point. *Computer, 33*(2), 134-136.

Nummi, T., Ristola, R., Ronka, A, & Sariola, J. (1999). Virtuality and digital nomadism in teacher education – The LIVE Project. *Technology and Teacher Education Annual*, 1999, Association for the Advancement of Computing in Education, Charlottesville, VA.1087-1092.

Shotsberger, P.G. (1999). The INSTRUCT project: Web professional development for mathematics teachers. *Journal of Computers in Mathematics and Science Teaching, 18*(1), 49-60.

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"Electronic/Distance Preservice Teacher Education – an example"

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Abstract: Teacher Education in New Zealand traditionally has been taught internally and on campus by the Colleges of Education.

This paper and presentation will review how Massey University College of Education went about meeting the challenge of delivering preservice teacher education to those who, for a number of reasons, could not attend an on campus programme. Programme delivery will be outlined demonstrating the linkages between traditional extramural delivery and the use of WebCT for web based delivery. The results of surveys and studies of the students involved in the programme in the first four years of course delivery will be presented within the discussion.

Over the past ten years there has been a growing demand from the New Zealand Ministry of Education, the schools and the client base of teacher education to have preservice teacher education programmes delivered extramurally. Massey University has met this challenge. The advent of the Internet and the merger of Palmerston North College of Education and Massey University has enabled extramural delivery of the Bachelor of Education (Teaching) Primary degree. Massey University bought its expertise in extramural delivery of degree programmes and the College of Education its expertise in teacher education.

Introduction

Traditionally the delivery of teacher education world wide has been embedded in the notion that Universities and Colleges of Education are the repositories of knowledge and teaching and that the client should attend such an institution to participate in teacher education programmes. *"For over a thousand years universities operated under the assumption that information would be stored centrally and scholars would come to the central store of knowledge and collaborate to produce more information that would be stored at this site." (Ferry, Kiggans, Hoben and Lockyer 2000) p 496*

In the 50s and 60s the advent of extramural studies delivered through the postal system began, in some parts of the world, to shake that tradition. During these two decades a number of universities around the world pioneered the delivery of extramural studies to clients who were geographically distant from the institution delivering the programme. Many, like Massey University in New Zealand, retained "apron strings", in that clients were expected to return annually to the "repository of all knowledge and information", to attend on campus study days or weeks during the delivery of the course or paper.

The 80s and particularly the 90s have seen these notions of the client attending the repository of information shaken from its foundation. The tide of development in electronic delivery, telecommunications, email, and the World Wide Web have combined with business approaches and market models to force the providers to deliver programmes to the client at an access point suited to the needs of the client. Innovative providers have found that this delivery can be facilitated anywhere in the world through the World Wide Web. Ferry et al (2000) "thus, instead of people coming to the information, people can now have the information come to them" p 496.

In 1996 the College of Education at Massey University recognised the growing demand for teacher education to be delivered extramurally (the University coined the term externally) within New Zealand. The challenge had been thrown down by the New Zealand Ministry of Education, schools, and those of the public who, for a number of reasons, wanted to become teachers but could not access the traditional on campus programme. There had been a history of recruitment enquiries to the College of Education from many prospective clients wanting external studies leading to teaching qualifications. Reasons behind these requests ranged from geographic isolation through changed circumstances and finance to family circumstances.

The College acknowledged the need and a working party was set up to investigate the feasibility of launching an external Bachelor of Education (Teaching) Degree programme. Much investigation and debate centred around such issues as:

1. Were there enough prospective students out there who would be suitable (a) academically and (b) within the criteria of the New Zealand Teacher Registration Board to be registered as teachers in New Zealand?
2. Given government restrictions placed on funding for extramural study of university papers could such a Preservice Teacher Education Programme be financially viable?

Evidence from overseas (Daniel, 1996) indicated that entry level costs into the type of course proposed were continuing to be reduced annually making it feasible for all institutions to enter the online education world.

3. Would already busy staff at the College be prepared to accept the responsibility of adapting and re-writing papers to meet the needs of external and World Wide Web delivery?
4. Was there a scaffold within the World Wide Web which would support such delivery and was there evidence to support the assertion that the World Wide Web was a viable medium for course delivery and debate? The working party found the answers to all these questions to be yes.

"When information comes to people via the World Wide Web, there are potential benefits. Such benefits include: direct access to a broad range of information; access to learning environments outside normal lecture and tutorial times; greater opportunities for experiencing a variety of instructional strategies including small group discussion and collaborative projects; and exposure to a forum for expressing and sharing ideas." (Lockyer, Patterson and Harper 1999).

The Bachelor of Teaching (Primary); now the Bachelor of Education (Teaching) Primary Degree; External Delivery Option (EDO) was offered for the first time in 1997.

The degree mirrored the on campus programme with some restrictions placed on the optional Studies in Subjects for Teachers papers. Papers are studied internally and externally concurrently and Teaching Practice in schools is also concurrent.

In the first year, 1997,the programme was delivered by email using Eudora and, although this worked well, the coordinators had continued to search for a web delivery option that would allow greater real time collaboration amongst the students and the staff delivering the programme. WebCT was the supporting environment that was found to stand up to the scrutiny that the coordinators placed on finding an interactive environment which could handle reasonably large volumes of traffic. The College has used WebCT 1 for delivery since 1998 but will move to WebCT 3 in 2001. *"Networking technologies, both hard and soft, that make possible online instruction are evolving at a continuing rapid rate that keeps shifting the grounds of possibilities for increasing learner information interaction." (Carr-Chellman and Duchastel 2000)*

1997 and 1998 saw fifty well qualified students selected into the programme. The restriction of fifty was placed on the programme to maintain quality of service during the initial development of electronic delivery. In 1999, 2000 and into the foreseeable future the intake will be restricted to 70 clients. The College maintains that given the level of service expected by the clients and the continued excellence of delivery the College wishes to maintain, 70 is the maximum number of clients the programme can sustain in any one year group. To go beyond this number would risk compromising the quality of delivery of the programme.

The Online Structure (see figure 1)

The first four years of the programme saw it structured around four sites supported by WebCT Version 1.0. All sites provide for whole group interaction, EDO chat group discussion; these are sub groups within the year group of 5-8 students and are private to the group; and private email facilities.

1. The Main Site: all students and staff have access to this site for general discussion, which in most cases is initiated by the programme coordinators. Students are discouraged from initiating discussion in this site or in the year group sites. However, there are times when students do initiate site discussion. Discussions generated around this site are usually of an administrative or programme structure nature. Socially the site is used to announce news of the birth of new babies, social gatherings, lecturer visits to particular locations where students may want to meet with them etc. On this site the weekly College newsletter, Stupot is posted. The EDO group are the most regular contributors to this publication.
2. The three Year Group Sites: There are three separate sites, one for each year group and allow the students within the year group to interact over matters pertaining to that group. Within each year group site students are sub divided in chat groups and paper forums; one forum for each paper.

Chat groups are groups of to 5-8 students formed to facilitate close small group discussion about topics generated within papers. The chat groups are private to that group of students. Staff do not have access to chat groups.

Paper forums are set up for all students enrolled in particular papers and the staff member who coordinates that paper. Staff generate weekly focussed discussions within each paper forum on the paper theme for that week. These discussions, which also include discussion of assignment topics, take place in EDO discussion groups. They have the same personnel make up as the chat groups. EDO discussion groups are a simulation of the internal groups that form on campus by chance and out of in class interaction. Staff are encouraged to take an active part in discussion that emanates in the paper forum. Students who take an active part in these forum report as do staff that they gain a great deal of personal satisfaction and academic growth from the stimulation that ensues from this form of discussion.

Thus there are a number of forum both public and private which encourage dialogue between student and student and student and staff bearing out (Tinker 1997). *"The principal way of encouraging student dialogue in the pursuit of learning is the availability of online forums, where the entire learning community can participate in an intellectual exchange profitable to all."*

The Online Environment

WebCT is the electronic software programme used to enable the students and staff to work in an interactive online learning environment. Clients are delivered through the postal service a set of paper based study guides, one for each paper, at the beginning of each semester. Activities for online interaction are built into the study guides and are initiated by lecturers during their online work with students. The students are encouraged to develop these interactions amongst themselves on a weekly basis for each paper in EDO chat groups (fig 2). Taking turns, one student from each group reports their interactions back to the paper coordinator/staff member.

Students report that the asynchronous environment allows time for reflection before comment and that this is a feature of their communication with others. Online discussions certainly have different time frames to face-to-face discussions. A typical time frame for online discussion has been found to be 7-10 days although discussion may proceed for weeks. 1-2 days would be a fast response within this environment. This does happen particularly when students have pressing, urgent interactions to make.

One of the original aims of the programme was to provide an interactive learning environment for the students and to a considerable extent this has been achieved, despite the fact that, to date, it has not been compulsory for students to participate in online work.

The 'learning community' notion is not always welcomed for several reasons. Some of the more traditional students see study as individual. They do not want to share and do not expect others to share. These students communicate only rarely during the semester. Staff and fellow students find themselves asking if this response is appropriate behaviour for one who is about to join the teaching profession. We think not and this has prompted the coordinators to initiate a signed agreement for the 2001 group. Interaction will be compulsory and will be reviewed with the group at the end of semester two 2001. A portion of paper assessment will be based around these interactions.

Students report continued annoyance when members of chat groups choose not to take part but also report that, for them, online collaboration is the first dispensable component of the programme when they come under constraints of time, especially at the end of the semester.

In 2000 this manifested at the end of semester two when students had four assignments to complete immediately after a two week full time school placement and examinations beginning one week later.

Technical Support

Staff are supported in the WebCT environment at three levels. The programme coordinators give a small degree of collaborative support when and where they can. A full time technical administrator administers the overall sites. This person enters all staff and students into appropriate groups, assigns passwords, and gives individual technical support to staff. Finally staff have access to the central helpdesk of the University Computing Services Department. Students are supported at a number of levels. The full time technical administrator is available to them at all times when the university is in session. The staff and in particular the programme coordinators give academic technical support as and when needed and the student body are brilliant at giving collaborative support to one another within and across year groups. The main site is a source of collaborative technical support between staff and students and students and students. Technical problems are the main reasons for students initiating communication on the main site.

Problems Faced

There have been relatively few problems with the programme delivered through the web. The nature of some interactions/non-interaction between students has already been discussed as a source of some frustration.

An ongoing problem which it is hoped will be overcome with the move to WebCT 3 has been the fragility of the environment at some times, particularly when traffic volumes are heavy. This is not necessarily the fault of WebCT but is embedded within the support network and servers of the university. As the use of WebCT has increased so has the fragile nature of the environment. The University has upgraded the server in 2000 and this has bought greater stability.

Students are selected with the full knowledge of the hardware and software requirements demanded by the delivery of this programme in the WebCT environment. However it is one thing to communicate the need to such frameworks but another to be sure that students obtain specified computers. When students do not upgrade they report problems with speed of access and continuing access to the course forums. At these times staff note that the interactions from such students decreases.

In some instances the isolated geographic location of some students is a problem. Telecommunication lines in some remote locations are fragile and can cause major problems when they go down for long periods of time. Students and staff have learned not to compose in WebCT. They risk the loss of pieces of work. Coordinators recommend to all staff and students who are working in WebCT that they compose in a word processing programme then cut and paste or attact the document in the communication being composed in WebCT.

Finding the time staff training is a continuing issue which causes later problems for coordinators when students become frustrated over communication problems with staff. In 2001 the coordinators are instigating a peer support system for staff where a staff member established in WebCT will pair off with a new staff member and give technical support to that new staff member.

Teaching Practice, which is the placement of students in schools on some days, placement days, and for up to six continuous weeks was identified early as a potential difficulty. Students are placed with a practising teacher who has been recommended as a suitable role model during these times. Many of these placements are remote making it difficult for the College to monitor the student and the associate teacher. Every effort is made to have a staff member visit students every time they are in school placement. Isolation, travel restrictions and time restraints do not always allow this. The World Wide Web has not been used to support this function. A feasibility study for this will be carried out in 2001.

The Future

As the EDO programme has evolved, change has been inevitable. The most dynamic change has come in the basic structure of the course in terms of its demographics. In its purest form, which is how the course was set up and was the vision for the course, year groups were to remain intact. It was believed that the selected group had such academic potential that they would no fail. The reality has been different. For a variety of reasons students do fail or pull out of papers and as a consequence the dynamics of each year group has changed. In 2000 the dynamics of all groups is such that each has students across year groups. Reasons include: family dynamics, time constraints, paper fails and the group of students who join the programme having been given cross credit for previous study or having completed up to four papers within the programme part time before entering the programme. A further dynamic has come from the group of internal students who transfer into the EDO programme and the group of students who transfer into the programme from other college and university programmes. Figure 3 illustrates the dynamics of those studying across year groups in the year 2000.

In 2001

1. all students who transfer into the programme from an internal programme or another College of Education or University will be interviewed to establish that they are ready for online external teaching and that they match the dynamics of the group.
2. A greater emphasis will be put on paper forum. It is envisaged that students who find themselves working in two year groups will identify with the paper forum rather than the EDO year group forum.
3. The annual survey of students had always indicated that students strongly disagree with all material being online. Carr-Chellmann and Duchastel, 2000 speak of the study guide as the student's main reference to the content, structure, and activities associated with the online course. In 2001 one paper will be delivered totally online and carefully monitored as to how the students cope with the dynamics of this form of delivery. It has been the study guide that has always been physically posted out to the students yet Carr-Chellmann and Duchastel assert that online study guides work for them. They point out that, *"online study guides must provide a level of detail that is sufficient to enable the learner to proceed without substantial further personal interaction or clarification from the instructor.*
4. WebCT Version3 will be used as the medium for programme delivery from 2001 onwards.

Conclusion

This paper limits its discussion to the current operation of the EDO programme of Massey University College of Education. The programme has met its main objective; the creation of a supportive, interactive, online environment for distance students that enables those students to gain a preservice teacher education qualification recognised by the New Zealand Teacher Registration Board. This qualification is the Bachelor of Education (Teaching) degree.

Proof of the success of the programme lies in the graduation of the first 36 students in May 2000. A further 41 students will graduate in 2001.

Reeves and Reeves (1997) stated "despite all the interest, little research evidence exists to support claims for the effectiveness of web-based instruction." (p 59)

The success of this programme provides further evidence of the potential of WebCT as an online environment for the delivery of off campus learning. In the year 2002 a second Teacher Education Undergraduate Degree, the Bachelor of Education (Teaching) Early Years – birth to eight years will be offered based on the model developed for the primary programme.

The concluding comment is left to one of the 2001 graduating group, "I have surprised myself and my family in reaching a lifelong dream; that of becoming a teacher and I have done it without ever going on campus. I will see you all at graduation."

Acknowledgement: My thanks to Bill Anderson and Mary Simpson, Senior Lecturers at Massey University College of Education. Bill and Mary were responsible for the development of the EDO programme and carried it through to the year 1999.

References

Carr-Chellmann, A. & Duchastel, P. (2000). The ideal online course. British Journal of Educational Technology Vol 31 No 3 2000, 229-241.

Daniel, J. (1996). Mega-Universities and Knowledge Media. Kogan Page, London.

Dawson, K. M., Marson, C. L., Molebash, P. (2000). Results of a telecolborative activitie involving geographically disporate preservice teachers. Education Technology and Society 3(3) 2000 470-483

Ferry, B., Kiggins, J., Hoban, G., & Lockyer, L. (2000). Using computer-mediated communication to form a knowledge-building community with beginning teachers. Education Technology and Society 3(3) 2000, 496-505.

Lockyer, L., Patterson, J., & Harper, B. (1999). Measuring effectiveness of health education in a Web-based learning environment: a preliminary report. *Higher Education Research & Development,* 18(2), 233-246.

Reeves, T. C., & Reeves, P. M. (1997). The effective dimensions of interactive learning on the WWW. In B. H. Khan (Ed.) *Web-based instruction,* Englewood Cliffs, NJ: Educational Technology, 59-66.

Figure 1

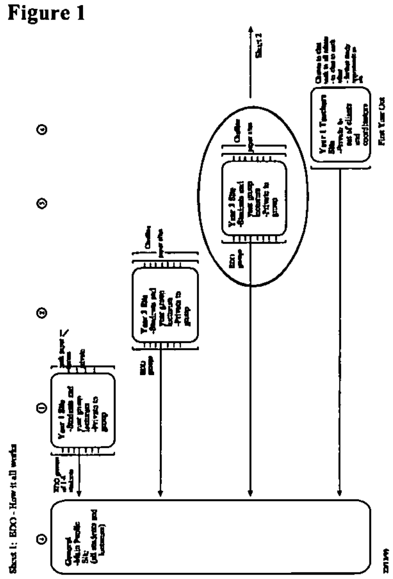


Figure 2

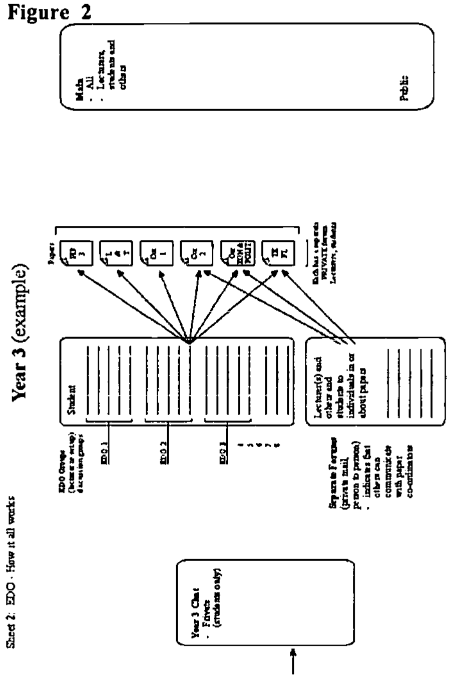
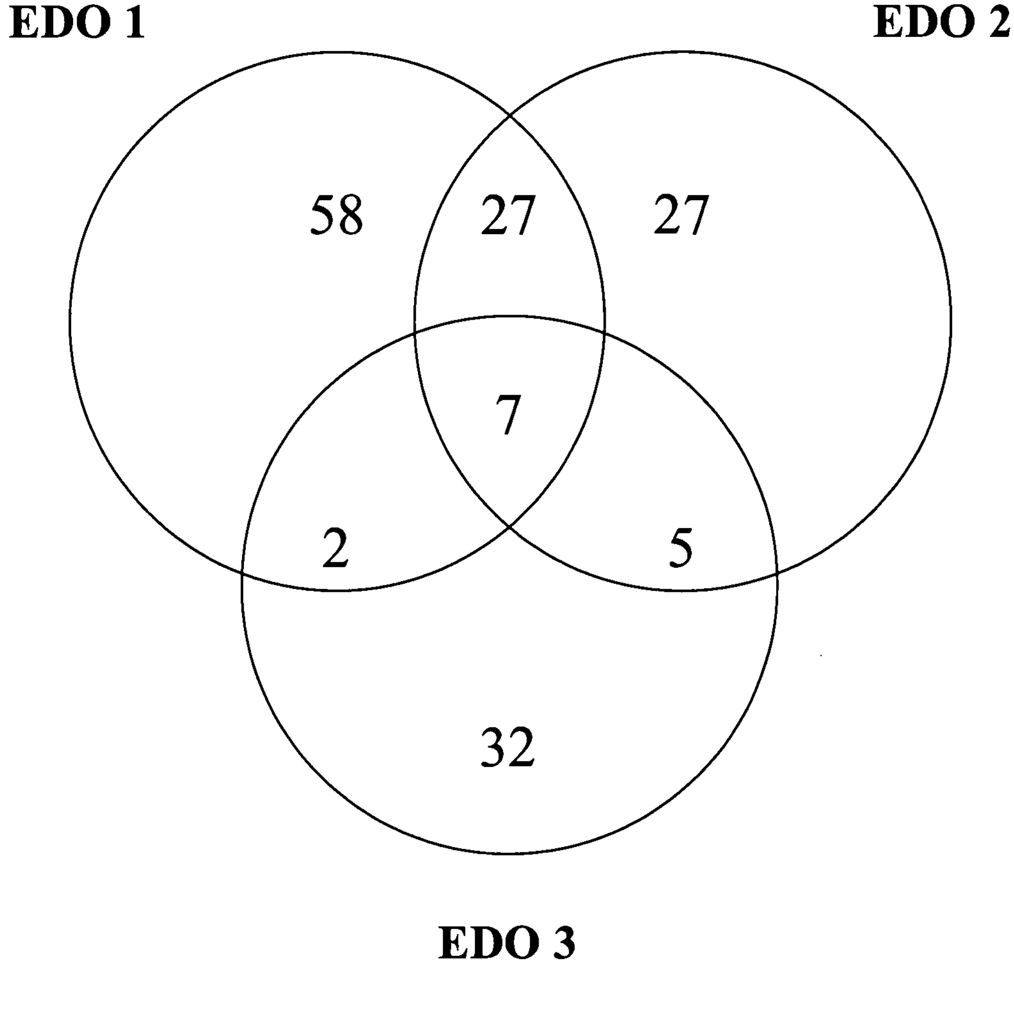


Figure 3

Current distribution of students in the EDO programme (2000)



Telecommunications: Systems & Services

Section Editors:
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Telecommunications systems and services are the foundation of the 'Information Revolution'. From a user services perspective it is clear that issues of systems and services are related to people as well as to technology. In this section we will focus more on access and training than on technical and software developments, as might be expected for this conference which focuses on technology and teacher education. We realize the importance of developing an infrastructure that addresses the complex issues of access and support. In our context we have experience of user services for more developed parts of the world, especially USA and Europe. Polly Mumma was coordinator of academic technology at the University of North Alabama for three years and recently she has been closely involved with user support for ClassNet online learning environment and its latest iteration, which is called Ecademy (http://webacademy.cc.iastate.edu and Mumma & Boysen, in preparation). Niki Davis has been involved in design of online services for teacher professional development with technology for over a decade, including the recent creation of an ICT Educational Research Forum (http://telematics3.ex.ac.uk/erf and Davis, 2000).

This section addresses a wide variety of topics, thoughts and interests. There is a notable range of papers from countries across the world, including several from developing countries where access issues take on a new dimension of challenge for systems and services. The primary theme this year is access, and how to best provide more equitable access to individuals. A second theme is content,which is approached from ways in which content can be made accessible and transferred across media for both teachers and learners. This is a usability approach, rather than one of instructional design. Training of systems and service personnel, including the training of trainers, is added by a further group of papers that mainly come from authors more directly associated with service centers and corporations.

One of the most interesting articles in this section comes to us from Annette Wilkinson and Liezel Wilkinson, from South Africa. They take a look at the issue of access in their country. Their concern not only lies in how to provide individual learners with access to the necessary technology, but providing instructors with access to learners. This is an issue that is equally important but is more frequently overlooked. Through the Curriculum 2005 project, they investigate how to best move away from traditional classroom models. The authors refer to this as "epistemological access". They wish to re-educate instructors and learners to think and learn in new ways, ways that will allow them to make more effective use of new technologies, as communications technology becomes available across South Africa.

Along these same lines, Nomusa Dlodlo and Nompilo Sthole, from Zimbabwe, take a look at the impact the Internet has had on education on the African continent. The focus of their research lies in how to make best use of the Internet to improve the educational systems of Africa, without increasing the divide between those countries that already have good information infrastructure and access, and those which are still struggling to grow and develop technologically.

Anthony Adams of the University of Cambridge brings us news of Ennis, a small town in Ireland, which won a competition in 1997 to become the first 'Information Town' in the republic of Ireland. Dr. Adams outlines changes that occurred in the town, as well as changes that did not occur, particularly among the town's schools. He discusses the need to change the way schools define themselves and their curriculum, if they are to continue to best meet learner needs. Maria Verdu and colleagues from the University of Valladolid in Spain also take a look at this changing definition of education. They propose restructuring education to focus on auto-learning, active learning, and pedagogical aspects of learning.

Janice Hinson leads a group from Louisiana and Connecticut addressing the issue of access and race in the

USA. They examined two very different fourth grade classes, and the effect that access to the Internet has on these two groups. They look at the effect that access could have on learner self-image, their reading scores, and their performance on a cross-curricular research project.

As previously noted, the second main theme addressed in this section is one of content. What should the content of online material look like, and how can it be best presented to users? In this vein, we have several authors presenting new applications and tools designed to improve the online learning experience for both learner and instructor.

Firman Gunawan of Indonesia provides insight into providing foreign language instruction via the Web. This paper looks at how to best build the interactivity as well as the content needed to address the needs of foreign language learners. Similarly, Jorge Kinshita of Sao Paolo University in Brazil introduces us to a tool he has developed which allows instructors to easily produce lecture slides for online courses. Kathleen Bacer from Azusa Pacific University looks at the issue of how to develop and nurture an online community. She addresses issues such as breaking down technological and communication barriers.

For a slightly different look at the issue of providing an effective, user-friendly online environment, Fannie Cox from the University of Louisville takes a look at the virtual library. She takes a look at the services offered in a digital research library, and how that information differs from what is found on the Internet and concludes that students and educators need to recognize that differences and similarities do exist between the University Library's gateway, online catalog and the Internet. Norshuhada Shiratuddin and Shahizan Hassan of Malaysia provide a look at CikguNet, a government designed Web site aimed at improving the online learning environment. The goal is to provide a location where learners can easily access the information and resources they need. The authors provide guidelines and criteria for evaluating and critiquing the effectiveness of a Web site to meet user ease-of-use and learning needs.

The final group of contributions describes several services that are available to support the development of service centers and their trainers. Joaquin Vila, Barbara Beccue and David Doss, from Illinois State University, present information on an interactive tutorial guide to ASP programming. Active Server Page (ASP) is a hot topic in Web design, and is commonly used to provide a variety of interactive Web functions. Dennis Sharpe provides feedback on a user needs assessment conducted last summer at Memorial University of Newfoundland, Canada. He has examined a series of changes which were made, and the subsequent improvements in support services. A team from the Labein Technological Centre in Spain describe an unusual training system that focuses on critical emergency situations, developed within the European Community's ETOILE project. This may be of interest to teacher educators who are designing simulation-based training that integrates Intelligent Agents, Virtual Reality and Shared Mental Models for learning from actions on equipment and management decisions.

Corporate demonstrations round out this section. Sandy Mills from WebCT introduces the WebCT Certified Trainer Program. Joyce Bokuniewicz provides a look at the services offered by Centra and its efforts to provide intuitive, sophisticated online learning environments. Steve Korin from BASCOM Global Internet Services offers information on the issue of filtering and managing Internet content.

References

Mumma P. & Boysen P. (in preparation). Accessibility issues and on-line course design.

Davis N.E. (2000) The emerging ICT Educational Research Forum. *Journal of Information Technology for Teacher Education*, 8, 3, 381-396.

Developing and Nurturing a Dynamic On-line Learning Community

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Abstract: This paper addresses the issues surrounding the creation of a dynamic on-line learning community. The development of an effective external and internal environment that embraces/capitalizes on the learning process and nurtures the learner is essential. Two components in developing the external environment are the design of the interface and the effective delivery of the curriculum. Effective communication and the creation/sustaining of a partnership in the learning community are the key components in developing the internal environment. Basic strategies for nurturing and maintaining the on-line learning community are delineated.

Introduction

Critical to any on-line learning community is the ability to create an environment that not only embraces/capitalizes on the learning process but nurtures the learner as well. While this is critical for any learning community, the on-line community sports a new arena of challenges as the dynamics of the human interface are facilitated by methods of telecommunication rather than the physical presence/interactions of students/teachers. The explosion of the internet and access to telecommunication tools has released the learner from the walls and boundaries of a physical building in which they are no longer restricted by specific time and place. This explosion is changing the way we are able to collaborate, problem solve, access and disseminate information, and engage in what is recently known as e-learning. Distance education/learning, online courses/learning, net courses, or e-learning is sweeping across the business and educational marketplace bringing to the forefront the many complexities of developing and nurturing an effective on-line community of learners. We as educators are being asked to take all of what we know so well in the face-to-face (f2f) instructional paradigm and translate it into an on-line paradigm. It is an exciting and daunting challenge. The purpose of this paper is to help with the translation!

What exactly is a Dynamic Learning Community?

A dynamic learning community (whether f2f or online) creates a sense of buy-in, pride, and ownership of the learning. It inspires and motivates thinking, creativity, problem solving, reflection, inquiry, and constructive collaboration among all the learners. The environment created can either promote or inhibit the learning dynamics of the community.

According to Merriam-Webster *environment* means "the total circumstances surrounding an organism or group of organisms that affect and influence the growth and development of organisms." (1956, p.276). I consider environment quite a powerful word and concept that is known to sustain life and in this case sustain learning! Throughout my K-U (Kindergarten to University level) teaching career, I have experienced first-hand the influence of the environment (good or bad) upon student learning. I consider the learning environment the canvas, the background, the supporting foundation upon which everything else is built and influenced. I have watched students' behaviors/learning patterns at all different levels drastically change just because an environment was modified and/or created that supported and encouraged what I consider a dynamic learning community.

So how do we create an effective environment that will develop and nurture a dynamic on-line learning community? Well, I'm glad you asked. If you didn't, there is still time. Hopefully by now you have noticed that although you are surrounded by text, much like many e-learning experiences, papers also have environments that are either effective or ineffective in creating a teaching/learning partnership. Notice I have written this paper in first person. Not typical for research papers I realize, but appropriate for the objective of this paper. Although I am restricted to a single-spaced 10pt black font, no graphics, sound or video, and limited interactivity, if you are able to continue to preserver through this paper in its entirety hopefully you will learn how to capitalize on the online environment and utilize its wealth of resources! So how do we create an environment that will develop and nurture a dynamic on-line learning community? First an understanding of the external and internal environments is necessary.

Developing Environments within the learning community

Within any learning community there is an external and internal environment. Both of these environments are equal in value and must be developed and nurtured effectively. To be able to create an effective external and internal environment online, it is important to first gain an awareness of what its role is in the schema of learning.

External Environment

The external environment is the place, so to speak, where the learning revolves. For f2f it is the usually a physical classroom/building. For on-line or e-learning it is the *interface* that the course is housed within and the manner in which the content is delivered.

Generally speaking, K-5 teachers are incredibly gifted with creating an effective external environment in a physical classroom. You walk into their classrooms and you are surrounded by a rich and stimulating environment, lots of evidence of past and future learning, celebrations of accomplishments, and reminders of content begging to influence young minds. What happens to this external environment as we progress to High School and College? The external stimulus slowly disappears and/or changes to a more stoic or what we might refer to as a "professional" look. Why? Do we not need it anymore? Is it no longer an essential component? As educators we silently justify the absence of effective external environments. We may believe students no longer need it, they have learned to control themselves, it is a distraction or we do not need to entertain them, so to speak. At the university level there are some logistics that stop the feasibility of being able to create an external environment that aligns with our courses as our classrooms are shared among disciplines. Yet I have experienced the amazing impact of creating external environment at the higher levels. For example, in a math/science methods class for pre-service teachers, together we created/decorated our own external environment. We weren't sure what impact it would have on the other classes, nor how long things would stay up, but decided as a class that we would try it. The results were amazing. I watched a whole transformation take place as students walked in the class. Students were excited to come to class, they were proud; they shared with their colleagues. Does this have an impact on learning? Absolutely! Word spread and I learned that the other classes that met in that room were also impacted. The inquiry process was stimulated, a sense of belonging and ownership in learning was fostered, and a realization that external environment is vital wherever we are learning was reinforced. So...move this into e-learning, take the awareness that it is just as important – if not more so, as you design the external environment – the interface and the development of methods of content delivery.

Developing the External Environment

Two essential components of developing this external environment are the design of the interface and the effective delivery of your curriculum.

The design of the interface is very important. It is your vehicle for not only communicating the content of the class, but also creating an external environment. Choosing and working with the correct tools is critical. There are now many providers and course managers for on-line courses to assist in the development of a course. The most common ones are listed in the resource list. It is not my purpose here to provide a critique of each, but to equip you with strategies and concepts that will empower the utilization of any tool. Remember, it's not the tool, it's how you use the tool to create an environment (interface) and communicate your message (curriculum/content) that is important. There is always the option of building your own website/portal for your on-line classes. There are many web authoring tools and collaborative software that you can download onto your site. You need to be aware of advertisements though and the servers that they may be housed on. Of course this requires a bit of experience. Ideally this would be the best route, but not the most likely. When considering the design of an interface, realize that no matter which one you decide to use, there will be limitations. I have found it beneficial to work around the limitations so that I can still communicate through the interface effectively. When selecting an interface to communicate and support your curriculum, consider these issues:

- Does the interface have a lot of layers to get at the information? If so, how can you eliminate them and work around them so the course is "push" technology and not "pull?" For example, there are many different interfaces for discussion groups/forums. Do they allow you to view all messages in an expanded form, view the question that is being asked in your response posting, email participants when you have responded to a posting? All of these are issues that reduce the layers of an interface and add to the usability of the learning experience.
- Is the interface transparent or is transparency easy to master? In other words, it is user-friendly and intuitive so that the interface does not hinder the learning? After one session will students no longer think about the technology and focus on the content?
- Do you always have to be on-line to edit the course? Whose server does all your work reside on?
- Do you have a complete copy of your work and is it copyright protected?
- Consider the tech support issues for the student and for yourself as the designer. Are they readily available?
- Is the interface flexible enough for you to be able to communicate effectively? Can you customize it to create the environment you want?
- If you are using a variety of collaborative tools, are they on stable servers? Are their advertisements running through them? What's the tradeoff?

In the development of my external environments I sometimes use a variety of tools to create the environment needed. For example, I utilize parts of providers and course managers that best meet my needs. I utilize ecollege for one of my on-line classes. Once I customized the environment, I found the collaborative tools very usable and students felt comfortable by the second session. I turned off the gradebook and chat room features though. I need a much more robust gradebook and virtual synchronous classroom. I prefer to utilize a dynamic virtual environment. I have created a virtual classroom within a thriving learning community called TappedIn. http://www.tappedin.org. My virtual office and classrooms are located on the 9th floor, Rm 915. TappedIn has very powerful collaborative features that allow me to move beyond the scope of a mere chat room. We can for example, creatively express ourselves (show emotions), work in groups at tables, write on whiteboards, post notes on bulletin boards, record our conversations, share resources, or create "bots" to enhance our environment. It also connects students with an active on-line learning community.

For my f2f classes, I utilize blackboard as a front portal and build supportive websites that link to appropriate sections within blackboard. Many times I stretch the interface to meet my needs. For example, I wanted a front-end in blackboard without all the layers – information that was in the face of the learner so to speak – so I built an attractive front-end website and attached it as a permanent announcement. You will find as you gain experience that the external environment will emerge. You don't have to have a "canned" environment that looks the same as all the others. Can you imagine the on-line learner that is faced with the same interface over and over again?

A dynamic on-line learning community actually allows those in higher education to have that external environment back – virtually of course! Remember environment stimulates inquiry.

Part of the external environment is also in the delivery of the content. In delivering the content on-line, variety is the key. Use a variety of ways of presenting information – audio and video clips, interactive pdfs (portable document formats) students can print and interact with offline, short presentations, and of course the utilization of web resources. I cringe when I see colleagues scan their lecture notes, videotape whole lectures, and type pages of information to present on-line. The effective ways of presenting your curriculum f2f may not be effective at all in the on-line environment.

As you utilize a variety of ways to present the information, implement a variety of activities for student response also.

Nurturing the External Environment

- Make sure your external environment is accessible to all your students. Create a support site with helpful resources and tools they will need to successfully execute all parts of the course (i.e., quicktime, realplayer, adobe acrobat)
- Create a photo website with short bio information
- Make available upon request online office hours in a virtual office.
- Believe it or not, brevity reinforces attentiveness, especially in an on-line environment. I emphasize the use of what I refer to as "powerful paragraphs." Everything that is posted, including my own content, needs to be a powerful paragraph - short, concise, and to the point. Remember, everyone has to read everyone else's work.

Internal Environment

The internal environment is all the inner workings of the learning community. This is the part of the environment we create to allow for risk-taking, intellectual challenges, creativity, the construction of new knowledge, motivation to excel, and support of the life-long learning quest. It is the internal environment that affirms and challenges the learner in collaboration with other learners. In a f2f classroom the effectiveness of the internal environment can be seen, felt and heard. Good pedagogy focuses on many strategies that lead to effective internal environments. In essence this is the he*art* of teaching. In the on-line environment, the "inner workings" are not easily seen, visual clues are almost non-existent, and gaining a sense of presence is more difficult. Effective ways of communicating and the development of a sense of community become essential and foundational. Providing different ways to communicate synchronously and asynchronously are important. There are many different interactive communication tools you can utilize. In creating the internal environment consider these:

- *Email* is the most transparent. Usually everything in a class centers around that basic communication tool. It is first layer, "push" technology.
- *Threaded discussions* allow for asynchronous communications, reflection, and interactive discussions. Author editing and being able to view all conversations/threads at the same time should be a part of this interface.
- *E-journals* are very useful for one-to-one student/teacher reflections. They are "private" and I have found them an excellent tool in establishing an effective relationship and gaining valuable insight into individual learning.
- *Virtual classroom* – while this is part of the external environment, it is also essential for building the internal environment. It becomes the synchronous environment where community is built that supports the internal environment.
- *Webliographies or data collection resources* – a place where students can share good ideas and "finds." Allows for networking to begin to emerge which strengthens the internal environment.
- *Shared documents* – All part of collaborating with each other and reflecting/learning from one another's work.
- *Videoconferencing* – If everyone has the technology and baud rates are fast enough, this has the potential of adding the human interface depth to the course.
- *On-line gradebooks* – Essential feedback tool if used to continue to allow for risk-taking, and motivation to excel.
- *Interactive quizzes and activities* – Creatively engage learners in problem solving, and construction of knowledge. Accesses the power of on-line learning.

Developing the Internal Environment

Effective communication and the creation/sustaining of a partnership in the learning community are the key components of developing the internal environment. Think of how you can add richness to your interactions both between students and with yourself. If students do not collaborate with each other you will have for example twenty isolate learners. They will be robbed of networking which is so much of what learning is. When we share and reflective in a collaborative environment our perspective in chaos or at peace with others allows us to construct our learning.

In developing the internal environment work towards providing an atmosphere that is

- Affirming
- Motivating
- Stimulates inquiry
- Nurturing
- Open, accepts, values and directs opinions
- Keeps students focused
- Draws the student into the process

Organize and integrate all your best practices into the course. Invest time to create a safe environment with lots of one on one and group interactions. The process will make you a better teacher.

Finally in developing your learning community build activities to create a sense of belonging, value, and foster collaboration. I utilize a virtual classroom filled with environment and ability to "emote" (express emotions textually) to encourage the development of the learning community.

Nurturing the Internal Environment

Nurturing the community can be challenging but also the most enjoyable. Some basic tips to get your started...

- Get to know each student. You will actually get to know them better than in a f2f class because they can't blend in with the crowd! Intimidation is less and everyone has an equal voice with equal access to you. Many times students will open up much more on-line than in a f2f class.
- Let your personality shine through – sense of humor, intellect if you will, etc... Make sure your emails reflect a warm and caring attitude.
- Email can get overwhelming so provide students with "filtering" strategies. A simple one is to have all email subject areas start with the course number.
- Take your best classroom practices and re-think them – how can you put them on-line? Take your worst classroom practices and either make them better on-line or throw them out!
- Use technology to nurture the community and environment – not frustrate it.
- Provide constant feedback that validates/encourages and challenges/promotes further learning. Do an "attitude" check on your responses making sure they reflect the personality and support that is conducive to learning. Email and postings can easily be misunderstood.
- Maintain a sense of flexibility – things will go wrong with technology!
- Protect the community – just like you would do in a f2f classroom. Discourage inappropriate comments/actions and encourage appropriate ones.

Conclusion

In working in an online environment, don't forget to consider possible barriers such as servers down, bad connections, download time, computer crashes, and URL's here today and gone tomorrow. Students will invariably encounter technology issues that will hinder their progress. I always encourage my students to not let the technology stop them. If anything, they get real creative!

Don't put something on-line if you can do it better f2f. Many times we give in to trends in education without thinking about the ramifications. On-line is a trend right now. If you can use the presence of the web, Internet tools, etc... to reach a depth of teaching and learning that you cannot accomplish f2f, then by all means embrace it. I have! If you can't, then don't. If you do not know how, then seize the challenge and learn – it is worth it. For example, I can not imagine teaching my "Emerging Trends in Technology" class f2f. I could never provide the depth of the learning f2f. Students would not be able to experience the immersion into the trends without being immersed on-line. I knew with this class that the technology would empower the learning process. That's what it is all about, isn't it? On the other hand, I still didn't put it totally online. I firmly believe in initially creating the learning community f2f, making sure we experience each other's physical presence, voices, personalities and interests while establishing a common starting point with the utilization of the technology. I also have found it just as important to celebrate the accomplishment f2f at the end of the learning journey. I am teaching in an educational technology program, do you realize how much more vital this strategy is in another discipline?

By all means, give yourself time for the process of reinvention to work!

As some final thoughts to create and maintain a dynamic learning community, work towards an environment that:

- Stimulates research, reflection, responses
- Motivates participation and the learning process
- Engages and facilitates the construction of new knowledge and emerging ideas.

Your curriculum coupled with a dynamic external and internal environment, interwoven in a supportive learning community is the optimum. If your online environment is richer than your f2f environment, then you have accomplished your goal and have a viable learning community.

WELCOME to the VIRTUAL LIBRARY
ARE YOU PREPARED to ENTER?

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Abstract: Like so many other university libraries, the University of Louisville Libraries is creating an environment where the university community, its students, faculty and staff can access information from "virtually" anywhere in the universe. No longer does one have to physically go to a building and search the card catalog. One can search the University Libraries electronic resources from home as well. But, with this new level of access come pitfalls. Faculty and students were already amazed with the abundance of information available from the Internet and now the University Libraries has increased the level of access by making electronic resources (journals, books, and databases) accessible using Internet technology through the University Libraries gateway and online catalog. This paper will discuss the differences between the Internet, the University of Louisville's gateway and the online catalog, by demonstrating a few of the major electronic resources accessible through the Internet. And, it will enlighten faculty and graduate students on the differences and similarities of searching the Internet, the University Library's gateway and the online catalog to become knowledgeable and efficient searchers for information in today's virtual library.

Introduction

Searching for information today, whether it is via the Internet, the public library or university library website, can be an overwhelming experience and a daunting task. Library users expectations have changed as computer technology changed. The "Virtual Library" has become a standard way of describing libraries that provide access to digitized information using numerous computer networks such as the Internet and the World Wide Web (WWW). (Saunders, 1999, p.2) Just when you think you understand all there is to know about searching the Internet, or your favorite library, something changes, or does it? The Internet and the online catalog have never been the same. Because of web technology, researchers and students looking for scholarly resources, no longer have to physically travel to the library. Instead, almost anyone can use the library's proprietary information resources from the Internet. Web technology allows the university community to search the library's web pages for its information or services at the University of Louisville (U of L) from anyway in the world. Anyone can search and find very diverse information on the Internet and anyone can also publish on the Internet. But in an academic environment, librarians have researched, evaluated, and in the case of electronic resources, contracted that information to make it accessible to library users. Library users have the convenience of using the library at home.

At U of L, one can enter the virtual library through its main web page, the gateway or the Research Center. From these two entry ramps, the patron can browse or search the online catalog and the Internet. They are not the same. But they are similar. To harness the power of the search, you begin by planning a search strategy. The goal is to take control of your time and become efficient, by planning an effective approach and understanding how it all works, whether it is the online catalog, the main library web page or "Research Center", which will be discussed later or the Internet. Each has a distinct purpose and its own computing structure and once that is understood, searching any type of online system, should become easier and more efficient, without ever having to become a computer scientist or a librarian.

Access to the Libraries Information and Services

U of L's Libraries' main web page (see Fig. 1, http://www.louisville.edu/library/) functions as a kiosk, pointing to sources and resources of information and services provided by the libraries for the U of L community of faculty, staff and students. Examples of the type of information available from the main web page are: the hours of operation, the online catalog (Minerva 2000), ZoomText to magnify images for people with low vision, along with other services for patrons with disabilities, frequently asked questions, library locations, job opportunities, interlibrary loan information and online request, distance learning services, instructions to access online resources from off-campus, information literacy instructional classes and much more.

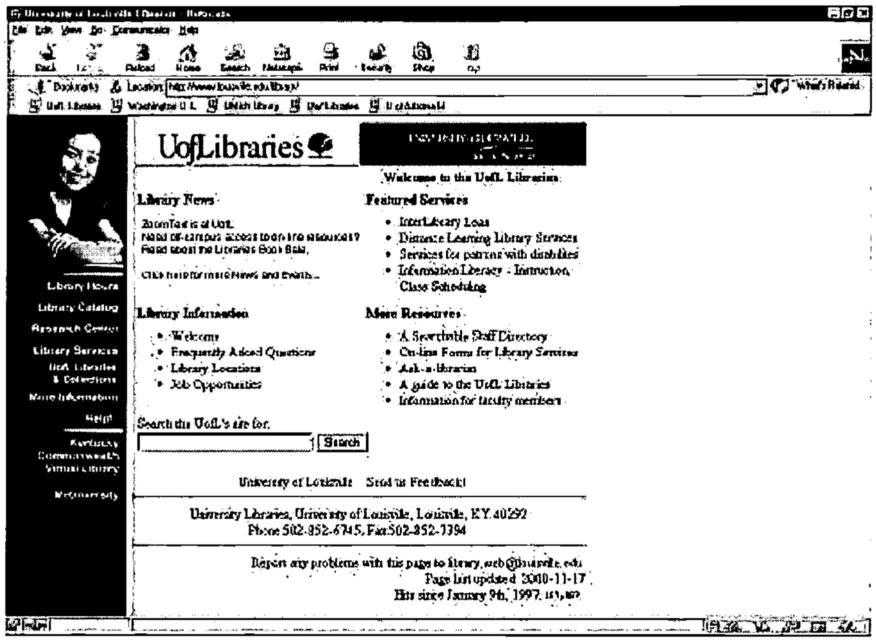

Figure 1: The University of Louisville Libraries' main web page to information and beyond

The Research Center

Another information kiosk and entrance into the virtual library at U of L is the Research Center web page. It is accessible from the main page or directly from the Internet, because it has it own Internet address or URL (Uniform Resource Locator) http://www.louisville.edu/library/research (see Fig. 2). When accessed from the main library page, it is a subset of the main page and you are in a different, but specialized virtual realm. As you virtually enter the Research Center, the University communities, its faculty, staff and students have accessed yet another layer of information. The Research Center is the initial step in doing scholarly research. Librarians organize and evaluate scholarly resources both in paper and electronic to create a web page specific to a particular subject based upon the library's holdings, special collections, archives and subscriptions. From this web page, the libraries provide the user with access to digitized information: books; searchable databases; electronic journals; specialized collections; other libraries on campus and around the world. Access to full-text journal articles are available from four access points: 1) the Research Center; 2) searching the online catalog; Minerva 2000; 3) from a publisher's website and 4) an aggregator's website, most commonly known as a database. A similarity is that they each use Internet technology, but differences begin when searching and retrieving an article, abstract, or a citation. As at many other Universities and Colleges, members of the community prefer full-text articles, over abstracts or citations. Library patrons prefer to be able to do a search and have the article in a matter of minutes. Technology has made it possible and users have these expectations.

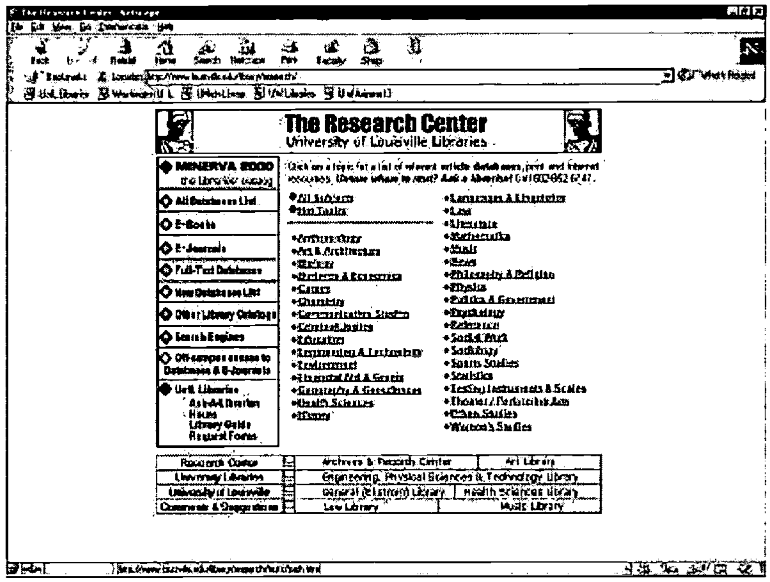

Figure 2: The Research Center

Searching

Earlier we discussed the attributes of both the main page and the "Research Center." Both are portals to sources of information and services for members of the U of L community, at the library and beyond. This digitized information is stored in computers networked around the world on a publisher's or aggregator's search engine. An aggregator will broker for many journals and bundle them to sell to libraries. Due to competition for library business, publishers and aggregators will create their own platform or search engine to provide access to the journals they sell. Each search engine is similar, but unique. These characteristics will be discussed later. They all use the Internet as their vehicle to disseminate information, but that is where the similarities end and the differences begin.

At the Library

At U of L, the main page and the Research Center are very easy to use. If a patron can point the mouse and click, then the user is already off to a good start. To use either of these web pages, a user must be able to read, use a mouse or equivalent equipment, be able to choose a button or hyperlink and click their choice. These web pages were created to be user-friendly. On the Research Center web page, each subject web pages was created with the content for the web page provided by librarians to aid users in their quest for information. Librarians use reliable sources and critically evaluate the content of all the web pages available through both the libraries main page and the Research Center.

Minerva 2000

Several different online catalogs are on the market today. U of L has the same type of online catalog that is currently being used by the Library of Congress. Many university libraries name their online catalog. At U of L, it was named after Minerva, the Greek goddess of wisdom. There are several ways to search Minerva 2000 such as: author/title/call number, journal title, keyword, phrase, etc. Minerva 2000 also allows limits to be set to restrict the results to various preferences such as format (paper, maps, electronic, microfiche) library location, and date.

Minerva 2000 is unlike the old paper card catalog. Gone are the days when a library patron's search was physically limited to using a card catalog and paper indexes. A search in Minerva 2000 will guide users to holdings of books, periodicals, video and other media, and special collections. (see Fig. 3, http://minerva.louisville.edu).

In contrast to searching a library for its proprietary scholarly holdings, searching the Internet provides users with information that is diverse; it goes from being scholarly to advertisements. Anyone can publish on the Internet and searching the Internet can be overwhelming.

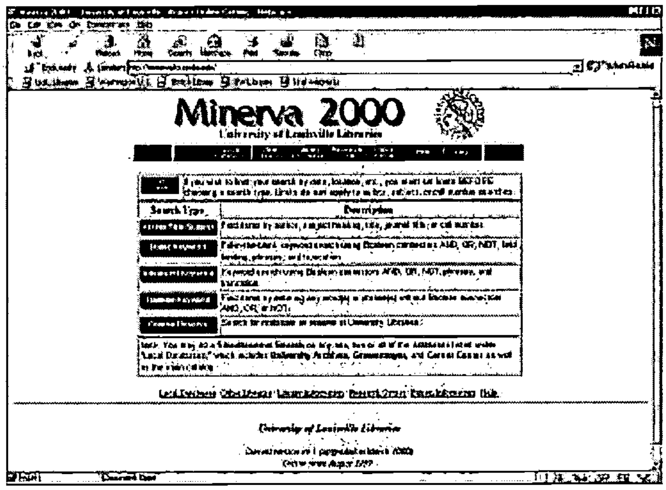

Figure 3: Interface to Minvera 2000

The Internet

All search engines are not the same, plus there are other web sources to begin the search process, such as a web directory. Web directories uses subjects to classify websites. (Fonseca and King, 2000, p.40). Similar to the Research Center web page where librarians have classified information for its subject web pages or the online catalog that allows subject heading searches. Two popular web directories are The Librarians' Index to the Internet (http://sunsite.berkeley.edu/InternetIndex) and Yahoo (http://www.yahoo.com/). Both web directories websites

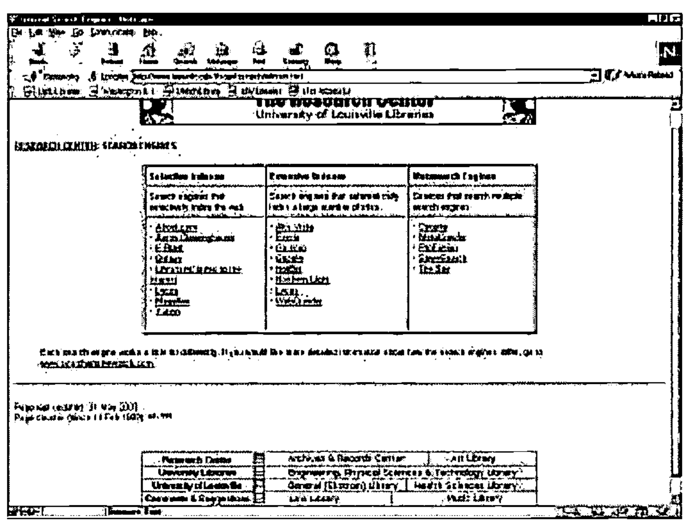

Figure 4: Selected types of search engines

are different, but they both direct users to specific information. Librarians not only research and evaluate content for subject web pages, but also search engines (see Fig. 4). Another website that can assist users in choosing search engines or web directories is Search Engine Watch (http://www.searchenginewatch.com), which also provides the latest news on search engines. The table below describes the differences in features and search capabilities for searching Minerva 2000, three popular databases: ProQuest Direct, Nexis-Nexis Universe, EBSCOhost, the U of L's main library web page and Research Center, Yahoo - a web directory, and Google - a search engine. All search engines have a help button for assistance. Becoming an efficient searcher takes practice, planning, and understanding that all search engines are not built the same. In general, search engines whether they search a database, an online catalog, or the Internet, all share some commonalties. What makes them different is how they are designed to search, access and deliver information.

References

Saunders, L. M. (1999). The human element in the virtual library. *Library Trends*, Spring 1999, 47(4), pp.771+. Retrieved November 14, 2000, EBSCOhost database (Academic Search Elite) Item no. 2055784 on the World Wide Web: http://www.ebsco.com

Fonseca, T. & King, M. (2000). Incorporating the Internet into traditional library instruction. *Computers in Libraries*, Feb. 2000, 38-42.

The Web and the Internet. (1996). Web Master Magazine. CIO Communications, Inc. Retrieved November 29, 2000 from the World Wide Web: http://www.cio.com/WebMaster/sem2_internet.html

What is the "World Wide Web"? (1996). Web Master Magazine. CIO Communications, Inc. Retrieved November 29, 2000 from the World Wide Web: http://www.cio.com/WebMaster/sem2_internet.html

Search Type	U of L Main library page	Minerva 2000	Yahoo-Web Directories	Google Search Engine	Database ProQuest	Database Lexis- Nexis	Database EBSCO host
Author	NO	YES	YES	NO	YES	NO	YES
Advanced Keyword	NO	YES	YES	YES	NO	NO	YES
Boolean operators	NO	YES	YES	YES	NO	NO	NO
Browse Table of Content	NO	NO	NO	NO	YES	NO	YES
Call Number	NO	YES	YES	NO	NO	NO	NO
Course Reserves	NO	YES	NO	NO	NO	NO	NO
Date	NO	YES	NO	NO	YES	YES	NO
Essential term	NO	+	+ OR -	+ OR -	NO	NO	NO
Field	NO	YES	YES	NO	YES	YES	YES
Format	NO	YES	NO	NO	NO	YES	YES
Foreign Language	NO	NO	NO	YES	NO	YES	NO
Journal Title OR Title	NO	YES	YES	NO	YES	YES	YES
Keyword	NO	YES	YES	YES	YES	YES	YES
Language	NO	NO	NO	YES	YES	YES	YES
Natural Language	NO	NO	YES	YES	YES	YES	YES
Phrase	NO	YES	YES	YES	YES	YES	YES
Subject Heading	NO	YES	YES	NO	YES	NO	YES
Thesaurus	NO	NO	NO	NO	YES	NO	NO
Full-text	NO	YES	YES	YES	YES	YES	YES
Truncation symbol	NO	?	*	NO	?	* OR !	*
Email	NO	YES	NO	NO	YES	NO	YES
Print	YES	YES	YES	YES	YES	YES	YES
Save to disk	NO	YES	NO	NO	YES	YES	YES
Download	NO	YES	NO	NO	NO	NO	NO
Help	YES	YES	YES	YES	YES	YES	YES

Table 1: Search type comparisons of the U of L main library web page, Minerva 2000, Yahoo-Web Directory, Google-Search engine, and databases: ProQuest; Lexis-Nexis Academic; and EBSCO host.

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THE INTERNET AS A TOOL FOR A REVOLUTION IN EDUCATION IN AFRICA: A DREAM OR REALITY

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Abstract

In this paper, the author looks at how the Internet can help Africa develop educationally. The research highlights the benefits that can be derived from access to the Internet for educational purposes in Africa and the problems which have caused the slow growth of Internet access in education in Africa. The author then suggests solutions to these problems in an effort to bring full Internet access to Africa as quickly as possible, thereby improving the quality of education.

1. Introduction

Before the Internet was introduced in Africa, (Osburn, 1999) observes that there was no other method capable of transmitting the same information and at the same time to both industrialised and developing countries. With the Internet, the people of Africa have, for the first time the opportunity to have access to the same information, and at the same time, as people in industrialised countries.

Other than giving Africans the same development opportunities as the industrialised world, the Internet is the fastest growing communication technology. According to (Molosi, 1999) it took 38 years for the radio to have 50 million listeners, 13 years for the television to reach the same mark and only 4 years for the Internet to cross the same line. By the end of 1998, more than 100 million people were Internet users. With the ability to grow so rapidly, one wonders why more people in Africa have not been able to gain access to the Internet, and have not been able to use it as an educational tool.

As the use of the Internet continues to grow, this will have profound implications on education in African countries. According to (Africa on the Internet, 2000), there are fears that if Africa does not 'connect fast enough' the growth of the Internet will only accelerate marginalisation of the African continent. As the pace of growth accelerates even more, the gap between those who are linked up and those who are not grows larger. These dangers and fears are real and should not be underestimated. Lamenting them will not stop the growth of information technology. Instead, Africa's civil society, governments and entrepreneurs need to be challenged to take advantage of the information technology revolution now gripping the rest of the world and bring the Internet to Africa.

2. Applications of the Internet towards the development of education in Africa

(Deutsh, 1956) states that, what we see happening today, that is, the networking of developing nations, generally began in the universities and research communities. The advantages of networks to academia were, and still are obvious - databases are shared, conferences organized, papers circulated and discussed, collaborative research and writing undertaken, and so forth.

Universities and research in developing nations are strengthened, and the "brain drain" diminished as the Internet reduces pressure on professionals to move abroad. (Deutsh, 1956) further observes that early in the 20th century, physics research was only concentrated in a few centers, but increased international communication-journals and conferences - led to worldwide dispersion of physics research. The Internet will actually accelerate the spread of information for educational purposes to even the remote areas, which have access to the Internet.

Electronic Distance Education (EDE) is the process of extending learning, or delivering instructional resource-sharing opportunities to locations away from a classroom, building or site, to another classroom, building or site by using video, audio, and computer communications technology including the Internet. At its most basic level, EDE takes place when a teacher and a student are separated by physical distance, and technology is used to bridge the instructional gap. As a result EDE can provide adults with a second chance at college education, reach those disadvantaged by limited time, distance or physical disability, and update the knowledge base of workers at their places of employment.

3 Internet resources for education

In EDE students can engage in electronic discussions with each other via facilities that are available over the Internet such as newsgroups, bulletin boards and chat groups and e-mail.

Newsgroups allow students to engage in discussion groups on areas of interest. A student subscribes to a discussion group and messages to and from subscribers are distributed via electronic mail (e-mail). An electronic mail message is a document that is created, dispatched and received on an electronic mailing system. Electronic bulletin boards on the other hand store messages on central computers and users must log onto these computers to read messages that are sent to these groups.

A chat group is a service in which participants around the world can talk to each other by typing in real-time on hundreds of channels. In an example where students are encouraged to actively participate in EDE seminars, the student leading the seminar prepares a paper and submits this by e-mail to a group for consideration. Some electronic discussion follows, prompted where necessary by the tutor. After a few weeks the student presenting the seminar summarises the discussion and presents a revised paper. Management of such seminars requires skill from the tutor in judging just when to contribute a comment in order to keep the discussion going.

In organisations where e-mail is available, both tutors and students are offered an efficient and straightforward means of communication. One such application is to use e-mail to remind students of impending deadlines. Even students who are absent when the message is first posted are certain to receive the message when they next access their e-mail. Similarly any changes, revisions to assignments or hints can be delivered to all students through e-mail.

The increased numbers of students and the corresponding increase in time spent by staff on assessment has encouraged interest into how technology can be used for assessment purposes at various levels. In a fully automated assessment system all aspects of the system from the assessment which the student completes to the processing and administration of the marks, including overall management of assessment information is technology-based. Perhaps the most immediately obvious and most easily accessible use of technology to assist the assessment process is in the recording, analysis general storage and management of results. A wide range of spreadsheet packages (e.g. Excel, Lotus123) and database packages (e.g. Access, Oracle) is available over the Internet. A package is a collection of computer programs to achieve a particular purpose. Spreadsheets are used to expedite record keeping involving mathematical calculations. The numerical data can be mathematically calculated and presented in an easy-to-understand format. A database is a collection of information that can be organised, sorted and printed in various report layouts. A database package assists in collecting information into a database. Examples of information, which may be collected and stored in a database, include personal student information, records of classroom resources and student academic information.

There is a growing interest and increasing practical experience in the use of computers to deliver objective tests. Objective testing is often taken to imply the use of multiple choice questions. The creation of a bank of questions on the Internet invites the possibility of each student being presented with a paper made up of different questions, but of an equivalent standard. It is possible to use the computer to generate different tests automatically from the bank of questions. It also offers the interesting possibility of an instant computerised marking facility that allows immediate feedback for students.

Computer technology is there to aid those doing research. Communications packages that provide access to databases and archives on the Internet and explore the World Wide Web can assist with research and information retrieval. Communications software is used to search library catalogs, search electronic journals and text, and retrieve text, graphics, audio and video files.

4. Problems Causing Africa's slow Growth in Internet access

Internet access in Africa has slowly improved over the years, but many people in the continent are still unaware of the Internet and those who may be aware of its existence don't know how it may be of benefit to them. There are several reasons why Africa's Internet infrastructure has remained so fragile, therefore slowing down the rate at which people are able to access the Internet.

4.1 Interference of state-owned PTCs

According to (Adam, 1993), the state-owned Posts and Telecommunications Corporations (PTCs) involvement and approval is usually required to proceed with networking plans in the area of telecommunications in most African countries. Because, in most cases, the PTCs have rigid policies and poor management and computing capabilities, the need for approval by the PTC to proceed with any networking plans frequently hinders the progress of networking in Africa.

4.2 Computing Equipment in Short Supply

(Adam, 1993) highlights the fact that both hardware and software are difficult to source in Africa in terms of cost. Therefore, equipment is usually in short supply. If it is available, it is either obsolete or under utilised. In an institution, one may find mainly old mini-computers and low-end personal computers with limited application software.

One is convinced that if the policy makers appreciate the importance of computer literacy, the resources would be made available to purchase computers for schools. The policy makers would also see to it that computer education is included in the school curriculum.

4.3 Low Investment in Research and Development

Statistics indicate that African universities and governments invest only a small percentage of their budgets in research and development. The policies implemented by the governments may only be short-term and do not take into account any long-term research options. As (Adam, 1993) put it, "the research staff work under extremely difficult conditions. Salaries and incentives are limited and not sufficient to promote the use of modern technology for research". Usually an individual researcher or a research department in an organisation or an institution is not able to afford the costs of using computing technologies in research and development. A lack of understanding of the impact of electronic communications on the telecommunications infrastructure and the impact on research and development is one of the persistent challenges to network development.

4.4 Extreme Dependence on External Technological Sources

There is an extreme dependence on external donors in the area of information technology. This dependence could be in the form of finance for purchasing equipment or computer hardware and software donated to an institution. According to (Adam, 1993) this has a few disadvantages. The use of information technology is mainly limited to themes selected by donors, consultants, etc. If the donors have donated equipment which they want to be used in the engineering department of the school, then even if there is a greater need for the equipment in the computer science department of that school, the equipment cannot be shifted there.

Despite these disadvantages, external sources are very important in bringing the Internet to Africa. They have the financial resources, which are needed in order to purchase equipment and train the system operators and users. Without them it is not feasible to try and implement a network plan in Africa which will benefit a greater part of the population. So there actually has to be a trade-off between the resources which have been donated by these external sources and the control that they have over the use of equipment.

4.5 Journals in short supply

Most information technology journals and magazines, with a broad range of technology assessments and updates on computers and networks are procured outside Africa. They are therefore, expensive for individuals to obtain and are generally in short supply. According to (Adam, 1993), " while journals in various fields can sometimes be found in libraries of universities and research centres, journals and proceedings on various tools for networking are generally unobtainable". This means that it is difficult to have access to the most current developments in networking.

4.6 Lack of formal training in the area of networking

There is an observable slack in the area of formal training in computer networking. Because of the lack of training in network design and management, and the fact that those who are skilled in the networking area move to places that offer better salaries which is usually in foreign countries, there is, therefore, a shortage of human resources in the field in Africa. In order to curb the brain drain, industries should be challenged to give salaries and conditions of services, which are comparable to those in countries, where the experts in computer networking are moving to. To curb the brain drain, industries should be challenged to give salaries and conditions of service which are comparable to those in the countries where the experts in computer networking are moving to.

4.7 Lack of culture for sharing information

In academic institutions and industry there is the problem of lack of a culture of sharing information, which should exist mainly in these circles. There is an unwillingness to share information and resources, maybe because of the competition for foreign resources.

With companies which are competing, this is understandable. Each of the companies wants to get ahead of the rest of the competitors by improving services and, therefore, increasing their customer base. In academic institutions, this problem leads to non-progression in the area of computer networking. If one has an idea, or information that they have been able to source, then sharing it with others will also improve their understanding and maybe bring in new insights which they had not realized before.

4.8 Telecommunications Costs

If the state monopolises telecommunications, there are no controls to the prices which they will charge for accessing the Internet. The problem is even compound in Africa because of the few telephone lines, which exist. (Cohen, 1999) puts it this way: "A few statistics illustrate why the basic requirements of access-a-telephone-line presents problems for less industrialized countries. Globally, 49 countries, 35 of which are in Africa, have fewer than one telephone per 100 people". The lack of telephone lines in some areas makes it difficult to cultivate an Internet culture, as there is need for a telephone line and a computer in order to be able to gain access to the Internet. Besides not having reliable telephone lines which are necessary for usage of the Internet, cost is also inhibitor to Internet access

4.9 Counter Regulation

The governments at times try to regulate the content of the information accessed over the Internet. According to (Cohen, 1999), this happens in countries where telecommunications are monopolized by the state. Governments can also restrict access for political purposes and economic gain.

5. Suggested Solutions

The problems, which have been listed in the previous section, have seriously affected the connectivity of African countries to the Internet. Although the Internet is essential, building intensive Internet connections require a thoughtful plan, long- term commitment, financial support for sophisticated Internet technology, sufficient human resources to run sophisticated networks, and in-depth knowledge of networking.

5.1 Sensitisation and Teaching

Sensitisation and teaching are important activities in networking. Continuous sensitising and teaching theory of networking costs system operator's time, but is most useful during the first stages of building a national network. There are several ways in which people can be sensitised on the use of the Internet.

5.2 Frequent Updating and Change

Networking is a dynamic area that needs frequent updating and change. Realising the fact that there is a continuous change in computer technology, there is a grave need for frequent upgrading of the equipment that an organisation has, and an improvement in the skills of the people in the field.

5.3 Collaborate with PTCs

Government-owned Posts and Telecommunications Corporations (PTCs) have been one of the major stumbling blocks to networking in Africa. PTCs actually claim to know much about networking than they do. If policy makers and key industry players collaborated with PTCs, they would be able to encourage each other in networking technology. PTCs should also acknowledge that electronic networking will not threaten their networks or reduce annual telephone bills but would rather improve their capacity and generate demands for newer services. In essence, this would be an advantage for the PTCs. If they have improved services, they are better able to compete with new players who come into the telecommunications market. Thus, long-term collaboration schemes should be established between community and government PTCs.

5.4 International Cooperation

The networking map indicates that Africa lags behind all other continents in the use of data communications technology. While the global Internet is growing at a phenomenal rate, its potential changes to society are becoming immense, and the creation of a truly global internetworked research village is becoming evident. Isolation from this global movement is still very much in evidence in Africa. African network enthusiasts can only become self-sufficient through learning from the experience of the international community.

5.5 Institutional Support

Institutions play a major role in promoting networks. Lack of institutional support and political will to promote a network initiative are, according to
(Pimienta, 1993) major stumbling blocks to networks in the region. To quote him directly, "Building of network user groups, supporting official structures for academic institutions such as science and technology commissions, and involving active researchers to obtain political backing from their institutions, " are ways of improving institutional support.

5.6 Organisation

Centralizing network activities using some appropriate organization that deals with plans, projects, results and impacts of activities is very important. Effective organisation saves money and effort in dealing with governments and different institutions. One has a set out plan and is able to follow it through sequentially.

5.7 Financial Resources

Technical plans and network architectures should be based on available financial resources. (Pimienta, 1993) lists the following as major costs of a network: the coordination of a network from conceptualization to implementation, the installation and configuration of a network, network support, including training (user support), the maintenance both at user level and at nation level and communication costs. Dependence on foreign assistance to cover all of the above costs makes national network overly dependent. When such donors withdraw, national networks may be jeopardised. (Pimienta, 1993) suggests methods of building cost recovery tools into the national network to help to support it. Some of these tools include institutional subscription fees, additional fees for conferences or other Internet services and training and support fees.

5.8 Technical Plan

A sound technical plan is also a critical element in sustaining a network. Networks should match national infrastructure and user requirements. (Pimienta, 1993) further suggests that concentrating efforts toward building large national hosts (rather than numerous smaller nodes) allows for better transmission media and continuous support for the improvement of bandwidth.

5.9 Wireless Technologies

Wireless technologies are actually being seen as one of the most important ways of addressing the needs of a continent with the least developed telecommunication systems in the world. (Jensen,1996) though argues that "although wireless systems can offer far more rapid roll out times, greater reliability, lower maintenance costs and better security, wireless Internet connections are also not inherently more viable than wired networks – they are more appropriate in applications where traditional solutions for some reason are not feasible or cost-effective. These traditional solutions would include access to the Internet via a telephone line and a modem.

6. Conclusion

The Internet is a communication tool that should not be confined to industrialised nations and begs to be utilised now to address Africa's chronic need for communications and development of education. The ushering of Africa into the new information age will be realised through a partnership of African governments, private business and donor agencies. The desirable outcome is a sound telecommunications infrastructure, decrease in access costs and equipment costs, proliferation of telecentres in rural areas, heightened computer awareness and improved communication.

References

Adam, N. (1993) Sustainable Academic networks in Africa - A system Operator's Perspective". *Electronic Networking for West African Universities.* A report from a workshop held in Accra, Ghana.

Africa on the Internet - Starting points for policy information. www.africapolicy.org/bp/inetall.html pp. 1-8

Cohen, T. (1999) Africa needs the Internet. *Computers in Africa.* pp. 22

Deutsch, K.W. (1956) Shifts in the balance of Communication Flow. *Public Opinion Quarterly 20.* pp. 143-160.

Guinness, M. (1999) The rise and rise of the Internet in Africa. *Computers in Africa*, pp. 22

Jensen, M. (1996) A guide to improving Internet access to Africa with wireless technologies www.idrc.ca/acacia/studies/ir_jens.htm

Molosi, K. (1999) Making the Internet work for Africa. *Computers in Africa.* pp. 25.

Osburn, C. (1999) Dealing with productivity losses caused by the net. *Computers in Africa* pp. 18.

Pimienta, T. (1993) Research networks in Developing countries: Not exactly the same story. *Proceedings of iNet'93, Internet Society*

Bilingual Web Based Learning:
"To know the world and to be known by the world"

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Abstract: Web is a simplest and a cheapest technology to deliver a knowledge to all over the world. This presentation paper would tell you about our concept about bilingual web based learning (our way to know the world and to be known by the world), type of services, research and development steps in developing bilingual web based learning ,development time-line, how the human resources organized in development and operational stage ,collaborative work with other institutions, and our future plan in web based learning concept.

Introduction

Invention of the Internet technology make everything change and move fast. Information flows very fluently make us very easy to get all information and knowledge we want and also we can share everything we know to others. We believe that to follow the change we can not move and work alone anymore. We have to collaborate with other parties , otherwise the changing will destroy us. To be have a good collaboration we need a good communication with others. Not only good communication but also we have to increase our knowledge. In order to achieve all above statement we try to build a distance Learning system through the web. Web is a simplest and a cheapest technology to deliver a knowledge to all over the world. We try to convince people especially in developing country like Indonesia that the technology is not as far as they thought before.

The course were made is a *general informal English course* especially for Indonesia or Local community. We aware that English language is a world language and to be able to communication we should have a good skill in English. Some of the courses are free to take, every body can take it whenever and where ever they want. That's the advantage of the Web!! And if you want to ask the expert you can contact them by e-mail. Another course is *Indonesia language course*. The course is intended to every body who want to learn Indonesia language. But at the first time, it is intended to help any foreigner who working in Indonesia because to be able communicate with Indonesia community it would be better if they know a little of Indonesia language. So this is the way ***to know the world and to be known by the world.***

Web based Learning Concept

Technology based Distance Learning is defined as a system and a process that connects learners (students) with knowledge centers (Instructor, Database) who are separated in distance and need to interact in real time or non-real time. And Web based Learning is a technology based Distance Learning that used web as interface. And some people said that web based learning have made many changes in knowledge material delivery. For some parties point of view this is the most effective way compare to other distance learning media alternatives. Up to now there about three training or learning program which is delivered through web both on the internet or intranet such as computer/technical training program, business program, and languages.

There are many classification of web based learning. This article will explain some of this classification. The first classification was according to the media type:

1. Text and Graphics Web base Learning
   Text and Graphics is the simplest web based leaning application. Instructor only put the courses material on the web and student can access it very easy. But this Web based Learning type present text and graphics only then interactivity level is very low.
2. Interactive Web based Learning
   In this type, the web based learning is equipped with a quiz, self-test, text entry test, and other. The interactivity level is higher than the first type.
3. Multimedia Interactive Web based Learning

Most of training program used this model as their web based learning model because this model has a highest interactivity level. Student and teacher can communicate in real time situation, audio streaming, interactive web discussion.

Interactive Multimedia Web based Learning have the highest level of interactivity but to achieve that level we will have a highest cost than others. In order to achieve that we have to use step by step work, first of all we could build the Text and Graphics Web based Learning then we enhance the capability step by step until we achieve the highest level of interactivity.

According to instruction type there are two kind of web based learning:

1. Synchronous
   Student could communicate with their teacher and other student at the same place and time
2. Asynchronous
   Student could communicate with their teacher and other student at the same place but not always at the same time.

Finally there are four type of business model in web based learning:

1. Free courses with commercial advantage
   Usually learning institution or provider provide a free courses and everyone could follow the course without pay it. Commercial advantage could be afford with advertising or form other content provider
2. Commercial course
   This course's mode is replica of conventional courses but use web as its media. Conventional process such as registration, placement-test, and others has to be passed before student could access the material and of course the student have to pay the course.
3. Learning Application Service Provider
   Mostly, this type of web based learning business model is provided by learning tool producer. Beside sold their application they also offer a leased service. Every party could used their software and host in their application on the basis per hour and per concurrent user.
4. Learning Portal

Like another type of portal , learning portal is also a collection about any resource to learning. It could be learning material, web based learning home page, and learning information.

Idea Generation

The idea comes up when my colleague try to enhance our English capability by send us one material a day. It was a good beginning but too bad it's not consistent because it stop when we get busy. When we busy we don't remember that we have to send our friend a

the web , we could reach all people that connected to our LAN/INTRANET. So I told this to my manager , he agreed and told me to start build this application. Then we start the idea about bilingual web based learning. We defined bilingual web based learning as a web based learning system that content or delivery process used an English and Native language as a main language. We develop a web based learning that content consists of English Language and Bahasa Indonesia with delivery language both Indonesia and English.

Implementation Steps

Prototype I (Oktober 99- February 2000)

Our Course Features

English.

In English feature we have a number of features. Those are:

- A grammar
  We deliver this section because we aware it is a difficult part of English beside the vocabulary.
- Idiom
  This feature was made to help people learn about idioms, what is the meaning and how to use it.
- Conversation
  To help student increase ability in any conversation style like at the office, at school, in the meeting, and occasional live
- Scientist story
  We try to make our community close to science. One of our weakness is that most of our student don't have a good capability in basic science. We try to attract people through the scientist story.

- Networking Terminologies
  We work in Telecommunication and Information technology field. Then it is important to know all about networking terminology.

  To deliver this course we have two step, first we give the stdent a brief theory then we ask them to answer a simple question on the web. This is a weekly program then we will update the course every Monday.

Indonesian Course
In Indonesian course the features are:

- Grammar
  In this section we try to help people learn about Indonesia grammar, how to speak, how to read. We aware that the difficulties in Indonesia language is how to spell in Indonesia. To we think that it would be better if we add a sound feature in every Indonesia word
- Vocabulary
  The feature were intended to help people to increase their indonesia Vocabulary.

This is also a weekly program then like the english course program we will update the course every Monday.

Type of Question
As we mention in above paragraph, the course will preceded by a short material or lessons and follow by the question. There is a lot of type of question that we give to learner but in general the question flow is depicted in this figure.

Multiple Choice Question Types
There are two program that used in this type, first a program from Hot Potatoes Software and Second is developed by RisTI using Java script .The First Program is more complicated and more sophisticated that the other. It's a user interface program. And if we work with the second program, we should working from the source program but the function is same and the advantage is we don't have to buy it. We used this type of question if for Reading Comprehensive Test and Networking Terminology test, but it is possible to use this type to the other item.

Short Answer Type
There are two program that used in this type, first a program from Hot Potatoes Software and Second is developed by RisTI using Java script .The First Program is more complicated and more sophisticated that the other. It's a user interface program. And if we work with the second program, we should working from the source program but the function is same and the advantage is we don't have to buy it. We used this type for Vocabulary test, Scientist Story, and any other items which appropriate.

Matching Answer Type
The matching type now is only from Hot Potatoes software but in the future as the other type we will develop our script to make this type question. For a while we used this type question for vocabulary test and Idioms test.

Prototype II (July 2000- February 2001)

In this second prototype we enhance the capability of our application. First, we do an assessment of First prototype. Second, we do a development process based on analysis result. We have to know and understand the system specification before we design new system which will be developed. Through system specification we will get information about processes that needed and involved in system.

Web based learning could be specified from a different point of view :

User Point of View.

From user's point of view , the system consists of two service type :

1. Free System, this system is intended to user who not or not subscribed to become a member of commercial course system. The user just only need to register but he/she doesn't have to pay anything but the facility is not as much as commercial system..
2. Commercial System, this system is intended to user who want to became a member of commercial course. User have to register first and pay for the course . We will give more feature for this user..

Facility Point of View

From the facility point of view our web based leaming are consists of::

1. User Management System is a System that function to manage user and content data base. System is consists of :
    a. Registration is a processes that consists of user items.
        a. User authorization which consists of:
            i. User ID
            ii. Password
    b. Payment method. There are two payment system : on-line and off-line
2. Interaction Facility, is a facility that function to provide interaction media or communication among instructor and student , instructor and instructor , or student and student. Interaction System is consists of:
        b. Chatting
        c. E-mail/mailing list
3. Teaching Facility, a facility that used to support teaching and learning system.
4. The content is consists of :
    a. Daily Lessons, this is a content that will change everyday. The contents are consists of :
        i. Idiom
        ii. Proverb
        iii. Vocabulary
        iv. Antonym
        v. Synonym
    b. Weekly Lessons, this is a content that will change everyday. The contents are consists of:
        i. *Idiom*
        ii. *Grammar*
        iii. *Vocabulary*
        iv. *Reading*
        v. *Scientist Story*
        vi. *Networking Terminologies*
    c. Sample Class, this is a class sample of commercial courses that consists of following material:
        i. Conversation
        ii. General
        iii. Business
        iv. TOEFL Exercise
5. Evaluation and Scoring Facility .
   This is a facility that used to evaluate especially student who take the commercial course or take a weekly lesson. This evaluatio system is consists of four types:
    - Examination (*Quiz*)
    - Exercise/Homework
    - (*Student Progress Tracking*)
    - R*eport* and Certificate
6. Supporting System,
   This is a facility that used by system administrator to administer the system, user, include create the material, quizzes, exercise ,etc.

Resources

Development

First step is to obtain who is the member of the development team. Development team is responsible to develop web based learning. This team build a web based learning from the beginning, integrate the software which is needed to develop the web or customized web based learning application software that available in the market. The development team are:

1. Project Manager
   The project manager will lead this development project, he oversees the assignment and flow of tasks and coordinates development schedule. The project managers might fulfilled other roles on the project in addition to management and supervision.

2. Instructional Designer
   Instructional designer for the web based learning project is the person who responsible for the teaching and learning process in web based learning that will be built. He/she should define need analysis, overall design, and often actual writing of storyboard. Storyboard are graphical and text presentation of the information that goes into each screen of the program.
3. Programmer and Database Expert
   Programmer is the one who responsible to encode the system that have been designed into a language that understood by the machine/computer
4. Software quality assurance
   Once the programming step in place, the team needs to test the applications. Software quality assurance may be apart of programming but in a large web based learning development there are some specially people responsible to maintain the software quality.
5. Subject Matter Expert
   Subject matter expert acts as a consultant in the actual of curriculum. Clearly, different subject matter expert are needed for each content. The SME are chosen from their expertise area, and work with writer and instructional designer to create the actual curriculum and training method that will be used.
6. Writer and Editor
   Writer crafts the text of the learning material. Its require communication with Subject Matter Expert and Instructional Designer. And Editor is needed to verify the grammar in the text of the curriculum and control all the material and exercise.
7. Web and Multimedia Developer
   Web and multimedia developer are responsible to design the web page , audio, video, and animation according to the result of Instructional Designer and Subject Matter Expert proposal

Operational Human Resources

In the web based learning operation we need a different team or different human resources.

1. Manager
   Manager Responsible for web based learning operational. He/she should maintain the web based learning operational.
2. Instructor
   Instructor responsible for delivering courses. She or he has to answer all the student question and if there are a discussion session the instructor should be able to moderate the discussion.
3. Web Master and Administrator
   Web master and Administrator handles the day to day technical support related to delivering the content over the network.

Lesson Learned

From the experience , we have several lesson that might be good if you consider it:

a. Be detail with Design
b. Be careful when evaluate
c. Do a Beta Test and Pilot Project
d. Watch your Content Development
e. Consider your Resources (Both Content ,Financial,HR, etc)

Future Plan

In the future we plan to continue develop bilingual web based learning by collaborate with other institution which have a different expertise (such as language expertise). And we try to enhance our facility like add some feature like bulletin board system, conferencing tools, web synchronized, etc.

Suggestion and Summary

As we mention above bilingual web based learning is a web based learning system that content or delivery process used an English and Native language as a main language. We hope we could make it as good as possible so people from out country could learn our language easily and people from our country will learn International Language easily anywhere, anytime. From the experience we have learned, I would like to conclude:

- Technology just a medium
  The technology is just a medium then we couldn't say it bad technology or good technology. But the important thing is what the technology which appropriate for our condition and situation
- Need collaboration with other institution

In globalization era we have to know that we can live by ourselves anymore , we need to collaborate with others..

- Need a subject matter expert
  For the content, if we don't have any resources for this field, feel free to collaborate with other who has these expertise
- Allocate Resource to the fit position
  Put your resource to an appropriate place.
- Next development: Desk Top conference, virtual library
  Desktop conference is a synchronous model of Distance Learning technology. This time we are not using this technology but we still do research about this technology. We believe that desktop conference technology will growth follow the internet technology growth especially voice over IP technology. And virtual library as the supporting system for our distance learning will be developed. It is possibly a joint partnership with other library who have very good expertise in this field

Reference

Brandon Hall. (1997). *Web based Training Cook Book*, John Wiley & Sons, Inc, Canada

Alan Chute, Melody Thompson, and Burton Hancock. (1999). *The McGraw-Hill Hand Book of Distance Learning*, McGraw-Hill, USA, 1999

Firman Gunawan. (2000) . Web based Learning and Its progress in South East Asia, InfoKomputer, Indonesia.

Teleeducation Laboratory of Research Division of PT TELKOM Indonesia(2000) . *English and Indonesia Web based Learning Development: A Technical Document ,* Indonesia.

A Lecture Generator in the Web

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Abstract: - We made a tool to generate presentations as HTML pages from a simple input text which can be generated in any text editor. This tool is available to public usage through a CGI script at http://www.pcs.usp.br/~jkinoshi/lecture. This paper presents how a text given in a simple notation can create useful presentations.

Introduction

It is common to use a computer tool (ex: PowerPoint [1]) in order to prepare a presentation. The material generated by the tool is a sequence of slides where each slide consists of:

- One title
- Many topics, organized in a hierarchical way.

In this paper we present a "lecture generator" tool that transforms a single text into HTML pages (slides) to be used in a lecture. Our approach is simpler than "PowerPoint":

- The input text has a very simple notation that can be created in any text editor.
- The output are HTML pages that can be seen in any browser, hence, in most platforms.

The tool is available for test in [2].

Input text and output slides

Each line of the input text basically corresponds to a title or a topic of some slide. The first character of the line tells the difference:

- **title**: A line beginning with '*'.
- **topic**: A line beginning with '-'.

Example 1:

```
* Title of Slide 1
- the first topic inside Slide 1
- the second topic inside Slide 1
* Title of Slide 2
- one
- second topic.
- the last topic.
```

The input text from example 1 generates two slides:

- Slide 1: The slide "Title of Slide 1". See figure 1
- Slide 2: the slide "Title of Slide 2".

Observation: The link to the former and next page is automatically generated at the head of the slide. Example: In figure 1, the link to the next page is "Title of Slide 2".

The hierarchy: Topics in a slide

Each topic line can begin with one or more '-'s. The more '-'s, the lower it will be in the hierarchical structure, as it can be seen in example 2. The first slide of presentation in Example 2 is seen in Figure 2.

Figure 1. First slide of example 1

Example 2: Hierarchy in topics

```
 * Title of Slide 1
 - 1. the first topic inside Slide 1

 -- 1.1. the sub-topic of 1
 --- 1.1.1 the first sub-sub-topic of 1
 --- 1.1.2 the second sub-sub-topic of 1.
* The second slide
- some topics inside
```

Figure 2: first slide of example 2

The hierarchy: Slides in a Lecture

A lecture can correspond to a sequence of slides organized in a hierarchical way. Each title line begins with one or more '*'s. The more '*'s, the lower the slide will be in the hierarchical structure of the lecture.

Example 3:

```
 * Title of Slide 1
 - one topic
 ** Title of Slide 1.1
 - another topic
 ** Title of Slide 1.2
 - one topic more
```

which generates three HTML pages. The first HTML page is in figure 3:

Figure 3: First slide of Example 3

Links to the "sub-subjects"

The tool creates links to the slides at the immediately lower level (sons in a tree structure) at the bottom of the page. This is done because:

- it is common to present the great sub-subjects under some slide and
- it enhances the navigation during presentation.

Example: The Slide 1 in Figure 3 has two "sons". The two links "Title of Slide 1.1" and "Title of Slide 1.2" (bottom of figure 3) are automatically generated by the "Lecture Generator" tool.

The table of contents

The tool automatically creates the HTML page pa0.html that displays the table of contents. The figure 4 shows the table of contents of the example 3.

Commands to the Lecture Generator Tool

We created a special notation in the input text (commands) that enables figure insertion, comment insertion, etc. The commands are:

1. mark a portion of input text as comment

syntax:

```
:rem
some comments
:/rem
```

The lines between :rem and :/rem does not appear in the output.

Figure 4 - Table of contents of table 3

2. keep the text as it is (ex: example of code)
syntax:

```
:pre
some text that must appear as it is at the output
:/pre
```

The lines between :pre and :/pre must appear as a text at the output HTML pages. It is useful to show programming code.

3. insertion of figure
syntax:

```
+img:file
Example: figure 3: +img:florida/ex3.jpg
```

The Lecture Tool creates the HTML tag 'IMG' from this notation.

4. insertion of a HTML link.
syntax:

```
+http:anURL
```

If the user adds the character '+' before an URL (in this context, a sub-string that begins with "http:") then the HTML tags Aa and /A are automatically generated.

5. insertion of a sub-window. It is possible to show some text during the presentation of a particular topic.
syntax:

```
+[some text]
Example:
+[this is an example of a sub-window]
```

When the sub-window is declared then a HTML link to a window containing "some text" is generated in the slide. This is done by a javascript function. In figure 5, the command: +[this is an example of a sub-window] generated the link "[*]" to the yellow window containing the text.

Figure 5: Example of a sub-window. The sub-window appears when user clicks the link [*]

6. insertion of any HTML tag
Any HTML tag can be inserted using the normal HTML tag notation.

Example:

```
this is a text in <b>bold</b>
```

The tool development
The tool was created in Perl in a Linux machine.
The tool in http://www.pcs.usp.br/~jkinoshi/lecture uses two Perl-scripts:

- the script palestreia.pl that takes the text and converts into HTML pages.
- a CGI script that deals with the user-interface. Basically it:
    - receives the text and user email from a form,
    - applies palestreia.pl, compacts it and,
    - sends the compacted lecture to the user.

Usage Examples

A presentation of the Lecture Generator Tool is in http://www.pcs.usp.br/~jkinoshi/lecture/pa0.html and its corresponding input text is in http://www.pcs.usp.br/~jkinoshi/lecture/lg.txt

Conclusion

The Lecture Generator Tool creates slides as HTML pages from a very simple input text. It is available to public usage through a CGI-script. It has some advantages and disadvantages over powerpoint.

Advantages over PowerPoint

- Our tool organizes the slides in a tree structure instead of a linear structure.
- PowerPointer can display presentations in the web, but it becomes photos that are heavy to send. The Lecture Generator Tool generates presentations in HTML format. The HTML tags are very powerful and can be used to enhance a presentation.
- Free of charge usage by [2].
- The input text can be generated in any text editor. I recommend emacs [3] in outline-mode. In fact, emacs outline-mode inspired me to construct the lecture generator tool. A description extracted from the help of emacs is:

    editing outlines with selective display.
    Headings are lines which start with asterisks: one for major headings, two for subheadings, etc. Lines not starting with asterisks are body lines.

Body text or subheadings under a heading can be made temporarily invisible, or visible again. Invisible lines are attached to the end of the heading, so they move with it, if the line is killed and yanked back. A heading with text hidden under it is marked with an ellipsis (...).

Disadvantages over PowerPoint

Powerpoint has many facilities that are not yet supported by the Lecture Generator Tool; for instance, it enables to create some special "effects" during the transition from one slide to another.

Future

I hope to enhance this tool and license it under GPL [4].

References

[1] PowerPoint: http://www.microsoft.com
[2] Tool demonstration: http://www.pcs.usp.br/~jkinoshi/lecture/
[3] emacs: http://www.gnu.org
[4] GPL: http://www.gnu.org

Internet Filtering vs. Content Management In Schools

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Abstract: Educators and parents across the country have been grappling with ways of making the Internet a safe extension of classroom learning. While many schools have implemented a filtering methodology to screen "inappropriate" or "non-educational" content, there is an emerging backlash that has come to view filtering as restrictive, unreliable and counterproductive. This paper discusses the benefits of another approach: curriculum-based content management. This approach enables educators to pre-select websites that are in line with a particular lesson or in accord with that district's overarching educational objectives. Moreover, curriculum-based content management promotes focused, proactive learning. Students do not "surf the web". Within such a system, students are presented with thousands of categorized, pre-evaluated websites, turning "search time" into "learning time." Curriculum-based content management maximizes the educational value of each school's Internet investment, allowing teachers and students alike to realize the power and efficacy of Internet-enhanced learning.

Introduction

Over the past thirty years, the Internet has grown from its beginnings as a military communications system to a tool used by individuals and organizations worldwide. Among its many supporters are students, educators, and administrators who benefit not only from broadened access to information resources, but from the ability to discuss and collaborate over any geographic distance. Among it's many applications, the Internet can enhance daily lesson plans and teaching in the classroom environment. This study examines ways the Internet can be used effectively in a classroom setting. Educators can use and accept the Internet not only as an alternative to attaining research materials in the library; but as another tool that creates interactive, higher-level thinking for teachers and students in the classroom. Educators can take advantage of the Internet in the classroom yet still remain focused on the information needed for an effective learning objective. For many reasons, educators may approach the use of the Internet in the classroom with slight apprehension. One reason is that we may be unclear as to what the Internet is and what it does. We have heard the raves about the Internet as this tremendous "superhighway" that allows teachers and students to access a vast amount of information, but sometimes educators are still uncertain as to where it fits into the classroom. The word "Internet" refers very generally to the global network of hardware and cabling that hosts information and carries it from place to place. There are many different types of information traveling through the Internet at a given time, (from electronic mail (e-mail) messages to Web pages). For K-12 schools, Web pages are doubtless, the most frequently used form of Internet information. This is most likely due to the similarity of Web pages to the pages in the textbooks that you use in the classroom. Web pages offer a way for textbooks to be taken to another level because the Internet provides a dynamic new way to create interactivity. Educators are familiar with using traditional textbooks inside and outside of the classroom environment. At times a main objective for an educator may be to find interesting and dynamic ways for students to become engaged in the texts and provide a way that will create the students' willingness to read and absorb the information. On the other hand, students may feel that the textbooks are unexciting or not interactive. Interactive tools and materials make it easier for students and teachers to relate mutually to the information conveyed. The Internet provides an interesting and unique way for students to relate mutually with each other and with their teacher. Students respond to the Internet with great enthusiasm because of its ability to be an interactive form of traditional textbooks.

Harnessing The Internet

The Web, a world community on the Internet has proven to be a tremendous tool for conveying information that can be used to facilitate learning and convey knowledge which can then be used for learning activities. However, there IS a common, major problem for educators. There is *so much information* that attaining a grasp on it may be difficult. The system is disorganized and teachers may feel as if there is no way to control it for classroom use. Educators are left with a giant system that provides information but in a disorganized and confusing fashion. It's like a library where all the books have been placed randomly in the stacks. The solution is a simple one..... creating software which organizes Internet content and makes it a beneficial tool for the classroom, computer lab and library. The development of content management software, thus allows for the "educational" shaping of the Internet within the school environment and provides educators with the ability to select Internet based information based upon classroom curriculums. Pre-selected, focused, content replaces the timely and cumbersome practice of "searching" for appropriate content while precious classroom time passes by. Students reach appropriate content FAST, maximizing their online time through "on task" learning. Websites can be selected from the vast volumes of Internet information and presented to students based on appropriate State Education Department K-12 curricula, across the breadth of subjects taught in our nation's schools. How can we develop FOCUSED resources and present them to students in the educational setting? Rather than use a "shotgun" approach by providing a "friendly" or "kid-safe" search engine as the vehicle, educators can offer pre-qualified Web-based curriculum resources via a drill-down menu system allowing students to get to the information they need quickly. This results in a more motivated student and a learning environment where students CAN complete the assigned tasks. The Internet was NOT designed for classroom use, a fact that explains many of the difficulties schools have had in trying to integrate its various offerings into their existing curriculums. As rapidly as schools are being wired, so too have rumors spread of functional weakness, perilous legal exposure, and loss of CURRICULUM FOCUS. Superintendents are often overwhelmed by the challenges of integrating Internet content into established methods of supporting school curriculums. And few vendors seem to have an answer that meets the educational requirement of supporting currently accepted curriculums. Yet, no one can deny that, properly deployed and managed, the Internet provides dynamic educational opportunities that extend far beyond the borders of classroom walls. When you think about it, your school is better prepared than you think to deal with Internet access issues: You already choose the books to include in your library and the materials to fill out your curricula. Thus, you have always managed educational content, in one form or another. Internet access will be no different, provided that you have the correct technology and a forward-thinking attitude. In planning for this new technology, superintendents may find themselves having to think about technical issues in addition to curriculum and overall administration of districts. Among the technical issues are: Integrating technology, while...Addressing parents' and school boards' concerns, while...Handling repercussions of educationally-inappropriate content being accessed on school grounds. Facing the threat of litigation through exposing students to "inappropriate material", while...Budgeting for the cost of setting up and maintaining a system,

Dealing with the fear of the changes that such a system will mean for your well-established curricula. As most of us are aware, schools across the country (and around the world) are scrambling for Internet access in order to take advantage of the rich content and communication ability this medium offers. More and more schools are integrating Internet content into their curriculum for some very simple reasons: It makes learning fun and interactive. It dramatically expands classroom resources. It makes students comfortable with research and reference sources. It opens students to cultures beyond the classroom, and breaks down the walls inherent in any learning situation. It enables communication with the global learning community. Internet access bridges the gap between technology and education. In general, it provides three elements that are crucial to bringing a school forward, arming it for future developments in curriculum delivery: 1) Effective and managed Internet access with content security, electronic mail, chat communication for community-building and peer strategizing, and access to educational materials and environments far beyond the classroom. 2) Network technology along with the connectivity, infrastructure, and speed necessary to effectively compete for bandwidth now and in the future, wiring a school for its Internet and *Intra*net needs. 3) Dynamic curriculum integration that fulfills a school's educational objectives for the next millennium, reducing preparation costs while providing students with dynamic, fun, and effective educational value. Web sites perform a similar function to textbooks but in a dynamic new that prevent access to specific Web site addresses, or to key word approaches that remove or block-out pre-determined words appearing in the text. Defined as such, filtering software provides a partial response of *removing* a danger. But what is *added* with this approach? It has no curriculum-based goals, it does not provide an alternate solution, and it *adds no educational value.* With all of the resources available to educators on the Web, the filtering response unfortunately approaches Web technology in the classroom as a formidable force that can only be managed through reducing a teachers' choice. Curriculum-based content-management is, however, a positive educational choice. This choice is in order for an Internet solution geared toward the educational community: *Guided, classroom-focused and curriculum-appropriate access* only to previewed sites – either self-defined by a school, or tested and approved by the guidelines of an educational advisory board. This system uses a different strategy than filtering software: A school starts by defining their "Allowed List" of sites to support their curriculum. These sites naturally are linked to State curriculums for K-12 across subject areas and naturally lead students down a path that fits the school's learning objectives, and keeps students focused on lesson plan objectives. This philosophy mimics the way in which educators have traditionally selected books and other printed materials for classroom discussion and library use. It places Web access accountability on educators and schools. A distinct benefit here is that a COMMUNITY DEFINES IT'S OWN STANDARDS for Web access, rather than accepting a corporate definition often found in filtering software solutions. It's simple to define access. A school can do this by using one or more of the following methods: 1) Use an educational portal such as an educator-developed school website as a rich access point, with sites broken down by curriculum area. Unfortunately, this is a time-consuming task and considerable effort must be given to development and maintenance of such a site. 2) A school can create its own "Allowed Lists" of sites which students can visit, and make these lists available to students in a number of ways without creating a school website. Lists can be tailored for different schools within a district, or different subjects within a school. However, giving students "allowed lists" as word processor documents with hyper-links is perhaps an inefficient solution. 3) Make use of the many educational sites already in place by universities, museums, government entities, and other schools themselves. Many educators and organizations have already constructed Web pages containing multiple access points into educational Web sites. Curriculum-based management removes concern over what content *will* enter the school environment. It's always up-to-date, dynamic, and channeled into age- and curriculum-appropriate educational objectives, just like any other classroom resource. Let's look at some of the common questions and concerns people have when implementing an educational solution as discussed above. Your educational and community peers are concerned about a definable number of important issues: 1) Are sweeping policy changes required? Teachers and parents are often concerned that the Internet will radically change the way schools operate. Given what'' been written about the *dangers* of the Internet (and the dearth of information on the sometimes overwhelming *benefits* of access), it's no wonder. One of your roles in guiding your peers through this process is to reassure them that there is, in fact, nothing to fear with this new technology. Whether it's administrators concerned about content or teachers concerned about learning new technology, you'll know how to choose a system that will keep their students safe *and* give them dynamic content that seamlessly integrates into their curriculum and your school environment. 2) What policies must we put in force? Choosing curriculum-based management over filtering software provides an easy, painless solution that really requires no particular policy, and no definitions of what is inappropriate for your students. Educators merely pick and choose what they need from the Internet (with help from a K-12 categorized library of sites) appropriate to the curriculum, age group, and study topic of your students. There's no need for educators or parents to worry about what will enter the classroom environment: educators have gained true management of the Internet. 3) Who defines what is "appropriate," and doesn't this vary by the student's age? Through a curriculum-based management system, *you* define where the students *go*, no where they *shouldn't* go—just like the way you've always done it. There is a distinct advantage to this since your "allowed" sites are not defined by a software company, but by educators in your school. Sites are agreed upon by those within your community. This approach enables educators to present educational Web content in a manner consistent with the way support materials have always been selected and used. Overall, this is the most natural way of dealing with Internet access. Furthermore, a solution such as one based on an Internet Communications Server offers group management, letting educators set up classroom groups, or choose content for labs and individual computers on the school network. This powerful feature assures are-, curriculum- and topic-specific Web content. 4) How is such a system maintained? Maintaining the system is extremely simple. An "administrator" program lets educators easily set up "allowed" sites, and can make use of the sites chosen by educators who review and select sites based on State and Regional curriculum guidelines. If students attempt to access a site that has not yet been "allowed", they see a friendly message; then they have the option to send a message to their teacher requesting the site's addition. Teachers can then examine the site and, if it is valuable, quickly and easily add that site to the Allowed List. This feature demonstrates the flexibility of an Internet Communications Server. Anyone who has ever operated a computer can easily pick and choose their options using the tab-driven tools in the user software. With the use of exclusive passwords, educators can use full Internet research capability on computers they choose. Choosing a curriculum-based management solution over filtering software automatically reduces concern over liability by allowing educators to choose sites just as they choose books for their library or curriculum. This gives educators comprehensive management of Internet content, while using password protection and a secure, server-based design to assure that only educators access the management settings.

Child Safety on the Internet

Like any highly populated community, the Internet has a dark side. Along with the positive contributions—online libraries, interactive museums, and access to cultures far beyond the boundaries of the classroom—there are negative influences: individuals who use the Internet harmfully to serve their own ends. Fortunately, managing the risks can be much easier here than it would be in an actual community. The challenge for educators is to replace the negative influences with true educational value. Filtering solutions used in school settings cannot always provide a totally "safe" solution because must always update so-called "not" lists based on the ever-growing number of undesirable sites found on the Internet. This is tantamount to the little boy whose finger in the dike is all that stops the onrush or the North Sea! Sooner or later, that type of approach will fail. Content-management, therefore represents a *proactive* approach: educationally valuable content, locally controlled, FOCUSED on specific K-12 curriculum as opposed to the old "reactive" approach. As an added measure of support for applications where educators choose to use selected computers in an "unrestricted" mode, popular "filtering" technology works *transparently* within the system to shield users from these common inappropriate areas: 1) Violence/Profanity, 2) Partial Nudity, 3) Full Nudity, 4) Sexual Acts, 5) Gross Depiction, 6) Intolerance, 7) Satanic/Cult, 8) Drugs/Drug Culture, 9) Militant/Extremist, 10) Sex Education, 11) Questionable/Illegal/Gambling, 12) Alcohol & Tobacco. Also, filtering is provided on sites deemed to be "productivity reducing" in the educational workplace: Sports, Entertainment, Games, and Humor. Any site on the Internet, however, can be "allowed" globally, or on a computer work group basis as well as on an individual computer. Therefore, for instance, a Physical Education teacher might choose to have certain

Sports related sites "allowed" on computers within his supervisory area. A librarian might also choose to have certain Health related sites available in the library, not generally allowed to the school population. This type of *proactive* solution allows educators to control their own preferred Web sites and to map out a *safe pathway* through the Internet. Another feature allows teacher the ability to create electronic "worksheets" called *PROFILES*, which present students with a learning task and the appropriate targeted websites the teacher has chosen for student use. Only those sites as well as textual instructions for the students are shown on workstations. Profiles are an additional way youngsters are kept on target and maximum focus can be maintained during a limited classroom or lab period. Providing such a "safe-harbor" for learning allows the Internet to be a wonderful resource for learning and exploration as it revitalizes the educational setting. As in many other facets of life, care must be used when introducing children to this resource. Using a content-management approach to provide educational resources supportive of accepted educational curricula provides a *proactive* solution to this challenge.

Creating Empowered Learners

In today's media-saturated world where children of all ages passively feed on an array of disjointed images and messages, furthering proactive and focused learning has become perhaps THE biggest and most important challenge facing our nation's schools. Rather than having students sitting in a classroom while teachers "lecture" and a few "motivated" students participate while the rest merely mark time, it is imperative that we turn teachers into "facilitators" and students into inquisitive learners. Teachers acting as -guides" facilitating "learning adventures" using Internet technology has been shown to promote a*ctive* learning. How, then, can we foster such learning? A curriculum-based approach to Internet-enhanced learning patterned along the lines outlined in this paper, will go a long way toward facilitating this process, creating dynamic classrooms brimming with energized teachers and proactive learners.

An Application for Training and Improving Co-ordination between Team Members, Using Information Technologies.

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Abstract: As most of the daily situations are handled by teams in the current world, the necessity of training teams which collaborate in order to solve situations in time-pressure scenarios arises. This type of training is complex; it may also be difficult to carry out periodically and besides, crucial information can be lost with the existing training systems. In order to increase the effectiveness of systems that promote learning by individuals, teams and organisations involved in the emergency resolution and to raise the frequency and quality of trainings. We present a training system based on a methodology, which integrates Intelligent Agents, Virtual Reality and Shared Mental Models for learning from actions on equipment and management decisions to be performed in emergency scenarios. We describe its application to the resolution of an underground fire emergency developed under the ETOILE project funded by EU. The system can be applied to other scenarios.

Introduction

In an increasingly complex world where most of the daily situations are handled by teams, the importance of the team training in the task of overcoming emergency situations is well known. The value of employing information technologies in these scenarios, for completing the existing training systems, leads us to present a methodology which integrates traditional trainings, individual computer based trainings (CBTs) and live emergency drills with collaborative training systems for teams, based on advanced information technologies.

Training individuals and teams that must work in emergency situations is complex for several reasons: the number of people involved in the situation can be high, the disruption caused may be expensive and the equipment involved costly to operate. It may be infrequent for similar reasons and also because agreeing on a common training date is not easy when the people involved belong to different organisations.

The most common existing trainings in complex time-pressure scenarios and emergency situations mainly consist of: theoretical trainings, specific trainings for each role and situation, and real drills. Most of the times, real emergency drills are considered the best way to improve co-ordination between the people involved in the emergency situation, however the high level of complexity of the trainings, the low frequency and the lack of realism are the reasons that make convenient for these drills to be complemented with another training systems. So the purpose of the developed training system is not to substitute the existing ones, but only to compensate the known drawback of the existing trainings and complete them.

Technologies Integration

The paper is based on the work developed in the ETOILE project (Environment for Team Organisational and Individual Learning in Emergencies). The project is funded by the European Union in the context of the ESPRIT programme. ETOILE proposal consists of technologies integration and the system proposes to apply jointly three raising technologies: Virtual Reality, Intelligent Agents and Shared Mental Models. The ETOILE system is designed as a distributed virtual 3D environment where trainees cohabit with intelligent agents.

Virtual Reality

In order to make the user (trainee) feel like into the real world, the training takes place in several computers, one for each of the trainees, and a 3D view of the participants and the environment is shown to every trainee (Fig. 1). In the Virtual Reality, the user has the possibility to navigate through the virtual world, interact with objects and participants represented in the scenario and even simulate communications by clicking on the corresponding devices. Changes in the environment and scenario are easy to perform and there is no need to use costly equipment. With the Virtual Reality interface, the trainees can be located at different places, connected by a network, and all they work together into the same virtual world in order to solve the emergency situation.

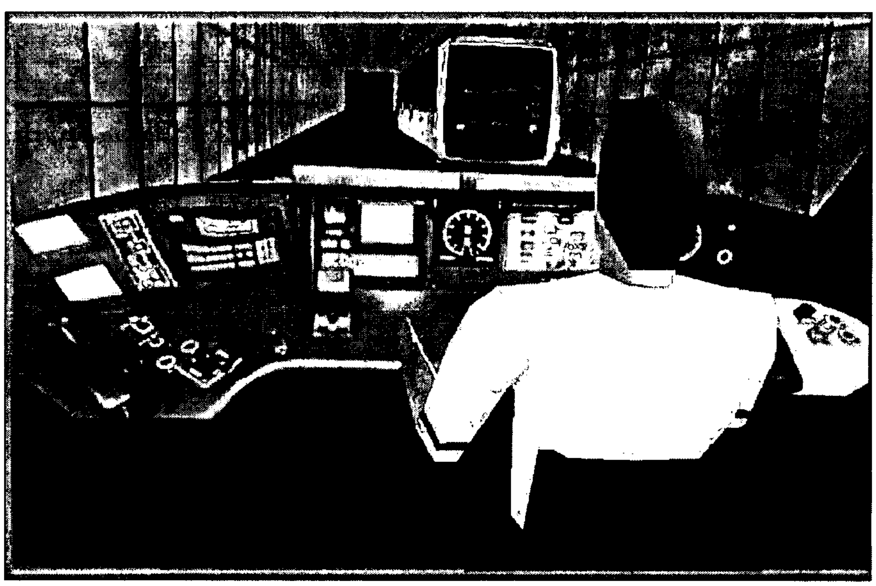

Figure 1: Virtual 3D view of the Train Driver in his cabin during the training session.

Intelligent Agents

Intelligent agents are software systems that can act by their own and react on incoming events or messages. In the ETOILE project two different kinds of these agents are included; behavioural agents and pedagogical agents. Behavioural agents are agents whose behaviour in the system is described as human-like, they plan and react like humans participating in the emergency situation. In the training system, not all the roles in the emergency situation are taken by humans but intelligent agents are used to take them over. These agents substitute humans and make the system available even when only some of the people involved in the emergency are available. Pedagogical agents are agents with didactic functions whose main task is to help the users to perform the tasks and achieve the goal in the emergency situation. Pedagogical agents increase the system ability for the communication between the trainee and the computer by giving assistant and advise during the training session.

Shared Mental Models

When humans do not work alone but together with other people in a team the concept of shared mental models appears. Shared Mental Models describe how the single team members proceed in developing a common "mental simulation model" that allows the team to make predications and estimations of the current situation. Shared Mental Models are implemented in the behavior of the agents. Two kinds of these models appear most frequently in the ETOILE demonstrator scenarios, compensatory and anticipatory knowledge. When messages between participants are passed by a third party, this intermediary has the opportunity to compensate for missing or incorrect information. Besides, people sharing information received by other participants or equipment are in the position to anticipate request to actions. Knowing that all the participants have a shared mental model of the training session, one of the participants can receive a feedback message from any other one when the action is not the appropriate one. The usage of these models significantly improves the training benefit. These ideas are taken into account for the communications between participants. Based on the same ideas, the system includes learning support tools, these tools help the trainer to make an evaluation of the training and the trainees after the session.

System Development

The technologies described above are used in the ETOILE project in order to develop two demonstrators. The system aids to complete the training of the personnel involved in the resolution of two specific emergency situations: an incident in a power plant and a fire emergency in an underground tunnel. Labein is developing the application for the second scenario, this scenario has been chosen due to its complexity and completeness. In this scenario lots of people belonging to different organisations are involved. Metro Bilbao personnel, security guards, paramedics, fire brigade and the emergency services dispatching centre. The aim of the system is to complete the training of the Metro Bilbao personnel who are in the emergency central dispatching room and the train driver of the train on fire. In a training session the trainees and the trainer are seated in front of their PCs. The trainer selects the scenario, the situation, the role of the participants and the current conditions of the training before the session starts, the trainer can also start, stop and pause the session and even introduce external events during the session. Every trainee enters in a 3D environment (Fig. 2) where a detailed representation of his workplace is shown, every participant in the session is represented by an avatar either the humans or the agents. The humans interact with the environment to perform their task during the emergency situation, task performed by each of the participants are updated in every of the VR windows. There are mainly two kinds of actions: equipment manipulation and communication with another participants. The main communications devices are simulated by the system, in this case (telephone, talk channel, megaphone, train-ground system, etc.). The system also includes a pedagogical agent, the assistant. This agent is in charge of monitoring the participant actions and give advice and assistant to the trainees. The training support tools included in the system give support for the evaluation of the training done by the trainer when the training session is over.

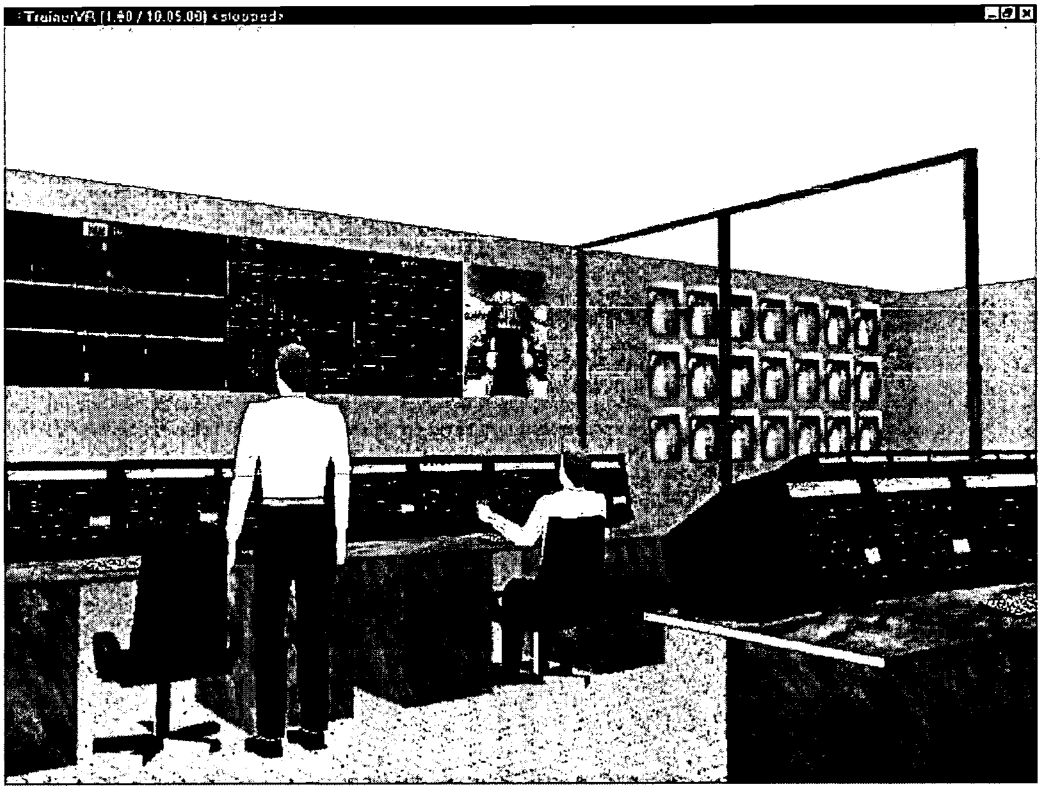

Figure 2: Participants in VR Emergency Central Dispatching room.

Conclusions

The use of the system facilitate the trainees to improve their co-ordination and decision making during the emergency situation. The application features enable the simulation of equipment malfunctions, which would be tedious to reproduce in a live emergency drill. All the main tasks involved in an emergency situation are reproduced during the exercise. The trainer can choose between the emergency scenarios provided in order to cover different situations and achieve a complete and adequate training. Different means of communication are used between the participants in the session and all these communications and devices are simulated by the system. Complementary learning support tools are provided by the system for the monitoring, supervision and evaluation of the learning. At this moment the project is in the phase of integration of the partners developed work.

The ETOILE consortium consists of two Spanish companies as final user, Metro Bilbao (Underground company of the city of Bilbao) and Iberdrola (Spanish electricity provider). Two German institutions as authoring tools developers, research institute Fraunhofer-AGC and the company STN Atlas Elektronik. Two Spanish centres as leaders developers, the authoring tools are used to develop two applications or training scenarios one by each of the Spanish centres. The first one developed by LABEIN Technological centre, deals with a fire emergency in a Metro tunnel. The second one, about an emergency in a nuclear power plant, is developed by Tecnatom and Iberdrola, two Spanish companies. The other partner of the project is the University of Lancaster located in the United Kingdom, as learning support tools developers and they also evaluate the benefits of the system.

Acknowledgements

The paper is based on the work developed in the ETOILE project (Environment for Team Organisational and Individual Learning in Emergencies). The project is funded by the European Union in the context of the ESPRIT programme. The ETOILE consortium consists of the following institutions: LABEIN, METRO BILBAO, IBERDROLA and TECNATOM from Spain, Fraunhofer-AGC and STN-Atlas Elektronik from Germany and the University of Lancaster from the United Kingdom.

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Virtual reality interface and behavioral agents defined in the Underground Demonstrator are based on Metro Bilbao procedures.

References

Dobson, M., Sime J.A., Pengelly, M., (1999). *Evaluation Plan for Etoile* C-SALT. Lancaster University, Bailrigg, UK.

Dobson, M., Sime J.A., Pengelly, M., Maseda, J.M., Castaño, J.R., González F., Velasco, E., Albaladejo, S., (2000). Instructional Design for Collaborative Learning and Training Fourth Workshop of the EARLI SIG Instructional Design. UB (Ed.) *Instructional Design For Cooperative Agent Simulations In Team Training: Lessons Learned & Research Questions Outstanding*. EARLI-SIG. Barcelona, Spain.

ETOILE (1998). *ETOILE Environment for Team, Organisational and Individual Learning in Emergencies* Annex I- Project Program. 29086 ETOILE project.

European Commission (1997). *White paper on Education and Training. Teaching and Learning. Towards the Learning Society*. European Commission.

Johnson, W. L., (1998) *Pedagogical Agents.* Center of Advanced Research in Techonology for Education (CARTE), USC, CA, USA.

Maseda, J.M., Arenillas, M.A., Garzón, C., Los Arcos, J.L., & Castaño, J.R., (1999). *Requirements for Emergency Training. Railway Underground Emergency Demonstrator.* 29086 ETOILE project.

Maseda, J.M., Los Arcos, J.L, Arenillas, M.A. , Garzón, C., (1999) *Design of the Prototype for the Railway Underground Emergency Demonstrator*. 29086 ETOILE project.

Maseda, J.M., Izkara, J.L., Mediavilla, A., Romero, A., (2000). I International Congress in Quality and in Technical Education Innovation. In U.P.V. (Ed.) *Distributed Virtual Environment For Training Individuals and Teams Involved in Complex Time-Pressure Scenarios* (pp. 181-184) San Sebastian, Spain.

Metro Bilbao, (1995) *Plan General de Protección de Metro Bilbao*. Plan de Formación.

Schön, D., (1987) *Educating the reflective practitioner*. Jossey-Bass San Francisco, CA, USA.

The WebCT Certified Trainer Program: Modeling Online Teaching and Learning with Industry Driven Standards

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Abstract: Written by professionals with extensive online teaching and learning backgrounds, the WebCT Certified Trainer program goes beyond typical technical training and was designed for those who are tasked with teaching others how to use WebCT and how to create instructionally sound courses. This discussion-based program focuses on the techniques, strategies and methods for integrating teaching and learning principles, learning styles, building online communities, and includes discussion on other topics such as intellectual property, copyright, academic honesty, and accessibility. This paper explores the research and educational philosophies behind the program, and highlights why over 90 institutions around the world have become involved and what they are saying about the program.

Introduction

The WebCT Certified Trainer Program is a program that extends beyond typical technical training and explores the world of teaching and learning online. It is a full-bodied program that is designed to give professionals who are responsible for delivering WebCT training an opportunity to discuss best practices and expand their skills in several learning environments. This paper provides an overview of the WebCT Certified Trainer Program, including why it was created, a description of the characteristics of the target audience, the educational philosophy that forms the foundation of the program, and the outcomes of the first year of the program. Included is an analysis of pre and post assessment data from 156 workshop participants.

The Purpose

Developed by Murray Goldberg and a team of students in 1995-1996 at The University of British Columbia, WebCT was one of the first fully web-based examples of software that provides a set of tools that enable instructors to perform typical instructional tasks through a Web browser (Goldberg et al., 1996). Early adopters of WebCT and other programs were typically technically savvy instructors who were seeking to "push the teaching envelope" in some way, by providing online communication pathways, self assessments, self-paced tutorials, or collaborative learning spaces. They tended to have a high tolerance for learning new methods. As the popularity and importance of teaching with online courseware grew, institutional early adopters turned into trainers and/or mentors for the next wave of instructors. There is evidence that instructors in this "second wave" learn differently. They commonly need to have the benefits explained in concrete terms to their personal situations and have different professional development goals than the "entrepreneurs" (Hagner, 2000). There has been a lag in further developing faculty to use technology in teaching. This "chasm" has been defined as the gap between "visionaries"--customers who seize on new gadgets--and more mainstream "pragmatists" who need convincing before they buy (Moore, 1999). To further complicate matters, many of the early adopters were self-taught and were not formally trained in instructional design, Web design, accessibility or teaching and learning research. Therefore, there is also often a gap between their training agendas and what the instructors need to learn.

As WebCT educational specialists traveled from campuses to conferences in 1999 conducting training and consulting, it became increasingly apparent that while institutions everywhere had committed to online education, they were voicing the need for higher quality online course development, and the need for higher quality training.

Understanding that individuals tasked with explaining the software to instructors have a perfect opportunity to spread strong online teaching and learning practices, WebCT developed a program to certify individuals who could exhibit such strengths. Since many institutionally based trainers may not have had formalized trainer training, certification was seen as an effective way to ensure trainers practice a structured training delivery method that allows for awareness, practice and feedback (Walter, 1998). A development team of WebCT professionals was formed, and the problem was defined: how do we help others become effective WebCT trainers while also contributing to the improvement of the overall quality of teaching and learning online?

The Target Audience

The team was able to categorize institutionally based WebCT trainers into three groups and identify potential strengths and weaknesses with each type. For example, the first group was defined as those who are considered "techies" and have been chosen as trainers because they have knowledge and experience with the technology. Often they receive little training on educational foundations or effective training techniques. Many of these folks do not have experience teaching with technology, but instead have been expected to maintain it. They know all about the buttons, and enjoy showing all of them. Their knowledge and passion for the technology is often their greatest training strength. With appropriate coaching and training, they can become empathetic to those who are not as technologically savvy, and can build a repertoire of teaching and learning examples for their WebCT training duties. The second group identified consists of instructional designers or curriculum specialists who are responsible for supporting technology needs of faculty along with helping them to design instructionally sound courses. Often these individuals must work hard at staying informed about new advances in technology fast enough to stay ahead of their faculty. They believe in instructional design and pedagogy, and are excited to use technology as a vehicle to transport their teaching and learning messages. They typically want to know best practices for introducing technology, and best design for delivering training. The third group of institutional trainers for web-course development consists of faculty who have learned how to use the product, and because of their early adoption of online teaching, they are often volunteered to aid with the professional development of their peers. These early adopters often have enthusiasm for and knowledge of the product based on experience, but lack a well-rounded set of technology skills that are necessary for training faculty. Most understand innately what works and what doesn't, but they may or may not have matched their techniques for online teaching with current research.

Understanding that these three groups of trainers have varying skills, competencies and needs, and there is an overlap of job responsibilities, WebCT defined four competency areas for achieving certification status. They are: 1) Presentation Ability, 2) Audience Concern and Empathy, 3) Knowledge of WebCT and Related Technologies and, 4) Pedagogical Understanding. Industry standards for similar programs were researched, and research on online teaching and learning and corporate technical training was utilized. It became clear that this program fell in the middle of teacher education, online teaching and learning, and technical trainer training.

The Program

Step 1-WebCT Knowledge Test

The program begins by gaining experience using WebCT and building online teaching environments. Since content knowledge is crucial for any trainer, the program is designed for advanced users and not to bring beginners up-to-speed rapidly. For this reason, it is highly recommended that one spend at least one semester working with WebCT before entering the program. A study area with sample test questions and study aids is available to help guide candidates who seek greater knowledge of WebCT. The WebCT Competencies for Online Facilitation and Course Design (http://webct.com/certify) is available to help individuals prepare for this test and the subsequent step, the Train the Trainer Workshop.

The WebCT Knowledge Test (WKT) is designed to test both product knowledge and a basic level of proficiency with instructional design, Web design, and teaching and learning principles. The test consists of 2 parts. The first part is a practical test, where each test taker is given two hours to put together a sample WebCT course based on a specific set of directions. The second part is a multiple choice, short answer, and matching test. To obtain a passing score, one must obtain a score of 75% or more on both parts.

Step 2-WebCT Train the Trainer Workshop

More important than the actual web course platform is the need for teachers to understand the pedagogy that drives each course. Simply teaching instructors to "point and click" may increase the number of teachers using technology, but will not improve the quality of online learning environments, or the quality of online teaching. Best-practice organizations claim to keep their focus on teaching and learning issues, and not just on the technology, and see faculty development as a series of steps that include addressing pedagogical application of technology (APQC, 1999). The workshop portion of this program focuses on online pedagogy, and begins in an online environment, where exemplar online course design and online facilitation are modeled. The curriculum involves research and discussion on the topics of: building online communities, good teaching practices, learning styles and theory, as well as important issues such as copyright, intellectual property and accessibility for the handicapped. The exit requirement for the online component is a portfolio that is uploaded into the Student Presentations area of the course. The portfolio deliverable is a job aid that the participants can use after the workshop at their own institutions to integrate teaching and learning resources while training others to use WebCT.

The face-to-face portion of the workshop is led by a WebCT Master Trainer, and comprises two days of discussion-based activities that emphasize the online materials. In addition, participants have the opportunity to demonstrate effective presentation and teaching techniques while receiving feedback from peers and the WebCT Master Trainer. The competencies used for final evaluation are further investigated, and the participants are asked to reflect on the workshop and their training skills before scheduling the last step for certification, evaluation.

Step 3-WebCT Certified Trainer Evaluation

The final phase of the WebCT Certified Trainer Program is evaluation, where the certification candidate conducts a live training session, incorporating and demonstrating very specific program competencies for this summative evaluation. The candidate either requests an onsite evaluation or submits a videotape of a live training session. A WebCT Master Trainer then evaluates the trainer against the 4 competency areas. A detailed evaluation report is written with suggestions for improvement. A team of master trainers then decides upon the certification status. Since the entire process is intended to facilitate mentoring and coaching of trainers, if the candidate is not successful during an initial evaluation then a second evaluation is granted with more feedback and more suggestions for improvement.

The Outcomes

The individuals who registered for the Train the Trainer workshop consisted of individuals who support faculty, instructors, administrators or managers, network or server administrators, and others. Of the 156 who were surveyed, the participants consisted mostly of individuals whose job it is to support faculty. The makeup of the participants indicated that network and server administrators comprised only 5% of the entire group, whereas faculty maintained 17% of the group.

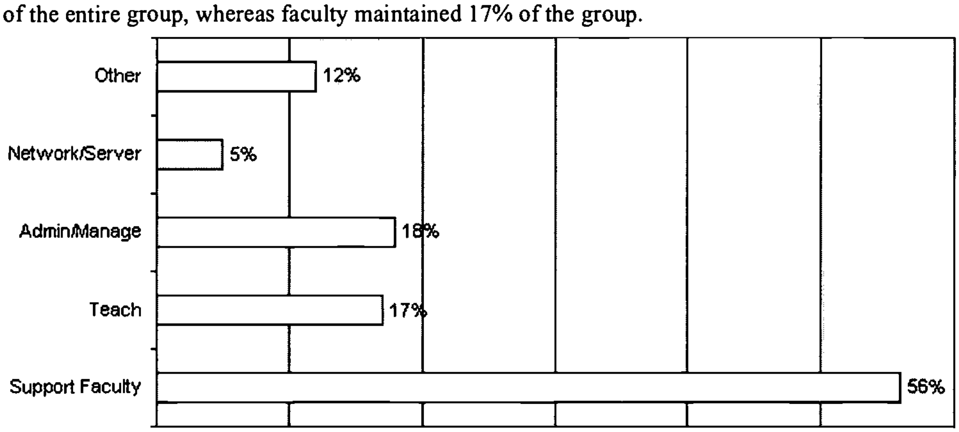


Figure 1: 156 participants were asked, "What is your primary role?"

Participants were asked what percentage of their current role is dedicated to training, including time spent coordinating, conducting, producing materials and planning for training. Only 15% of the 156 participants appear to be full-time trainers whereas 82% of the participants have other responsibilities besides training. It is interesting to note that 3% have no recognized responsibility for training, but were interested enough to enroll in the program anyway.

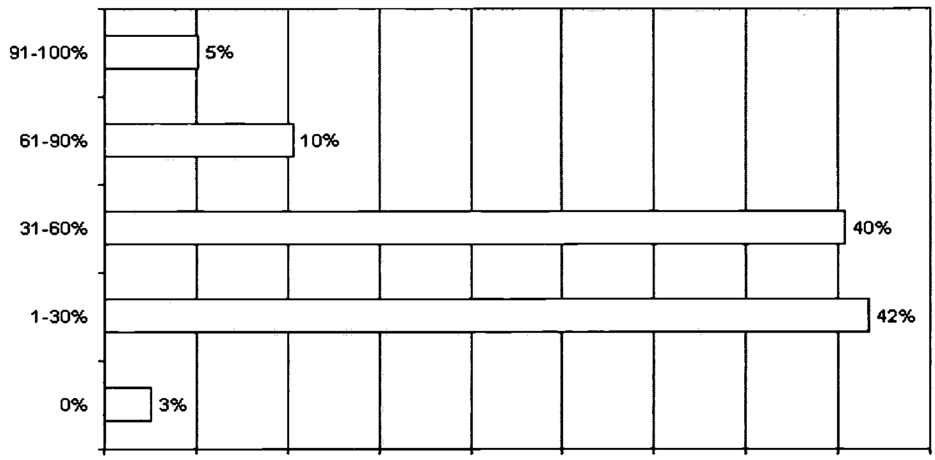
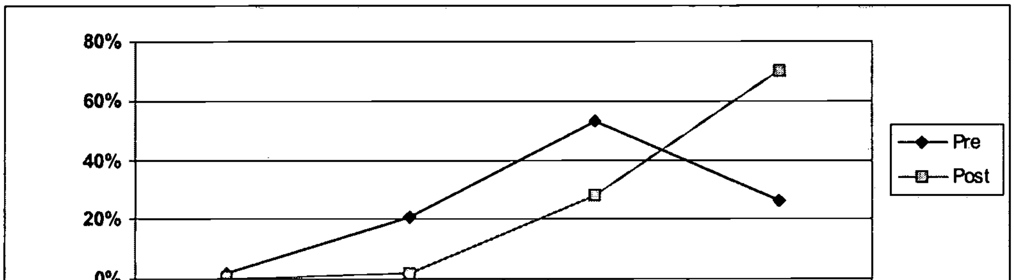


Figure 2: 156 participants were asked, "What percentage of your weekly duties involve training? This includes coordinating, conducting, producing training materials, and/or planning."

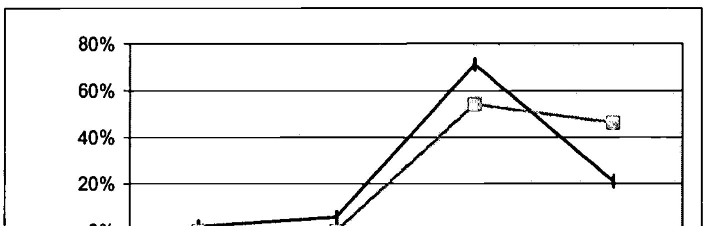
Participants indicated very favorable growth in comfort levels for incorporating the philosophies of learning styles, good teaching principles, and building online communities while conducting WebCT training. These comfort levels were assessed at the beginning of the workshop, and then again at the end of the workshop. Positive growth in comfort levels was seen in specific survey questions, as well as in the comments area of the survey. The area of content that showed the greatest increase in was learning styles while conducting WebCT training. The Percentage of respondents for each comfort level is outlined in Figures 3, 4, and 5. Anonymous comments submitted from the participants also indicated an extremely consistent perception of growth from the experience. A few comments have been included below:

- *This workshop provides many good examples from both the course designers(s) and the other participants that are very beneficial. Talking about "good teaching principles" is no more helpful than simply lecturing students - engaging the participants and providing concrete examples is as essential for WebCT training as it is for courses delivered in any other setting.*
- *It put my focus back on WHY we use these tools and not just the HOW of the tools. I will now include these practices in my future trainings.*
- *I do not have a lot of experience in teaching. This training has really helped me to focus on things other than technology.*
- *This was very good information for me. I feel much better about my knowledge base. I have so many great links and now feel like I belong to a great community of trainers... to all in the class and the great facilitators. Thanks!!*



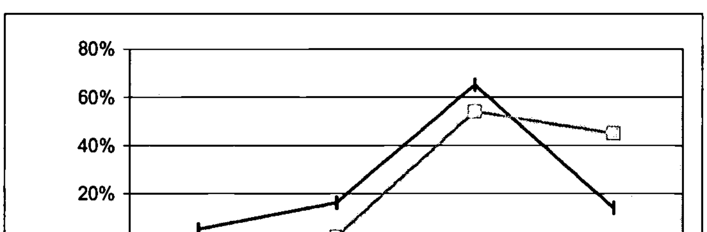
	Very Uncomfortable	Uncomfortable	Comfortable	Very Comfortable
Pre	2%	21%	53%	26%
Post	0%	2%	28%	70%

Figure 3: 156 participants were asked how comfortable they were discussing learning styles with instructors while conducting WebCT training in an introductory survey and then again upon exiting the workshop.



	Very Uncomfortable	Uncomfortable	Comfortable	Very Comfortable
Pre	2%	6%	71%	21%
Post	0%	0%	54%	46%

Figure 4: 156 Participants were asked how comfortable they were discussing and illustrating Good Teaching research with instructors while conducting WebCT training in an introductory survey and then again upon exiting the workshop.



	Very Uncomfortable	Uncomfortable	Comfortable	Very Comfortable
Pre	5%	16%	65%	14%
Post	0%	2%	54%	45%

Figure 5: 156 Participants were asked how comfortable they were discussing ways to build online learning communities with instructors while conducting WebCT training in an introductory survey and then again upon exiting the workshop.

Summary

The outcome of this program is the creation of a community of certified trainers who not only teach the "how" (button-clicking) but also the "why" (educational purpose) when teaching others about WebCT and online learning. Access to a private discussion and document sharing area is one of the benefits of attaining certification, and within this area continued community building, educational materials and best practices are shared. The program is definitely unique, and is determining what the industry standards are for certified trainer programs in education. The impact this program has on the world of online teaching and learning is being tracked through close communication with its graduates and continued assessment and evaluation of the program.

References

American Productivity & Quality Center (APQC) (1999) *Today's Teaching and Learning: Leveraging Technology—Best-Practice Report.* APQC International Benchmarking Clearinghouse.

Goldberg, M.W., Salari, S., and Swoboda, P. (1996) World Wide Web Course Tool: An Environment for Building WWW-Based Courses. *Computer Networks and ISDN Systems, Vol. 28, 1219-1231.*

Hagner, P. (2000). Interesting Practices and Best Systems in Faculty Engagement and Support, (http://www.educause.edu/nlii/meetings/orleans2001/reading.doc).

Moore, G. (1999). *Crossing the Chasm: Marketing and Selling High-Tech Products to Mainstream Customers.* Harperbusiness.

Walter, D. (1998). Training and Certifying On-the-Job trainers, *Technical Training, March/April 1998.*

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Using Information Technology Applications to Support Distance Learner Services

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Abstract: This paper presents a brief summary of a comprehensive report that documents the results of a needs assessment of a sample of university distance education students engaged in degree courses during the 1999-2000 academic year. The intent was to examine the current use of available student services and to determine, based on the expressed needs of distance learners, the kinds of multimedia, interactive support services that should be developed to enhance student success and retention in an increasingly competitive market

Introduction

Post-secondary institutions in North America are rapidly expanding distance program offerings through both traditional print/mail formats as well as through variations of tele-learning that include video-conferencing, tele-conferencing and on-line web-based courses. Such approaches are being driven by escalating advances in information and communications technology. The demand for distance delivered programs continues to increase nationally and internationally, with institutions competitively reaching out to clientele who do not want the inconvenience of more conventional on-campus full-time programs. However, despite these trends, the provision of services for distance learners has tended to receive much less attention, yet such services are considered a vital component in linking students with the institution and helping to ensure student success. Almost all universities and colleges maintain web sites that enable current and potential students to access a wealth of information. The use of on-line course registration systems also continues to grow. Many other students support systems, however, tend to be less evident; and individual distance course support services vary widely by both institution and program. A review of such services is both appropriate and timely.

The Project

For over 30 years, Memorial University of Newfoundland through its School of Continuing Education has had an extensive (and expanding) involvement with distance education. Current annual course registrations are over 11,000. In July 2000, the School conducted a needs assessment of distance support services as part of the initial phase of a project to ascertain: (a) the use of current services by students taking distanced delivered courses; and (b) the kinds of services and support structures such students would like to see developed. The results of this assessment, it was anticipated, would then be used to inform the second part of the project. This would involve the development and testing of new and/or improved distance learner support services that appropriately utilise current interactive media technology. The overall intent was to further enhance the delivery of distance programs and courses, provide exemplary services to students regardless of time and location, focus on products that are learner oriented, and to increase student retention and success.

The needs assessment survey involved an extensive phone interview of a random sample of approximately 200 distance students engaged in one of a number of degree programs, but with a primary focus on students who were located in Labrador and/or were completing courses toward a Bachelor of Technology degree. The semi-structured interview included questions pertaining to respondent technological competencies, their access to technology, use and evaluation of current support services, and the kind of resources they considered would be of help to them and to new distance learners.

A profile of study participants reveals that 43% were taking correspondence courses, 23% web-based only courses, and 34% at least one course by each of these methods during the 1999-2000 academic year. Their ages ranged from 19 to 54 years (average 31.7 years), 48.7% were female, 53.6% were single, and 82.9% were working full-time in addition to studying. The number of years that had lapsed between their current program and any prior one ranged from zero to 29 years, with over 27% saying it was at least 10 years. Over 92% had access to basic internet technology, however the quality of this service was generally considered poor in the remote areas of the Province. In terms of the use of basic computer- based technology (email, word processing, using on-line resources and web searches), 80% felt fairly comfortable. Many though, were less certain about their ability to send or receive files, configure software or take part in on-line forums.

Some Identified Needs

As a group of distance learners, respondents expressed a wide variety of individual needs. Where applicable, these were grouped under common themes for analysis and discussion purposes. The most frequently identified need was for help with time management. This was not surprising given the work and/or family commitments of many respondents. Also it is not an uncommon problem with many other groups of adult learners, and points to an area in which to develop appropriate support services. Other identified needs were more detailed course outlines for program planning and course selection purposes, personal and program counselling, a toll-free help line, continuing education contact information, and improved communication and feedback during courses. Most respondents also indicated that they would make use of CD or on-line resources that addressed such things as research writing skills, library orientation, more advanced internet searching, and preparing for tests; and over half said they would make use of, if made available, on-line services such as a Afrequently asked questions@ web site, a campus bookstore merchandise catalogue, a peer mentoring system, and a virtual student lounge. It was also apparent that a fair number of respondents needed help simply adjusting to university courses as well as with many of the fundamental aspects of "being a learner". A few also expressed feelings of isolation as a student and not being part of the university community. The latter perception was, however, greatly reduced where there was frequent interaction between students and with course professors through, for example, email, chat groups, and on-line forums.

Issues and Challenges in Developing Distance Support Services

Whilst there were commonly identified needs, it is apparent from the survey (and other research in this area) that distance learners represent a diverse group when combinations of personal competencies, life style and geographic circumstance are taken into account. For those with the requisite technological competencies and tele-communications access, the development and provision of quality support services is much less onerous, and enable service providers to make use of a variety of current technologies, typically internet based. For some learners, the development of basic technological competence will almost certainly need to precede engagement in interactive computer and/or web-based services, and could perhaps be embedded into the introductory sections of a university program or course. By contrast, for those students with the competencies, but with, for example, poor internet access, alternate technological solutions for some support services would be appropriate. In particular, CD-ROM based delivery might partly address some of the identified needs of distance learners, especially if such multimedia was interactive, user friendly and adult learner based.

Despite advances in asynchronous communication, most respondents expressed a need for a combination of live (person to person) and on-line forms of communication, depending on the kind of service or help they were seeking. It was also evident that such support mechanisms need to be available at times other than during regular work hours. Ideally, this could involve a central contact source at the university, easily accessible by two or three communications means, who can either deal directly with diverse student issues/problems, or point the student to a source that can help (but not give that student the "run-a-round"). Communication with distance learners can also be enhanced with up-to-date web sites that are appropriately cross-linked, catalogued and referenced within an institution. This would likely reduce the demand for personal communication.

Overall, the results of this needs assessment affirmed the need for a number of existing student services and also revealed a number of new directions to take. Evidence of varying levels of technological competence and availability, as well as diverse student backgrounds and needs, suggest that a "one solution, one approach" perspective is neither appropriate nor advisable. Many of the services that respondents expressed a need for could be made available through the application of appropriate technology. Some of these services might obviously be linked to, or integrated into, existing services; whilst others would require fairly extensive development, especially to meet the needs of a diverse group of distance learners.

Web Sites Usability Evaluation Guidelines for Teachers: A Case of CikguNet On-line Environment

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Abstract:
Web usability is one of the important factors that determine the success of a web site of any type, especially web learning environment sites. Teachers, who have the intention of developing on-line teaching materials, must take into consideration the issue of usability not only during the development process but also when the web site is being implemented. This paper describes a usability-testing model, which is then applied to evaluate CikguNet web site. CikguNet (at http://www.cikgu.net.my), is one of the well-known web sites for teachers in Malaysia maintained by a governmental agent MIMOS and is designed as an environment to assist teachers in producing quality teaching and learning materials especially materials that are technology based, for teachers to exchange their educational ideas or materials and serve as a resource centre for academics and teachers. CikguNet proves to exhibit a high usability level with only few usability problems. The usability-testing model proposed in this paper is intended as a guideline for teachers to adopt.

Keywords: web usability, usability criteria, usability model

Introduction

As the number of web sites on various subjects is increasing over times, the issue of web usability has become very important. Publishing a web site is a very easy job to do even by a primary school children, but to produce a usable and useful web site would not be as easy as one would think. Usability is a concept that is related to the design aspects of web pages that not only make sense to people who use them, but also allow users to easily get the information they look for. Usability problems should not be considered as a minor issue as there are many examples of cases to prove that usability problems could affect on-line sales and customer visits to a particular web site (Rowland, 2000; Seminerio, 1998).

Considering these, web designers must take into consideration the issue of usability not only during the development process but also when the web site has been published. This means that designers should regularly evaluate their sites to maintain and improve the level of web usability. To perform the evaluation, however, designers need to measure their site against relevant usability criteria. However, many web design guides differ between each other in terms of coverage and level of technicality. In addition, some of them are too exhaustive and difficult to follow by the non-technical people. With this in mind, this study attempts to propose a model of web usability criteria for teachers who intend to develop a web site for their teaching purposes. This model was tested on CikguNet web site, one of the well-known web sites for teachers in Malaysia.

Methodology

Content analysis method was used to analyse the usability literature such as web design guides, textbooks, and journal articles. Based on the analysis, a total of 40 generic usability criteria were identified as suitable for teachers web sites. These criteria were then grouped into 7 main categories, abbreviated as SCANMIC (Screen Appearance, Content, Accessibility, Navigation, Media Use, Interactivity and Consistency). This model was then tested on the CikguNet web site. The evaluation on CikguNet was done on 22nd November 2000 involving two expert reviewers. In the first stage, the experts spent 1 hour exploring the CikguNet site so that they could get familiar with the site. Then, in the second stage, they reviewed the site for 1 hour by using the listed criteria. During the review, both experts will determine the score (0-5) for each usability criterion. Two pentium Personal Computers were used, one with Local Area Network Internet access and the other with 33Kbps modem Internet access.

Web Usability: the SCANMIC Model

Gathering from various literatures on web design and usability, the researcher has identified 40 generic criteria of web usability. These criteria are then clustered into seven main factors, abbreviated by the researcher as SCANMIC. These factors are as follows;

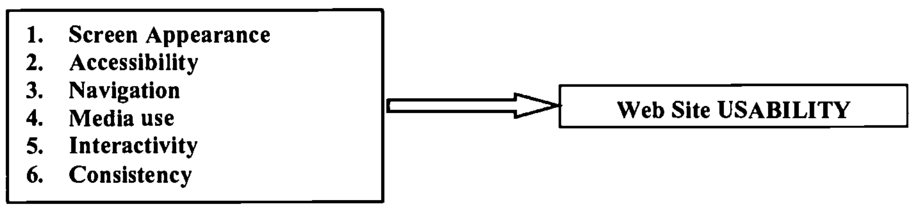

Figure 1: Seven categories of criteria that determine the usability of web sites

a) Screen design

Screen Design can be divided into 4 sections: space provision, choice of colour, readability, and scannability (Shirley, 1999; Morkes and Nielsen,1998). Space provision refers to proper allocation of space for web page elements such as menus, advertisement banners, and content display to help users focusing their attention. Choice of colour, emphasises the need to use proper colour in web page design not only to attracts users but also improves learnability and ease of use. Readability concerns with the issue of providing a readable content within web pages. This is not easy to be achieved because reading from a computer screen is different from reading from a paper. Nielsen (1997) argues that users read 25 per cent slower from a computer screen than a paper. Therefore, designers must take into consideration issues of on-line writing including type of fonts, leading and legibility, page appearance, word and letter spacing, and typographic colour. Apart from readability, designers should also consider the issue of scannability, the concept whereby contents are chunked into smaller parts so that the users could skim rather than read (Morkes and Nielsen, 1998).

The proposed criteria for screen design in this study are shown in table 1 as follows;

- Sharp colour contrast between text and its background
- Use of fonts that are easy to read and commonly used
- Different text sizes to differentiate between titles, headings and texts
- Clear page titles
- Clear headings and sub headings for general text/ document
- Short paragraphs (not more than 6 short sentences)
- Use of typography and skimming layout, for example, bold fonts and highlighted words

Table 1: Web criteria for Screen Design

b) Content

The question of what should be on a web page depends largely on the goals of the web site. Some intend to sell products and service, some offer free entertainment, some provide government information and so on. However, one should bear in mind that providing content in a web page is not as easy as providing a printed page in a book. Yet, a designer should not run away from the basic elements of a document to ensure a web site's usefulness.

There are four basic elements of traditional document design; *who, what, when, and where (*Lynch and Horton, 1999). ***Who*** here refers to information in a web that tells who the owner is. ***What*** refers to the question of "what is a web site offering?". This means that users must have some kind of ideas of what to browse when they are at the main page of a web site. The third element, ***When,*** highlights the need to specify the date a piece of information and a particular web page are published. It also emphasises the issue of currency or timeliness of an information in a web page. Finally, the ***Where*** element that relates to the need to inform users on the whereabouts of servers they are browsing from. The criteria for content design use in this study are shown in table 2 below.

• language used is suitable for audience • High quality writing, for example, good grammar and no typographical error. • Information of authors of articles and other text documents is provided (e.g. names and affiliations) • References or sources of articles and other text documents are provided • Background information of the site's publisher(site's owner) is clearly stated i.e. logo, name, address, phone number and email address • Resource date • Choices of language for multi-ethnic audience • Links to other relevant sites (list of schools, education authorities etc)

Table 2: Web criteria for content designs

c) **Accessibility**

One of the goals of having a web site is to attract visitors as many as possible from various locations. The basic way to achieve this is to ensure that the site is accessible to target users. By the word 'accessible', it means that users would not only be able to get connection to a web site but also able to browse all contents available. The higher the degree of accessibility, the higher the level of usability. There are three elements of accessibility: *loading time, browser compatibility, and search facility*. Loading time is the time it takes for a network PC to download data and files from a server. Apart from loading time, designers should also consider different browsers used by surfers across the world. Although users might use two popular browsers of Microsoft Internet Explorer and Netscape Navigator, the browsers might differ in terms of their product versions. The proposed criteria for web accessibility are shown in table 3

• Acceptable loading time (10 – 20 seconds depending on the contents of the page) • Compatible contents for all main browsers (e.g. Netscape and Microsoft Explorer) • Compatible contents between different versions of the same browser

Table 3: Web criteria for accessibility

d) **Navigation**

Some people believe that the best site contains lots of graphics, animation, and colours. However, not many realise that the basic of an effective web site is its navigability. In her 'Designing Electronic Material' article, Parker (1999) states that good navigation in a Web site is comparable to a good road map. With good navigation, users know where they are, where they've been, and where they can go from their current position. In short, navigation is the key to making the experience enjoyable and efficient. The criteria for navigation are listed in table 4.

• Main menu/ list of key categories of contents in the main page is provided • Links to the main page in all sub pages is available • List of key categories of contents in all sub pages so that users do not have to go back to the main page to browse other pages • Contents should be grouped into a small number of key categories (not more than seven) • Small number of steps/ links to arrive at a particular information (not more than 3) • Accurate/ unbroken links • Use of sitemap

Table 4: Web criteria for navigation

e) **Consistency**

There is an element of 'fear of the unknown' when users visit a web site for the first time. Although they might be familiar with the browser and hypertext application environment, the design of a web site is different from others. Some web sites might put the menu bar at the top of screen, while others might use a horizontal hypertext button at bottom of the screen. Some web sites prefer using frames to divide functional areas while others merely use colour boxes. Therefore, there will always be some elements of unfamiliarity on behalf of users when the visit a web site for the first time. In considering this, design consistency is important to speed up user's learning. The main criteria used for consistency are shown in table 5.

- Consistent page layout, for example, screen size for content display, banners, and menu bar.
- Consistent use of text in terms of its type, font size and colour.
- Consistent use of navigational aids, for example, menu bar, buttons and links in terms of graphics metaphor, size and colour.

Table 5: Web criteria for consistency

f) **Interactivity**

Interactivity is a broad term and can be misleading. However, the researcher is referring this word *to features in a web site that facilitate a two-way communication between users and site owners or other pre-assigned personnel*. Additionally, the features allow users to give feedback and comments on any issues raised by the web site. The introduction of the interactivity features such as email, guess book, on-line forms and net conference might enhance a web site's worthiness. The key criteria for interactivity are listed in table 6.

- Availability of features for users' feedback about the site, for example, web master's email address and on-line form.
- Availability of features for sharing ideas and discussions, for example, e-forum, net conference and net chatting

Table 6: web criteria for interactivity

g) **Media use**

The use of media such as graphics, images, animation and audio in web pages distinguishes it from information presentation on papers. Studies on on-line electronic materials have shown that the integration of this media keeps users attention and, when used effectively, can enhance usability. However, designers should take extra care when introducing all these elements as improper use of them may distract users and affect usability. Additionally, heavy utilisation of media elements consumes web site server's hard disk space and lengthens the downloading time. The main multimedia elements are sound, graphics, images, audio and video (Web Workshop, 1999). The list of criteria for media used are suggested in table 7.

- Use of continuos/ time-based media (audio, animation and video) to suit context, for example, demonstration, instruction, speeches, and songs.
- Alternative access to any information presented through continuos/ time-based media (audio, animation and video)
- Use of static media (graphics and images) to enhance the information being presented
- Non-excessive use of static media (graphics and images) in all pages
- Use of thumbnails to display photos with the option available to see a large image
- Information or warnings on file type and size for downloading

Table 7: web criteria for media use

Case study: Usability Evaluation of the CikguNet Web Site

The proposed SCANMIC evaluation model was used to evaluate the CikguNet web site (http://www.cikgu.net.my). CikguNet is a portal site specially developed for teachers by Mimos Ltd., one of semi-government IT-based companies in Malaysia. This site can be considered a one-stop-centre for teachers who are looking for teaching related materials as well as general education news. In addition, this site also provides a platform for teachers to share ideas and discuss on certain important issues pertaining to teaching and education in primary and secondary schools in Malaysia. As a portal site, CikguNet also provides opportunities for teachers to register for free web space, email facilities, web development tools and discussion forum.

In general, it can be said that CikguNet web site has a high level of usability with a total score of 71 percent. Three factors; interactivity, screen design, and consistency contribute significantly towards this with 100, 91, and 87 per cent score respectively. This is followed by navigation and accessibility that score fairly well with 77 and 73 per cent respectively. Two more factors fell below 70 per cent level with 56 per cent score for content and 54 per cent score for media-use, the lowest of all. The summary of the results is presented in table 1 and figure 1 as follows.

No.	SCANMIC Factors	No of Measuring criteria	Score	
			Overall	*Percentages*
1	Screen Design	7	32/35	91%
2	Content	11	31/55	56%
3	Accessibility	3	11/15	73%
4	Navigation	7	27/35	77%
5	Media use	7	19/35	54%
6	Interactivity	2	10/10	100%
7	Consistency	3	13/15	87%
	Total	40	142/200	71%

Table 8: Summary Results of CikguNet Web enUsability Evaluation
Note: each criteria was given a score between 0 to 5 by the experts

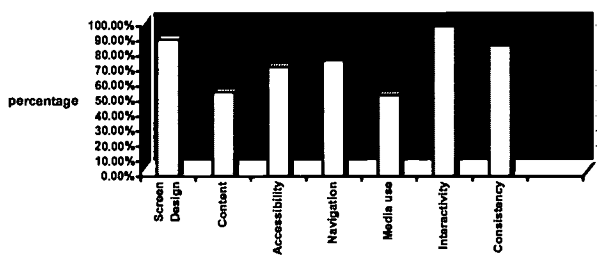

Figure 2: CikguNet Level of Usability

From the evaluation, it can be concluded that in general, CikguNet was properly designed and well maintained. The choice of colour for this site is appropriate and suitable for the audience. Similarly, the use of fonts and their sizes, the arrangement of paragraph and the space allocation for text lead to high level of readability. In addition, the level of scannability is also considerably high due to clear titles, headings and sub-heading in each page, the use of short paragraph and effective typography and skimming layout. Apart from this, CikguNet is also easy to be accessed by users who use different type of browsers. The other good aspect about CikguNet is the availability of contact addresses, online forms, online survey and forum facilities that constitute towards a very high level of interactivity. Also worth mentioning is the use of graphics and images that are effective and not too excessive.

Despite its strengths, CikguNet also has some usability problems that might affect its usage. The major problem comes from the screen design structure of the main page that is too long, scattered and could be confusing. From our study, we found that the main page is as long as 6 screen pages and the list of contents are scattered on the left and right-hand side of the screen. To make things worse, the main page is jumbled up with links and advertisement banners. In addition, the news section (Berita Pendidikan CikguNet) is also included in this page with several broken links. Using the lowest modem connection with 33kbps and a pentium 133Mhz personal computer, the main page took about 5 minutes to load, which is too long and unacceptable.

Apart from the main page, this site also has some usability problems affecting the design of the whole site. The major problem is the content design that scores only 56 per cent as shown earlier. The lowest score is caused by several criteria violations such as no authors are stated in the news section (Berita Pendidikan CikguNet), no reference or sources in some articles in several sections, for example, teaching tips section (tip mengajar), no resource date (except news section) and no page revision date. Another aspect of usability problems that needs improvement in this site is navigation. The low level of navigation was contributed by the poor design of the main page. In addition, there is no site map available for this medium-size site. This study also reveals that Cikgunet has a low level of accessibility for text-only browsers because there is no labels (alt tag) for graphics files.

Discussion and Conclusion

This study reveals that the proposed model could easily be used to evaluate any web sites including the sites used for educational purposes. This is because all the 40 criteria used in this model are generic in nature and therefore they are applicable to all type of web sites. Also worth mentioning is that the usability criteria proposed in our model are designed to be used by both non-technical and technical people. Hence, teachers who are not very good at web publishing can use the model to evaluate their sites. The outcome of the testing shows that CikguNet is highly 'usable' contributed by high level of readability, scannability, consistency, interactivity and accessability. This study also identified a few major usability problems found in CikguNet that need urgent attention to improve its usability. Nonetheless, this study also has its limitations. First, the content analysis of the usability literature was based on the interpretation and judgement of the researchers. Second, 5 out of the 40 criteria used to evaluate the site are subjective criteria, which means that the interpretation of one reviewer might differ from others. Finally, this study only employed two expert reviewers.

Bibliography

Lynch & Horton (1999). Interface design for WWW Web Style Guide, *Yale Style Manual* [Online]. Available: http://info.med.yale.edu/caim/manual/interface.html. [access:1999, Dec. 25]

Morkes, J. and Nielsen, J. (1998). Applying Writing guidelines to Web pages [Online]. Available: http://www.useit.com. [access:1999, Nov. 25]

Nielsen, J. (1997a, March). Be Succint! Writing for the Web, *Jacob Nielsen's Alertbox* [Online]. Available: http://www.useit.com/alertbox/991003.html. [access:1999, Dec. 23]

Parker, A. (1999, November). Designing Electronic Materials [Online]. Available: http://www.rockley.com/designin.html. [access: 1999, Nov. 9]

Rowland, C. (2000, March 10). Usability Matters: What's Usability, Webreview.com [Online]. Available: http:www.webreview.com/pub/2000/03/10/feature/index3.html. [access: 2000, June 4]

Seminerio, M. (1998, September 10). Study: One In Three Experienced Surfers Find Online Shopping Difficult, *ZDNet* [Online]. Available: http://www.zdnet.com/intweek/quickpoll/981007/981007b.html. [access: 2000, June 8]

Shirley, H., (1999, November). Effective Electronic Training, *Designing Electronic Materials : Articles and Papers* [Online]. Available: http://www.rockley.com/designin.htm. [access:1999, Nov. 9]

Shneiderman, B. (1997). Designing Information-abundant Web sites: issues and recommendations, *International Journal of Human Computer Studies*, Vol. 47, 5-29.

Web workshop (1999, July 24). Improving Web Site Usability and appeal [Online]. Available: http://msdn.microsoft.com/workshop/management/planning/improvingsiteuser.asp. [access: 1999, December 12]

Electronic Tutorship Support in an Educational Intranet

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Abstract: Information and Communication Technologies have changed the way we work, the way we live and the way we learn. One of the things that should be updated regarding the new educational context is the tutorship support, that is specially important in a learning environment. In this communication a definition of the educational system of the Information Society for primary and secondary education is proposed, what is called Educational Intranet. Next, it focus on how should the tutorship support be offered by such Educational Intranet. So, this document describes and proposes an original tutorship support system to be incorporated to an educational intranet for primary and secondary education. The tutorship support can be performed face-to-face, that is to say, in real time using a video-conference system (Synchronous Tutorship Support) or it can be carried out by means of a text-based messages or queries electronic mailbox (Asynchronous Tutorship Support).,

Introduction

A New Space of Education and Communication is coming, which is driven by the culture of Information and Communication Technologies. Schools should be aware of this change and should set up the new objectives and educational methodologies inside this new context. One of the things that should be updated, regarding that new educational context, is the tutorship support, that is specially important in a learning environment.

The tutorship support plays an important role in the learning process. This fact is true in each learning context in general, but in some cases, such as rural schools, the tutorship function is specially complicated.

Castilla y León, in Spain, is a rural, vast and sparsely populated region, with a lot of small towns and villages. This fact makes difficult to offer the minimum public services. Regarding education, children in rural areas suffer too many drawbacks: larger distances from home to school, a poorer educational offer, remoteness from other educational and cultural services, such as Universities, libraries, museums and Research and Development Centers. It has to be emphasized the fact that teachers have also a lot of added problems: they have to teach children of different ages, with few resources, ...

The use of Information and Communication Technologies (ICT) at primary and secondary schools could decrease the differences between children from rural and urban areas regarding the access to sources of information and services. Moreover, it introduces teachers and students into the Information Society, contributing also to the development of this New Society.

So, in the last decades, the educational infrastructure in the rural areas of our region has changed from a centralized model into a more distributed model based on what is called the GRS or Gathered Rural School, with classrooms distributed in the area of the GRS and some centralized services. The newest element incorporated to this model is the Rural Center of Educational Innovation, where students stay for a long period of time and study some especial matters such as Technology, Music or Art.

The fact is that the tutorship support in the GRS model plays an important and critical role and it must be considered from the perspective of the possibilities of ICT.

So, this document is referred to the use of ICT as a support to the learning process, that is to say, an instrument for teaching and learning, in contrast to the use of ICTs as a subject or as an aspect (Plomp et al. 1997). ICT must be an instrument integrated into the educational process: it is not a substitute for either the teacher or for any other educational tools. Moreover, since technology will actively change the learning process and the pedagogical relationships, ICT should be considered as an important point in the foundation of the learning environment, as the learning theory and the social organization of learning (Pulkkinen, 1999).

In this paper the authors describe their vision about how should the tutorship support be offered by an Educational Intranet for primary and secondary education, which concept is defined below.

Educational Intranet

Our concept for Educational Intranet is related to an education strongly based on the use of computers. It consists in the fact that students use computers and the Internet (together with some traditional tools) as the cornerstone of their education.

This model is based on the fact that knowledge requires learning by experience, so students should take a more active role in the learning process.

The teaching methods and learning processes are very different from the traditional ones: the traditional curriculum-based education evolves an education based on objectives, guided auto-learning, active learning and cooperative work. It involves a complete change in organization of contents, learning process and pedagogical aspects.

The Educational Intranet defines what we think the educational system of the Information Society should be: a new way of learning, a change in the students and teacher's roles. One of the main advantages of Educational Intranet is that it facilitates a collaborative learning versus the traditional and more competitive one. At traditional schools students were motivated by competition. At new schools, the schools of the Information Society, this objective should be reached by cooperation.

Cooperative learning has a lot of advantages, for example, it increases the motivation and the productivity and it is a good training for future professional team works (Mülhäuser, 1995). When students work in small groups, school time and space are better employed. Teachers can dedicate more time to the least advanced groups or work on different subjects with each group, according to the students' necessities. These strategies are efficient and proven against school failure. Consequently, a more efficient and less expensive learning process can be achieved, due to a decrease in school failure.

Therefore, the Educational Intranet can be defined as a new educational system, where computers, networks, multimedia materials and telecommunication services are basic tools and where new learning methods are used. These new methods are based on guided auto-learning, active learning and collaborative learning.

The Educational Intranet should be based in an Educational Server that offers some distance services:

- Construction of communities around some matters.
- Communication among teachers and students.
- Control of work streams in the educational area: homework, revisions and tests.

This document deals with the tutorship support as a specially important way of communication between the student and his/her teachers. We will describe how the tutorship system should be implemented in an Educational server and we will show an example of pilot project.

The Tutorship Support System

The tutorship support system we propose for an Educational Intranet is based on the tutorship system implemented by the authors in the pilot project Internet for Schools (see Rodríguez et al. 1998): this pilot consists in different Internet-based services for teachers and students of primary and secondary education. Some of those services are electronic tutorship support and communication among different scholar centers.

The objective of our electronic tutorship system is to put students in touch with teachers of different subjects. Students can ask questions to teachers and obtain answers from them.

Therefore, it is necessary that different teachers from different schools participate as electronic tutors for one or several subjects, in a way that students can communicate with each of them.

The tutorship support can be performed face-to-face, that is to say, in real time using a video-conference system. That is what we call Synchronous Tutorship Support. Or it can be carried out by means of a text-based messages or queries electronic mailbox: Asynchronous Tutorship Support. Both types of electronic tutorship support are being implemented together in a new educational server.

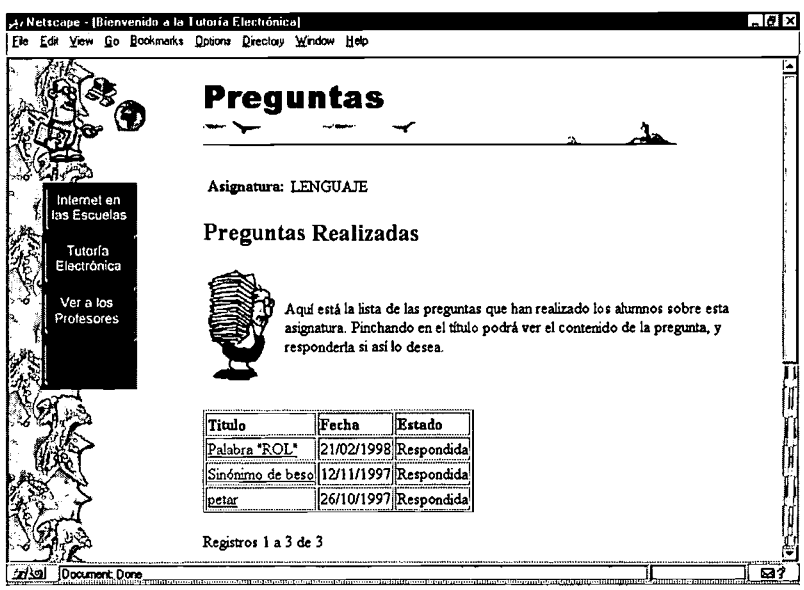

Figure 1: A tutor accessing to the queries about Language introduced by several students. All questions have been answered by other teachers and the tutor could see the answers or introduce a new one.

The Asynchronous Tutorship Support

Asynchronous communication provides freedom from the constraints of time and place and it involves more reflective thinking (Pulkkinen, 1999), so it is a powerful aid for the tutorship support in an open learning environment.

The Asynchronous Tutorship Support proposed makes use of a text-based messages electronic mailbox. In order to facilitate and make more flexible the work of teachers and also enrich the tutorship support process itself, the system works as described below: a student send a query to the electronic mailbox established for a certain subject. All teachers that have been subscribed for that subject can deal with the query, introduce his/her answer and access to the answers introduced by other teachers. That is, it is possible for a student to obtain more than one answer to a query. This system was implemented and tested in the pilot project Internet at Schools (Fig. 1 and Fig. 2).

Figure 2: A student accessing to the answer to one of his or her questions. The student can see data about the tutor who dealt with the query (including a photography) and communicate directly with him by e-mail.

The Synchronous Tutorship Support

The Synchronous Tutorship Support proposed is based in a desktop video-conference system. The video contact provides a human face and dimension to the distance communication, which is so important in an educational environment (Wright & Cordeaux, 1999).

The system proposed works like a web call center. More than one teacher can be available to contact with. A student will be able to select the teacher who he wants to communicate with using video-conferencing, from all of them being on-line. The communication will be established on a peer-to-peer basis between the student and the selected tutor (Fig. 3).

Students can always make use of other communication tools, also synchronous or asynchronous, like text conferencing, e-mail or the asynchronous messages electronic mailbox.

Conclusions

This document describes an original tutorship support system to be incorporated to an educational intranet for primary and secondary education. The combination of a synchronous and an asynchronous tool provides accessibility and flexibility to the distance learning environment. Both of them involves a group of tutors which students could communicate with, the first one by means of a desktop video-conference system and the second one by a text-based messages electronic mailbox. This asynchronous part of this system has been used before in a pilot project, and has been demonstrated to be a completely new and efficient method of tutorship support.

That model of tutorship support and its practical implementation have been included in the curriculum of a doctoral course at the Faculty of Pedagogy of the University of Salamanca (in Spain).

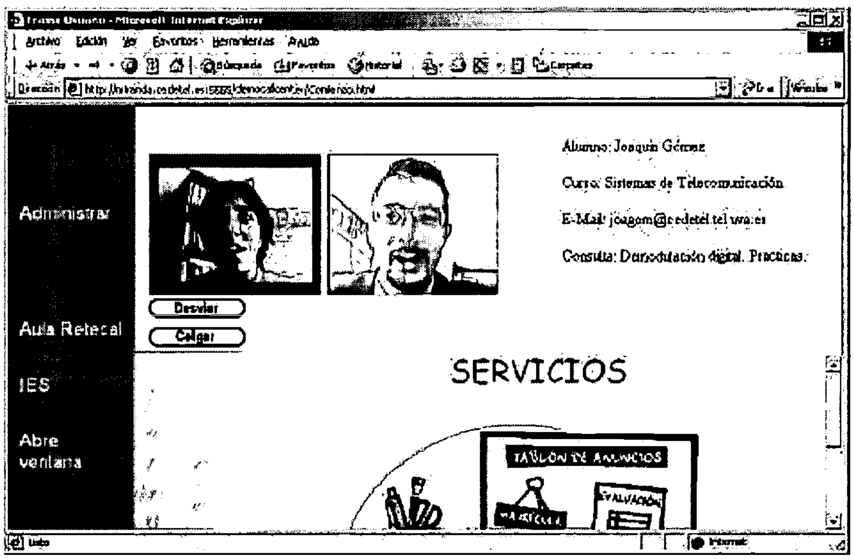

Figure 3: A student communicating with a tutor by means of the video-conference system.

References

Mülhäuser, M. (1995). *Cooperative Computer-Aided Authoring and Learning.* Boston, MA: Kluwer Academic Publishers.

Plomp, T., Brummelhuis, A. ten., & Pelgrum, W. J. (1997). Nuevos enfoques para la enseñanza, el aprendizaje y el empleo *Perspectivas*, 27 (3), 461-478.

Pulkkinen, J. (1999). Pedagogical foundations of open learning environments. In M. Selinger & J. Pearson (Eds.), *Telematics in Education: Trends and Issues.* The Netherlands: Elsevier Science. 76-87.

Rodríguez, B., Verdú, M. J., Pérez, M. A., Navazo, M. A., López, R., Mompó, R., & García, J. (1998). Internet for School: educational Web for Children Living in Rural Areas in Castilla y Leon Spanish Region. *International Journal on Information Theories & Applications*, 5 (3), 84-88.

Wright, N., & Cordeaux, C. (1999). Desktop video-conferencing: Telematic learning. In M. Selinger & J. Pearson (Eds.), *Telematics in Education: Trends and Issues.* The Netherlands: Elsevier Science. 167-177.

Active Server Page Programming Tutorial

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Abstract: This paper describes a web-based Active Server Page (ASP) Tutorial that provides an interactive online guide for ASP programming. The application was created using a variety of technologies including ASP and Macromedia Flash to implement the interactive segments of the tutorial. All the sample codes written in ASP can be demonstrated online. Flash movies are used to provide online, side-by-side ASP code interpretation. This site is intended to provide an easy-to-follow, step-by-step tutorial for inexperienced ASP programmers. The ASP Tutorial introduces ASP syntax and the basics of ASP programming. Using an interactive style, this tutorial provides fully commented easy to follow examples, programming techniques, and quizzes. Both linear and random navigation are provided on every page so the user can easily find topics of interest.

Introduction

The ASP Programming Tutorial (http://138.87.169.64:2012/index.htm) was developed to provide an interactive online guide for Active Server Page programming. The target users include undergraduate and graduate students who are interested in ASP programming. However, anyone interested in learning ASP could benefit from this tutorial application. For years, faculty members have relied on textbooks and assignments to cover and drill programming language specific concepts and syntax. However, some of the difficulties faced by the students in grasping these concepts are the limited scope of the assignments and the lack of opportune feedback. In order to strengthen students' understanding of these concepts and syntax, they need to have more immediate feedback when solving assignments than traditional textbooks and teaching methods can provide.

In order to provide students with a different type of learning environment, it was decided to develop a supplemental tool for teaching ASP scripting. Providing students easy and convenient access to the information both at school and at their place of residence was also an objective of the project. To meet these objectives, a web-based tutorial was designed and implemented using HTML, ASP, and Macromedia Flash.

Active Server Page (ASP) is one of Microsoft's Web server application development technologies. Web developers can use ASP technology to dynamically generate browser-neutral content using server-side scripting. An ASP file is usually an HTML file that includes one or more scripts (small embedded programs) that are processed on a web server before the page is sent to the user. The ASP code can be written in a number of scripting languages including JavaScript, JScript, VB script and Perl (Practical Extraction and Report Language). However, the default scripting language for ASP is VBScript.

Contents of the Tutorial

ASP Programming Tutorial consists of primarily textual content explaining the basics of ASP programming. Some of the topics covered in the tutorial include:

- What is ASP -- Definition, servers supporting ASP
- Client/server -- N-tier model
- Scripting -- Scripting vs. programming, compiled vs. interpreted.
- Why ASP -- Advantages, characteristics
- Structure of an ASP application
- ASP Objects and Server Variables
- User Interaction (HTML forms)
- Web Database Connectivity
- ODBC and DSN System
- ActiveX Data Object Connection
- Cookies and Session Control
- Interactive Examples
- Interactive Quizzes

The ASP Programming Tutorial is divided into the following 5 major topics: What is ASP, Getting Started, User Interaction, Session Control, and Web Database Connectivity. A consistent organizational template is used to structure each topic so that people taking the tutorial quickly become familiar with the procedure followed in the tutorial. First, the user is presented with a coherent, progressive set of lessons that cover the current topic. The lessons are followed by an interactive programming example that elucidates the concepts covered. And finally, an interactive quiz is provided for self-testing.

The lessons are normally text-based presentations of the topics. However, when appropriate, Flash movies are included to help the user visualize the concepts being presented. For example, the client/server architecture lesson includes a movie. This movie steps through the interaction between client and server using animation and voice over narration. See Figure 1.

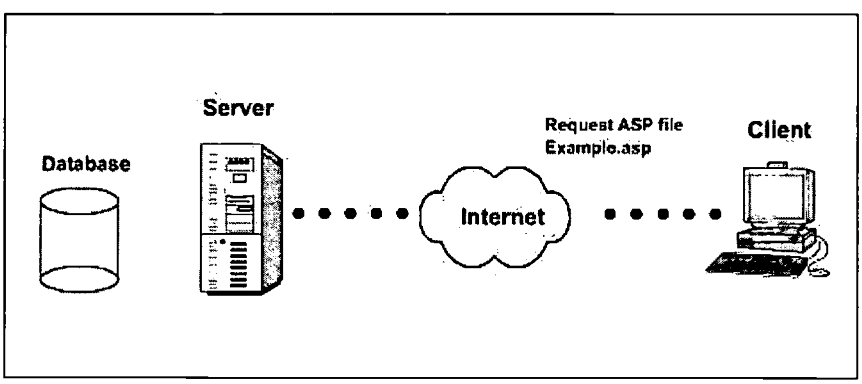

Figure 1: Client/Server Interaction Movie Implemented in Macromedia Flash

The interactive programming examples have been implemented using Macromedia Flash. These program examples illustrate ASP code structure, user interaction, server variables, session control, cookies, and web database connectivity. Each of these programs introduces ASP syntax via meaningful examples that are explained in detail when interacting with the program. The event of a user placing the mouse over a section of code triggers the display of a window which explains that code segment. In addition, all of the examples can be downloaded and executed upon request. Figure 2 is a screen capture of one of the example programs with added explanatory labels.

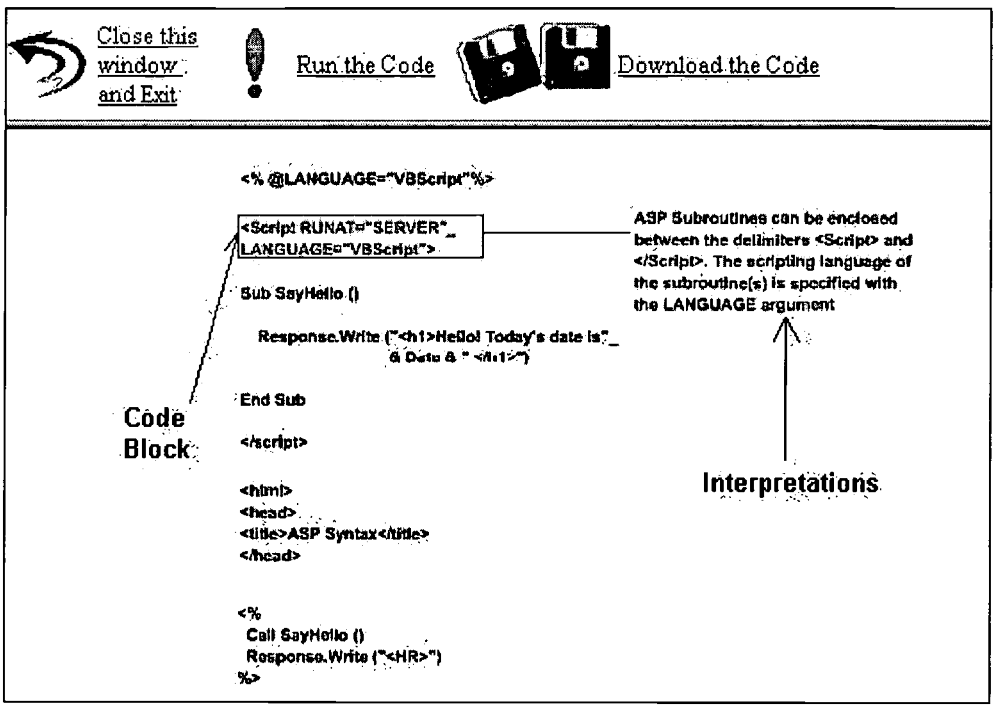

Figure 2: An Interactive Programming Example Implemented in Macromedia Flash

Both linear and random navigation are provided on every page so users can easily find topics of interest. Figure 3 shows the typical screen layout and navigation options. At the left of the screen a navigation panel shows the major sections of the tutorial and highlights the user's current location within the tutorial. Using this panel, the user can navigate the tutorial in a non-linear or random fashion by selecting the topic he/she wants to visit. Linear navigation has been implemented by traditional arrow icons pointing left and right for previous page and next page navigation within the tutorial. Additionally, a horizontal menu bar listing commonly used utilities, such as a glossary of terms, site map, and links to relevant ASP sites, is included at the top right most corner of the screen.

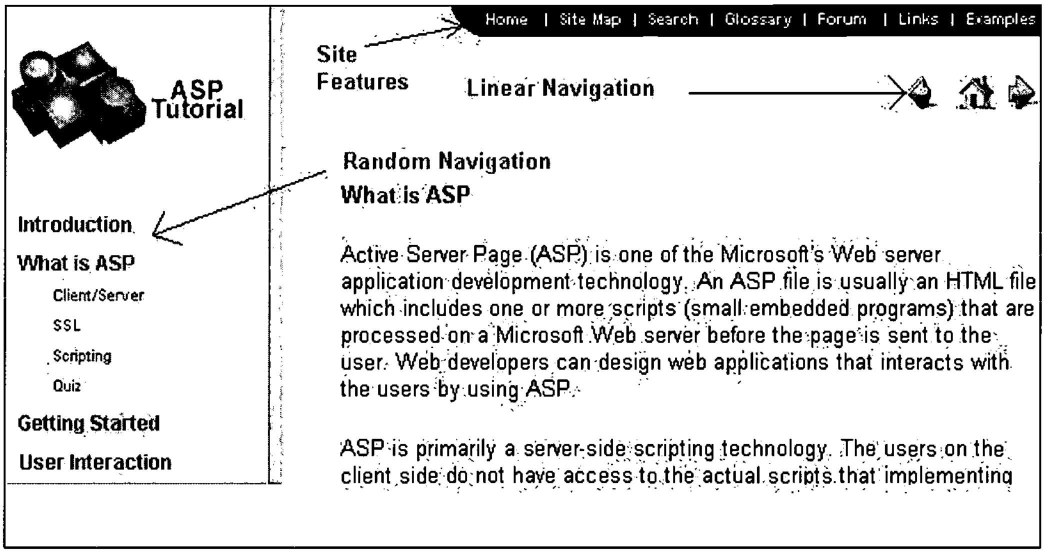

Figure 3: Screen Layout and Navigation Options of the Tutorial

The utilities referenced in the menu bar provide an effective way for the user to interact with the web-based tutorial. For example a full-text search function is available to the user for finding available references within the site. An interactive site map utility allows users to visualize the content and provide hyperlinks to any of its sections. Figure 4 shows the graphical site map.

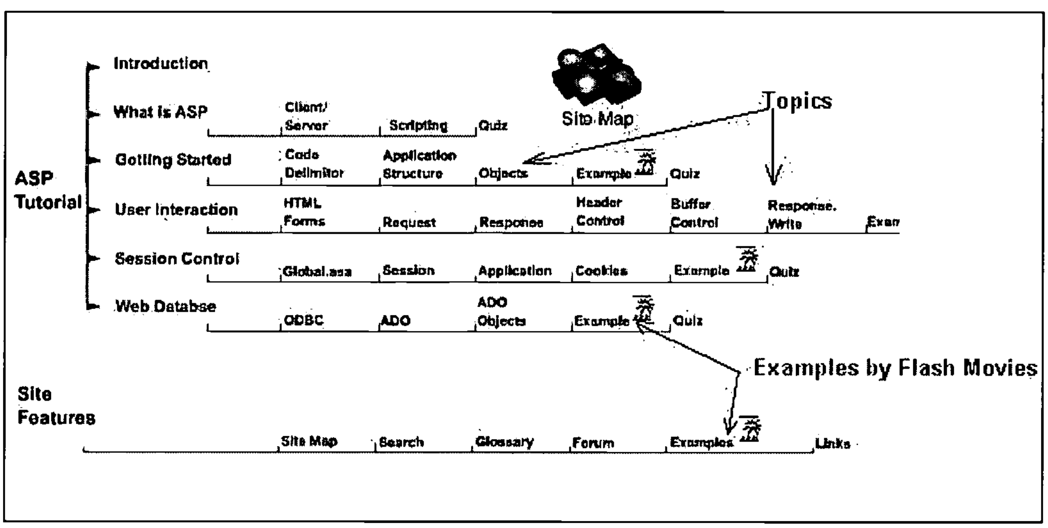

Figure 4: Tutorial Site Map

The glossary function for this site contains a navigation panel with a tree-like structure where the user can select the term he/she wants defined. See Figure 5.

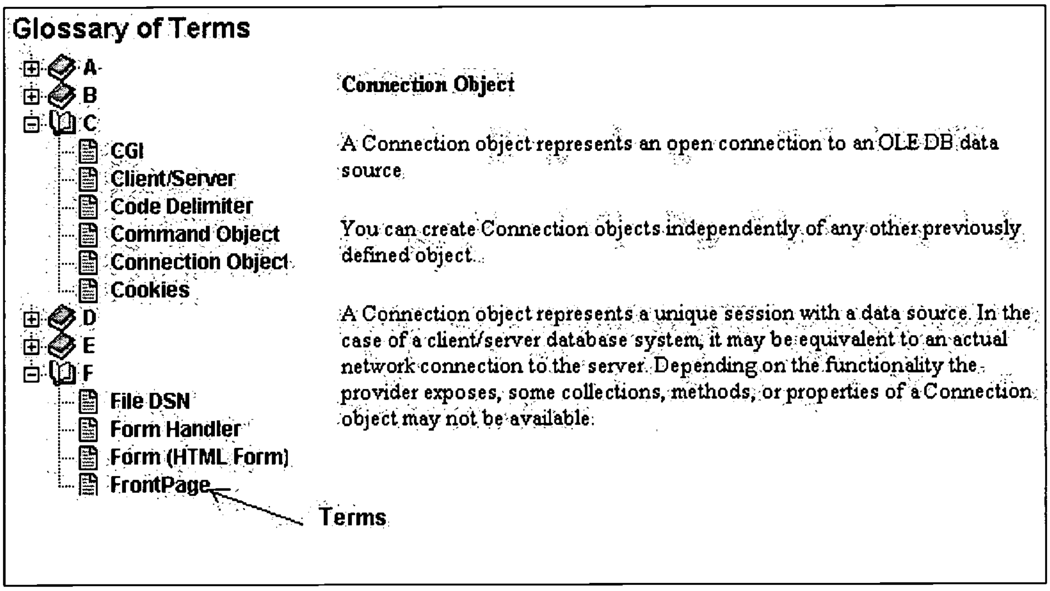

Figure 5: Glossary of Terms

Conclusions

There are numerous books available that cover these ASP Programming topics thoroughly. However, books have their limitations in a learning environment. For example, they are static by nature. Though they may be able to explain concepts in great detail, they still do not present students with an opportunity to study and learn concepts in an interactive fashion. Actually using or applying the concepts helps students improve their understanding of the subject matter. This limitation of textbooks can be effectively rectified by using interactive instructional multimedia technology like the web-based tutorial presented in this paper. Another advantage of this type of application is that students can effectively interact with a web-based tutorial anytime and anywhere when connected to the Internet.

References

Brick Mountain (2000). *ASP 101*, http://www.asp101.com.

Kaufman, J. (1999). *ASP Databases*, Wrox Press Inc.

Weissinger, A. K. (1999). *ASP in a Nutshell: A Desktop Quick Reference*, O'Reilly & Associates, Inc.

Wolters, V. (1996). *Using Microsoft Internet Information Server 2, Special Edition*, QUE Corp.

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Teachers On-Line in Africa: The Issue of Access

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Abstract: South Africa is on the threshold of drastic changes in the field of education. The ideal is to move away from the stereotyped teaching methods and passive learning to a learner-centered approach. This is linked to efforts to address inequalities in education and to overcome historical disadvantages. One of the major stumbling-blocks, however, is the relatively underqualified teacher corps and the massive undertaking of the retraining of ten thousands of teachers - many of them in re90%mote areas, far from the larger training centers. A lack of basic infrastructures further complicates the situation. The major issues addressed in this paper concern the availability of the necessary infrastructure and technology for the delivery of effective learning opportunities, and the nature of several innovative projects inclined to create learning communities of educators and learners that use Information and Communication Technologies (ICTs) to enhance education.

Orientation

South Africa is on the threshold of drastic changes in the field of education. The outcomes-based education (OBE) model, Curriculum 2005, is in the process of being implemented in South African schools. The ideal is to move away from the stereotyped teaching methods and passive learning to a learner-centered approach according to which the pupil is actively engaged in constructing his/her own knowledge and comprehension. This ideal is linked to efforts to address inequalities in education and to overcome historical disadvantages.

Other important initiatives are currently being launched in the country. As far as technology in education is concerned, an example is a ministerial investigation into technology-enhanced learning [Technology Enhanced Learning Investigation (TELI) 1996] which has synchronized with the development of Curriculum 2005 since 1995. Special emphasis is placed on the role of technology and other resources in the process of reconstruction: "... old and new technologies have the potential to help tackle critical problems of access, redress, flexibility, and relevance" (TELI 1996 p.7).

One of the major stumbling-blocks in the process of change, however, is the relatively underqualified teacher corps and the massive undertaking of the retraining of tens of thousands of teachers in the OBE mode of thinking, as well as the upgrading of their qualifications to the accepted standard of a four-year tertiary qualification. Many of these teachers find themselves in remote areas, far from the larger training centers. A lack of basic infrastructures such as electricity, telephones and adequate transport facilities further complicates the situation. The nature and extent of these problems were clearly revealed in several national surveys like the National Teacher Audit (Hofmeyr & Hall 1996), the School Register Needs Survey of 1996/97 with regular updates [Research Institute for Education Planning (RIEP) 1997], and the Science/Mathematics Teacher Survey undertaken by EduSource (1997).

But can the introduction of computer technology in any way promote the process of change? Is it realistic to consider on-line education as a mode of tuition when principles such as cost-effectiveness and equal opportunities for all are at stake? What about the availability of the necessary infrastructure and technology for the delivery of effective learning opportunities, i.e. the issue of access? And what is being done to bring teachers and learners in contact with the new on-line world of information?

The Issue of Access

For many countries, and particularly those in the developing world, the lack of network and telecommunication infrastructure is considered the major obstacle to Web-based education. In his set of guiding principles and practices for the design and development of distance education, Ragan (1999 pp.3-4) states as principle that the selection of instructional media and tools should reflect their accessibility to learners. In countries like the United States, quality concerns are more likely to relate to the lack of capacity or band-width within their computer/telecommunications networks. Institutional needs for network and desktop hardware, software, support and training are also considered as major factors in the growth of on-line distance education in the developed world (Broad 1999 p.8).

Like many other developing countries, South Africa is battling with the challenge of harnessing information and communication technologies effectively to accelerate social development. Most debate in this regards tends to center on the extent to which the adoption and use of these technologies can contribute to reducing the massive inequity that exists among and within societies. These debates often tend to reflect a simplistic conviction that Africa will benefit from the development of advanced communication. This type of observation is sometimes tempered with some awareness of the danger that the explosive growth of these technologies may serve to entrench disparity rather than eradicate it [South African Institute for Distance Education (SAIDE) 1999 p.1].

It is important to note that, of the 750 million inhabitants on the African continent, only about 2,85 million are using the Internet on a regular basis - with 1,82 million linking up from South Africa. This is perhaps an encouraging figure, indicating a high level of technological advancement in the country in comparison with the rest of the continent, but it also means that roughly only 6% of the South African population link up regularly. The cost of computer equipment and the lack of basic infrastructures are held as the most important reasons for the relatively slow growth figure of the Internet in South Africa, but it is expected that, in future, cordless Internet (WAP) can play a major role to bring the Web to the masses by means of cell phones and handheld computers (*Sake* 2000 p.3).

But what about epistemological access? Lelliott, Pendlebury and Enslin (2000) rightfully warn that physical access is not sufficient; at the very least, epistemological access to on-line education requires students and their teachers to become computer literate as well as conventionally literate and numerate - and even more so in the field of teacher education with its very special demands.

These are the challenges. Information communication technologies clearly do have the capacity under appropriate circumstances to reach large numbers of learners through a few well-qualified tutors using materials developed by specialists. It does not ask for an Internet connection to each household, because a properly equipped learning center within walking or cycling distance from every household, no matter how remote, can serve a similar purpose. We must also remember that, at present, the prerequisite of access can be met by very few countries, even in the world.

Availability of Infrastructure and Technology

When the realities of the South African education are regarded, the picture for a possible technology-enhanced approach in education does not appear bright at all. The picture becomes even bleaker when the possibility of on-line education is considered. In the first place one must realise that South Africa has a very big and extensive education system which is governed by a National Department and nine provincial education departments. In 1999 there were approximately 12.3 million learners in South African schools, attending 29 386 schools with just over 375 000 educators. [Department of Education (DoE) 2000]. The majority of these learners (more that 80%) can be considered as from developing communities.

The School Register of Needs Survey (first conducted in 1996/97 by a consortium of research-based institutions) provides a comprehensive database of the physical facilities, equipment, resources and services available at almost 28 000 primary and secondary schools in the country. It was, for example, found that more than half of the schools lack basic administrative equipment like typewriters and computers. A shortage of more than 57 000 classrooms nationally was reported, while learner laboratories in secondary schools showed acute shortages (RIEP1997; The Teacher September 1997). Fewer than half of the schools (43%) nationally had an electricity supply. With the exception of the Northern Cape, Western Cape and Gauteng, most schools had no telephone lines. In the Free State it was found that only 25% of the more than 2900 schools had a telephone; duplicating facilities were only available at 17% of the schools; with a 19% availability of overhead projectors, 11% video recorders; and 6% computers (RIEP1997). All this information indisputably indicates only a limited applicability of the ideals of technology-enhancement in education. "What this means is that in a world increasingly wired up and becoming a global village because of advanced technology...there are thousands of schools and millions of South African children who are getting left behind in this information era simply because they cannot be reached" (The Teacher September 1997 p.3).

The School Register of Needs is regularly updated. The most recent data for the Free State province (made available by the Free State Department of Education) shows some improvements in electricity supply, telephones and also in the availability of computers at schools. In 2000, 83% of the schools now have an electricity supply. Telephones are available at 43% of the schools, with mostly rural and farm schools who are missing out in this regard. Just over 5 100 computers are in use in 600 of the schools (24%). This still means that 76% of all schools in the province (1334 rural and 600 other) are still without a single computer! Furthermore, an analysis of the designation of the 5 100 computers shows that most of these computers reside in well-equipped laboratories in schools in wealthy urban and semi-urban communities. These laboratories were mostly established by school governing bodies who used their private school funds for this purpose. Roughly 150 of the schools with computers are linked up and has Internet and/or E-mail facilities to facilitate communication with the provincial department of education. About 15 schools also have their own Web-sites.

The above statistics highlight the major inequalities that still exist among schools in different communities in this province, and it can be accepted that the pattern will not differ much throughout the country.

During interviews with officials of the Free State Department of Education, several of them clearly stated that computers and computer education are not priorities at this stage. This viewpoint can be understood when it is taken into consideration that education in the province suffers from a shortage of funding and that there is still a battle to erase the effects of the unequal distribution of money in the apartheid era. According to the TELI report, inequalities have to do with many aspects, *inter alia,* the poor physical infrastructure in many areas, poor communication, insufficient provision of library services and other resources, poor training facilities, people who are not yet ready for high technology strategies, and a lack of a supportive learning environment for pedagogical and professional development. The fear is therefore expressed that the introduction of technology will further broaden the gap between the urban and the rural areas (TELI 1996 pp.34-36). There are, however, also other views. Other officials, however, feel that all learners and teachers have a right to be introduced to the new technologies and the new world of information yet unknown to them. In accordance with the views of Carl (1995 pp.2-3), they believe that technology can be the bridge to equality for all and that advanced technology can make a "quantum leap" possible.

When it comes to higher education in South Africa, research shows that most students in the formerly disadvantaged communities do not have access to basic technologies such as the telephone and audio recorders. Beneke (1998) reports on the availability of technology to students studying through Vista University Distance Education Campus (more than 60% in teacher education programs), as determined in successive surveys undertaken in 1989, 1994 and 1998 (see Tab. 1). He shows that limited numbers of students had access to computers and, with a mere 20 – 40% accessibility to telephones, it is quite obvious that online education, for example, would not have been possible for most of these respondents.

Technology/Year	1989	1994	1998
Radio	75	82	88
Audio equipment	16	57	48
Television	14	45	82
Computer	1	3	5
Telephone	25	40	30

Table 1: % availability of technology to Vista University distance education students in 1989, 1994 and 1998.

In accordance with the research of Beneke, the authors conducted a survey among three groups of students at the Free State Technikon and Vista University. Group A represents 47 second-year students in the

IT department and Group B 150 first-year students in a Computer Literacy class in the Faculty of Management at the Technikon Free State. Group C represents 43 final year teacher education students at the Bloemfontein campus of Vista University (see Tab. 2).. All the students are from formerly disadvantaged communities. Although the high accessibility figure to electricity (93%+) looks encouraging, a situation like this is unthinkable of in a developed country, namely that more than 60% of a group of students in a second-year computer science course and more than 90% final year teacher education students did not have access to a personal computer. The 10% and lower linkage to Internet and E-mail respectively, indicates that on-line education is at present just a far-off dream to these three groups of students. This is despite the fact that all these students are basically computer literate, because all students in non-computer science courses have to follow a one-year computer literacy course at their institutions.

Technology/Group	**Group A (N=150)**	**Group B (N=47)**	**Group C (N=43)**
Electricity	93	100	95
Radio	91	98	95
Television	82	95	88
Satellite TV	5	7	5
Telephone	55	60	58
Computer	7	38	8
Printer	5	31	5
E-mail	3	10	3
Internet	3	7	3
Audio recorder	55	40	50

Table 1: % availability of technology to students at Technikon Free State and Vista University

In further surveys undertaken by the authors, teacher education students and practicing teachers were asked for their views on the possibility of INSET and PRESET programs offered at a distance by means of Internet/E-mail. Most students reacted positively to the possibility of on-line education, but great concern was expressed regarding the inaccessibility to computer equipment and the cost involved. Another great concern involves the lack of an "ever-present" lecturer as well as a possible lack of contact with other students. The important aspect of the technological literacy of tutors as well as students was also mentioned. A fundamental principle was touched upon by one respondent who wrote: *"All people must be given a chance to know more, also about computers"*. This remark again highlights the burning issue of equal opportunities to all in a country where such great disparities between the richer and the poorer still exist.

But what is the solution? Nobody really knows. In South Africa the problem is addressed by means of deliberate efforts by tertiary institutions, industry, the private sector, the national and provincial governments, international agencies and others to make money available and introduce innovative projects that may break this vicious circle of ever-increasing disparity.

Projects and Other Initiatives in Progress

National level

SchoolNet SA (at www.school.ac.za) is the most important national organization that has to be mentioned. It is linked to the National Department of Education in the country and organizes, manages and co-ordinates on-line activities on school level or, in its own words: "... an organisation formed to create Learning Communities of Educators and Learners that use Information and Communication Technologies (ICTs) to enhance education" (www.school.za/about.htm). It has core funding from the International Development Research Centre (IDRC) - a Canadian donor organisation - and Open Society Foundation for SA, with project funding from the World Bank Institute and a range of corporate partners. SchoolNet SA is currently involved in initiatives and projects such as the national Minister of Education's Tirisano Project, the Telkom 1000 Schools Internet Project, the Thintana i-learn Project, the Nortel Phumelela Networks Project, and several others.

Special mention needs to be made of the Thintana i-Learn Project. It is funded by Thintana, a consortium of the national communications network, Telkom, and its strategic equity partners - SBC International and Telkom Malaysia. The consortium provided R21, 2 million ($3M) to set up computer centers in 200 disadvantaged secondary schools equally distributed in all the nine provinces and to train a minimum of ten educators per school. Each of these schools will receive between ten and twenty networked computers with Internet connectivity. This project will be implemented over a two-year period. The strength of the project has attracted the partnership of the world-wide computing software leader, Microsoft, funding the cost of software to the value of R5,9 million ($0,75M). The project, which will be managed by SchoolNet SA, forms part of Thintana's commitment to invest R120 million ($15,5M) from 1997 to 2002 on a series of educational programs that will improve technology learning and bring future generations to a knowledge-based society.

Free State Initiatives

The Department of Education in the Free State province is also involved in several projects to provide schools in developing communities with computers and get them linked up. In 2000 the national telecommunications company, TELKOM, provided 133 schools with a computer and provided some training to a few teachers at each of these schools as part of its national Telkom 1000 Schools Internet Project. The idea was to get each school connected via E-mail and the Internet. In 2001 further training of teachers will be undertaken by SchoolNet SA through 28 so-called TELKOM Super Centers.

Many of the farm schools in the province still lack essential facilities like electricity and telephones. In the eastern part of the Free State (near the Lesotho border) private companies are planning to get rural schools connected via satellite communication. In one remote area an innovative project is even using solar energy to get computers and the Internet going!

From the side of universities, colleges and technikons in the Free State, the possibilities of on-line education in reaching students in remote areas are slowly being exploited. Several on-line programs have been implemented or are in the process of implementation - with the Technikon Free State (at http://eswot.tofs.ac.za) that has taken the lead in this regard. Other innovative projects between institutions and schools are opening the new world of ICTs to teachers and learners in these schools. Two of them are briefly discussed:

The *Thutamahlale Upliftment Project* at Vista University in Bloemfontein forms part of the South African Science Education Network (SASEN), a project sponsored by the Flemish government. Four South African Universities and the University of Leuven in Antwerpen, Belgium, are the partners in the project. The purpose is to develop interest and enthusiasm, as well as to provide teachers with teaching strategies and computer literacy skills they can apply in the context of the outcomes-based Curriculum 2005 in Grade 7-8 classrooms. The project is aimed at establishing science, technology and computer laboratories on the university campus, and at presenting workshops to 90 teachers and providing 32 teachers with computer literacy skills. The SASEN computer laboratory was completed during 2000 and the computer literacy part of the project could be implemented. The participating teachers are now attending workshops one afternoon per week and they already received training in basic computer skills and application software. The progress of the teachers is carefully monitored. The challenge, however, is to assist these teachers in utilizing their newly-found skills effectively in environments where one computer has to serve a school with more than a 1000 learners!

With the aim of playing an active role in the community and in support of the National Education Department's Tirisano Project 2000-2004, the Technikon Free State (TFS) launched its *TFS/Lereko Adopt-a-School* program in September 2000. In the first phase of the program, the emphasis has been on the professional and personal growth of Lereko's teachers, with computer literacy as one of the main objectives. The TFS equipped a computer laboratory with Internet facilities at the school, and is now providing training to the teachers. The Department of Information Technology at the TFS handles the IT component of the program. It will carefully monitor the progress of the teachers over the next twelve months and will adapt its training to the teachers' needs.

Concluding thoughts

This discussion has provided a rather bleak picture of the possible large-scale introduction of computer technology and on-line education in South African schools and institutions of higher education. The problem of access - informed by a lack of funding, the high cost of technology and the unavailability of basic infrastructures - seems to be the major stumbling-block in this regard. And if the possibility of on-line teacher education is considered as a viable option for INSET and PRESET purposes in South Africa, the issue of access (including epistemological access) clearly constitutes a major challenge. With the rapid growth in the use of the information communication technologies in the more advanced section of the South African community, fears that the gap of inequality in this regard is rapidly widening, need to be addressed. Projects to counteract this vicious trend need to be supported. More funding, also from international donor communities, need to be attracted. The country's progress can only be served if educators are open to innovation and change and willing to tackle all the challenges, including the issue of access, in a creative and innovative way. As far as the aspect of equality is concerned, it is appropriate for all those concerned with education in South Africa to pay attention to the warning words of Apple (1992 p.86): "... The new technology is here. It will not go away. Our task as educators is to make sure when it enters the classroom it is there for politically, economically, and educationally wise reasons... We should be very clear about whether or not the future it promises our students is real and not fictitious. We need to be certain that it is a future all of our students can share in, not just a select few".

References

Apple, M. (1992). Is the technology part of the solution or part of the problem in education? In: Beynon, J. & Mackay, H. (Eds). *Technological literacy and the curriculum.* London: The Falmer Press.

Beneke, P. (1998). Students' technological access to open learning in a historically disadvantaged institution. *OLiSA Review* 1998, 74 - 83.

Broad, M.C. (1999). *The dynamics of quality assurance in on-line distance education* (http://www.usq.edu.au/electpub/e-jist/vol3no1/contents.htm). Read on 19 January 2000.

Carl, I. M. (1995). Equal opportunity technology can be a bridge to mathematics equity. *Electronic Learning* (http://www.eric.org/online/ENC2286/2286.html). Read on 6 May 1999.

Department of Education (DoE). (2000). *Annual report 1999.* Pretoria South Africa: Department of Education.

EduSource. (1997). Mathematics and science teachers: Demand, utilisation, supply and training in South Africa. Report for the Department of Education and Training. *Edusource, 97/01.*

Hofmeyr, J. & Hall, G. (1996). *The national teacher education audit. Synthesis report.* Johannesburg South Africa: Education Policy Unit.

Lelliot, A., Pendlebury, S. & Enslin, P. (2000). Promises of access and inclusion. Online education in Africa. *Journal of Philosophy of Education*, 34(1), 41-52.

Ragan, L.C. (1999). *Good teaching is good teaching: An emerging set of guiding principles and practices for the design and development of distance education* (http://www.educause.edu/ir/library/html/cem9915.html). Read on 29 September 1999.

Research Institute for Education Planning (RIEP). (1997). Database of education statistics: School Register of Needs Survey. Bloemfontein South Africa: RIEP, Faculty of Education, University of the Orange Free State.

Sake. 10 Augustu 2000. Suid-Afrika flink voor met Internetgroei in Afrika, 5.

South African Institute for Distance Education, SAIDE. (1999). Introduction to the telematics for African development consortium (http://www.saide.org.za/) . Read on 16 February 2000.

Teacher, The. September 1997. SA schools in shocking condition, 3.

Technology Enhanced Learning Investigation in South Africa (TELI). (1996). *Report of the ministerial committee on development work of the role of technology that will support and enhance learning.* Pretoria South Africa: Department of Education.

THEORY

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Educational Technology is not an oxymoron, and yet there is a continuing struggle to find the blend between education and technology. Perhaps part of this struggle occurs because research over the past half a century continues to modify the conceptions of how teachers teach and how learners learn. At the same time, technology has changed and expanded in ways beyond expectation. The development of technology has altered society, creating new cultures and shifting individual perceptions of the world. Technology has influenced language by providing new words and phrases or new meanings to old words and phrases, for example, hardware, software, and multi-tasking. The message delineated from the articles presented in this section indicate that as education shifts with the advancing technologies, the theoretical constructs of teaching, learning, and evaluation must continue to guide this process.

There are twelve articles that are referred to in this introduction. These articles can roughly be placed in the categories of a) ethics, b) paradigm shifts, and c) lessons learned from the implementation of education and technology. All of the articles provide thoughtful considerations for educators as they continue to grapple with the integration of technology and education.

Banister's article, "IT with integrity" speaks to the fundamental issues regarding the ethical use of technology in education. Instructional technology provides an abundance of opportunities but certainly can be misused. Teachers have a greater understanding of the needs of their students and the promotion of appropriate classroom environments than does the corporate world, therefore, Banister believes that teachers must be at the forefront in ensuring that technology is implemented with integrity. For example, teachers should be involved in the design and choice of software rather than just using what is available thus depending on the persons who may profit from the use of software. Cassidy's article, "Historical perspectives on teachers, technology, and American public education" complements Banister's article by stressing that educators should develop a sophisticated sense of how to integrate technologies. Cassidy provides an historical perspective to relay the message that theories of curriculum and pedagogy have influenced the complex process of technology integration more successfully than social, political, and economic interests. Educators in the present can learn from the lessons of the past as they implement new communication technologies in the classroom.

The second group of articles concentrates on paradigm shifts that incorporate teaching, learning, and/or evaluation theories to provide new understandings of the integration of education and technology. The authors of each of the articles convey concepts related to the continuing effort to enhance communication and learning through the blending of education and technology.

Barner-Rasmussen's article, "Designing tasks for networked technologies using intentional acts" merges the taxonomies of interactivity and communicative events to provide a model for designing tasks related to online courses that foster interaction. The shift to the new taxonomy presents four intentional acts (informative acts, applicative acts, reflexive acts, and evaluative acts) that produce successful interactive communication. The implementation of the new taxonomy should also provide documentation and evaluation of why certain interactions succeed and others fail.

Holmes, Tangeny, FitzGibbon, Savage, and Mehan's article, "Communal Constructivism" introduces an expanded definition of Vygotsky's social constructivism that is dynamic and adaptive in trying to understand how to teach and learn effectively with technology. The authors have developed an approach in information technology that they call 'communal constructivism' that assists students to construct their own knowledge as well as knowledge for others. They use a river analogy to depict this type of learning. Parton's article, "IT practice from theory" also draws upon Vygotsky to present a paradigm shift beyond constructivism. Parton uses Vygotsky's Zone of Proximal Development to show how teaching and learning can be transformed through the social context of instructional technology. Kayashima's article, "A tutor's advice trains a student's self-regulation skill" presents for tutors a new paradigm of learning also based social constructivism as well as Soviet socio-cultural theories and situated cognition. Tutors do not give answers to questions posed by students but instead regulate how knowledge is to be attained by providing advice and modeling of their self-regulation skills. This provides the opportunity for students to develop their own self-regulation skills to gain knowledge.

Thampi and Mantha's article, "Creation of a new paradigm for the roll of educators through in service training that facilitates innovation and improves the process of imperfectly seeking emerging technology in tandem with the evolving market place" utilizes a case study approach to explain innovations needed for individuals to learn skills to keep pace with emerging new technologies. The authors apply the ABC analysis model in training to enhance the teaching-learning process of new technologies.

Connel's article, "Applications of knowledge based evaluation in educational technology" presents a paradigm drawn from formal evaluation theory that will improve research and evaluation in a field with an emerging knowledge base. Educational technology is just such an emerging discipline that can benefit from evaluation conducted based on the link between knowledge and justification systems. Lenaghan and Choate's article, "How do we know whether to plug in or plug out?" provides a paradigm shift for evaluation that departs from Connel's model by focusing on technology-based activities related to brain-based learning. Drawing upon the theoretical perspectives from brain operations research, Gardner's Multiple Intelligences, and three types of thinking (Bloom's Taxonomy, Scriven's Critical Thinking, and Ouch's Creative Thinking), Lenaghan and Choate offer a foundation for how to implement and assess teaching and learning with technology.

The next group of articles focuses on lessons learned in the use of technology that can be incorporated in education. Robinson's article, "Instructional technology: Practical application alignment with theory in student teaching field placement" describes a case study of a buddy system configuration between student teachers and cooperating teachers in order to appropriately integrate technology in the classroom. The findings indicated that time is the greatest obstacle in integrating technology. The lessons learned from this study were that in order to have a successful merging of technology theory with practice, student teachers need preservice training that enhances collaboration, self-directed learning, and coordination of equipment.

Solovieva's article, "Communication technologies: Post-industrial infrastructure. This model depicts the lessons learned so that humans can find their position in the complex world of technology and the interplay between society and technology. On the other hand, Neto's article, "Virtual worlds, real minds: An investigation about children, videogames and cognition" investigates the lessons that can be learned from investigating children's learning processes involved in skill acquisition in video games. This research project provides analyses that indicate how children learn in video games that can be incorporated into educational technology implementation in the classroom.

Ultimately, the articles presented in this introduction have provided a picture of how research and theory related to teaching and learning guide the integration of education and technology. Education will continue to provide answers for the expansion of technology and technology will likewise aid in the development of education. Eventually the struggle to find the blend between education and technology will lessen as the paradigm shift stabilizes.

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IT with Integrity

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In the past three decades, the use of computers in education has continued to grow and develop. With the introduction and expansion of the Internet, K-12 schools, as well as colleges and universities are tapping into the resources of the World Wide Web. "Technology" is the buzz word on the lips of educators across America and few seem to question its appropriateness. There are, however, signs that the manner in which technologies are impacting education is not always as positive as many claim (Olson, 2000; Stroh, 1999). It is time for teachers to critically examine the phenomenon of **instructional technology** with a commitment to honestly relating the shortcomings and dangers, as well as the benefits. Decisions based on such examination have the potential to focus the use of computers in education more productively (Bromley, 1998). Areas for consideration include an emphasis on teacher and learner needs, rather than computer system needs, an awareness of environmental consequences of our computer technology habits, and an acknowledgement of the economic factors that drive many of the choices being made today in the educational technology realm.

Analyzing these areas with a keen eye for disparities and inequities and then translating these discoveries into catalysts for action begins to foster an atmosphere of dedication to the process of education, rather than a commitment to increased technology, regardless of consequence. Such work is not easily accomplished and requires a willingness to sometimes question the authorities spreading more propaganda concerning the use of computers in the classroom, than productive advice. To embark upon such a task is pursuing instructional technology with integrity.

There is evidence to suggest that American educational institutions have rushed to include computer applications in their curriculum too quickly, with little evidence to demonstrate that these applications will provide more benefits than drawbacks. We have launched a huge national experiment that in years to come may prove to have been detrimental at many levels, including placing children at risk (Cordes & Miller, 2000). Teachers must take a stand and be vocal about what computers do well in their classrooms, and what they cannot do (Fabos & Young, 1999). Realistically evaluating these functions allows for a more balanced role of technology in the classroom.

Needs of Teachers and Students

Firstly, focusing on teacher and learner needs must be paramount, as technological "solutions" are made available to classrooms. Cuban (Cuban, 1986) examined the use of various technologies offered to classroom teachers since 1920. Historically, technologies such as the motion picture, radio, and television have been heralded by those outside the classroom as being "the answer" to improving the curriculum and transforming the schools. Once the technologies were placed in the schools and promised outcomes did not materialize, teachers were traditionally blamed for resisting the newest educational technology and attacked for not implementing the technology effectively. Cuban offers an alternative to this typical interpretation.

Teachers commit to working in an environment that is filled with complex expectations and multiple restrictions. Over the years, teachers have developed various strategies that effectively allow them to navigate through this environment and accomplish their work - teaching students. Teachers, for the most part, are astute and very capable people who will adjust and adapt outside intrusions to meet their needs and the needs of their students. In his argument, Cuban affirms a belief in the trustworthiness of the teaching profession. If instructional technologies are truly going to improve teaching and learning, then the best process for achieving this improvement will involve harnessing the expertise and the energies of those who are in the classrooms. Their knowledge and skills need to be respected and acknowledged.

Currently, most software is developed and produced with little or no input from classroom teachers. Why is it surprising that much of this software, once purchased, collects dust on classroom shelves? Perhaps if software developers more actively sought to involve teachers in product design and construction, and pursued innovative ways to recruit and compensate these experts, educational software would become a more integral component of classroom instruction.

Teachers can provide additional insights as to how computers in the classroom honestly help or hinder the work of teaching and learning. While dedicated "technophiles" bemoan the use of computer applications in the classroom that provide practice or review of skills introduced in the curriculum, dismissing them as "kill and drill", classroom teachers value some of these programs. Teachers know that students need practice and repetition over quite a long period of time to master certain skills or content, and using the computers to accomplish this, sometimes, mundane necessity is quite helpful. Rather than mocking educators as "out of touch" or "short-sighted", proponents of informational technologies in schools should cultivate an attitude of understanding and respect in this area.

Many advocates of computer-based education claim that students benefit from this method of instruction by experiencing a greater comprehension of the material being taught. The success of American classrooms has traditionally been measured by standardized tests, so linking technology to increased test scores is an attractive assertion. A multitude of research studies exists to demonstrate technology's positive effects on achievement (Fabry & Higgs, 1997). Many of these studies are quantitative in nature, operating with both a control group and an experimental group and comparing the educational results through the use of pre- and post-tests. Control groups received instruction through more "traditional" teaching methods (i.e. lecture, textbooks, worksheets), while the experimental groups participated in computer-based instruction. Meta-analyses, consolidating the results of hundreds of these studies, revealed that the average student in the experimental group performed about .3 standard deviations better than the average person in the control group.

Though the amount of research demonstrating technology's ability to increase student achievement seems compelling, a closer look reveals cause for skepticism. Most of these studies have been short-term and have focused on drill and practice applications. The issues of higher-order thinking skills and influences other than the technology specifically were not addressed. Dillon and Gabbard (1998) report that, after reviewing quantitative studies of hypermedia technology applications, the results were inconclusive. While the use of technology to teach various skills did not cause a decrease in student achievement, most achievement levels were similar to those in the control group (Dillon & Gabbard, 1998). To date, research does not conclusively demonstrate that introducing technology into the classroom environment will measurably impact student achievement and those who are championing the cause of instructional technologies must take care to not overstate the abilities of computer applications to impact this area.

Some longitudinal studies have been done which suggest that improved learning occurs when teachers and students have access to computers *whenever needed.* The Computers Helping Instruction and Learning Development (CHILD) research done in Florida from 1987 until 1992 revealed statistically significant changes in standardized test scores for all participating grades and schools. The Apple Classrooms of Tomorrow (ACOT) project, from 1985 until 1993, also demonstrated that technology significantly increases the potential for learning (Fabry & Higgs, 1997). However, though both of these studies spanned several years, they also contained elements that could account for the student achievement results, other than computer access. Monies spent to train teachers and provide additional guidance and support in the classrooms, as well as the interest and excitement generated by the addition of so much new equipment into the educational settings of these students, were influences not directly addressed in the research.

Other advocates point to the motivational characteristics of computers in schools. In a review of the Buddy System Project, teachers, students, and parents reported that the computers placed in the students' homes as a component of the project motivated the children to do homework. "The computers are fun and the children not only don't mind, but often enjoy doing homework." (Duffy & McMahon, 1992)

The excitement of being allowed to do something apart from the normal school routine, such as work on the computer, can be very motivational for students. The use of multimedia programs or presentations can increase attention and students report that they are more attentive to classroom presentations that incorporate these elements (Yaverbaum, Kulkarni, & Wood, 1997). Using a computer is heralded as a favorite activity of students (Cummins & Sayers, 1995) and teachers are eager to tap into their students' natural interest in technology (Quesada, 1996). The motivational qualities of multimedia make it the instructional material of choice in many classrooms (Roblyer, Dozier-Henry, & Burnette, 1996).

While the motivational characteristics of technology use are important to educators, we need to consider the appropriateness of the computer being used as a reward for students, a type of recreational or diversional unit. Is this the proper use of technology in educational settings? Also, will computer use still prompt excited reactions among students once the novelty of the technology begins to fade? Experts in the realm of instructional technologies need to openly admit that the motivational characteristics of computer use have been a curiosity since the 1960's. Early studies by the military in using computers to train personnel noted that automated instruction could elicit "sustained performance from students with little independent motivation for the particular task posed". (Noble, 1991, p. 124) It is clear that the computer can be a powerful medium for capturing the attention of students, but this characteristic alone can be as dangerous as it is beneficial. To truly promote the use of instructional technology in an honest way, we must be willing to caution teachers to not always equate student interest in the computer with an improvement in instruction.

Since schools are expected to increase the amount of information available to and understood by students, it is not surprising that technologies that promise to deliver a broader base of available information would be attractive to schools. Public school libraries have been renamed "media centers" and card catalogs have been replaced by databases. The fastest growing budget in the list of school technology expenditures is telecommunications, increasing thirty-three percent in the 1997/1998 school year to $266 million (Felix, 1999). Interest in assuring that students and teachers have access to the legion of informational resources available through internet connections is high among government, business, and community leaders. Thirty-five percent of our schools had some sort of Internet access in 1994, growing to ninety percent by 1998 (Becker, 1999).

Statistics continue to provide evidence of continued additions of hardware and software to U.S. classrooms, but "an account of technology in terms of circuits and processors alone is sorely lacking" (Garner & Gillingham, 1996). A closer look at the distribution of Internet resources in schools reveals grave disparities. American school districts in affluent areas with a high tax base also are equipped with high-speed modems and the newest computers. Most inner-city and rural districts are not so fortunate. Even with additional government grant monies and the recently added "E-rate" provisions, most poor and minority populations in the United States had no internet access in their classrooms in 1999 (Burns, 2000). In order to pursue informational technology with integrity we must admit the disparities that exist in our nation and around the world when the issues of access are considered.

Finally, it is hard to argue against giving students access to more information relevant to their interests or the curriculum they are expected to master. Educators committed to promoting the process of inquiry welcome resources for students to explore. However, unlimited access to everything available on the World Wide Web is another unrealistic vision for our schools. Providing access to multiple sources of information without screening inappropriate material or guiding students' evaluative processes to determine what information is useful or applicable to specific areas of study, is counterproductive. Very little empirical evidence exists linking Internet access to student learning and researchers are being asked to help fill the gap in this area. Again, accessing information alone, may not be a sufficient reason for investing in educational technology.

Besides the interest in increased achievement, motivation, and information accessibility, computers in the classroom are being promoted as tools of collaboration and communication with those beyond the walls of the school building. Students and teachers are being encouraged to exchange ideas, work on projects and develop relationships with those who are accessible through the technologies of email and the internet. Barab and Duffy (1998) discuss the benefits of developing these "communities of practice" and cite several examples of schools demonstrating this type of development.

Judi Harris (Harris, 1998) has devised a category structure based on the kinds of classroom activities which utilize telecollaboration. She outlines three broad areas of telecommunications activities which she entitles **interpersonal exchange**, and **information collection and analysis** and **problem solving**. Within these broad categories she groups eighteen types of activities used by teachers and students to incorporate internet resources into the classroom curriculum.

The National Geographic Kids Network is a telecommunications project that involves students in geographically dispersed classrooms working through real research processes in their communities and sharing their results over the network. Scientists review the data collected and organized by the teams of students, and participate in the conversations over the network by giving their interpretation of the data. This program is only one example of the type of communication and community of practice that can be nurtured through the use of technologies in the classroom.

However, teachers must also help students recognize the limitations of telecommunications. Much of what happens over the networks is a metaphor – we chat without speaking, smile without grinning, and hug without touching. While e-mail does have conversational qualities, it also possesses limitations, and those limitations are magnified when communicating with people from different cultural backgrounds. It is interesting to note that, even after months of online communications between the students of Joliet, Illinois and Tununak, Alaska, the Joliet students still held stereotypes about the Eskimo children, which were shaken loose only after viewing video tapes of the Yup'ik (Fabos & Young, 1999).

While computers offer a valuable way for students to share their ideas and thoughts with others, a few drawbacks should be considered. Communication is necessarily limited to those who are economically advantaged enough to possess the technologies required to make the exchange possible. Postal services and telephones are available to a greater percentage of potential collaborators, and some projects may be limited, if only those with internet access are included. Also, not everyone willing to collaborate may be capable of offering valuable feedback to the project at hand. Care must be taken to monitor projects to insure productive and meaningful work.

If those of us who are convinced of the value of using computers in the classroom can communicate with teachers in a respectful manner, freely admitting that the use of instructional technology has limitations, we might be able to begin to develop productive collaborative efforts. Efforts that help instructional technologies to become a more vital, rather than peripheral, part of the classroom work of teaching and learning. Focusing on the needs of teachers and students can help to accomplish this goal.

In order to be advocates of computers in the classroom from an ethical perspective, we need to admit that computers cannot meet all the needs of students. In fact, it is possible that channeling so much money into placing computer hardware and software and Internet connections into classrooms is harming students, by depriving them of resources that they need far more. Money invested in nutrition programs, health care, high-quality childcare, and early childhood education for low-income families could perhaps yield better results in the area of academic success than placing more computers in a classroom. Students also need more opportunities and resources provided through the updating of the traditional school library, and expansion of art, music and foreign language curricula.

> Teachers, for example, continue to call for smaller class sizes so they can give their most challenging and disadvantaged students the personal attention they deserve. They ask for more human resources of all kinds – more aides and volunteer mentors, more tutors in reading and other subjects, more social workers and counselors, to help meet children's emotional and remedial needs. (Cordes & Miller, 2000, p. 87)

Attempting to keep instructional technology in perspective will help us to support teachers and students more effectively.

Environmental Consequences

Considering the environmental consequences of the choices we make concerning educational technologies is also necessary. A constant upgrading of hardware leaves countless "outdated" machines filling up landfills across the country. Is it possible that the needs of the classroom can be met with computers that don't always have the fastest processor and maximum memory? Or can more pressure be placed on manufacturers to produce units that can be upgraded internally, eliminating the cost and waste of replacing hardware in 2 or 3 years? A sensitivity to the tax base that is supporting public education, also would demand that we evaluate the monies spent in this area.

It is impossible to purchase a new computer or piece of software without an updated, better, faster, more powerful, more versatile product not just about to be marketed. Our ability to continually produce these improved high-tech products may be overpowering our ability to discriminate what is truly needed in the classroom, and how the constant practice of upgrading can sabotage instruction, as well as the environment. I faced an example of this dilemma in my own teaching last year.

Being an elementary music teacher at an inner-city school, I have limited financial resources available for equipment purchases. When the computer monitor on one of my classroom machines went out, the corporation technology staff suggested I go "slumming" and look over the equipment that had been discarded by other teachers. I was told that most of this hardware still worked, it had just been replaced by newer equipment and schools didn't have space for all of it. I was directed to the "basement" of one of the corporation's larger elementary schools, a building that was originally designed as a junior high school. I entered what was fondly labeled "the dungeon, a huge open area underneath the building, complete with a dirt floor. As I wandered through the piles of outcast pieces which included stacks of chairs, tables, chalkboards and even a piano, I spotted a mountain of computer equipment in one portion of the area. I began to crawl over the piles of computer monitors, printers, and CPU's, hoping to find something that I could use. Taking advantage of a nearby electrical outlet, I began testing the units and found many to be in working condition. I was really enjoying "the hunt" until I lost my footing in the mass of technology and was nearly caught in the avalanche that ensued. Realizing that being alone down in this huge mound of equipment was probably not safe for me, I left quickly, without finding the monitor I desperately needed.

On the drive back to school, I began to reflect on what I had seen...stacks of computer equipment, some in disrepair and some not, waiting to be eventually transported to the land fill. If this was a sample of what is happening in our schools, as well as our homes and offices, as we continue to purchase new machines year after year, will we soon be living on top of such mountains? Is upgrading our system to provide more power and memory really worth the expense of creating such waste?

If we are able to continually manufacture these more powerful machines, can't we figure out a way to use existing units and just replace processors and memory cards to improve their performance, without constantly acquiring completely new units? In schools especially, where tax dollars are supporting the operating budget, wouldn't it be more ethical to try to make computer units last as long as possible, considering the needs of the classroom? Isn't it possible that the applications teachers and students find most useful don't always need the fastest processor speeds available or the maximum memory (Bromley, 1998)?

It's very possible that we undermine teachers' abilities to experience optimal success in using computers in the classroom by constantly upgrading. Teachers have tremendous demands placed on their time and energy, and working with a certain operating system or application may require years of use before a comfort level is reached and real curriculum integration achieved. Changing the hardware and purchasing upgraded versions of software every year or two may serve only to keep teachers feeling uncomfortable and ill-prepared to use these resources. As advocates for instructional technology, we need to concede that the newest "tech-toy" on the market is not always going to be of great advantage in the classroom.

Education or Ecomomics?

Finally, considering the classroom environment over the corporate world is crucial if instructional technology is to be implemented with integrity. A strong interest in preparing students for the work force of the future drives one segment of the educational technology proponents. Business owners want students to learn the skills necessary to function in their job markets. They believe that placing computers in the classrooms will encourage the development of these skills (Jamison, 1992).

This concern with training students to meet the economic needs of the business community reflects the social efficiency model developed by Kliebard (Kliebard, 1995) in his writings on the American curriculum. For nearly one hundred years a segment of the American populace has advocated that the public schools train students to efficiently join the working world with practical skills. Vocational education programs are now being reconstructed into "tech prep" programs in high schools across the United States in order to satisfy this demand. "Computer literacy" is a term that is tossed about in this dialogue, though a clear definition of what is meant by the phrase is difficult to articulate.

Students who are adept at manipulating digital information through the use of a computer are a valuable commodity in the job market. Corporations are eager to contribute computer hardware to school systems when they believe that they will receive a substantial return on their investment. Those in the business of producing and marketing computer hardware and software have a vested interest in the use of technologies in the schools, profiting most from the growing budgets for computer equipment in education.

Though training students to use computers to prepare them for the adult working world is a strongly supported rationale in the American culture, educators must evaluate their goals in the classroom and the overall context of their curriculum in order to decide what needs to be taught. Jonathan Kozol (Kozol, 2000) discusses the dangers inherent in a mindset that views young people as our future workforce. Spending time and money in the schools to produce students who possess computer skills alone is unrealistic and dangerous.

Especially at the elementary school level, it is difficult to argue that students really need to be able to effectively use the office applications of the workplace today. Technology is changing at such a rapid pace that it is ludicrous to believe that constructing a PowerPoint presentation in the third grade is somehow going to prepare students for the working world of tomorrow. Yet teachers, parents, and school board members are being lured by the business world to see such activities as exciting and highly desirable. Just the image of a child sitting at a computer seems to provide adults with the false sense that something wonderfully educational is happening, and those in the business of selling technologies are taking full advantage of this phenomenon.

Hardware, software, networking, and telecommunication companies have gotten directly involved in financing and/or taking leadership roles in groups like the Consortium for School networking, TECH CORPS, and the CEO Forum on Education and Technology. The press frequently quotes such organizations without mentioning their close links to companies with a financial interest in high-tech schools (Cordes & Miller, 2000). Before taking the advice of these groups on how to transform education through the use of powerful technologies, we need to acknowledge that their opinions are heavily based on their hopes for increasing corporate profits.

Even government commissions are susceptible to the propaganda espoused by corporate America. For example, the Web-based Education Commission, established by Congress, has conducted hearings at the headquarters of Sun Microsystems in Silicon valley. At the hearing, the commission heard testimony from Sun's vice-president, Kim Jones who testified, "There may be only a handful of, say, third-grade math courses that are the best in the world. A robust network that links schools and students to those courses ensures that any third-grader anywhere can benefit from the best course, no matter where it originates. This is why Congress must invest not only in such a network, but also in the best educational content." (Jones, 2000) Is Congress also considering the dismal track record of the last 30 years of computers in education?

The business of distance learning is booming across the country, not because all universities have embraced the great educational benefits of such programs, but because distance learning offers revenue potential previously untapped. Again, this is a national experiment that has yet to demonstrate effectiveness in producing well-educated citizenry. Are educators being duped into believing that their "business partners" are truly interested in the development of well-educated minds, or do we see the "dollar signs" in the eyes of those who view schools as customers who will keep paying for the products they develop?

Conclusion

Teachers who want to use information technology with integrity must come to grips with these issues and push to create learning environments with technology that genuinely meet the needs of their students, while protecting the environment and frugally making use of the tax dollars being spent in the classroom. Those in the business world must be influenced to tailor their products and services to better match school needs and goals. We must be honest about what computers in classrooms can do and what they can't. We must demonstrate courage in openly acknowledging the disparities that exist between what we envision and what currently is happening. If we can discuss the weaknesses and dangers of computer use in schools, as well as the benefits, then we are on a better path. When these practices become the norm, instructional technology will function with integrity.

References

Becker, H. J. (1999). Internet Use by Teachers: Conditions of PRofessional Use and Teacher-Directed Student Use (Teaching, Learning, and COmputing: 1998 National Survey 1). Irvine, CA: University of California, Irvine

Rniversity of Minnesota.

Bromley, H. (1998). How to tell if you really need the latest technology. Thought & Action, 14(1), 21-28.

Burns, S. (2000, Tuesday, April 25, 2000). Equal Access to Technology? A Comparison of Public and Private Schools.

Cordes, C., & Miller, E. (2000). Fool's Gold: A Critical Look at Computers in Childhood . Spring Valley, NY: Alliance for Childhood.

Cuban, L. (1986). Teacher and machines: The classroom use of technology since 1920. New York: Teachers College Press.

Cummins, J., & Sayers, D. (1995). Brave New Schools: Challenging Cultural Illiteracy through Global Learning Networks. New York: St. Martins' Press.

Dillon, A., & Gabbard, R. (1998). Hypermedia as an Educational Technology: A Review of the Quantitative Research literature on Learner Comprehension, Control, and Style. Review of Educational Research, 68(3), 322-349.

Duffy, T., & McMahon, T. (1992). The Buddy System Project . Bloomington, Indiana: Indiana University.

Fabos, B., & Young, M. D. (1999). Telecommunication in the Classroom: Rhetoric versus reality. Review of Educational Research, 69(3), 217-259.

Fabry, D. L., & Higgs, J. R. (1997). Barriers to the Effective use of Technology in Education: Current Status. Journal of Educational Computing Research, 17(4), 385-395.

Felix, K. (1999). NewsWatch. Multimedia Schools, 6(1), 80.

Garner, R., & Gillingham, M. G. (1996). Internet Communication in Six Classrooms: Conversations Across Time, Space, and Culture. Mahwah, New Jersey: Lawrence Erlbaum Associates, Publishers.

Harris, J. (1998). Curriculum-Based Telecollaboration. Learning and Leading with Technology, 26(1), 6-15.

Jamison, P. K. (1992). Adopting a Critical Stance Towards Technology and Education: THe Possiblility for Liberatory Technology in an Information Technology Age. , Indiana University, Bloomington, IN.

Jones, K. (2000). Sun Microsystems VP Calls on Congress to Invest in Network Infrastructure (Press Release). Palo Alto, CA: Sun Microsystems.

Kliebard, H. M. (1995). The Struggle for the American Curriculum. (Second ed.). London: Routledge.

Kozol, J. (2000). Ordinary Resurrections. New York: Crown Publishers.

Noble, D. (1991). The Classroom Arsenal: Military Research, Information Technology, and Public Education. London: The Falmer Press.

Olson, J. (2000). Trojan horse or teacher's pet? computers and the culture of the school. Journal of Curriculum Studies, 32(1), 1-8.

Quesada, A. (1996). Global Education in a Connected World. Technology and Learning, 17(1), 24-28.

Roblyer, M. D., Dozier-Henry, O., & Burnette, A. P. (1996). Technology and Multicultural Education: The 'Uneasy Alliance'. Educational Technology, 36(3), 5-12.

Stroh, E. A. W. (1999). Teachers' Concerns about Technology as a Classroom Innovation (pp. 111). Terre Haute, IN: Indiana State University.

Yaverbaum, G. J., Kulkarni, M., & Wood, C. (1997). Multimedia Projection: An Exploratory Study of Student Perceptions Regarding Interest, Organization, and Clarity. Journal of Educational Multimedia and Hypermedia, 6(2), 139-153.

Designing Tasks for Networked Technologies using Intentional Acts

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Abstract: Teachers all over are finding that designing tasks for networked technologies requires more than setting up a web-server with class schedules, a few links to related materials, e-mail, discussion areas and so on. All too often on-line-materials are not read, on-line-discussions die out and teacher-mailboxes remain empty.
What is happening, when no mails to the teacher arrive? When a conference dies? When a carefully prepared volume of on-line-papers is not applied to the student-task at hand?
We need a better way to model/understand/connect the various elements of the on-line learning experience to understand these failures in more detail.
The theoretical framework described in this paper greatly expand the analytic understanding of student-student and student-teacher interaction in the educational context to allow for a better founded planning of these when designing online courses or course-support.
From this outset a number of specific teaching situations using networked technologies are analyzed in order to show the depth and breath of the frameworks capabilities.

Introduction

Teachers all over are finding that integrating networked technologies into the educational setting requires more than setting up a web-server with class schedules, a few links to related materials, e-mail and discussion areas - All too often on-line-materials aren't read, on-line-discussions die out and teacher-mailboxes remain empty. What is happening, when no mails to the teacher arrive, when a conference dies, when a carefully prepared volume of on-line-papers aren't applied to the student-task at hand? We need a better way to model/understand/connect the various elements of the on-line learning experience to understand these failures in more detail.
This article explores a pragmatic linguistic approach to understanding how communicative failures can lead to such breakdowns and how to avoid such failures in the design of electronically mediated communications in the teaching situation. By combining Bordewijk and van Kaam's theory of modes of interactivity (Bordewijk & van Kaam, 1986) with an adaptation of Ole Togeby's theory of communicative events (Togeby 1993), the constitutive rules governing the success of communicative events can be used to formulate the success-criteria, which must be met in order to turn an intention to interact into an interaction. Incidentally this leads to a much more general model of interactivity, since communicative events can be affected by anyone with access (students, teachers, third parties), thus opening up the field to a plethora of socio-institutional relationships other than the 'traditional' teacher-as-center-student-as-periphery-relationship.

Assumptions

Three assumptions or claims underlie the proposed framework:

1. All interactions starts with an <u>act</u>, which, importantly, is the only thing, the one intending to interact has any control over (Sperber & Wilson, 1986)
2. Due to the opacity of computer-mediated communications most if not all acts through networked media can be considered intentional and purposeful communicative events
3. Technology assisted/delivered courses can be viewed as being comprised of series of sequences of communicative events, which only retrospectively can be seen as a series of interactions.

The interesting bit, from a linguistic viewpoint, is what happens 'in-between' he abovementioned events: What makes a communicative event successful in affecting interaction? How does one facilitate the turning of communicative events into the intended gainful **interactions**? To answer the question we need a usable taxonomy for communicative events as well as a taxonomy of interactivity in order to combine them into a theory of affecting interaction.

A Taxonomy of Interactivity

When dealing with communicative events, that are mediated through some electronic delivery channel or other, differentiating the interactions, that takes place by looking for different traffic patterns seems logical. Bordewijk & van Kaam (Bordewijk & van Kaam, 1986) arrive at such a taxonomy by posing two questions to Interactive Mass Media:

1. Who is the producer/owner of the content? The Center or the Consumer?
2. Who controls the delivery and use of the content? The Center or the Consumer?

Which, when placed in a matrix, yields the four basic modes of interactivity:

	Content owned (produced) by Center	*Content owned (produced) by Consumer*
Center controls choice of content and time	Transmission	Registration
Consumer controls choice of content and time	Consultation	Conversation

Both the explanatory power and weakness of this taxonomy lies in the fact that the power-relationship is built into the understanding from the outset. In today's networked interactive media, and particularly in the educational setting, problems arise with understanding who is fulfilling the role of Center and who the role of Consumer. Modern teaching methods casting the teacher as anything but a information-controlling center
In addition, the model makes no determination as to why and when a consumer might choose to view a transmission, supply information, consult the center and so on, and when he or she might choose to ignore the 'difference' made.

That is all somewhat well and good for Interactive Television, but not so good for Interactive networked media. Here success (meaning the event is received as intended and has the intended consequences) is not granted the initiator in the same 'easy' fashion as an information controlling and -disseminating center.

Interaction is what happens when personally initiated events has the intended consequences, not the acts in themselves; Bordewijk and van Kaam model is descriptive, simultaneous or (more often) after-the-fact, and what we need is a heuristic for creating tasks that are more likely to succeed in the electronic classroom. However, the four interactivity-modes identified still reflect different basic modes of availing information for perception and inference, and are, for the educational setting, quite all-encompassing, so it should be possible to analyze them to deductively reformulate the model in terms of sender(initiator)-intentional acts instead of in terms of content- and temporal control.

- Transmission
  To transmit something means the uninteruptable transfer of signs - The purpose of transmitting must then be to **inform** about some point about the state of affairs by means of availing the information in its entirety to the receiver before allowing any transmission-interrupting interactions to take place.
- Consultation
  To consult is basically to ask a question, again about the state of affairs, to some authoritative source. The purpose of consulting can then be said to be the whish to **apply** the sought for information to some problem or deliberation.
- Registration
  Registration is an inverse consultation, where the information sought doesn't concern the state of affairs (since the consumer isn't an authoritative source) but instead concerns the consumers personal attributes .e.g. views, opinions, knowledge, skills in order to **evaluate** the questioned attributes on some scale or other.
- Conversation
  Conversation is the free exchange of ideas, information, knowledge etc. between equals (consumers). Since we have already covered the intentions of informing, applying and evaluating, what remains in the domain of conversation, and that is not covered by the first three intentions, is the individual purpose of achieving a better understanding of ones own views, knowledge, feelings, etc by means of **reflecting** on what is known, thought, meant etc., against a peer intellect.

Thus, the four basic modes of Interaction can be shown to subsume four basic purposes/intentionalities with acting to attempt to initiate an interaction, by means of creating a communicative event for perception and inference by the receiver. The:

1. Informative
2. Applicative
3. Evaluative
4. Reflexive

Communicative events.

A Taxonomy of Communicative Events

Communicative events are what the actants produce to 'create a difference' in the environment of their intended receivers (Sperber & Wilson, 1986), thus, a text event is ... *not an object which can be recognized in physical or mental space, but a historical event in time.* (Togeby, 1993, p. 819). In Togeby's taxonomy of these events five outside contributing <u>factors</u> of the text-event are linked to their related <u>functions</u> by a <u>constitutive rule</u> for each function (Togeby, p. 819-845) in the following manner:

Function	**Constitutive Rule**	**Factor**
Expression	(must be) Sincere	(of) Sender (views and oppinions)
Use	(must be) Correct & Comprehensible	(in the chosen) Sign System
Contact	(must be) Regular & Fair	(through the) Channel
Information	(must be) Relevant	(to the) Receiver
Proposition	(must be) True	(about the) State of Affairs

I'll briefly explain the terms used to denote the factors and, where relevant touch upon their related functions and constitutive rules:

- Sender
  The **initiator** of the text-event. The initiator creates the difference in the intended receivers' environment for some purpose or other. It is the fulfillment of this purpose that is the intent with creating the difference, not the transferal of the informational content of the communication. For this intent to succeed, the **senders expression** must be regarded as **sincere**.
- Sign System
  The semantic and structural content of the text-event. This is the **code-level** of the taxonomy. For any message to succeed the **use** of the sign system must **be correct and comprehensible**. Meanings exist at the code level – Togeby's taxonomy is definitely not purely inferential, but 'the meaning' can only be unequivocally/unambiguously determined by looking at all the other factors present in the specific historic communicative-event.
- Channel
  The **social-institutional and technical arrangement**, the **channel**, that enables and constrains the contact to be made. That contact must be **regular** denotes that the relationship between sender and receiver must be well defined and be within societal-institutional norms. That contact must be **fair** denotes that no undue/unfair social-institutional demands or requirements may be placed on any of the communication partners through the arrangement. Note that regularity and fairness must be fulfilled both for the technical and the socio-institutional arrangements.
- Receiver
  Whom or what the text-event is intended for. Human decoding of text-events is not perceived as happening at a code-level only, but also at an inferential (often abductive) level at which the receiver infers the intention of the sender and selects the domain of optimal **relevance** (Sperber & Wilson, 1986).
- State of Affairs
  The **knowledge-domain** treated in the text-event. Determining the **truthfulness** of the proposition is a process involving not only knowledge within the domain, but also knowledge of that particular domains epistemology and (scientific) methods.

Merging the two Taxonomies

We now have both a taxonomy of text-events and a taxonomy of the accompanying purposes of initiating them. Integrating the two different optics can then derive the success-criteria; the constitutive rules in Togeby's taxonomy with the four base intentionalities derived from Bordewijk & van Kaam:

- Informatives
  Since the purpose is to inform a 'receiver' the foremost demand must be that of **relevance**, to that receiver, and secondly truthfulness/consistency in respect to the state of affairs.
- Applicatives
  With the intent of gaining a usable answer, the foremost concern when affecting applicatives must be to supply a correctly posed question to make a more success likely. Thus focus of attention becomes that of **correctly and understandably** using the sign system.
- Reflexives
  Here, the purpose is 'achieving a better understanding of ones own views, knowledge, feelings, etc by means of reflecting on what is known, thought, meant etc., against a peer intellect'. Thus, one must have the feeling of being in the presence of peers and for that feeling to present itself; the initiator must primarily ensure that the communicative event created is a **sincere** expression of his or her views etc.
- Evaluatives
  Much the same way as Reflexive-interactions, a certain level of trust is required for an Evaluative text-event to turn into an Evaluative interaction. However, here trust is established through a formal system since the trust is directed towards the institutions/initiators formal right to evaluate the receiver. Thus focus is foremost on the social-institutional arrangement, the Channel, so, for an evaluative communicative event to succeed it must be **regular and fair**.

A new matrix can now be proposed. Whereas Bordewijk and Van Kaam concentrates ownership and temporal control, we now instead ask **only the initiator**, why he or she attempts to affect the interaction. Is it to avail or to get something? And is that something declarative conceptual knowledge or is it the views, attitudes, understandings, etc. of a certain individual or entity?

A matrix of potential purposeful acts intended to affect interaction (foremost success-criteria parenthesized):

	Purpose is to avail	**Purpose is to get**
Declarative conceptual knowledge	Informative (Relevance)	Applicative (Correct use & understandability)
Views, attitudes, understandings, etc.	Reflexive (Sincerity)	Evaluative (Regularity & Fairness)

We now no longer have the problem of determining a center or periphery. The four types of acts can be undertaken by all actants present in the situation, and every act can be interpreted or misinterpreted freely by the receiving actants.

Designing Tasks using Intentional Acts

Coming all the way back to task-design we can now begin designing tasks by designing the communicative events intended to affect the undertaking of the task. With the proposed taxonomy of four different intentions with affecting a communicative event, we can uniquely fit each communicative event to the whole and thus create a learning experience that at least will fail in a document-able manner or will succeed and we will know why. The rest of the article therefore discuss a number of common task-elements in relation to the new taxonomy.

How to make Informative acts succeed

Where the other three concepts of the proposed taxonomy somewhat subsumes their own purposes an Informative act does not. We must always ask: **in relation to what**, the informative act should be relevant.

Informative acts are always the answer to (interaction with) some previous communicative act or setting the stage for something that comes after.
Examples of Informative acts, that sets the stage:

- If the Informative act is a lecture, it implicitly fulfils the need of the students to prepare for the upcoming exam, i.e. the informative act must be relevant in relation to preparing for the upcoming Evaluative act.
- If the Informative act sets the stage for some exercise of task, it must be relevant in relation to the implicit Applicative act of asking, "How do I do the exercise?"
- If the Informative act is followed by discussion, it must be relevant in relation to the upcoming Reflexive act of relating the knowledge presented to ones previous views, opinions, feelings etc.

Examples of informative acts, which are answers to previous acts:

- Interactions with Applicative acts
  - ⇒ The student signs up for an exercise by clicking a button on a web-page, thus interacting with a previous applicative act initiated by a teacher.
  - ⇒ The teacher answers a question using e-mail regarding a previous lecture, some administrative procedure, previous task etc., thus interacting with a previous applicative act initiated by a student.
  - ⇒ A student does the same thing as the teacher in the previous example, thus interacting with a previous applicative act initiated by another student
- Interactions with Evaluative acts
  - ⇒ A student fills out an online examination questionnaire, thus interacting with an Evaluative act initiated by the teacher
  - ⇒ A teacher answers a question regarding his teaching style or choice of content, thus interacting with an Evaluative act initiated by a student
- Interactions with Reflexive acts
  Most of the time, interactions with Reflexive acts will take the form of new reflexive acts, but sometimes it becomes necessary to 'short-circuit' or stop the discussion and put forth an Informative act to achieve that end.
  - ⇒ The teacher informs a student, that there is not enough time left to continue a discussion started by the student, thus interacting with a previous Reflexive act
  - ⇒ A student informs another student or the teacher, that he or she cannot participate any further because of other duties, thus interacting with someone's previous Reflexive act.

How to make Applicative acts succeed

I probably interpret Togeby's factor, 'the sign system', in a somewhat wider sense than anticipated by Togeby himself. My reasoning is that often the biggest problem with asking questions is not that there aren't things one isn't clear about, but that phrasing the question itself is too demanding of one's present capabilities.
The Applicative act, requiring correct and comprehensible use of the sign system, can in the educational context be analyzed to require of the 'sign-system-use', that the question posed must:

- correctly and understandably use the terms/concepts specific to the subject being taught
- correctly and understandably pose the question within the subject being taught's area of inquiry.
- correctly use the subject-being-taught's epistemology in the determination/description of the 'problem'

It seems obvious, that in order to pose 'good' questions the asker must have a good grasp of the sign systems concerning the 'state of affairs' that the course presents.
So, to ask questions 'correctly', one must have at least partially appropriated the specific concepts and concept-relationships of the domain - the correct and understandable use of the sign system in the specific domain.
In most teaching situations, Applicative acts are most often enacted by students asking questions of a practical nature to their teacher, but as this analysis shows, often are stumped because many questions cannot be phrased correctly at the time, where their answer has any usefulness. Understanding this brings focus to the demand on the teacher or 'availing institution or technology' of supporting the 'correct and comprehensible' asking of questions.

How to make Reflexive acts succeed

This mode of interactivity is often more difficult to achieve than the others due to the fact that affecting it puts the initiator a risk of being labeled or judged by peers and tutors. The competitiveness of many school environments naturally inhibits any personal display of preference or depth of knowledge.
The level of risk can often be coupled to the way a course is evaluated. In the Nordic countries we have a tradition for using oral examinations of a discursive nature, making the teachers opinion of ones 'standing' an important factor. In this situation, it can prove impossible to achieve a true state of Reflexive interactions – the students will rather attempt to say, what they think the teacher wants to hear.
For the Reflexive act to succeed it must be interpreted as sincere, but it is exactly the sincerity of the expression that gets to be questioned, when the institutional and/or social context, that the Reflexive acting out is taking place within, is not sincerely addressed in the initial Reflexive act!
Reflexive acts can then be encouraged along two dimensions:

- Controlling the audience
  - ⇒ Providing students with private and/or anonymous forums for having such discussions
  - ⇒ Dividing classes into smaller units, that can have private discussions (as in the point above), that maybe later is brought into plenum as a 'group-
- Controlling (or understanding) the potential consequences
  - ⇒ Addressing the problem directly to get discussions started
  - ⇒ Asking teams to discuss rather than individuals, thus 'smearing' responsibility across multiple persons
  - ⇒ Require participation as a part of the course-completion-demands

Not addressing these issues leads to insincere, and therefore failed Reflexive acts. Resolving the social and institutional barriers is a real challenge to educators today, since their resolution may entail concrete changes to the formal and cultural side of conducting a course, the way it is evaluated and the way it is taught.

How to make Evaluative acts succeed

In the examination-situation, ensuring that the Interaction takes place is most often not a problem, however, there are many situations, that are not exams, where Evaluative acts are in order. Self-evaluations are more and more becoming de rigeur, and can often prove useful for modifying a course to the level and whishes of the students taking the course.
For the educational setting we can explicate the general requirements of regularity and fairness:

- Constituting regularity
  - ⇒ Make obvious, that the answer is needed for a relevant task, e.g. giving a grade or modifying an upcoming lecture.
  - ⇒ Assert, that the initiator has the necessary social standing and -relationship to be able to ask the question
- Constituting fairness
  - ⇒ Ascertain, that the answers sought are (or has had the chance to get) 'inside' the person or persons queried
  - ⇒ Ascertain, that the answers sought can be fully communicated through the used technical arrangement (technical side of the channel)
    In technologically mediated situations, this can prove a real problem. E.g. where a model or prototype is required many a times it is much easier to build that in the real world.

Making sure, that regularity and fairness is communicated properly in the evaluative act can often be a good authors tool in determining whether one really knows, what it is one whishes to know about; what the purpose of requesting the input is.

References

Bordewijk, J. L. & van Kaam, B. (1986). Towards a new classification of Tele-Information services. *Intermedia*, 14 (1).
Goodyear, P. (1997). The ergonomics of learning environments: learner-managed learning and new technology, in *Creacion de materiales para la innovacion educativa con nuevas tecnologias*, Instituto de Ciencias de la Educacion, Universidad de Malaga, Malaga, 7-17
Sperber, Dan, and Dierdre Wilson (1986): *Relevance: Communication and Cognition*. Basil Blackwell.
Togeby, Ole (1993). *Praxt: Pragmatisk tekstteori. Vols. 1-2.* Aarhus Universitetsforlag

Historical Perspectives on Teachers, Technology, and American Public Education

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Abstract: New technology is one of the most frequently named components in, or rationales for, school reform. Many of the hopes expressed today for educational technology sound reasonable and desirable, but history suggests that integrating technology into classroom practice is a very complex process, profoundly affected by trends in educational policy, curriculum theory, and pedagogy. This paper points out some of the common themes that run through the history of educational technology, with particular attention given to overlaps with trends in educational policy and theories about curriculum, teaching, and learning.

Introduction

It has been a characteristically American response to new media to see them as reasons for changing schools, and to hope that their introduction into classrooms will revitalize education in one way or another. Hopes for the educational potential of new technologies abounded throughout the twentieth century, and continue to dominate policy talk. Film was so vast in "its possibilities for the instruction . . . of humanity that did it not already exist we should, if we possessed enough imagination, pray for its invention" (Forman, 1935, p. 1); once fully understood, films would, "no doubt, be considered as necessary a part of school equipment as are textbooks, maps, charts, and blackboards" (Ellis & Thornborough, 1923, p. vi). Radio was predicted to raise the human mind "to an entirely new level of precision and efficiency" (Darrow, 1932, p. ix). Television was hailed as "the power tool
"the greatest vital force in modern education" (Long, 1952, p. 417). Computer-assisted instruction would "march relentlessly into our instructional lives" (Goodlad, 1968, p. 7). Each of these media was embraced by many education reformers of its day, and argued to be compatible with then-current ideas about pedagogy, curriculum, and the purposes and priorities of schooling. And yet, despite some very high hopes about the potential uses of these media in schools, they rarely saw extensive use in typical classrooms.

A common response to this troubling history is to claim that today's computers will be differently received by schools, because they occupy a different role in social life than did those earlier technologies. There is some truth in that claim; however, one of the common themes running through the history of twentieth century educational technologies is that some difference in the new technology is *always* named as the reason why the new one will succeed where the older one failed. Mere difference is not enough to ensure different outcomes.

The differences in these various attempts to bring new communication technologies into the school environment are in the details—for example, in the particular social problem people hoped to solve by using a new technology in schools—<u>not</u> in the basic, underlying assumptions—for example, that social problems can be addressed by using technology in schools. We need to be more consciously aware of the assumptions being made today about technology and education, so that we can think harder about their validity and usefulness. A good place to start—and, it sometimes seems, a rare one—is in the past, where we are not quite so emotionally invested in what people were thinking and doing, and are therefore more likely to be able to establish some critical distance. From there, with any luck, we can apply our newly honed skills in critical distance to the present, along with some different ideas against which we can compare our own. What's more, we come back to the present with a better understanding of where our ideas came from, what circumstances brought them into being in the first place, and how they have changed over time.

The story of educational technology must be more thoroughly and deliberately intertwined with other aspects of school reform if the repeated attempts to transform schools with technology are to be more adequately understood. That is, what happens to new media in schools is—and has always been—mediated by theories of curriculum and pedagogy, prevailing beliefs about the purposes of schooling, and the relationship between technology and the work of teachers. For example, educational film and radio were closely tied to the child-centered progressive movements of the time. These media were advocated for their appeal to multiple senses, for their capacity to arouse students' interest, and to connect children to the world outside the classroom—all hallmarks of child-centered progressivism. At the same time, some of the social efficiency reformers of the time also advocated the use of these media, believing that children would learn more quickly and efficiently through film and radio than through conventional instruction.

Similarly, instructional television was tightly bound up in educational policy of postwar America. After World War II, American public schools suffered from intense overcrowding and a severe teacher shortage. Instructional television was developed, in large part, with the aim of spreading out the teaching force by providing mass instruction by master television teachers. The idea was that television-taught classes could be much bigger than conventional classes, and would only require a teacher's aide for supervision. Furthermore, television lessons could make up for the inadequacies of underqualified teachers.

Other aspects of postwar educational policy were related to the development of teaching machines and computer-assisted instruction. As the Cold War intensified, Americans became increasingly concerned that their public schools were inferior to the schools of the Soviet Union. In particular, there was great anxiety that American instruction in math, science, and foreign languages was inadequate. There had been a great deal of military research during World War II on the use of various audio-visual devices for training, which brought together audio-visual educators and psychologists. In the 1950s, behaviorism, and the teaching machines that went with it, were popularized, where the material to be learned was broken down into its smallest components and "dispensed" to the learner. Also popularized in this period was the "systems approach" to education, another inheritance from military research and practice, which involved conceiving of the learner as part of a human-machine system, where each was to be adapted to the other to streamline training. Computer-assisted instruction was developed in the context of these efforts to make learning efficient and failsafe.

Some of the more recent modifications to computer-assisted instruction are a product of further psychological research and the development of information-processing models of human cognition. For example, computer simulations arose largely out of an interest in modeling the workings of the human mind and, in turn, using those models to shape human learning. Much of the current "constructivist" focus of educational technology arose out of these developments.

Hopes to improve American public education though the use of new technology need to be informed by the historical context in which those hopes are embedded. In the process, we can develop a more sophisticated sense of how to integrate new technologies into schools, and a better understanding of the factors that can work so powerfully against such integration.

References

Conrad, L. H. (1954, March). Schools can start using tv now. Educational Leadership, 11(6), 373-375.

Darrow, B. H. (1932). Radio: The assistant teacher. Columbus, OH: R. G. Adams & Company.

Ellis, D. C., & Thornborough, L. (1923). Motion pictures in education: A practical handbook for users of visual aids. New York: Thomas Y. Crowell Company.

Forman, H. J. (1935). Our movie made children. New York: The Macmillan Company.

Goodlad, J. I. (Spring 1968). The future of learning and teaching. Audio-Visual Communication Review, 16 (1), 5-15.

Long, M. S. (1952, April). Television has a part in modern education. Educational Leadership, 9(7), 412-417.

Applications of Knowledge Based Evaluation in Educational Technology.

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Abstract: In an emerging system, one of the primary functions of the founders should be to explore acceptable justification systems. Consider, for example, intuition, logic, or causality. In doing this, it is helpful to recognize that each choice of systems—even if only made on a temporary basis—will have significant impacts on which true items may be proven and which false items may be disproved. When this is done a case is easily made that a meaningful evaluation is possible with only a shared justification system present. Items of truth and belief, although of extreme interest to the parties of most evaluations, are shown to be irrelevant to the advancement of knowledge that may come about as a result of the evaluation itself.

Introduction

I use the term Knowledge Based Evaluation to refer to a conceptual framework that arises when one uses an epistemic perspective to examine the dynamics of performing an evaluation within an emerging, or ill-structured, domain. A full description of this framework is beyond the scope of this paper, but may be found in a future volume of the Journal for Technology and Teacher Education[1].

As was suggested in the abstract, one of the primary functions of the founders in an emerging discipline should be to explore and legitimize various acceptable justification systems for use within the emerging discipline. This does more then just legitimize a research paradigm, at a foundational level it serves to frame the broader parameters of what knowledge may and may not be found within the discipline and how such knowledge claims are to be contextualized.

Application

Within an epistemic tradition knowledge has often been expressed by the rather formal relationship K=JTB. In this expression K refers to Knowledge, J to justification system, T for truth, and B for beliefs. These are all to be thought of in the perfect idealized form. In actual applications we are not dealing with abstracted perfection, however, but rather with a localized and specific area of inquiry. I will use the lower case *k=jtb* to refer to this contextualized set of features.

Thus in an actual evaluation, from the perfect set of all knowledge, K, a subset, *k*, would be selected to for the basis for creating areas of evaluation. Although not previously noted, *k* is also contextualized by the institutional constraints of the target audience, as influenced by the evaluators. This points to the need for an extensive period of development between all parties to the evaluation to develop a mutually meaningful *k*. Thus, expectancy management is not only important for the nature of the deliverables, but also to set up the epistemic foundation and philosophical arena within which the evaluation will function.

Once a shared understanding of what is to be measured is determined, this item of measurement is the *k*-knowledge item, which may then be explored and measured by examinations of the systems of justification accepted – *j*, the truths shared by the parties to the evaluation - *t*, and the beliefs expressed - *b*. Each *k* needs to be justified by the holder or knower of that *k*, using a *j*-system of justification appropriate for the system at hand. This *j* is comprised of the acceptable methods of defense for the domain from which the *k* was drawn. This *j* should be the subject of significant debate, particularly in the case of emerging systems, or ill-defined realms of inquiry such as technology and teacher education.

Within education, for example, two paradigms—each with their respective *j's*—might be classified as qualitative and quantitative research methodologies. Should these be blended in evaluation, great care must be taken to ensure the developing *j's* reflect the *k* under consideration. This often creates situations within which selected items of knowledge are intuitively obvious, yet must be classified as an unknowable *k* within *j*—the acceptable system of proof. A poignant example currently exists in education in the struggle with paradigms concerning which *j's* will be accepted and institutionalized. Such struggles are characteristic of an emerging discipline, but distract from the nature of what specifically the systems should be able to measure. It would make more sense to first decide the true nature of *k* and the select an appropriate *j* for the task at hand for each study.

In an emerging discipline, such as educational technology, there may not be a well-established and institutionalized method of justification for *k* claims. In mathematics, on the other hand, there are well-established systems of proof that are acceptable within that discipline. This has an impact on the nature of the knowledge claims that can be made. Clearly justification systems, once accepted and privileged within any system, determine not only what a good defense should look like, but also what a knowable item is and under what circumstances knowledge advancement may be claimed.

Apart from the advancement of knowledge within a field, this has a direct implication on the evaluation in progress. If an element (i.e., an individual, system, institution, or whatever can make appropriate use of the accepted *j*) is under evaluation, then that fact itself can be an item for evaluation. When that is done, the following are examples of the type of inquiry that this conceptualization might generate:

- How well does the *j* used by the element correspond to the *j* accepted by the system performing the evaluation?
- How well is the *j* used by the element implemented by that element?
- From the potential *j* available, was the element able to select one appropriate to the problem under investigation?
- From the potential *j* available, was the element able to select one that was acceptable to the field?

It should be noted that whether the *k* is true or false, knowledge could still advance within the system. The state of knowledge advancement is only determined by the selection of an appropriate *j*. The selection of *k*, that is the form of knowledge to be evaluated, is critical to guide subsequent evaluations. Its own universal truthfulness, however, is not itself subject to universal verification. All that is required is that it is acceptable as a *k*—a knowable item within the field or audience conducting the evaluation.

Although there is not room to develop this argument here, it is sometimes the case that at one level, even the localized *t* becomes unimportant to the evaluation. Thus, a *k* can be held to be universally true or false for all of the potential knowers who are members of the discipline conducting the evaluation. Indeed, the system of justification can be independent of the truthfulness of the *k*. An item may or may not be *t*—true at the individual or institutional level, but this decision is independent of the evaluation. Similarly, b—beliefs held by the institution or individual only impact the evaluation to the extent to which they are instantiated in the *j*—justification system in use by the individual or institution. Thus, when conducting an evaluation using this knowledge-based approach, we can express the "space" within which we are concerned by filling in the necessary assumptions and limitations.

An emerging field or discipline, such as teacher education and technology, defines itself by creating the linkages between *k* and *j*. It is through this mechanism that we define the forms of knowledge that will be known and knowable within the emerging field. It is also through this mechanism that we may discover what legitimate items of inquiry might look like.

References

Connell, M. L. (In Press). Knowedge Based Evaluation. Journal of Technology and Teacher Education.

Communal Constructivism:
Students constructing learning *for* as well as *with* others.

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Abstract

We believe there is a need for an expanded definition of social constructivism that takes into account the synergy between the more recent advances in information technology - which are increasing our potential for communication and the ability to store a variety of data types - and advances in virtual learning environments. In particular we are still at an early stage in trying to construct knowledge as to how to teach and learn effectively with ICTs. What we argue for is a communal constructivism where students and teachers are not simply engaged in developing their own information but actively involved in creating knowledge that will benefit other students. In this model students will not simply pass through a course like water through a sieve but instead leave their own imprint in the development of the course, their school or university, and ideally the discipline.

Introduction

The most interesting effects of the advent of Information and Communication Technologies (ICTs) in teaching is they force the teacher to undertake a radical re-assessment of the way in which they teach. The use of ICTs raises a whole series of questions ranging from the appropriateness of the 'chalk and talk' paradigm, through the role of assessment, to the need to cater for different learning styles. This paper describes how the authors, who are themselves both teachers and learners, are re-assessing the way in which they teach and learn in light of the enormous flexibility being offered by ICTs.

The context for the discussion is a 2-year, part-time Masters program in the area of ICTs and Learning – Master of Science in Information Technology in Education - in which a wide variety of techniques, many old but some new, are being used in an attempt to enrich the learning experience and have begun to fundamentally change the way in which we envision education. The theme, or educational philosophy, underlying our approach is one we call '**communal constructivism**', by which we mean an approach to learning in which students not only construct their own knowledge (constructivism) as a result of interacting with their environment (social constructivism), but are also actively engaged in the process of constructing knowledge **for** their learning community.

We argue that the modern education process is too like a sanitized pipe system through which large numbers of students are pushed through to emerge from the far end 'educated' but without leaving any discernable trace on the system they have passed through. The 'communal constructivist' philosophy is more akin to a river that shapes its own environment as it flows forward. We draw upon a diverse range of educational inputs ranging from the constructivist theories of Vygotsky to those of Cognitive Apprenticeship, through techniques used in one-teacher rural Irish primary schools to the Japanese *han* system. Of particular interest is the way in which ICTs can be creatively used to bring new life into these diverse ideas and how it can combine and synthesize many previously separate initiatives.

A search for an appropriate model of education

Our current classroom model is largely a product of the industrial revolution whereby groups of students of the same age come to a single physical location to be instructed in the same subject matter at the same pace. By comparison, earlier models of learning were much more tailored to individual learners and stressed high-level interaction between the tutor and student. Indeed modelling the process of learning was considered as important as imparting facts and information. A stress on skills of speaking and rhetoric has been largely lost as delivery was increasingly restricted to the teacher. Assessment plays a defining role that results in students being conditioned to learn only what is of direct relevance to examinations and often only then in a superficial manner. Although it varies somewhat from country to country, for the most part the education system acts as a shrinking pipeline with students being channelled into greater and greater specialisations at earlier and earlier ages[1]. The emphasis is on an individual learning by oneself, for oneself, and even where learning is within a wide group or social context, the goal of learning is still for ones own benefit.

[1] In Ireland for example many undergraduate degrees are specialised, or professional in nature. Entry to university is highly competitive and judged on the results of a single set of nation-wide exams and students are encouraged, and in some cases are required, to pick between language and science courses as early as fourteen.

Not only are the processes of learning narrow, but the products are also boxed in. School subjects are increasingly standardised and defined. Science subjects, for example, have been delineated and divided while the field is increasingly connecting and evolving. Developments are moving so rapidly that whole areas of knowledge are increasingly obsolete. What is needed is a reflection of the growth and expansion of the knowledge of the discipline within the subject being taught in the classroom.

Pouts-Lajus and Riche-Magnier (2000) argue that new educational technologies give us an opportunity to rethink educational relationships as we reflected on what was presently being offered to students as an educational experience as well as best practice, both from our own tradition and internationally we began to evolve a new theory of an approach based on building a community of learners with a focus on the community itself rather than on the individual learner.

Our ideas on 'communal constructivism' derive from a wide variety of sources. Theories of social constructivism, combined with advances in ICTs are introducing new ways of learning. Social Constructivism is defined as a process by which students make meaning, and the central role their community, through culture and language, plays in this process. Learning is seen as a social and collaborative activity that is facilitated rather than directly taught by the teacher. Building on constructivist theories, where students are involved in building their own knowledge, social constructivism adds an interactive dimension. This approach is influenced by the work of Vygotsky who believed that children learn from within themselves and as well as from influences in their social or cultural environment. Although Vygotsky focused on the role of speech and not on the role of new technologies, the fact that communication is increasingly supported by computers, e.g. e-mail, discussion boards, chat rooms, MOOs, MUDS and Virtual Worlds, has lead to his work influencing theories of learning in the information age.

We also have been influenced by the concept of cognitive apprenticeship and the work done in designing supporting computer environments to test theory (Lajoie & Greer, 1995). Essentially teachers offer students cognitive apprenticeships by working with students and modelling key aspects of learning until the students are able to work unassisted. The teacher is responsible for passing on knowledge of the process rather than simply focusing on content. Earlier models of apprenticeship learning underlie the theory.

> *Before schools appeared, apprenticeship was the most common means of learning and was used to transmit the knowledge required for expert practice in fields from painting and sculpting to medicine and law. Even today, many complex and important skills, such as those required for language use and social interaction, are learned informally through apprenticeship-like methods - that is, methods not involving didactic teaching, but observation, coaching, and successive approximation (Collins, Brown & Newman, 1989; p. 453).*

The great educator Cardinal Newman argued in his classic *The Idea of a University* that people learned more from been in contact with each other than from formal classes. "If I had to choose between a so-called University which dispensed with residence and tutorial supervision and gave its degrees to any person who passed an examination in a wide range of subjects, and a University which merely brought a number of young men together for three or four years… I have no hesitation in giving the preference to the later…" (Newman, 1852; p. 35). This is very much the same thinking that underpinned the classic British Boarding School model for many years. In both these cases, however, the collective aspect of learning is in the area of socialization, or in Newman's case becoming a 'gentleman', rather than on traditional subject-based learning that was still done in a conventional classroom.

An in-depth study by one of the authors, Holmes (1998), of a rural Japanese community in the Hiroshima area identified many practices which have given us ideas as to how our view of teaching and learning can be expanded in a Western context. In Japan, for example, Grade 6 students primary school collect the younger ones walk with them to school each morning and home each afternoon. This is obviously a valuable exercise in socialisation but of even more interest is the use of *han* groups within school. A *han* is made up of 3 or 4 students within a class and it is the responsibility of the *han* to make sure that all members are able to progress through the materials. This is radically different from Western education where the individual is paramount.

The *han* system in Japan – from an interview with a Japanese teacher.	Students working individually– from an interview with a British teacher.
It looks like in the UK that students should not disturb other students; but in Japan, in such a class, it is encouraged. One plus one is usually more than two. Partly because of this, students turn to each other for help before turning to the teacher. Since the class moves at the same pace they will help each other to move forward. Students rarely compete with each other in class.	*We do not deliver skills from the front, but instead, we are allowing people to develop skills at their own rate.* *(W)e are very much encouraged to look at differentiation and we are asked to provide extensions of tasks for those people who are able to move more quickly.*

Group-work is also of course prevalent in Western education and much has been written on the advantages of group-work and project-based learning (Papert, 1993; .Rotherenberg, 1999) A related concept is that of peer tutoring which has been shown to have benefits for the tutee. We are particularly interested in the benefits for the tutor in such arrangements.

Closer to home small rural Primary schools, of which there are still very many in Ireland, where two or three teachers take the full range of ages from 5 to 12 years old, offer very interesting models of education. Enormous creativity is required in timetabling subjects and extensive use must be made of both group project work and peer-tutoring. Economies of scale argue that such schools are not viable units but the power of ICTs to extend the horizons of such schools is seriously challenging that assumption.

At the other end of the educational spectrum, the concept of a learner making a contribution to the field within which they are learning is at the core of what it means to do Ph.D. level research. Ph.D. students attempt to expand knowledge of a discipline and are encouraged to publish their results so that their own work is recorded and helps develop the field of knowledge. At this level in the formal education system delivery, and reception, of information is replaced by the process of building new knowledge and making it available to others. This we argue is one of the best learning experiences but applies only to a select few. We shall explore how it can be delivered at other levels in education.

Courses in the formal educational system are predominantly static in that a teacher covers the same material year after year. At the same time new technologies are impacting with subject disciplines and teaching pedagogy to evolve present fields, such as biology into new areas such as biotechnology. The syllabi of many courses could be constantly rewritten and still be almost always out of date.

External pressures are also calling for change in the education system as employers are more and more looking for people with good teamwork and communication skills. There is a real challenge for an education system to ensure its graduates have relevant and applicable knowledge and skills. Partly in a response to such issues, large-scale organisations such as the OECD are stressing skills of knowledge management and creation rather than simply memorization of content materials.

Communal Constructivism

Many of the previous proposed solutions to challenges faced by educators today involve more time and more money. Teachers are increasingly pressured to provide more of their own time to training and updating their skills while governments are obliged to keep increasing educational budgets. What has not been considered is a way to build on the knowledge, skills and energy of those at the heart of schooling – the students.

We believe there is a need for an expanded definition of social constructivism that takes into account the synergy between the more recent advances in information technology - which are increasing our potential for communication and the ability to store a variety of data types - and some of the educational ideas outlined above. In particular we are still at an early stage in trying to construct knowledge as to how to teach, and learn, effectively with ICTs. What we argue for is a communal constructivism where students and teachers are not simply engaged in developing their own information but actively involved in creating knowledge that will benefit other students and teachers. In this model students will not simply pass through a course like water through a pipe but instead, river-like, leave their own imprint in the development of the course, their school or university, and ideally the discipline. This will result in a gain for the institutions or course, but more importantly the students themselves will benefit.

We argue that a diverse range of techniques can, and should, be used to enrich this type of learning environment within which the focus is on learning *with* and *for* others. Peer tutoring and project-based learning are obvious techniques but we also advocate the ideas of cognitive apprenticeship, the publishing of information, flexibility in the time table, a radical look at the way in which assessment is done, and so forth.

Our pipe and river analogy derives from the observation that presently much of the student learning that happens in one year of a course is lost for the next. The pipe can not be enriched by water travelling through it, indeed over time the pipe may need repairs, whereas water flowing through a river will leave rich mineral deposits and slowly influence the course of the river. Obviously the students have learnt material during their studies, and the teacher would have learnt from the students, but there is little or no year-to-year transfer of knowledge between students. If the student learning processes and their work could be captured then courses might instead build on knowledge rather than simply repeat it.

To create an environment where students leave their imprint on the course, and the field, as an integral part of their learning not only benefits their own learning, the learning of their colleagues in their classes and those that will come after, them but more importantly creates a vast number of graduates who will be well aware of the importance of teaching and education and thus communal constructivism also provides a teaching apprenticeship for all those who come through the school system. The profession would benefit from a rich pool of people who understand the concerns and support new initiatives.

Putting Ideas Into Practice aided by ICTs

We are now seeking to explore ways in which these ideas of communal constructivism could be developed by applying them in a classroom setting. The course in question is a new two-year, part-time Master's programme in the area of Information Technology in Education. The students, or learners, on this course are predominantly teachers themselves who are involved are some level in using ICTs in the classroom. The course has an intake of 25 and the first year is made up of a taught component with the second year being devoted to a research dissertation. The first in-take was in October 1999 and at the time of writing we have now both the taught year and the dissertation year up and running.

The Communal Constructivist approach requires that the course be dynamic and adaptive. As the field itself (ICTs and Learning) is so dynamic it is necessary that both the course content, and more importantly the method of delivery, be capable of adapting to new information and new techniques as they emerge from within the course itself and from the discipline at large.

The potential of information and communication technologies (ICTs) in the area of learning are well known. Aspects which are particularly relevant to our subsequent discussion include the potential to allow students to become publishers, and not just consumers, of information through the use ICTs, for example, word processing, web and multimedia authoring tools. The use of Email, list servers, discussion boards, virtual chat rooms, MOOs and so forth greatly enhance communication capabilities and cut across divisions of space and time. Digital audio, video, web cameras, on-line logs can capture and disseminate classroom experiences for research and reflection. Databases, referencing packages, statistical and text analysis packages allow the storing, structuring, and analysis of information. On-line tracking, monitoring software, adaptive learning environments, for example, aid in the structuring and analysis of ones own learning.

Our approach also requires that from the very outset students see themselves as producers and not just consumers of information. Students are given instruction in various technologies for presentation to their peers, ranging from PowerPoint tools to produce slides to sophisticated Web design. All coursework and projects have presentation built in as a fundamental part of the exercise. The students must present their work to their peers and also place it on the Web for use by students in subsequent years and for inspection by the wider community. Students are actively encouraged to submit their work to national and international conferences, not just at the end of the degree but during their study and not simply as an addition but as an integral part of their studies. All proposals for research topics must include a section on how the work could make an impact on their field and an outline of plans for publication and dissemination of the research. Students are encouraged to write research papers with the academics and to jointly present their work at conferences, specific individuals are not encouraged but rather the entire class is prepared. This is not just a passive participation but an active collaboration in both the preparation and the presentation. It is probably best summarised by our experience at the students first outing at a national conference where one first year student, who was asked to videotape a presentation being given by some students from the second year, felt compelled to come forward and give the audience the benefit of his views on the topic. Students are also required to write their dissertation proposal in the form of a grant application and to actively pursue (with some success) real research contracts.

Within the course a wide variety of techniques are used to instil in students the idea that they are involved in a process of constructing knowledge and that that construction is a communal affair. Of particular interest are the following.

1. Extensive use is made of **group work** and **project-based learning.** Assignments are done in groups of 3-4 for first term and then in groups of 2 for the second term. The final term assignment is an intensive individual project by which time the students are much more confident with the technology and the subject matter.
2. The initial specification of the course had built in assessment by examination. A realisation that the learning taking place in an exam is purely focused on the individual lead us to adopt a portfolio approach **assessment process** that would both benefit the individual, their peers and learners that followed them[2].
3. Student work has developed into a **portfolio** allowing for reflection on their year-long learning process and also allowing for future students to see the progress of knowledge acquisition.
4. The **lecture format** used varies somewhat between modules but typically involves making reading material available on the web a week in advance with a modest amount of "lecturing" in any class. Students engage in project work and discussion during lecture time.
5. Extensive use is made of **peer tutoring** and **mentoring**. There is considerable diversity in the backgrounds of the students on the course so peer tutoring arises naturally within the class. More formally each student on the 1st year negotiates with a student on the 2nd year of the program to act as their mentor.
6. 2nd year students are encouraged to engage in an **apprenticeship** lecturer role by being given the opportunity to: deliver part of a lecture; lead a discussion group; develop course content; adapt and expand on a lecturer's notes; act as a technical assistant; act as a general helper (there is always a need for someone to answer questions in the hands on session); develop related tasks for students to undertake in the hands-on sessions and add relevant links into the lectures.

[2] The specification for the end of year capstone project is "Do something interesting that showed you learned something".

Conclusion

There are a number of down stream effect of the flow of students through the course. Although it has taken time and effort to set up a system the benefits are already apparent, numerous, and include the building of a dynamic and well-researched body of course material. This material will be continually updated and thus new directions for the course will evolve. Already there is a to expand the course into new areas such as distance learning and we hope to be able to offer the course for the blind. The active participation of students in the course has created an internship for university teaching as well as strengthening their own understanding of the 3rd level learning environment thus increasing their metacognitive and reflective skills. Having student work available also drives up the level of the course as other students can more easily understand what is expected of them and thus build on a high standard rather than reinvent the wheel.

The fact that we had a student population of adult learners who had already demonstrated responsibility in their learning and professional lives was of benefit to us. We were interested in how this model might be rolled out for learners of other ages. One of the most interesting effects observed in the first year of the course was, therefore, the extent to which students on the course began to replicate the learning environment they themselves were part of in the classes that they in turn were teaching. The most dramatic example was where one of the authors, herself a primary teacher, employed both peer-tutoring and Web-based publication with her class of 10-year olds. The class were taught how to use a simple story-authoring package and gained experience in its use. They then were given the task of going into the classes of 9-year-olds in the school and teaching not just the students how to use the package but also the teachers of the other classes. The whole process was documented on a Web page that the students took great delight in showing their parents. The teacher in question would have described herself as barely IT literate at the outset of the course and what is interesting is to see how she felt empowered to apply her own experiences from the Masters course to her very different classroom situation. Other examples include the accompanying papers in this proceedings by Dearbhaill McKibben and Sharon McDonald on their experiences in the course and as well a paper by Eileen Brennan on how she is conducting research into public policy in ICTs.

Dewey (1916) argued at the turn of the century that learning is a building process, we believe that education as a whole should also be considered as a in the same light. It is early days yet but we feel that we have much to learn, or rather much to construct, in this communal approach to constructivism. Luckily we are not alone in this rather daunting endeavour but have the human resources to regularly expand and update the course as we are presently supported and aided by over 25 master's students and will soon be aided by 25 more and so on and so on... With their aid we will enrich the course and our own ideas with resources. Not just the identification of more useful information but we are investigating developing software that supports interactive student input to the course. Ubiquitous computing we believe will ease applying communal constructivism ideas to classrooms. When students all have lightweight, wireless laptops that are connected to the Internet they are able to download lectures, visit resource, and post material to the lecturer while engaging in group work or listening to lectures. As our own students reflect on and record their experiences in the course we will also research on our own learning in order to build back into the course. This will aid future students and record the evolution of the modules, future teachers understand the work to date and indeed the discipline itself.

We are also meeting a need to identify and train 3rd level instructors as the course provides an apprenticeship and internship for lecturing at university. As each of our own students returns to influence teaching practices in their own schools communal constructivism is impacting the community and thus supporting lifelong learning.

The biggest benefit of communal constructivism, however, is to the learners themselves. At present their role in the education system is akin to a charity case. They receive benefits from the state and/or their parents for years and have very little input into what they learn, as well as when, where and how they learn it. This has created passivity not only in the learners but within the whole system. A sense of community has been lost. Communal constructivism is about empowering the learner to allow them to reclaim a role in their own education. The advantage to the learner is in taking part in deep meaningful and allowing them to have a role in society throughout their formative years and not just after graduation. Giving students responsibility will train them to be responsible.

Communal Constructivism stresses that learners should be listened to and to be important to others. We believe that they should be useful and have some say in their own lives. They must be included and their work should be valued by others. Their learning tasks should be useful and recognized as such. They have a right to be needed.

References

Collins, A., Brown, J. S., & Newman, S. E. (1989). Cognitive apprenticeship: Teaching the crafts of reading, writing, and mathematics. In L. B. Resnick (Ed.), Knowing, learning, and instruction: Essays in honor of Robert Glaser (pp. 453-494). Hillsdale, NJ: USA.
http://forum.swarthmore.edu/~sarah/Discussion.Sessions/Collins.html (26/11/2000).

Holmes, B. & Greik, L. [1998]. Views of the Mountain from the Valley: a rural community assessment of the Japanese education system. The 43rd International Conference of Eastern Studies. Tokyo: May 22-23.

Holmes, B. [1999]. Doctoral Degree in Education (Information and Communication Technology). University of Cambridge, Department of Education, (1994-99). Cross-Cultural Differences of Use of Information Technology in Education: A Comparative Study of the Use of Computers in Japanese and British Classrooms.

Lajoie, Suzanne P., & Greer, Jim E. (1995). Establishing an argumentation environment to foster scientific reasoning with Bio-World, *Proceedings of the International Conference on Computers in Education*, In Jonnassen, D., and McCalla, G, (Ed.) Singapore; December 5-8. pp 89-96.

Newman, J. H. (1852(]. The Idea of a University: Defined and Illustrated in Nine DisCourses Delivered to the Catholics of Dublin in Occasional Lectures and Essays Addressed to the Members of The Catholic University. Martin J. Svaglic (Editor). London: University of Notre Dame Press.

Papert, S. (1993) *The Children's Machine*, Basic Books.

Pouts-Lajus, S. & Riche-Magnier, M. (2000). New Educational Technologies, an opportunity to rethink Educational relationships. In Observatory of Technology for Education in Europe. http://home.worldnet.fr/~ote/text0008.htm (28/11/2000).

Rothenberg, D. (1999) Internet Resources for Project Work. *The Project Approach Catalog 2*. ERIC/EECE Publications.

Van Der Veer, R., & Valsiner, J (1994). The Vygotsky Reader. Cambridge, Basil Blackwell Ltd.

Vygotsky, L. S. (1978). Mind in Society. Cambridge, Harvard University Press.

A Tutor's Advice Trains a Student's Self-regulation Skill

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Abstract: We propose that a tutor's appropriate advice trains a student's self-regulation skill. Through analysis of the tutoring interaction between academic departments, we discovered that a tutor's advice transformed a student's questionings. Our hypothesis by the analysis is that this transformation indicates an appropriation by the student of the tutor's self-regulation skill. We propose a training model of a student's self-regulation skill, which is based on the appropriation by the student of the tutor's self-regulation skill.

1. Introduction

Currently, a new paradigm of learning incorporating three distinct theories is emerging - social constructivism, Soviet socio-cultural theories, and situated cognition. This new paradigm brings these social issues to the foreground as a central phenomenon for study (Koschmann 1996 p.11). Under this new paradigm, the emphasis in research on collaborative learning has shifted from the study of the conditions under which group members learn more effectively, to the collaborative interactions themselves. Chi and VanLehn have shown that specific kinds of interactions may engender specific kinds of outcomes (Chi and VanLehn, 1991). The outcomes of these studies led collaborative learning research to show that the interaction must be structured in order to promote effective discourse (Cohen 1994). Some researchers have developed the structured interaction model in order to force the group members to mediate each other's learning. For example, in Reciprocal Teaching (Palincsar & Brown, 1984), the interaction is structured to promote a specific discourse pattern: questioning, summarizing, clarifying, and predicting. Reciprocal Teaching has been found to improve the ability of understanding prose. The ASK to THINK – TEL WHY (King 1999) model of peer tutoring also relies on structuring the interaction which consists of a question and answer component. In the Reciprocal Teaching and ASK to THINK – TEL WHY, the discourse pattern promotes interactive cognitive activity as well as metacognitive process such as monitoring and regulating the cognitive activity.

On the other hand, effective discourse has a common factor. It involves metacognitive processes such as mutual regulation and reflection (Brown 1987). This indicates that effective discourse plays the role of controlling a group member's thinking or causing him to reflect upon his thinking. In other words, effective discourse temporarily supersedes a student's self-regulation skill. From this, we can see the possibility that structured interactions composed of specific utterances can fulfill the metacognitive processes of interlocutor-regulation skills and self-regulation skills.

The purpose of this study is to explore an appropriate advice, which train a student's self-regulation skill. In this paper, we propose that a tutor's advice trains students' self-regulation skills. We will first focus on the discourse pattern: a question-answer methodology using structured interactions, and we describe how the use of appropriate questions trains a student's self-regulation skill. Next, we will describe how a tutor's advice trains a student's self-regulation skill. Finally, we will describe a training model for self-regulation skills.

2. Training the student to use of appropriate questioning

In both the Reciprocal Teaching method and the ASK to THINK – TEL WHY model of peer tutoring, students were trained to use appropriate questions. This is indicative of a students' self-regulation skill training.

In the Reciprocal Teaching method, students as well as teachers take on the role of guiding other members in a group through the processes required to understand texts. In the initial phase, the teacher modeled effective monitoring strategies and feedback. In the intermediate phase, students became much more capable of playing their role as dialogue leader, and by the final phase they provided sophisticated paraphrases of the text and asked sophisticated questions (Brown 1987). One reason for this effect is that the teacher introduced students to their role as a dialogue leader through explicit instruction about appropriate strategic directives (Wertsch 1998).

In the ASK to THINK – TEL WHY model of peer tutoring, the student who is in the tutor role also constructs a more accurate student model through the student's feedback. And the tutor could select the appropriate question on the basis of the student model. If the student's answer to the tutor's question is incomplete, the tutor asks another question. This methodology of training using appropriate questions causes the student who is in the tutor role to construct a model of another student's knowledge and to control another student's acquisition, integration and organization of knowledge through asking appropriate questions. From these analyses, we can conclude the following.

- Through explicit instruction in appropriate questioning technique as described in Reciprocal Teaching and the ASK to THINK – TEL WHY model, the student could be trained to see an interlocutors' thinking as an object of his cognition.
- These methods imply that the teacher advices or appropriate questions give students a demonstration of the proper self-regulation skill.
- The students who are in the tutor role or group leader role could be trained to control the interlocutors' thinking with the basis of appropriate questions.

It should be emphasized that these processes indicate that the students who are in the tutor role took the meta-level role for the interlocutor's cognition. In other words, the student's ability to use appropriate questioning indicates the [interlocutor]-regulation skill.

3. A Tutors' advice transforms student's questions

Now we are ready to consider our main problem. We regard both Reciprocal Teaching and the ASK to THINK – TEL WHY model of peer tutoring as an indirect training of self-regulation skills. In this section we will analyze research of student's spontaneous questionings and a tutor's advice. We will consider that a tutor's appropriate advice can directly train a student's self-regulation skills.

We analyzed the interaction between advisers and students during tutoring sessions among different academic departments. And we observed that the students' questionings prior to receiving a tutor's advice were different from questionings after receiving advice.

In the initial phase of the tutoring, all students asked similar questions such as "What is a modem?" However, tutor's advice transformed some of the students' questions into a confirmation-question or another what-question. The former students were asking for justification of their own assumptions that were based on an explanation encountered in their reading. The latter students were asking for information to integrate their understanding of what they read. For example:

Confirmation-questions:

"I suppose that all information is represented as one or zero. If so, is hiragana or katakana represented as

What-questions:

"Let us know more information about it, for example, the merits or the demerits and so on."

3.1 A classification of user's questions

In order to account for this transformation of students' questionings, we categorized the various questionings. As there were many factors encountered in students' questions, it was very difficult to determine their classification. Moore (1995) classified students' follow-up questions according to previously given explanations and communicative goals. As student's questions are spontaneous and random, we decided to follow her classification. Our adaptation of this classification is shown in the following table.

QUESTION	PREVIOUSLY GIVEN ADVICE	COMMUNICATIVEGOAL
What?	None	Acquisition
Is it true?	Make uncertain things clear	Comprehension
What?	Make uncertain things clear	Integration

Table 1

As table 1 shows, the communicative goal of student's questions was changed. This transformation of the user's communicative goal leads us to consider the student's knowledge transformation. The initial questions: What–question (Goal: Acquisition) indicate that a student was only cognizant of an unknown thing in the subject matter. Also he did not regulate his knowledge. However the communicative goal of questions after receiving advice, which is Comprehension or Integration, was changed. The latter questions indicate the student's attempt to regulate their knowledge.

On the other hand, it is known that low ability performers are deficient in both knowledge and the resources for controlling that knowledge. And knowledge differences reflect processing differences. Poor learners are deficient in knowledge because of poor learning skills, in particular, the self-regulation skill (Campione 1987). Furthermore, there are many degrees of self-regulation skill but the distinction has not been made as clear. And conscious awareness and direction of thought rank lower than self-correction and regulation that can proceed below the level of consciousness (Brown 1987).

From these, we can see that the transformation of students' spontaneous questions indicates how they regulate their thinking.

4. A tutor's advice trains students' self-regulation skills

Here we will describe how a tutor's advice trains students' self-regulation skills from the viewpoint of the relationship between advice and the transformation of students' questionings. Before describing this claim, we will analyze the relationship between advice and the students' transformed questions.

4.1 What is advice?

There are three typical advice patterns in response to students' questions in the initial phase of tutoring.

Advice #1: You should be more specific when you ask somebody a question.
Advice #2: You should be more specific when you ask somebody a question. There are explanations about CPU's in magazines. Please read them. If you have questions after reading them, I can help you.
Advice #3: You should be more specific when you ask somebody a question. If you make the things you don't know clear, you will be successful and will enjoy learning.

This advice is representative of a tutor's own self-regulation skills, which are informed by the student's questionings and which regulate student's cognitive activities (Kayashima and Okamoto 1999a).

This is made clear when we see that all of the advising statements include the same phrase: " You should be more specific when you ask somebody a question." This phrase means that students should perform conscious cognition of their thinking. In other words, this phrase gives students insight into how a tutor regulates a student's thinking.

4.2 The relationship between advice and the transformation of students' questionings

Here we describe the relationship between the advice and the transformation of student's questions. We claim that the transformation was triggered by the student's appropriation of a advice. This claim is not new and can be found in various studies (Rogoff 1991, Wertsch 1998).

The tutor's advice indicates his monitoring and control: i.e. how the tutor monitored the student's knowledge structure, and how the student should regulate his knowledge structure if the roles were reversed.

What is important is whether students engage in conscious cognition when they receive this advice (Kayashima and Okamoto 1999b). This is important because metacognitive experiences are most apt to occur whenever one engages in conscious cognition (Flavell 1981). By engaging in conscious cognition, the student's thinking can become an object of his cognition. Some students, who engaged in conscious cognition, were aware of their deficient monitoring and then appropriated the tutor's regulation itself. Others did not appropriate it. Although the former student was transformed, the latter was not transformed in the light of questionings. The appropriation of a tutors' regulation might lead to modification of the student's knowledge structures, which then might transform his questioning. In other words, the transformation of students' questions does not necessarily mean that the student's self-regulation skills have developed. However, the development of self-regulation skill requires the appropriation of a higher self-regulation skill.

5. The training model of self-regulation skills

Now we shall describe how a student appropriates a tutor's self-regulation skill, using the following description:

Monitoring:	monitoring (Agent, Target, Level)	(1)
Control:	control (Agent, Target, Level)	(2)

Here we describe how a learner (Agent) monitors his own or another's cognition (Target) through some monitoring level (Level) as shown in (1) above. Additionally a learner (Agent) controls his own or another's cognition (Target) at some control level (Level) as shown in (2) above. The agent is a person who monitors or controls. The target is knowledge structures that are monitored by the Agent. The value of Agent or Target is shown as T and L, in which "T" refers to tutor and "L" to learner. The value of Level is "L_i" meaning that monitoring level is i, and "L_{i+1}" means that monitoring level is higher than "L_i".
We describe a learners' questionings and a tutors' advice as follows:

Questioning:	tell (Agent, Others, To do)	(3)
Advice:	want (Agent, Others, To do)	(4)

We describe that a learner (Agent) asks a tutor (Others) a question as shown in (3) above, because a learners' questionings imply that they tell tutors their immediate antecedent cognitive actions (To do). As tutors (Agent) want learners (Others) to engage in proper cognitive actions (To do), they advise. Therefore we describe advice as (4).

As students' questions at the initial phase of the tutoring represent their awareness of incomprehensible concepts, we describe them as (5). This monitoring level is "L_0", because students were only cognizant of incomprehensible concepts. The advice received from their initial questions represents that tutors want learners to regulate their knowledge structures in the same way the tutor regulates learners' knowledge structures. It is a higher level than one that was initially seen in their questionings. We describe it as "L_i"($i>0$). This we also indicate as (6).

tell (L, T, monitoring(L, L, L_0)) (5)
want (T, L, control(L, L, L_i)) (6)

Now, we describe how a learner appropriates a tutor's self-regulation skill; especially regulation as follows. We describe that the learner appropriates the tutor's regulation skill following a learner's questioning and the subsequent tutor's advice as shown in (7) below. That is to say, the learner appropriates the tutor's regulation skill: control (L, L, L_i). It should be noted that "control (T, L, L_i)" is the same as "control (T, L, L_i)" in "want (T, L, control (T, L, L_i))". Thus the appropriation might engender the learner to modify his knowledge structures. The transformation of his knowledge structure leads the learner to ask a question that has a different communication goal from that of his initial question. This is shown as (8) below.

tell (L, T, monitoring(L, L, L_i)) (8)
<-tell (L, T, monitoring(L, L, L_0)) (5)
& want (T, L, control(L, L, L_i)) (6)
& control (L, L, L_i) (7)

This model of training self-regulation skill indicates that learners use appropriate questions by the appropriation of the tutor's self-regulation skill.

6. Conclusion

We propose a prototype model for training self-regulation skills. This model is based on question-answer dialogue, and is also based on the view of a user's internalization of another's self-regulation skills as users appropriate them.

If we develop the model, we can create a new, effective advice discourse and improve learning through changes in a student's self-regulation skills.

In further work we intend to explore what advice encourages a students' appropriation of a tutor's self-regulation skills, specifically, what advice becomes the object of conscious cognition. Solving this issue, we could then utilize more effectively this model for training self-regulation skills.

References

Brown, A. (1987). Metacognition, Executive Control, Self-regulation, and Other More Mysterious Mechanisms. In *Metacognition, Motivation, and Understanding*. F.E. Weinert and R. H. Kluwe, eds. 65-116. Hillsdale, New Jersey :Lawrence Erlbaum Associates Publishers.

Cahour, B. (1990). Competence Modelling in Consultation Dialogues. In *Work With Display Units 89*. L. Berlinguet and D. Berthelette, eds. 363-370. Elsevier Science publishers B.V. (North-Holland)

Chi, M.T.H. & VanLehn, K.A. (1991). The Content of Phisics Self-Explanations. *Journal of the Learning Sciences* 1(1):69-105.

Cohen, E. G. (1994) Restructuring the Classroom: Conditions for Productive Small Groups. *Review of Educational Research* Spring 64(1):1-35.

Campione, J. C. (1987). Metacognitive Components of Instructional Research with Problem Learners. In *Metacognition, Motivation, and Understanding*. F. E. Weinert and R. H. Kluwe eds. 117-140. Hillsdale, New Jersey: Lawrence Erlbaum Associates, Publishers.

Flavell, J.H. (1981). Cognitive Monitoring. In *Children Oral Communication Skills.* W. P. Dickson, ed. 35-60. Academic Press.

Kayashima, M. and Okamoto T. (1999a). Reflective Thinking by the Other Response is able to Produce Monitoring In *Proceeding of ED-MEDIA99 and ED-TELCOM99*, 1803-1807. Association for the Advancement of Computing in Education.

Kayashima, M. and Okamoto T. (1999b). Awareness of the Other Metacognition is the Discerning Factor by Which Reflection Turns into Monitoring In *Proceedings of AIED99.* 717-719. IOS Press.

King, A. (1999). Discourse Patterns for Mediating Peer Learning. In *Cognitive Perspectives on Peer Learning.* O'Donnell A.M. & King, A. eds. 87-115. Mahwah, New Jersey: Lawrence Erlbaum Associates, Publishers.

Koschmann, T. (1996). Paradigm Shifts and Instructional Technology: In *An Instruction. In CSCL: Theory and Practice of an Emerging Paradigm* . Koschmann ed. 1-23. Mahwah, New Jersey: Lawrence Erlbaum Associates, Publishers.

Moore, J.D. (1995). *Participating in Explanatory Dialogues*. The MIT Press.

Palincsar, A. S. and A. Brown (1984). Reciprocal Teaching of Comprehension Fostering and Comprehension Monitoring Activities. *Cognitive and Instruction.* 1(2):117-175.

Rogoff, B. (1991). Guidance and Participation in Spatial Planning. In Perspectives on Socially Shared Cognition. L.B.Resnick, J.M.Levin, and S.D.Teasley, eds. 349-364, American Psychological Association, Washington, DC.

Vygotsky, L. A. (1978). *Mind in Society: The Development of Higher Psychology Processes*. Cambridge, MA: Harvard University Press.

Wertsch, J. W. 1998. *Mind As Action*. Oxford University Press.

How Do We Know Whether To Plug In Or Out: The Quintessential Question for Education/Learning Enhanced Through Technology?

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Abstract: How do we know whether or not to Plug-in or out" is the most important question educators must answer before the first dollar is spent on technology. And if money was spent on technology without improving learning, the plug should be pulled. Insights and criteria for such a decision are provided within this paper's analysis of brain operations, technology enhanced learning opportunities, research study comparing learning styles with technology self-efficacy, and a review of assessment strategies. The two guiding questions for this paper are: What technology-based activities are associated with brain-based learning and how is the effectiveness of technology assisted learning measured. The authors assert that technology can be a powerful tool for teaching and learning and more and different ways to assess technology's effectiveness are needed.

Brain Boosting with Technology

Brain boosting (analogous to rocket boosting) is the process of harnessing the natural powers and functions of the brain for effective and efficient learning. Brain Boosting requires an understanding of brain development potential components (multiple intelligences, brain operations, and types of thinking). The following tables offer a review of these components and link them with technology activities. They illustrate how technology can be an additional brain booster to launch the potential of students.

Multiple Intelligences

Howard Gardner revolutionized educators' understanding of the brain's potential through his Multiple Intelligences theory. He redefined intelligence as "the ability to solve problems or to make something that is valued in one or more cultures" (Checkley, 1977, p.9). According to Gardner, students are smart in a combination of at least eight different areas. Multiple Intelligences theory and categories within it should not be used to classify people, but should assist in understanding, planning, and evaluating the teaching and learning process. Each person has two or three dominant intelligences that he or she uses to complete daily tasks, solve problems and respond in stressful situations. Teachers should provide multiple opportunities for students to learn and demonstrate their learning through all these intelligences. Numerous opportunities to explore and develop different intelligences are found on the Internet (Table 1).

Multiple Intelligences and Internet Activities

Intelligences	Ability to create or use…	Internet Activities
Linguistic	Language, words and verbal expressions	Newsgroups, List Servers, e-mail, Chat Rooms, access to Libraries through the world, on-line journals, Bulletin Boards and text used in most sites
Logical-Mathematical	Sequential and deductive logic and reason, and mathematical and scientific methods of problem solving	Access to current researchers and data bases, information and site data analysis, math and science game sites, scientific gaming simulations, NASA's Quest Program, Global SchoolNet Foundation and sequential problem solving opportunities in most sites

Spatial	Colors, dimensional relationships and holistic and contextual reasoning	Tours of greatest museums around the world, virtual reality sites, video bits, 3-Dimensional representations, Clip art and colorful displays and graphical environments used in most sites
Bodily-Kinesthetic	Hands and body movement for expressions, coordinated movement and model building	Olympic coverage, Centers for Health Research and Statistics, NCAA online, Gaming Zone, and haptic and item manipulation skills found in basic keyboarding skills and most games
Musical	Hear, recognize, remember, manipulate and create sounds and patterns of music	Rock & Roll Hall of Fame, Classical Net, House of Blues, Music on the Web, Piano page and musical backgrounds in sites or sound files with various texts
Intrapersonal	Self understand, reflection and personal power	Personal Home Pages, on-line portfolios, personal thoughts and reflections expressed in E-mail, listservers and discussion groups
Interpersonal	Make connections among other people, influence, understand and produce well with others	Telementoring, Youth in Action sites, on-line discussion groups, travelers' guides, virtual tourists, electronic villages, CyberPals, Senior Sites, MicorMuse
Naturalistic	Discriminate among living things and sensitivity to features of nature	Electronic field trips, Natural Geographic Society for KidsNet, Save the Environment Sites

Table 1: Describes Gardner's different multiple intelligences and links these with potential Internet activities.

Brain Operations

Through brain mapping (observing and analyzing the neuron firings in human brains) the biological paths and processes for learning are defined. When these paths and processes are linked with variables of learning with technology, certain strengths of learning with technology appear and the surface validity of incorporating technology into the teaching and learning process is revealed (Table 2).

Linkages of Brain-Based Learning with Technology

Brain Based Learning	Learning with Technology
Affective Learning	It is fun, novel and students feel in control. Most Internet sites require students to hear, see and do the content.
Neural networks reinforced through repetition	Consistent communication protocols reinforce linear thinking process in some areas (not the Internet).
Concepts learned must be used for transfer from short term to long term memory	Active manipulation of data and/or skills on a site requires learners to do something with the information, thus aiding the transfer from short term into long-term memory.
New learning builds on past learning networks	Instructional design and hypertext allow learners to start and review basic concepts and build upon those with additional links.
Problem Based learning requires cross-brain neural activities	Many internet activities are contextual and problem based requiring students to research an issue and/or manipulate data. This requires brain activity across different brain operations and memory centers.
Ninety minute energy cycle of the brain	Activities and stimuli change so frequently in Internet and software programs that the sensory habituation is less noticeable.

Table 2: Links components and concepts of Brain-Based Learning with technology activities.

Types of Thinking

When types of thinking are added to the mix of understanding of brain capacities (intelligences) and how it works (brain operations), the foundation for knowing what and how to assess begins to appear. Blooms' Taxonomy, Scriven's Critical Paradigm, and Ouch's Creative Thinking steps are excellent schemas to provide an overview of types of thinking. Think of each of these as three rocket boosters to launch aspiring stars—your students.

Blooms Taxonomy

Bloom's Taxonomy, an educational benchmark of concept mastery for years, prescribes levels of thinking. These levels are matched with technology activities in Table 3.

Bloom's Taxonomy and Technology Activities

Type of Thinking	Technological Learning Activities
Level 1 = Recall	Drill & practice software, presentation and reference software, electronic spelling test, math drills
Level 2 = Understanding	Tutorial software, integrated learning systems, reading comprehension series, virtual field trips
Level 3 = Application	Problem solving, gaming, thematic software, virtual reality, Sciencelabs
Level 4 = Analysis	Databases, spreadsheets, reading for critical thinking series, "Science Court", "Carmen SanDiego"
Level 5 = Synthesis	Writing across curricula, Humanities software, Web page builders
Level 6 = Evaluation	Computerized testing, electronic portfolios, grade books

Table 3:Lists categories of Bloom's taxonomy and illustrates technology activities for integration into curricula.

Critical Thinking

Critical thinking is defined as a set of characteristics and steps to process and generate information.(Scriven, on-line and Elliott, 1966). Universal characteristics and steps for critical thinkers with potential technology activities are listed in Table 4.

Critical Thinking Characteristics and Steps with Technology

Critical Thinking Characteristics	Technology Based Activity
Illustrative Thoughts	Visual mapping and design programs
Accuracy	Internet and TV information examined for accuracy and conflicting data
Consistency	Use of spreadsheets and tables to track information
Relevance	How recent and credible is the author of sources of information.
Depth including complexities	Hyperlink branching for more knowledge in CAI and Internet
Breadth with others viewpoints	Discussion Boards and Chat Rooms
Fairness	Examine articles and videos for presentations of arguments & opinions
Precision with details	Table and charts to visually organize information for comparison
Logic	Programming logic, Discovery programs
Critical Thinking Steps	Technology Based Activity
Distinguish between fact & opinion	Analyze news and articles for facts
Recognize language bias	Compare and contrast viewpoints. Highlight in different colors bias

	and emotional language
Research for Accuracy	Check out assumptions with facts, search multiple sources
Analyze arguments based on facts	"Reading for Critical Thinking", "Science Court", "Thinking Things"
Explore all perspectives before making a decision	Problem solving software and games, integrated science and critical thinking curricula
Present and defend arguments	Videotaping of arguments, bulletin and discussion boards

Table 4: Describes Elder's and Paul's characteristics and steps of critical thinking and list activities for technology integration.

Creative Thinking

Creative thinking (third rocket booster) is related to critical thinking (second rocket booster) but not the same. Critical thinking does not require creative thinking. A comparison of the components of critical and creative thinking finds two clear distinctions. First, there is the presence of emotion in creativity and its controlled absence in critical thinking. Secondly, creative thinking requires divergent thinking (generating a range of acceptable ideas) and critical thinking process requires convergent thinking (one acceptable solution). These distinctions are critical to assessment and evaluation process and outcomes measures and instruments.

Howard Gardner describes a creative person as "one who regularly solves problems, fashions products, defines new questions in a domain that is considered novel but that ultimately becomes accepted in a particular setting" (1993, p. 35). Creative thinking includes problem solving, initial novelty, and ultimate acceptance by others. Eight stages of the creative process are identified and listed with technology activities in Table 5.

Creative Thinking Steps and Technology

Creativity Component	Technological Learning Activities
Germinal Phase	
Willingness to try new ideas	Fun and exploratory software, fantasy games
Explore new ideas	Internet, encyclopedias, "CAD" programs
Brainstorm without judgment	"Inspiration", "Semantic Mappers", "Kid's Pics"
Evaluate strengths and weaknesses	"My teacher is an Alien", "Dr. Brain", "Widget Workshop"
Rest awhile (incubate ideas)	Play musical CD or take a virtual field trip
Practical Phase	
Apply ideas to task	Create story book, "Metacreations", "Print Artist", "SimCity", drawing packages
Create something new or solve a problem	Problem solving software, Hyperstudio, SoundCompanion, Multimedia projects
Share product with others	Bulletin Boards, file exchanges, Web publishing, contests and activities

Table 5: Describes Oech's creative thinking steps and potential technology based learning activities.

Learning Styles and Technology

When traditional learning style theories are applied to teaching and learning with technology, it is expected that linguistic, visual, kinesthetic, global and specific learners will succeed with computers. An interesting study went beyond these traditional expectations and compared conceptual thought processes with computer usage.

In this study, three instruments (a computer technology questionnaire, a computer user self-efficacy scale, and a learning style inventory) were given to 152 employees (mostly teachers) in a large metropolitan school district who were enrolled in computer training. The findings included a significant relationship among convergers (people who prefer abstract conceptualization and active experimentation) and computer efficacy and no significant relationship between learning styles and a most or least preferred software application.

Interesting implications for staff development and integration of technology in teaching and learning activities emerged from this study. Among these implications are questions about how to effectively measure technology assisted learning activities.

Assessment/Evaluation Strategies (process & outcome) to Measure

How do we know if the teaching and learning process is conducive to brain potential, operations and types of thinking (rocket boosters) is the purpose of process (formative) assessments. Outcome (summative) assessments measure the learning outcomes. (Did the rocket boosters work and was the rocket successfully launched into the appropriate orbit?) Traditional assessments--essays, multiple choice tests, true-false tests and standardized normed tests—were and are frequently used to assess learning with technology. Traditional assessment are adequate in measuring some levels of thinking but need to complemented with newer assessment strategies to capture the variety of learning possible with technology enhanced learning. With new technologies in the teaching and learning process, there appears an emphasis on non-traditional forms of assessment such as authentic assessments (portfolios and journals), project based learning products, and rubrics. Different types of assessments are matched with types of thinking in table 6.

Current Assessment Strategies Matched with Types of Thinking

	Recall	Understanding	Application	Synthesis	Evaluative	Creative	Convergent	Divergent
Essays	X	X	X	X	X	X	X	X
Multiple Choice Tests	X	X	X	X	X		X	X
True-False Tests	X	X	X	X	X		X	
Standardized Normed Tests	X	X	X	X	X		X	
Authentic Assessments (Portfolios, Journals)	X	X	X	X	X	X	X	X
Project Based Learning Final Products (i.e. papers, videos, etc)	X	X	X	X	X	X	X	X
Rubrics*	X	X	X	X	X	X	X	X

(*Rubrics are tools used to measure process and outcomes in authentic assessments and project based learning.)

Table 6: Current assessment strategies matched with types of thinking.

As noted in the table 6, the traditional assessment will measure most types of thinking, but the reliability and validity with a variety of learners and learning outcomes are often questioned. Non-traditional assessments are critical for measuring creative thinking. The current practice of predominately using traditional assessments for basic skills and the non-traditional assessments to assess creative and problem solving products reflecting learning with technology creates a disbeneficial dichotomy.

A need for a new paradigm of assessment emerged with the integration of technology in the teaching and learning process and the predominance of constructivism theory or techniques in technology integration. As we are teaching and learning in new ways, we need to measure the process and outcomes in different ways. In order to fully capture the richness and vastness of teaching and learning that integrates technology, a bridge connecting the traditional assessments for convergent thinking and the nontraditional assessments for divergent thinking is needed. Normed quantitative tests measuring concept recall and understanding often miss the unexpected insights of creative problem solving. From another perspective, too often, qualitative portfolios and projects fail to explicitly assess basic concept mastery. Since standardized objective competences are predicted to remain an emphasis in school achievement, they need to be explicitly addressed in the constructivist and project based learning assessments.

Conclusion

How do you know when to plug in or plug-out? The plug-in or out decision should be made by examining whether or not the teaching and learning process is more effective and efficient (complementary to brain potential and processes and types of thinking) with technology. (Did the rocket boosters work to their full potential in combination with each other and was the human spirit—rising stars---students launched.) Individuals should make this decision based on: 1) the process and types of learning to be assessed and 2) findings from outcome instruments that measure basic skill competencies as well as creative meaningful application. Thus, the decision of Plugging-In or Out is an informed decision based upon assessment data and the potential of launching our students as all-stars!

References

Bennis, W. (1997). *Organizing genius*. Reading, MA: Addison- Wesley.

Barrett, S. (1992). *It's all in your head.* Minneapolis, Minn: Free Spirit Publishing.

Caine, R. and Caine, G. (1994). *Making connections: Teaching and the human brain*. Addison-Wesley Publishing Company:

Choate, A. (2000). The relationship of learning styles to computer self-efficacy and to preferred computer productivity software packages. Dissertation Abstracts International.

Deejski. "Connective transactions - technology and thinking Skills for the 21stCentury. [On-line]. http://www.adprima.com/_disc6/0000005a.htm

Dwyer, D., Ringstaff, C. and Sandholts, J. (1994). Changes in Teachers' Beliefs and Practices in Technology-Rich Classrooms. In Asen, S. (ed.), *Teaching and learning with technology facilitator's guide*. Alexandria, VA: Association for Supervision and Curriculum.

Elder, L. and Paul, R. *Universal intellectual traits*. [On-line] www.sonoma.edu/cthink/University/univlibrary/intraits.

Elliot, et al. (1996). *Educational Psychology*. Madison, Wisc.: Brown and Benchmark.

Fuijita-Starck. (1996). Motivations and characteristics of adult students: Factor Stability and Construct Validity of Educational Participation Scale. *Adult Education Quarterly*. 47(1). pp.29- 40.

Gardner, Howard. (1993). *Creating Minds*. New York: BasicBooks.

Greenfield, S. (1996). *The Human mind explained.* New York: Henry Holt and Company, Inc.

Hannaford, C. (1995). *Smart Moves: Why learning is not all in your head.* Arlington, Virginia: Great Ocean Publishers.

Lenaghan, D. "Resources in Education", ERIC, October 1999, *Brave new world: A good news scenario for educational reform.*

Oech, R. The seven steps. On-line:http://www.ozemail.com.au/~caveman/Creative/Brain/vonoech.htm.

Scriven, M. Defining critical thinking. [On-line]. http://www.sonoma.edu/cthink/University/univclass/Defining.nclk

Sylwester, R. (1995). *Celebration of neurons*. Alexandria: ASCD.

IT Practice from Theory. The Need for a New Paradigm.

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Abstract: IT is seen as having the power to transform teaching and learning. Extensive commitments have been made to its use throughout education. In some ways IT has been successful but it has not always achieved its intended aims. It can be argued that this is because IT's introduction and implementation has not been based on an appropriate pedagogy. IT's power renders aspects of existing pedagogical understanding obsolete. What is required before we can be truly successful is a new paradigm. Within the area of electronic communication a social constructivist position can illuminate our current position and show how best to use the technology to support teaching and learning in undergraduate degrees in the future.

This paper is intended to be of interest to individuals involved in initial teacher education.

References.

Astleitner H & Sams J, (1998), Ways of Supporting Teachers in Web-Based Instruction, in Davis (Ed), Teleteaching 98, *Distance Learning Training and Instruction,* Vienna; International Federation for Information Processing.

Brown S & McIntyre D, *Making Sense of Teaching*, Buckingham, Philadelphia, Open University Press.

Committee of Scottish Higher Education Principals (COSHEP), (1992), *Teaching and Learning in an Expanding Higher Education System,* (MacFarlane Report), Edinburgh, Polten.

Ewing J, Dowling J & Coutts N, (1997), Superhighways Teams across Rural Schools (STARS), Aberdeen, Northern College.

Fischer C, (1997), Evolution of Complex Systems by Supporting Collaborating Communities of Practice, in Halim Ottmann & Razak (Eds), ICCE 97; *International Conference on Computers in Education*, Kuching.

Hudson B (1999), A social Perspective on Teaching and Learning in the Social Context of Computer-Mediated Communication in Teacher Education, *in Journal of Information Technology for Teacher Education* Vol 8 No3.

Korthagen F, (1985), Reflective Teaching and Pre-Service Teacher Education in the Netherlands, *Journal of Teacher Education* 36.

Korthagen F, (1988), The Influence of Learning Orientations on the Development of Reflective Teaching, in Calderhead (Ed) *Teachers' Professional Learning*, London, Falmer.

Lamont M & Munro R, (1993), *Support and Promote Information Technology in Teacher Education* (SPRITE), Dundee, Northern College.

Learning Technology Dissemination Initiative (LTDL), (18997), *BrITe Ideas*, Edinburgh, Herriot-Watt University.

Lewis R, (1999), The Role of Technology in Learning: Managing to Achieve a Vision, in *British Journal of Educational Technology,* Vol 30 No2.

Pellegrino J & Altman J, (1997), Information Technology and Teacher Preparation: Some critical Issues and Illustrative Solutions, *Peabody Journal of Education,* Vol 72 No 1

Simpson M, Payne F, Munro R, Hughes S & Lynch E, (1998), *ICT in Initial Teacher Education in Scotland,* Aberdeen, Northern College.

Simpson M, Payne F, Munro R & Hughes S, (1999), Using Information and Communication Technology as a Pedagogical Tool: Who Educates the Educators? in *Journal of Education for Teaching* ,Vol 25 No 3.

Tharp R & Gallimore R, (1988), *Rousing Minds to Life*, Cambridge, Cambridge UP.

Tulviste P, (1991), *The Cultural-historical Development of Verbal Thinking,* Commack, Nova Science Publishers.

Vygotsky L, (1978), *Mind in Society.* The Development of Higher Psychological Processes, Cambridge, Harvard UP.

Vygotsky L, (1986), *Thought and Language*, Cambridge, Massachusetts Institute of Technology Press.

Throughout the Scottish education system extensive investment has been made in Information Technology (IT). A number of reasons have been given for making greater use of this. Not only is it viewed as being cost effective it is also seen as encouraging flexible and independent student learning. Increasingly IT is used as a medium for delivering significant parts of degree programmes. More widely there appears to be an ever growing consensus that IT will continue to expand its role as a medium for learning. Often though claims regarding its efficacy are not fully substantiated. It is not uncommon for little detail to be given. At times it can seem that it is enough to describe the proposed practice without offering either an overarching rationale or an examination of the proposed pedagogy. Even when a theoretical justification is given it can be less than rigorous.

For example, Fischer (1997) argued that work was an increasingly collaborative effort among colleagues and peers and this process was being accelerated by the use of ICT. Learning was becoming, "a new form of labor." (p 9). Although the notion of the development of, "collaborating communities of practice," is appropriate the paper tends towards a restricted view of the nature of learning. Knowledge seems to be seen as a series of facts and the transmission of knowledge is emphasised. Fischer argued that the effective use of ICT allowed the delivery of the, " *right* knowledge at the *right* time to the *right* person and in the *right* way." (p 12). Although IT systems do allow access to vast numbers of facts, an overemphasis on this not only devalues knowledge itself, it also suggests a limited view of both the nature of learning and the complexity of the relationship between learner and teacher. Astleitner and Sams (1998) explain that there are numerous examples of such limited expectations and argue that the majority of World Wide Web sites designed to support student learning either directly or indirectly seem to equate learning with the transmission of facts. They go on to suggest that what is needed is a, "firm foundation based on pedagogical principles in order to provide the theoretically founded knowledge necessary for extensive and high-quality support for teachers." (p 85)

Personal experience suggests that although the use of IT in both schools and universities has made some impression it has not had the impact on learning and teaching some of its loudest proponents have anticipated. In Scotland a rationale for the introduction and use of IT in higher education was outlined in the MacFarlane report (1992).[1] This initiated a series of developments throughout those institutions involved in initial teacher education (ITE). These included the development of policies confirming a commitment to the role of IT within teaching and learning settings, extensive investment in both hardware and software for academic staff and the introduction of relevant staff development programmes. Further provision was made to allow students access to both IT facilities and appropriate support. A number of innovative developments resulted including, SPRITE (1993), STARS (1997) LTDI (1997). It has been subsequently argued by Simpson *et al* (1998,99) that the innovative expertise developed by individuals through involvement in these activities has not been widely disseminated amongst staff in the institutions and that impact on the organization and structure of teaching activities has been limited.

Within the Edinburgh undergraduate ITE programme IT has been successful in changing the experience of students in lectures. For example the publication of notes in an electronic format means that students no longer need to take extensive notes and can focus on the lecturer. The lack of frequent pauses to allow for students completing note taking has meant that there can be more effective interaction with the content of the lecture. Students and staff now have access to a wealth of information so extensive it could be held by no traditional library. Email has proved to be a highly effective method of conveying administrative messages to students and dealing with their questions of a similar nature. Although somewhat reluctantly students have been prepared to use email to describe aspects of their professional activities. However the introduction of the technology has not proved to be as successful with the more academic aspects of student work. Students have not been prepared to use email to hypothesise, discuss or attempt to refine their understanding of professional issues. It would appear that this is not because they are unsure of how to use the technology, there is a lot of evidence of a high degree of technical proficiency in using the medium. It appears that young people use informal networks to effectively develop their skills in the use of this technology, at times innovatively adapting them to meet their own needs and priorities. Nor is it because students are unaware that it can be used for open-ended discussions, even a brief examination of student bulletin boards will show evidence of spontaneous discussions about a range of non-academic subjects. Some of these can show evidence of development in the participants' understanding. It can be argued that Astleitner and Sams (*ibid*) view that a stronger theoretical underpinning is required if IT is to be used effectively to support academic work, is correct.

An essentially Vygotskian perspective seems to be able to offer this theoretical underpinning. Vygotsky (1978) defined the zone of proximal development (ZPD) as the distance between the, "actual developmental level as determined by independent problem solving and potential development as determined through problem solving under adult guidance or in collaboration with more capable peers." (p 86) This implies not only that the mind has a potential for development but that it can develop in a range of different ways. The manner and direction of this development depends not only on the assistance given by adults and more capable peers but also on the socio-cultural environment. Tulviste (1991) argues that within any given society thinking develops in accordance with the types of activities in which people engage. By engaging in culture specific activities people develop higher mental processes that are appropriate for culture specific tasks. The mind itself constantly evolves as individuals find themselves facing new challenges.

According to Tharp and Gallimore (1988) to understand learning in the ZPD three concepts are important; situation definition, intersubjectivity and semiotic mediation. In any given situation an experienced practitioner may define it differently from a novice. For example, an experienced teacher tends to be more perceptive as to what is important in classroom situations and shows more sensitivity to the subtle characteristics of the classroom than a student teacher. This is situation definition. Once the novice has reached an understanding that allows him to generate a definition of a situation that is in tune with that of the experienced practitioner intersubjectivity has been achieved. This is a qualitatively different understanding of the situation to that held previously. Intersubjectivity is achieved through semiotic mediation, that is through dialogue between the experienced practitioner and the novice. It is through this that the novice's understanding of what needs to be done develops. With the experienced practitioner's support the novice moves towards their mentor's understanding of the situation. Intersubjectivity is achieved when their understandings overlap.

It is possible for the novice to progress through the ZPD. Tharp and Gallimore (*ibid*) suggested that this progression goes through two stages. Initially assistance is provided by the, 'more capable others,' who explicitly advise and support the learner. Over time intersubjectivity develops and the support becomes less explicit with the novice taking more responsibility for the situation. Eventually the processes become, "internalised, personalised, adapted and owned," by the novice. This is the end of the first stage.(p 252). Stage two is when the, "assistance is provided by the self." The responsibility for the task has shifted from the experienced practitioner to the learner. At this point the relevant processes are not automatic. Tharp and Gallimore argue that this stage is, "intermediate between external regulation and full individual competence. It may also be seen as the stage in which the voice of the regulating other is gradually acquired by the learner so that the regulations may be stated self to self, gradually taken underground, transmuted into thought and eventually discarded as behaviour becomes fully developed and adaptively automatic." (p 253).

Vygotsky (1986) suggested that intellectual development takes place on two planes. The first is the inter-mental plane which is between people in social and cultural situations and the second is the intra-mental plane which is the internalisation of the inter-mental processes. The implication of this is that higher mental functions are carried out in collaboration with others in a range of settings. Language, therefore, must play a central role in their development and internalisation. Vygotsky considered language to be an important tool for thought and problem solving. "Thought is not merely expressed in words, it comes into existence through them." (p 128) Language allows individuals to examine thought, clarify it, explore contexts, solve problems and identify connections. It is an important aid in structuring and refining thoughts.

Learning is a complex process. It is about developing understandings and making links rather than just the transmission of facts. It is influenced by the culture of the society in which the learner resides. It is not a solitary experience but something that happens in a social context. Interaction with others is central to the learning process. Language, both oral and written, has very close links to learning. Not only is it used as a means of communication but it is also central to the thought process and hence to learning itself.

As IT can be used to facilitate communication it could be seen as having a role to play in supporting this type of learning process. As with all activities that lead to learning its structure needs to be appropriate to its purpose. Electronic communication opens up possibilities for dialogue that could be used to support effective learning. It is not as spontaneous as oral language and does not contain the non-verbal cues that are involved in verbal interactions. It is less formal and more flexible than traditional methods of written communication. Although arguably not a totally new genre of communication it does have advantages over more traditional methods. These include:-

- allowing communication over distances that would otherwise be prohibitive;
- allowing access to expertise that would otherwise be unavailable;
- allowing groups of individuals with shared interests to exchange views in a common forum;
- helping the writer to express views they would be reluctant to share in a 'face to face' exchange;
- facilitating communication through its asynchronous nature.

It would seem therefore that it should be a highly effective medium for supporting learning and helping the learner progress through the ZPD. It has the potential to be used to develop thinking as well as communicating with both mentors and peers. Within the context of initial teacher education (ITE) there would seem to be potential for using electronic communication to develop student understandings during their times in the Faculty when they are not being directly taught. It would also seem to be an ideal medium for supporting students when they are involved in school placements outwith the Faculty.

This potential for IT to transform teaching and learning within educational establishments has been widely predicted. For example, Lewis (1999) argued the emergence of a pedagogy arising from, 'constructive learning,' stressing learner choice and multiple routes to outcomes. Pellegrino and Altman (1997) amongst others have speculated upon the processes of change, the forms these changes may take and their potential desirability or otherwise.

In the past it has proved difficult to bring about significant change in educational practice and, as stated previously, there is some evidence that pedagogical change relating to the use of IT is not unproblematic. In practice centrally planned initiatives tend to have only a limited impact on teaching and learning. Brown and McIntyre (1993) argued that within education, professional practice involves complex judgements, the process of which experienced practitioners have internalised to such an extent they appear to operate with a superficial simplicity. In contrast to a centralized approach to change it can be argued that a different approach is needed if a lasting change in educational practice is to be achieved. Within this model the educators themselves generate new concepts and frameworks through their roles as reflective and controlling participants in innovation.

It is not enough to introduce electronic communication into any learning situation and expect it to transform learning and teaching. Although applying existing pedagogical principles helps its effective use what is needed is a further exploration. The technology does have potential to transform but before this can truly happen we need to revisit our theoretical understandings. What is needed is a new paradigm.

Instructional Technology:

Practical Application Alignment With Theory In Student Teaching Field Placement

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Abstract: This case study explores what student teachers learn about practical classroom instructional technology applications within their elementary field placement and any underlying influences on student teachers implementing instructional technologies in the elementary are described along with their cooperating teachers' accounts of factors in the school that either promote or inhibit professional technological growth.

Student teacher/cooperating teacher participants were placed into *buddy system* configurations. These pairings served to investigate a) What effects do instructional technology using educators have on non-instructional technology using educators? And, b) What effects do non-instructional technology using educators have on instructional technology using educators?

When looking for ways schools of education can successfully merge instructional technology theory with classroom practice, three themes emerged: a) collaboration and rapport; b) self-directed learning; c) equipment: time and availability.

Introduction

Seventeen years ago, *A Nation at Risk* (United States Department of Education, 1983) addressed the need for secondary students to take a computer course prior to high school graduation. Standard course work emphasized programming in BASIC. Computer literacy was rarely considered in preservice education curriculum. Today, The Department of Education officially views technology as a change agent for public school systems.

With a new century upon us, educators are witnessing a convergence of brain-based research, technological innovations, a new culture of students, *au courant* learning theories, and a federal agenda to place computer-based technology into the nation's K-12 classrooms. This notable amalgam of developments combined with the exponential growth of the World Wide Web and newly published National Educational Technology Literacy Standards (International Society for Technology in Education, 2000) for teachers and students provide promising new implications for teaching and learning. As a result, schools of education are becoming points of egress for encouraging, modeling, and training preservice teachers to effectively synthesize computer-based technology into their newly developing classroom methodology. "The effect of computer-based learning technologies in facilitating student learning and performance is seen only when participants have the knowledge and skill to use the technology" (Fulton, 1998, p. 1).

The United States Department of Education (2000) found 66% of public school teachers integrated technology into classroom curriculum "compared to 47% of teachers who reported feeling somewhat prepared and 14 % of teachers who reported feeling unprepared" (p. 89).However, schools of education infusing the technology standards to already overcrowded teacher certification programs have developed into a slow course of action. According to Thomas, Larson, Clift, and Levin (1999) technology is best infused in all preservice education coursework. The "autonomous course model" subtly promoting learning technology applications was "not valued by students" and they were "seldom able to incorporate technology into their own curriculum" (pp. 4 - 5).

A predominate inconsistency exists between many schools of education faculty technology knowledge base and what they are training preservice teachers to do. Only 40.4% of faculty members indicated moderate to high proficiency in instructional methods for integrating technology (Vannatta, 1999, p. 1485). Queitzsch (1997) discovered major technology concerns directed toward faculty curriculum integration and student field placements. Students deserve teachers who model the best that technology can bring to learning (Topp, Thompson, & Schmidt, 1994; Jinkerson, 1995; Kortecamp, 1995; Queitzsch, 1997).

How can schools of education successfully merge instructional technology theory with classroom practice? This study is primarily concerned with investigating the student teaching practicum from the student teachers' viewpoints of being prepared to effectively integrate computer-assisted learning and instruction into their classroom practice. This will include underlying influences on student teachers implementing instructional technologies in their classroom practice. Emphasis will be directed toward revealing any internal and external support mechanisms and/or curriculum methods to better encourage appropriate proficient integration.

The Study

Participants for this naturalistic case study consisted of three elementary education student teachers enrolled in their final student teaching semester and their respective cooperating teachers. The field experience study site has a national reputation of being one of the premier school districts in the area and a reputation of one of the best and most progressive especially in the area of technology. Each classroom teacher is equipped with a personal use windows platform networked computer. All classrooms has four or five additional networked computers as well as a color printer. Teachers have access to the school server for bulk license purchased educational software, Internet access, and student project storage.

By placing student teachers in the same field placement elementary school site, participants had access to the same technology. This was important in investigating individual views of a technology-enhanced teaching environment and its underlying influences on implementing instructional technologies during the student teaching practicum. Noteworthy student teacher study outliers included technology experience prior to admission to the education program, school of education instructors, and cooperating teacher designation.

Paring was in a *buddy system* configuration (Carlson & Gooden, 1999). It intended to provide insight into how partnering of differing technology competencies translated into practical classroom application as well as the advantages and disadvantages of these field experience pairings. Individual cooperating and student teacher technology ratings were determined by unbiased evaluators served to establish commonalities as well as distinct technology abilities - a key in considering their field placement classroom pairings.

Participants	Pair 2	Pair 3	Pair 4
Student Teacher	Novice	Nearing Proficiency	Proficient
Cooperating Teacher	Nearing Proficiency	Proficient	Proficient

Table 1: Study Participant Pairing Configuration by Instructional Technology Competencies

Patton (1990) subscribes that there are three classical methods of generating qualitative data: reading (document analysis), talking (interviewing), and watching (observation). The general design of this study incorporated all three classical methods.

The first phase of the case study is biographical in nature. Participating preservice and cooperating teachers participated in an informal interview early in the student teacher's field placement experience. The informal interview introduced the study and allowed the researcher to better understand each participant's interests and concerns regarding the study. Interview questionnaires and informal interviews were also used throughout the semester to gain some perception into what teaching and computer-based technology means to each interviewee.

To better understand the participants' classroom experiences and gather first hand information necessary to furnish detailed accounts, student teachers were observed in their classrooms during the second phase of the study. The primary observational resource was videotaping and the observer remained as non-participatory as research conditions allow. The first observation was made on the first week the student teacher took over the classroom from the assigned cooperating teacher. The middle two videotaped sessions were equally spread as circumstances allow between the first and the last formal week of the student teachers' field placements.

The third phase of the case study entailed reflection and comparison. Student teachers and cooperating teachers were asked about their involvement with technology following their student teaching semester. Additionally, each student teacher's School of Education Summative Assessment of Student Teaching, filled out by both their cooperating teacher and university supervisor prior to teaching certification and filed in the Office of Curriculum and Instruction, was studied for any pertinent commendations (strengths) and recommendations (weaknesses) significant to this study.

Data analysis was the fourth and final phase. After perusing and careful analysis, the themes that became the foci of this report emerged from the data. Even though key factors at times coalesced, overlapped, and intertwined, themes remained distinct. After constructing a matrix of tables delineating the themes and the number of times each of them was backed by the data, I focused on the three that were most heavily supported: a) Collaboration and Rapport, b) Self-Directed Learning, and c) Equipment: Time and Availability.

Findings

The study recognizes that many of the student teacher participants' field experience perceptions corresponds to substantial national data regarding obstacles to and facilitation of a national thrust toward technology literacy. Time quickly emerged as an overlying theme. Data became predisposed to a multiplicity of participant time perceptions influencing technology integration decisions on many levels. The present analysis is congruent with existing research findings citing time as a critical implementation component (Beggs, 2000; The United States Department of Education, 2000; Mitchell & Hutchinson, 1998; Nantz & Lundgren, 1998; Kane, 1994; Sheingold & Hadley, 1990).

Since the first day of the study, participants wrestled with a responsibility overload. Weekly research focus groups were scaled down to bimonthly scheduling. I opted to end the focus group in favor of preceding and / or following each video observation with informal student teacher interviews as well as conversing with participants when I was visiting the study site for supplementary data. However the overlying issue throughout this study was how much time influenced the field placement experience (c.f. Fisher and Dove, 1999; United States Department of Education, 1998).

During many classroom video observations, I witnessed schedule conflicts with technology-enhanced projects. Student teachers related that it is not uncommon for technology acute teachers to sacrifice other content areas for a technology-integrated assignment. Further investigation using informal interviews revealed a pattern of the teaching staff engaging in unofficial reprioritizing of subject area scheduling.

The need and motivation to integrate technology during the field experience waned for two of the three student teachers as the semester progressed (c.f. Thomas, Larson, Clift, & Levin, 1996). Lesson planning was time consuming enough and incorporating goals and objectives involving technology made a demanding endeavor even more so. I witnessed a student teacher's good intentions overridden by not enough time to effectively integrate technology into the lesson plan, to choose software content to supplement the subject area, to prepare the computers for the project, and apprehension about not enough time in the schedule to work all the students through the computer station component (c.f. Medcalf-Davenport, 1999; Larson, Clift, & Levin, 1999; Queitzsch, 1997).

Each student teacher often became frustrated over the amazing amount of time it took their young students to work through technology-integrated assignments and to use technology not typically located in their classroom. A majority of student and cooperating teachers often spoke to considering the time it took to locate and set up technology into viable working mode as a major consideration when integrating it into his or her curriculum.

The preoccupation with time led to a parallel investigation into what factors contributed to these student teacher's coping mechanisms (support system) during their field placement experience. The bonding element between the participant pairs in the study underscored the heavily researched and proven phenomenon of student teachers readily implementing their cooperating teachers' classroom practices in lieu of the university professors' with which they have spent two years of preparatory work (c.f. Calderhead, 1988; Pratt, 1993; Merriam, 1993; Richardson-Koehler, 1988). I observed a direct connection evolve between this study's participant pairs' collaboration and rapport and their individual self-directed learning characteristics. Classrooms became settings for experiential learning - self-directed learning activities involving gleaning and synthesizing knowledge placing student teachers with personal responsibility for their own learning.

Cooperating teachers served as the student teachers' fundamental ongoing transitional support system toward becoming skilled educators. Field experiences provided a mentored trial-and-error authentic learning environment where, hopefully, theory may connect to practice. Participant pairs became collaborators working together in real time, not just in theory - a missing element in their university-based teacher education program. Feedback was immediate. These elementary classrooms represented the bell jar wherein student teachers had daily opportunities to synthesize previous academic coursework, including two previous semesters of school observations, on a conscious level.

Pair One complemented each other's contributions toward increasing curriculum technology integration. The technology literate novice student teacher and nearing proficient cooperating teacher expanded each other's technology literacy base and energized further learning toward a common goal – creating and facilitating a challenging engaging learning environment.

Pair Two's experiences appeared more one-sided. The cooperating teacher's proficient computer-assisted learning and instruction integration methodologies put theory into action for the student teacher. The proficient technology literate cooperating teacher largely affected the nearing proficient student teacher by making him an active participant. Even though the cooperating teacher greatly appreciated her student teacher's technology abilities and contributions to her classroom, she did not learn from the student teacher.

Pair Three's proficient technology literate team appeared an anomaly to this research. The student teacher did not flourish in this technology-rich professionally modeled learning environment. Eventually he reengaged his self-directed learning abilities to become better prepared for class. However, neither the student teacher nor the cooperating teacher grew exponentially in technology integration. Both voiced frustration about the experience.

Recommendations

Teacher educators and administrators working in technology accommodating university environments are ultimately responsible for working toward setting functional integration priorities in motion throughout preservice curriculum. Implementing priorities will emphasize focus on a necessary goal of the educational institution – preparing teachers for the new century of students. Largely, classroom technology integration debates have shifted from *if* to *how* in the last decade – *How can schools of education successfully merge instructional technology theory with classroom practice? How* cannot possibly be approached until priorities shift to facilitating the process.

Recommendation 1: Begin Now

Appropriate computer technology integration should become an automatic response to specific methodological needs prior to student teaching. Teacher educators must begin to transition their own curriculum design toward facilitating this goal. Once the student teacher enters his or her field placement experience, time elements are often weighed against exploring technology integration. Unless more student teachers establish a better comfort level with the latter, integration is often bypassed. So, if and / or when a student teacher becomes overwhelmed from his or her field experience demands, with the proper preservice training, integrating technology should not be interpreted as an overwhelming additional curricular chore.

Recommendation 2: Infuse Technology Into Every Course

Holistic integration is the key. Systematically infusing educational technology into the every teacher education course in some way will assist the curriculum transition toward graduating technology competent new teachers. As teacher educators enhance their own technology-based skills by connecting computers with each facet of school curriculum and instruction, preservice students will begin to connect with technology to contextual learning activities involving age-appropriate, competency-building learning experiences to be used in student teaching. Even beginning observation course could require students to locate instructional technology within the building site and establish a familiarity with reservation procedures.

Educational technology courses estranged from the main body of educational coursework further perpetuated the notion that technology is an entity to be dealt outside the mainstream academic courses. A danger lies in isolating technology from an authentic learning environment. Isolating may translate primarily into a computer application course. However, courses of this type could be renovated to include authentic learning environments where preservice students design and implement technology integrated activities in K – 12 settings.

Recommendation 3: Do Not Assume Assimilation

It is doubtful that teacher educators teach curriculum methodology and content standards around machines. Think of the disservice to education if teacher educators certified new teachers who built lesson plans around equipment, like pencils or color markers, not concepts. Laughable perhaps but novice educators need to be able to assimilate the difference between computer technology applications and integration. Just because preservice teachers can assemble a PowerPoint presentation does not guarantee that they can conceptualize and construct a curriculum implementing PowerPoint that engages higher-order thinking skills. Teacher educators should never assume preservice students have the ability to assimilate theory into practice. The ability to assimilate is not a given for every undergraduate - especially since they have most likely spent at least 13 years in educational systems primarily entrenched in drill-and-practice and memorization.

Recommendation 4: Model, Model, Model

Research proves its importance in student teachers' ability to integrate technology into their classroom curriculum. School of education instructors and administrators must evaluate how to make prevalence in every preservice classroom every day - then set the practice into action as soon as possible.

References

Beggs, T. (2000). Influences and barriers to the adoption of instructional technology. [Online]. Available: http://www.mtsu.edu/~itconf/proceed00/beggs/beggs.htm [2000, October].

Calderhead, J. (1988, Spring). The contribution of field experience to primary student teachers' professional learning. Research in Education, 40, 33 - 39.

Carlson, R., & Gooden, J. (1999). Mentoring pre-service teachers for technology skills acquisition. Proceedings of Society for Information Technology and Teacher Education, 2, 1313 - 1318.

Fisher, S., & Dove, M. (1999). Muffled voices: Teachers' concerns regarding technological changes. Proceedings of Society for Information Technology and Teacher Education, 2, 1338 - 1343.

Fulton, K. (1998, February). Learning in a digital age: The skills students need for technological fluency. T.H. E. Journal [On-line serial] 2(298) Available FTP: Hostname: thejournal.com Directory: /journal/magazine/98/feb/298/feat5.html [1999, January].

Jinkerson, L. (1995). Educational technology: School administrators voice what teacher candidates need to know. [Online]. Available: http://www.coe.uh.edu/insite/elec_pub/html1995/1810.htm [1998, December].

Kane, C. (1994). Prisoners of time: Research, what we know and what we need to know. [Online]. Available: http://www.ed.gov/pubs/PrisonersOfTime/PoTResearch/flaw.html [2000, September].

Kortecamp, K. (1995). Integrating technology in preservice education: A model for faculty development. [On-line]. Available: http://www.coe.uh.edu/insote/elec_pub/html/1995/1819.htm [1998, December].

International Society for Technology in Education (ISTE). (2000). ISTE develops technology standards for teacher preparation. [Online]. Available: http://www.iste.org/news/NETS_T_Release.pdf [2000, November].

Medcalf-Davenport, N. (1999). Historical and current attitudes toward and uses of educational technology: Chapter two. Society for Information Technology & Teacher Education, 2, 1424 - 1428.

Merriam, S. (1993). Adult learning: Where have we come from? Where are we headed? In S. Merriam (Ed.), An update on adult learning theory. (pp. 105 – 110). San Francisco, CA: Jossey-Bass.

Mitchell , N. & Hutchinson, C. (1998). Preservice teachers experience technology through collaboration with elementary students. [Online]. Available: http://www.coe.uh.edu/insite/elec_pub/HTML1998/ re_mitch.htm [2000, September].

Nantz & Lundgren. (1998). Lecturing with technology. [Online]. Available: http://www.nlu.edu/~rakes/ lecturewithtech.pdf [2000, October].

Patton, M. (1990). Qualitative evaluation and research methods. (2nd edition) Newbury Park, CA: Sage.

Pratt, D. (1993). Andragogy after twenty-five years. In S. Merriam (Ed). An update on adult learning theory. (pp. 15 – 24). San Francisco, CA: Jossey-Bass.

Queitzsch, M. (1997). The northwest regional profile: Integration of technology in preservice teacher education programs. Northwest educational consortium. [Online]. Available: http://www.netc.org/ preservice/challenge.html [1998, December].

Richardson-Koehler, V. (1988). Barriers to effective supervision of student teaching: A field study. Journal of Teacher Education, 39(2), 28 - 34.

Sheingold, K., & Hadley, M. (1990). Accomplished teachers: Integrating computers into classroom practice. New York, NY: Center for Technology in Education.

Thomas, L., Larson, A., Clift, R., & Levin, J. (1996, Winter). Integrating technology in teacher education programs: Lessons from the teaching teleapprenticeships project. Action in Teacher Education , 7 (4), 1 - 8. [Online]. Available: http://lrs.ed.uiuc.edu/tta/Papers/TLCL.html [2000, October].

Topp, N., Thompson, A., & Schmidt, D. (1994). Teacher Preservice experiences and classroom computer use of recent college graduates. In Technology and teacher education annual. 46 - 51.

United States Department of Education. (2000). National Center for Educational Statistics. Teachers' tools for the 21st century: A report on teachers' use of technology. [Online]. Available: http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2000102 [2000, September].

United States Department of Education. (1998). Office of Educational Research and Improvement. Technology and education reform. [Online]. Available: http://www.ed.gov/pubs/EdReformStudies/EdTech [2000, February].

United States Department of Education. (1983). A nation at risk: The imperative for educational reform. [Online]. Available: http://goalline.org/Goal%20Line/NatAtRisk.html [2000, July].

Vannetta, R. (1999). Evaluating ncate technology standards implementation in a school of education. Society for Information Technology & Teacher Education, 2, 1483 - 1488.

Virtual Worlds, Real Minds:
an investigation about children, videogames and cognition

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Abstract

The Virtual Worlds, Real Minds project aims to investigate and understand the cognitive processes that take place when young people play videogames and to provide educators with some insights based on this understanding. Preliminar findings show that traditional, Cartesian ways of thinking can be perceived, along with new, more emotional and interactive forms of viewing and making sense of external stimulae.

Children resemble more their times than their parents
Ibn Kaldum, Arabian thinker, XIV century

Introduction

This research project started when my nine year-old boy asked me to go with him to a videogame rental shop. A new game had just arrived from Japan and he wanted to get it ahead of his friends. He didn´t know exactly what the game was about. Needless to say, neither of us knew a single word in Japanese, spoken or (of course), written. This basic fact didn't stop him at the least. He rented the game, we went back home, he inserted the cartridge in his console and wonderfully – started playing. Just like that.

How? It became immediately clear to me that important mental processes were being mobilized at that moment. He was enjoying himself, he was having a good time, but he was learning as he played.

In order to be able to play a new and still "uncracked" digital game, in which written and spoken word were in a different and unknown language, my son had to rescue and apply everything he knew about games and how to play them. And he had to do it "on the fly". The pace and sheer speed of the game didn't allow him time to think. Or maybe it is better to say that he couldn't think in cartesian ways, racionalizing everything as he went along.

It was then that I decided to investigate the processes of thinking and learning that are involved in the act of playing videogames, in the hope of reaching further understanding about the ways the new generations think, communicate and interact. If we could advance our comprehension of the young minds, maybe we could devise more efficient educational methodologies. In other worlds: it is time to develop educational systems that are "in sync" with the generation we are supposed to teach – or to help in their learning.

Videogames were chosen as a particularly relevant subject also because they are pervasive: kids' main use of technology.

The research project

The research has been going on for a little more than an year and some results are being obtained. These preliminary results are the topic of this paper.

The research is part of a broader project being conducted at the Pontificia Universidade Catolica do Parana, a private-owned university in south Brazil. It is a medium-sized institution by Brazilian standards, with about 20,000 students and 1,500 staff members. The Faculty of Education started in 1998 a new area of research called "the Centre of Tomorrow Education", with the aim of studying new educational technologies and methodologies, of evaluating the

impact of these innovations in different educational environments and of helping teachers and academic staff in the difficult task of applying new technologies and methods in their day-to-day work as educators.
The "Virtual Worlds and Real Minds" project is one of the projects presently being carried on at the Centre. It started formally in the beginning of the 1999 academic year (which in Brazil is March) and is expected to take on more year to reach final results.

Methodology

The project comprises field work and analysis. Field work is being done in three different environments: home, videogame rental stores and arcades. The Home environment is itself divided into two categories: console-based videogames and computer games.
The first part of the observation was directed towards videogame home users. Young people from 4 to 14 years old, mainly middle class, living in three different neighborhoods. They were observed and interviewed, both at their home and at six videogame rental shops which agreed to cooperate with the researcher, allowing an interesting comparison between these two playing environments. All in all, the universe of this first stage totalized 54 "regulars" (50 boys and 4 girls) and about a little more than a hundred other kids who contributed to the research in more open ways (some were interviewed but not observed while playing, others were observed only once or twice and were not follow-up, for a number of reasons). Data were collected and registered in a spread-sheet/data base/graphics integrated software. A control group of 8 kids who claimed not to play games at all was identified and interviewed regularly.
Apart from direct observation and interviewing, a large number of materials was selected and analised, such as specialized videogame magazines, fanzines, web sites, books, posters and other related stuff which belong in the gamers universe. Videogames of many different types and systems were seen in detail and played by the researcher (as far as I was able to go...).

Preliminar Findings

For explanatory reasons, preliminary results are shown in three groups:

- classical processes and patterns of tought
- non-cartesian and emotional intelligences
- social behaviour and sociability patterns

Thinking Digital

First, it could be observed that many ways of thinking that educators put a lot of effort into to develop in their students are already being employed by kids when they play their games. Association, generalization, analysis and sintesys, tranfer, projection, simulation, trial and error and a number of others forms, alone or combined, are put into action by the gamers all the time.
It is not in the scope of this paper to present and discuss all those "ways of thinking" and how they operate in the gamers minds and actions. But let's take generalization, for instance. One of the main components of Cartesian/Newtonian processes, generalization occurs when there is not enough data to proceed – so we start from what we have and try to extrapolate the ideas we consider as generic enough (and so, applyable) to the new situation; generalization also happens in the opposite direction, when we have too much data and must discard what is not relevant (for not being generic enough) in order to proceed within a safety error margin. Well, that is what we can see young people doing when they put a new game in their favorite console or when they get to new phases of a game. They advance by grasping – in a wink of an eye – what is relevant and what is not, what must be discarded and what must be fulfilled so they can deal with new situations. Surely educators would love to see their students doing the same when they tacked the contents of a traditional course...
One of the aspects which may present teachers and educators with food for thought is the way gamers deal with error. They are not afraid of making mistakes, of following the wrong turn or of choosing a bad weapon. They know that to err is to learn: error is a natural, necessary part of a learning curve. How different from what they get in schools, where they are taught that to make a mistake is something bad, something to be ashamed of. No wonder they accept a passive role as students while they are so very active playing games.

Thus, kids are not discouraged to play a new game. On the contrary, they love the challenge, they yearn for the new and are nor afraid of facing new obstacles. When dealing with a new game or screen within a game, they think – fast – and they act, without hesitation, on the basis of what they decide, after considering, with mind and body, what should be done.

Emotional Intelligence on the Fly

This complex structure of trial-and-error, of thinking and acting, of seeing and doing, of feeling and knowing, of risk and feed-back, is quite amazing for an adult who were raised believing in the power of rational, logical, processual thinking.

For emotions, intuition, sensibility play a very important part in the world of the gamers. Many times, when a problem arises which is not solvable by association with past experiences, by generalizing, analyzing, transferring, previewing or any other rational way, they trust their feelings, their intuition. "I don't know how, but I was sure I should go that way". They also know that you must keep a delicate balance between being "cool" and relaxed and being keen, attentive, adrenaline-driven if you want to be a good gamer. Emotional intelligence applied…

Sociability in the gamers' world

Other interesting considerations in the educational point of view can be made at this point. For instance, research is very import in the world of videogames. Gamers publish and read magazines, web sites, fanzines and other printed materials. They look into these materials to find and share tricks, suggestions, opinions, open and secret codes, even illegal or a least unauthorized information that show how to defeat a tough enemy, how to get more money or new lives, how to go faster, how to find that secret passage. They also consult more experienced gamers (nothing to do with age: experience is measured by the time one have already spent playing); they build and use a highly integrated network of players; they interact.

In a way, gamers tend to form a kind of "urban tribe" as defined by French sociologist Michel Mafesoli: a post-modern pattern of sociability, in which individuals behave in certain pre-defined ways accepted and valued positively by the group, who derives its own identity as a group from these shared values. This pattern affects the way kids play (and the way they learn) since the ones who interact tend to be more effective in reaching their goals. The isolated individual gamer must rely on his own habilities and often thet are not enough to win ("to zero", to "

tough game. Thus, we may be facing a very interesting case of cooperative, collaborative learning environment.

This may conflict with the highly competitive nature of games, digital or not. In the specific case of videogames, it seems that competition is seen more like a dispute against the machine than against the other players. We can see that in a boy's party (if there is a videogame console available, there is where kids will gather around): young and older kids helping each other to defeat the mean phantom. They don't really care if a friend killed the monster in less time (they will try to better their scores latter); they want to learn how to do it, or how to do it faster or more efficiently.

There is a lot more to games than simple hand-eye coordination. Among other capacities, it can be observed a gain in visual understanding, in media awareness and in the development and use of a multimediatic, interactive language.

Problems over the horizon

On the other hand, an educator can easily see a number of problems in the games kids play. There is violence, for sure. A kind of sublimated violence, as some psychologists argue, or at least the representation of violence. Videogames – a boy's world, for sure. Many games are "politically incorrect", since kids look into virtual worlds usually through the eyes of a white-macho-american hero, who kills everything that moves. They go beyond a sexist view. Here are Nazi fundamentals: everyone who is not like me wish to do me harm; better to eliminate them before they get a chance to eliminate me.

This arguments are nor to be discarded lightly. They suggest a deeper investigation on the sociological and psychological aspects of videogaming, which are beyond the scope of this research. Even so, it can be pointed out that violence, racism, sexism are not inventions of the games industry and would not disappear from the world if games were abolished (as some propose). It is out task as parents and educators to contextualize these issues, to discuss them, to amplify the world of references and values children have access to – then they will be able to make right choices. Is

was noted in this research that some very violent and bloody games are popular, but not played as much as other, more involving and challenging games.
Other negative aspect perceived during this investigation was a tendency, shown by some kids, of over-self-valueing. A good gamer considers himself "the best". He can always find a way to defeat his enemies, to win a challenge, to find hidden treasures. He is so good that nothing is beyond his capabilities. Life outside the game must be the same. He will always be a winner. There are some considerable dangers here, from a narcissistic isolation to a self-centered, egotistic individualism.

Next Steps
Field work will continue with the groups mentioned above and with two new groups: computer-game players and arcade gamers. Those two groups were left out of the first stage of the research because they tend to involve kids older than 14, and in the case of arcade players, from other social stratus.
Analysis of data will be carried on with more attention to statistical procedures and methodologies. Observation and interviewing will continue, with special attention to the control group. Cognitive aspects will be the main issue to be tackled, in the hope that we will be able to deepen our understanding about the ways the new generations think, communicate and act.

As author Douglas Rushkoff pointed out,

"To look into the children's world is not to look back to what we were. Is is to look into the future".

References
JOHNSON-LAIRD, Philip. The Computer and the Mind. Harvard University Press, 1988.
RUSHKOFF, Douglas. Playing the Future. Harper Collins, 1997.
TAPSCOTT, Don. Growing Up Digital: the rise of the net generation. McGraw-Hill, 1998.

Communication Technologies: Post-industrial Infrastructure

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Abstract: This work addresses the complex relationship between the post-industrial society and communication technologies. This interaction results in the acquisition and the codification of theoretical knowledge and information that influences the key aspects in the social and technological development, namely: social, political, economic changes. A model was developed to represent the balanced coexistence of technical and human infrastructures in our information era. As a result of the presentation of this model, the readers will gain a new perspective on their position within the multi-level human-technology infrastructure.

Introduction

Technique possesses a universal significance,
for through it a new cosmos comes into being.
Nicholas Berdyaev.

This work investigates the relationships between the two essential components of the technological infrastructure: technical and human factors, represented, respectively, by the communication technologies and the post-industrial society. The paper presents the conceptual macro view of the infrastructure and its surrounding issues discussed in the historical and analytical works by contemporary thinkers in the field of technology and culture. Technology reshapes traditional society, its values, and its routines. Most of the contributors recognize the potential benefits of technology, however, they also express the genuine concern about human mind and freedom. Alongside the infrastructure related topics, the writing introduces multiple interpretations of the impact of modern technological world on the nature of human experiences in social aspects of life. In order to address contemporary issues about communication technology, it is essential that we define what is meant by technology in modern world. The illustration of the evolution of its definition will give us a better picture of the subject matter of our discussion.

What is Technology?

Feibleman defined technology as "the name for the invention and employment of artifacts, and artifacts as materials altered through human agency for human uses. Another name for artifact is tool" (Feibleman, 1982, p. 74). Neil Postman (1997), the author of the article "Defending ourselves against technology," makes a distinction between a technology and a medium. He states the following: "As I see it, a technology is a medium as the brain is to the mind. Like the brain, a technology is a physical apparatus. Like a mind, a medium is a use to which a physical apparatus is put. A technology becomes a medium as it is given a place in a particular social setting, as it insinuates itself into economic and political contexts. A technology, in other words, is merely a machine, a piece of hard wiring. A medium is a social creation" (p.229). He also presents the idea that it is possible for a technology to be used in a manner in which "its social, economic and political consequences are quite different from one culture to another" (p. 229). In different cultures and languages, philosophers defined technology in different ways.

The French word *technique*, and German *Technik*, are usually put into English as "technology" (except by Lewis Mumford, who calls it "technics"), and the English word "technique" means something else: "a technical method of accomplishing a desired dream" (Webster). Ellul's usage of *technique* in both French and English is vastly broader still: the totality of all rational, efficient methods in every field of human activity. In other words (those of his translator, John Wilkinson), technique is "nothing less than the organized ensemble of all individual techniques which have been used to secure any end whatsoever"(Susskind, 1973, p. 89).

Jacque Ellul (1964) sees technology, *la technique,* as an ensemble of technical means, a totality of means that operates at its best efficiency. Langdon Winner (1977) in Chapter II "
widely recognized work *Autonomous technology* views technology in the following way:

A technique is a structure of human behavior designed to accomplish a definite outcome. A technical organization is an assemblage of human beings and apparatus in structured relationships designed to produce certain specific results. A technical operation, to the extent that one engages in it, determines what one does (p. 75).

It is certain that technology does not exist in a vacuum. The interaction between humans and technology is taking place at many levels. The technological phenomenon is a constant of human history. The paradox is that culture cannot exist without technique and technique will not exist without culture. According to Marx, humans make their world, but they are also made by it. *The idea of paradox, the dualism, "the double edge sword" type of relationship is the characteristic of the interaction between humans and technique of modern era. This very idea of paradox, the dualism is one of the central themes of this work.*

To Ellul, the greatest wonder of our time is the integration of people and society into the complexity of the technical world. The final definition of the technology in this paper can be formulated as a multi-complex interrelation with life, society, and the environment. Lewis Mumford (1983) in the article "Technics and the nature of man" refers to the classic Greek usage for technics that "makes no distinction between industrial production and art; and for the greater part of human history these aspects were inseparable, one side respecting objective conditions and the functions, the other responding to subjective needs and expressing sharable feelings and meanings" (p. 81).

Technique may be understood in a broader and narrower way. One word stands for both industry and art: another means to make, to create with skill. We speak not only of an economic, industrial, military technique, a technique of transport and the comforts of life, but also of a technique of thought, versification, painting, dancing, law, even of a spiritual technique (Berdyaev, 1983, p.203).

In connection to the definition of the *technique* that contributes to the understanding of its meaning, it appears necessary to present its defining characteristics in the context of modern time due to its special position in our life.

The Characterology of Modern Technique

According to Jacque Ellul (1964), "the technique of today has the same characteristics as all preceding techniques" (p.62). Yet, "primitive techniques have no reality in themselves; they are merely the intermediary between man and his environment" (p. 63). Modern phenomenon is that due to the advancement of its features" today's technical phenomenon has nothing in common with the technical phenomenon of the past" (p. 78). Rationality and Artificiality are two obvious characteristics of the technical phenomenon. Self-augmentation "can be formulated in two laws: 1) in a given civilization, technical progress is irreversible; 2) technical progress tends to act, not according to arithmetic, but according to a geometric progression" (p. 89).

Winner (1992) writes: "any suggestion that there be a slowdown, limitation, or moratorium on scientific inquiry, research, and development is unthinkable at present" (p. 66)."Technological determinism stands or falls on two hypotheses: 1) that the technical base of a society is the fundamental condition affecting all patterns of social existence; (2) that changes in technology are the single most important source of change in society" (p 76). A restricted technology does not exist.

The Technological Imperatives show instrumental and economic requirements. "Vertical integration is the state of affaires in which the output of one operation becomes input for the next. Ellul labels the same phenomenon "monism" and "the necessary linking together of techniques" (Winner, 1992, p.101). The technological systems have an inherent tendency to set a complex of linkages that continues beyond society's original anticipation. We do not know the outcome. We are not able to decide what is best, or what should be.

For Winner, technological advancement is characterized by industrialization means in social, technical, economic structures to support the large-scale production of goods, mechanization, rationalization, modernization (dynamism, extension, size and concentration, division, complex interconnection, interdependence, centralization, apraxia, universality, pervasiveness, irreversibility, inevitability, positive destiny), growth or "progress". Langdon Winner, altogether with the characteristics of modern technique, presents one aspect of the paradox, the master-slave paradox, the issue of control. He asks why technology is problematic. And he answers: "It changes itself and its development generates other kinds of changes. The major concern is the issue of human autonomy and the loss of mastery. One idea is that technique is believed to be a reality in itself and to have its own special laws. On the other hand, the modern history of technological change is "a diverse collection of patterns rooted in the specific choices that individuals, groups, and nations have made for themselves and imposed on others" (p. 54).

Ellul agrees with Winner that in technological society we are all technicians who do not have much of a consciousness, which puts us into a position of peasants who could not control their destiny. The rules of the game have changed. Technology has a trend to be a new God. Technological impact is so great and complex that men no longer can cope with it as a means, and therefore, it is more an end-in-itself. Men must adapt themselves to it.

Winner is also concerned about this very issue of reversed adaptation and the dual nature of technology that in not neutral in his view. It is ambivalent. Technology is not neutral. It is both, good and bad. It constantly interacts with humans who are praising it and trying to escape from it at the same time. It always produces "winners" or "looses." Postman (1997) is in agreement with Winner in his statement: " Only those who know nothing of the history of technology believe that a technology is entirely neutral or adaptable" (p. 229). To Ellul, however, technique is about the choice of its use, It is human responsibility to make ethical choices, which becomes more plausible if we, as a post-industrial society, gain a better understanding of our place within the complex, multi-level communication technology infrastructure.

Post-Industrial Infrastructure

In order to develop a successful network, the members of a global society need to know the core components of a complex system called communication technologies infrastructure. This infrastructure is a multi-level system where all its parts are interconnected and function together to achieve common goals.

Originally, 'infrastructure' referred to the military support system (e.g. Roman roads, city walls, etc.) The concept of infrastructure includes technical and human aspects. According to Byrd, Turner (2000), "Information Technology (IT) infrastructure is the shared IT resources consisting of a technical physical base of hardware, software, communications technologies, data, and core applications and a human component of skills, expertise, competencies, commitments, values, norms, and knowledge that combine to create IT services that are typically unique to an organization''(p.167). Sometimes there are three aspects of the communication technologies infrastructure specified, namely: hard, soft, and economic. In *The technopolis phenomenon: smart cities, fast systems, global networks* (1992) infrastructure is seen as a comprehensive three-tier integrated system comprising hard, soft (education, government), and economic components. Table 1 demonstrates the conceptual model of communication technologies infrastructure signifying a more detailed strategic approach to establishing a deep hierarchy of inner systemic relationships among all the core elements of the infrastructure.

Post-Industrial Society

The boundaries are very likely to be marginalized between the Post-Industrial Age (1950-1969) and the Cybernetic Age (1970-present). Why then are we talking about 'the post-industrial society and not about the information society, the knowledge society, the professional society, maybe? Bell (1973) writes: "In Western society we are in the midst of a ...change in which old relations, existing power structures...are being rapidly eroded...What the new social forms will be like is not completely clear" (Dordick, 1993, p. 11) From the model [Table 1], we gain an understanding that there are five groups of knowledge-producing activities: education, research and development, media and communication, information machines, and information services-constituted what Bell defined as the knowledge industry. Post -industrialization is a process with new technical, social, cultural components where the integral parts are professionals as the established ruling class, risk, and control (Nelson, 1998). "Despite early predictions that information workers would be riding high in an information economy, they are often the first to lose their jobs as firms consolidate their activities and relocate work, made less valuable by information technology, to low-wage-rate countries "(Dordick, 1993, p.5). There is no contradiction of terms in the remarks about the leading role of technical elite and its unstable market value due to increased competition resulting from rapid diffusion of postindustrial innovations.

Communication Technologies

According to the conceptual model of infrastructure [Table 1], communication technologies are to be examined at different levels. The first layer is the four core elements: telecommunications, computers, visual and acoustical technologies (Maughan, personal communications). No nation can expect to maintain a technological advantage for too long. What will matter is how well that nation can utilize the market to its advantage and for how long. This requires marketing skills, organizational innovations, and educated work force. These are the "technologies" that are crucial in the twenty-first century. Dordick (1993) notes that technology, then, should be seen not in terms of hardware or software alone (the next level of information objectification) but also as a way of managing, educating, and organizing which is a macro level of communication technologies structural analysis.

The end product of all information service markets is knowledge. The link between the post-industrial society and communication technologies, the "axial principal" if we use Daniel Bell's expression, is the acquisition and codification of theoretical knowledge. Information itself has three dimensions economic, scientific, and behavioral. The key idea of the social life is development. Its progressive nature is best described through the examination of the numerous variables that comprise development.

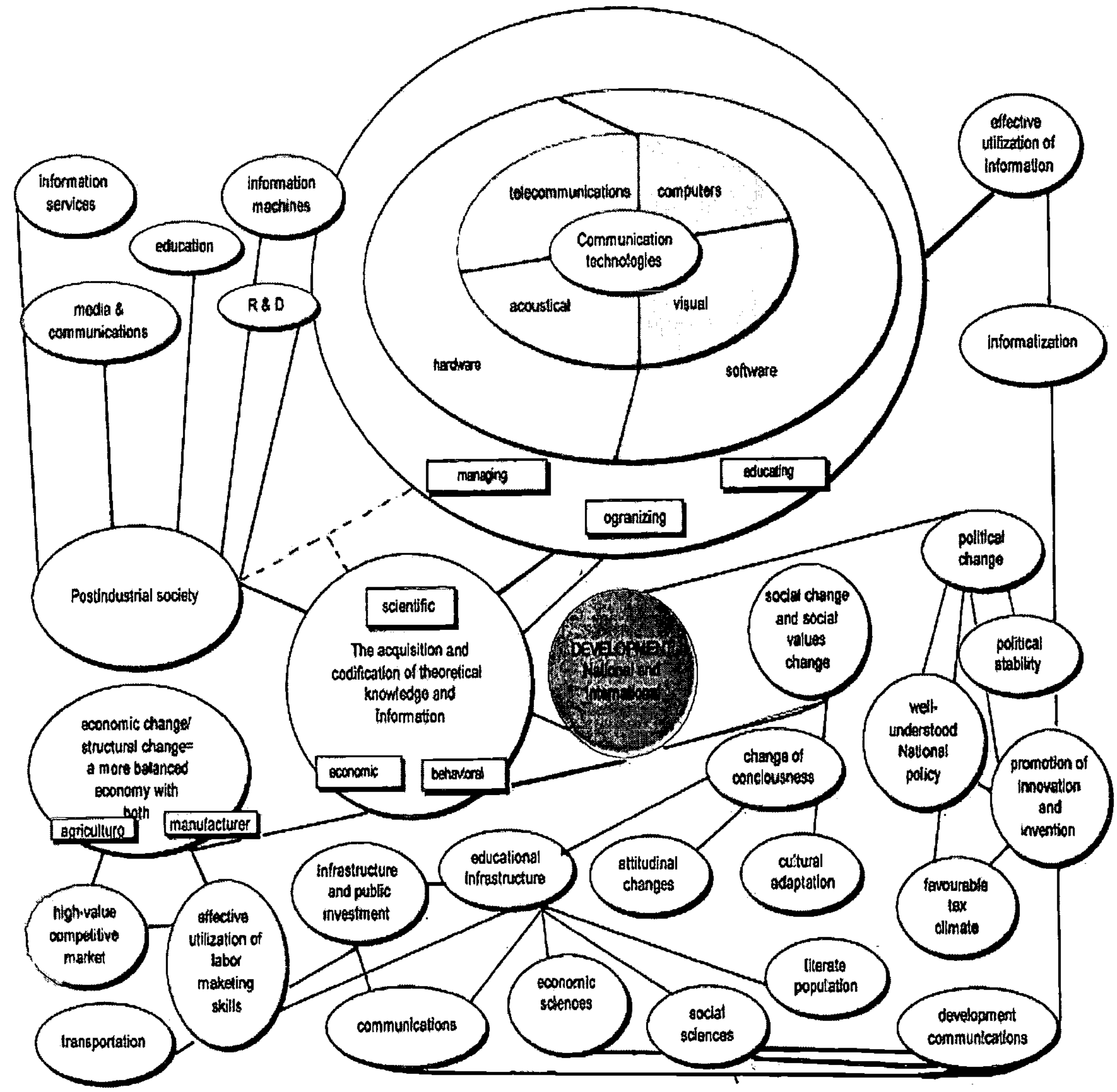

Table 1: A model of communication technologies infrastructure in the post-industrial society.

Development Variables

Contemporary problems of the well-established and developing nations are caused by several factors, for example, the cultural differences among nations, money constrains, time constrains, and inadequate training. Economic growth is a necessary but not sufficient condition for development. Development is more than economic growth. Development is a complex process that encompasses economic, social, and political changes. Development requires *attitudinal changes, cultural adaptations, a trained and educated work force, and a political structure.* Communications and communications technology are agents of *economic, social, and political change.*

Economic Change: Technology is a significant determinant of economic growth. The measurements of the economic scope in the information society are: 1) *the size of the information force* (as a percentage of the total labor force), 2) *its contribution to the nation's Gross Domestic Product*, by sectored analyses of labor force and contribution to GNP. Within the economic pyramid, the shift to a more balanced economy in which an agricultural sector and a diverse manufacturing sector are key factors in the development process. *Social Change:* For development to continue, there must be a trained and educated work force, an effectively functioning government, public investments in basic infrastructure, communications, and transportation, and a positive attitude toward progress. *Political Change:* There has to be *a well-understood national policy* that encourages the development of high-value industries, and there must be a policy that encourages *competition* among firms, emphasizing innovation and invention. In order to encourage long-term investments there must be *political stability and a favorable tax climate.* The following points help explain the variables associated with political change.

Innovation / Invention in a postindustrial world is more process-oriented than product-oriented. Carley (1995) notes: "mass-communication technologies that enable greater competition among messages and greater message complexity will enable faster information diffusion than those technologies that inhibit competition and message complexity" (p.547). Companies differ in the speed with which they adopt innovations.1) Innovators-the first firms to adopt a new idea 2) Initiators-the firms who adopt the idea soon after the innovators 3) Fabians-the firms who adopt the idea only after its utility is widely acknowledged in a particular industry 4) Drones-the last firms to adopt new ideas" (Mueller, 1971, p. 54) There are *four states in the process of innovation:* 1) The scientific discovery, when the theoretical principle behind an innovation is discovered. This results from basic research; 2) the invention, when it is for the first time made clear that the production of a given product or process is possible. This results from applied research; 3) the innovation, when the product or process is for the first time applied successfully in practice. The innovation is the result of product development; 4) the innovation diffusion process, by which an innovation spreads from the first innovator to other potential innovators" (Pedersen, 1975, p. 74) *Informatization* is an important determinant of development.It is a process of change leading to an information society. ere is a relationship between informatization and the global economy, and national development and economic growth.

The Role of Communication Technologies in the Post-industrial Society

Nowadays, people question the domineering role of technology in their social organization. Strijbos (1997) in the article "The paradox of uniformity and plurality in technological society" illustrates the duality of the human and technology relationship: social unification and pluralism at the same time. There is no doubt that a technological universalism in a geographical and a qualitative aspect is a fact of life. There are two distinct visions on the results of technological influences. Some people believe that a growing pluralism and disintegration is a distinct characteristic of our time.

However, the contrasting phenomenon of uniformity, mechanization might be just the other side of this technological culture we live in. The author examines the relationship between technology and culture from a historical perspective beginning with the early rise of technology in the tenth century in Europe to the present. The author warns us that technocracy realizes its potential in a totalitarian technology. Technology in its modern form becomes a reality to the laws of which man doesn't have access. At the same time there is another angle: the level of uniformity rises in parallel with the advancing technology. The works of different philosophers, including Ellul, Mumford, Postman, Winner present the paradox that technology makes us uniform in our thinking and at the same time gives us opportunity for diversity.

Conclusions

The key to the effective utilization of newly produced objectified information is access to that information. The National Information Infrastructure is a measure of this access. The maturity of the infrastructure is measured in terms of hardware/software purchase patterns, policy (access, control), real/perceived value, skills of information workers (knowledge workers, data workers) and users, maintenance and upgrade, leadership, change acceptance or resistance.

The negative aspects of postindustrial technological autonomous expansion are the separation between labor and private life, an enormous social mobility, and the identity crisis. Technology makes our life easier but it also makes it extremely complex. *The complexity of our relationship with technology makes us seek direction:* Where are we going? Who is in control: man or machine? These issues are highly disputable in regard to the direction we are taking technology vs. it is taking us. The answers to these and many other questions the readers are called to seek for themselves. " In a complex technological society, "almost every one, in fact, can find his niche in a public world where all things must work somehow together" (Feibleman, 1982, p. 87). Despite the marvelous paradox of the world we live in that is characterized by ambivalence, dualism of the nature of technology and its interaction with humans, we exist in a dynamic, yet a balanced system.

References

Berdyaev, N. (1983). Man and machine. *Philosophy and technology. Readings in philosophical problems of technology.* Micham, C., Mackey, R. (Eds.) New York: The Free Press.

Byrd, T. A., Turner, D. E. (2000). Measuring the flexibility of information technology infrastructure: exploratory analysis of a construct. *Journal of Management Information Systems, 17* (1), 167.

Carley, K. M. (1995). Communication technologies and their effect on cultural homogeneity, consensus, and the diffusion of new ideas. *Sociological Perspectives, 38* (4), 547.

Dordick, H. S., Wang, G. (1993). *The information society: A retrospective view.* Newbury Park: Sage Publications.

Ellul, J. (1964). *The technological society.* New York: Vintage Books.

Feibleman, J. K. (1982). *Technology and reality.* The Hague: Martinus Nijhoff Publishers.
Mueller, R. K. (1971). *The innovation ethic.* American Management Association, Inc.

Mumford, L. (1983). Technics and the nature of man. *Philosophy and technology. Readings in philosophical problems of technology*. Micham, C., Mackey, R. (Eds.) New York: The Free Press.
Nelson, J. I. (1998). Out of Utopia: the paradox of post-industrialization. *Sociological Quarterly, 39* (4), 583.

Pedersen, P. O. (1975). *Urban-regional development in South America: a process of diffusion and integration*. Paris: Mouton & Co.

Postman, N. (1997). Defending ourselves against technology. *Bulletin of science, technology, society, 17* (5), 229-233.
Strijbos, A. (1997). The paradox of uniformity and plurality in technological society. *Technology in society, 19* (2), 177-194.

Susskind, C. (1973). *Understanding technology.* Baltimore: The John Hopkins University Press.

The technopolis phenomenon: smart cities, fast systems, global networks. (1992). Gibson, D.V., Kozmetsky, G., Smilor, R. W. (Eds.) Lanham, MD: Roman & Littlefield Publishers, Inc.

Winner, L. (1992). *Autonomous Technology.* Cambridge: The MIT Press.

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Creation of a new paradigm for the roll of educators through in service training that facilitates innovation and improves the process of imperfectly seeking emerging technology in tandem with the evolving market place.

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Abstract Change is the name of game in the hyper - competitive international market place - radical, unrelenting and ever accelerating change. It is not an event. On the contrary, it is a journey that has no end. In this whirlwind of change, only such educational institutions of higher learning that are prepared to take the leap beyond the traditional hierarchies would thrive and survive. Educators should understand the deeper forces that operate on the Teaching Learning process and the market place. The paper attempts to find this synergy through a case study.

Introduction

Observations

* In depth and complete knowledge of subjects are not sacrosanct.
* Academic excellence is a myth.
* New treatise is to be evolved.
* Educational system churns out hordes of "one dimensional" people.

The advent of the new technology is creating unprecedented ,yet fleeting opportunities .The educational Institutes that fail to act now and build newer Teaching -Learning methodology that capitalize on these opportunities will find themselves relegated to mediocrity or will obsolesce in the emerging market place. There are some critical challenges that incumbents need to overcome to succeed in the global market place. The incumbents fail to attract the right talent by crippling the new Teaching -Learning process with old educational models and methodologies. The world is complicated, demanding and unforgiving It is clear that the complexity of building a sustainable educational –training model will only increase.

New imperatives

Educational process is the source of almost all value creation, knowledge based industry thrives on this; the efficacy of intellectual capital depends on the training model one choose to implement. What is new is that the stakes are now much higher and competition is intensifying dramatically.

Leaders of education should give focus and direction to the process of innovation even at cost of in depth knowledge of any one subject. Design of curriculum should be with a mission statement. It needs to take a holistic approach of Teaching Learning process and training to develop skills and disseminate information.

"Instead of fixing problems, the millennium humans will chase opportunities, they will not seek to optimize. Instead, they will be hard wired to innovate. They will not seek to perfect the known. Instead they will seek to create wealth by imperfectly seeking the unknown", quoted in a leading newspaper, which manifests the attitude of all and sundry. Keep this in mind while preparing the course and training material.

The time has come to terms with "Education by objective". The curriculum design process should be left to market force, but then the roll of educationist should be to develop physical content and logical sequence to satisfy the market aspirations, which dictates that, "Content is the king". The practice of concurrent engineering can be applied in the curriculum design by simultaneous interaction with the interested and all concerned parties. The technological innovations like video conferencing, chat facility through internet and dedicated web sites for university curriculum design department, facilitates and gives thrust to holistic approach to the training program.

Our study shows that this improves the perception and participation of teaching learning process by all concerned parties involved. The market appreciates the removal of the process of "reinventing the wheel" and appreciates the cultivation of temperament for the emerging technology and the proactive role of universities in bringing about a cultural revolution in the name of technology integration in all walks of life.

The paper discusses ways and means to create a skill set to enable the teachers to change gear to innovate and assimilate the emerging information technology and evolves a practice to figure out the non-essential part of the subject domain to optimize the creative energy of the people involved.

Case Study

A technique like ABC analysis in the realm of inventory control is to be discussed in the paper at large. Most importantly the paper address the pedagogy involved in the Teaching-Learning process of computer programming languages such as Object Oriented Programming in C++, JAVA and other Internet technologies and methodology to innovate to understand and follow the technology, with out a time lag, so that state of art technology can be offered to trainees and students.

Programming languages are the pace setter for developing mastery over the emerging technology in the realm of technology convergence. Object Oriented Design, Analysis, and Programming introducing students to a new paradigm in implementing and practicing any of problem solving strategies.

It is observed that teachers handling the programming language classes tend to distanced away from newer languages and related technologies and exhibits inertia to be comfortable with ongoing process of pushing technology to it's limit. On the contrary the market dictates to produce more and more technology savvy educators and administers. Our experience in conducting refresher courses for teachers, introduce them to a new paradigm in seeking knowledge and capability to study and assimilates newer and ever unfolding technologies. The teachers were told to give priority to certain areas rather than trying to master every bit of the available forms and literature on the subject. They were advised to give importance to the process of "conversion of problem to logic".

The need not elaborate on data types, Compatibility, Portability, Multithreading Capabilities of the language or even java virtual machine. There is lot of parallel between previous programming language and newly evolving programming languages, try to figure out the similarities in the newly created language or software packages. Teach and learn in the mould of previously developed methodology, but with new constructs. Develop computer program for same set of exercise problem definitions which were developed for earlier languages. The fundamental understanding in interdisciplinary subjects, data structure, Numerical methods, Operations Research techniques, mathematics of Graphics and human behavioral psychology gives us a deeper understanding and helps us to translate the nuances of any problem definitions. These self sufficient modules not only contained, tried and tested code but also had programming capabilities built in to make holistic 'building blocks' that make application development easy.

ABC Analysis approach applied to innovate Teaching – Learning process of fast emerging technology.

This is a classification which attempts to distinguish the 'Vital few from the trivial many'.In inventory management the basis is annual value . A, B and C are categories of importance. Different controls are adopted for each category. ABC analysis is the widely used approach for classifying the inventories on the basis of cost and use in the realm of Industrial Engineering practices. This is a type of *Pareto analysis and* some times also referred to as *Always Better Control* approach. We created categories of varying importance amongst Object Oriented Analysis, Design, programming in Java and C++ and interdisciplinary subjects which cater to the supply of problem definitions to be converted in to computer program.

Findings

One cannot overemphasize that the single key priority for Teacher educators is to rapidly reposition themselves for extreme competitive preparedness without any further delay .The direction of flow of value, whether into or out of the educational Institutions, will depend upon the relative competitiveness of the Institute. Educational process of an institute needs to be calibrated for there ingenuity on the basis of the net value that they capture for the national economy . It is the Institutions endeavor to continuously explore opportunities for growth by establishing synergy and blending its multiple core competencies to create new epicenters of growth. The market mechanisms are essential to engender efficiency and add value to the Teaching Learning process. Yet, they must be supplemented with a much broader growth strategy to create and retain value to uplift the Standards of institutions of higher learning.

Application of ABC analysis like technique on training model, witnessed a sharp response from among teacher's undergoing refresher course on Object Oriented programming in C++ and Java programming languages. Majority of the incumbents (92%) embraced this technique to improve their ability to assimilate newer technology at a faster pace.

YOUNG CHILD

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Last year there was a great deal of press discussion around a report produced by the Alliance for Childhood entitled *Fool's gold: A critical look at computers in childhood.* The report was critical of the amount of funding spent on introducing and consolidating the use of computers and other media in early childhood classrooms, when, in their view, the funds should have been diverted to maintain the traditional format of early childhood curricula. In particular, the authors of the report claimed that "... the benefits of computers for preschool and elementary school children were being vastly overstated." And that "... the costs - in terms of money spent, loss of creative, hands-on educational opportunities, and damage to children's physical and emotional health - were not being accurately reported." (Alliance for Childhood, 2000, p.1)

Some contradictions in their findings cause us to question the Alliance's conclusions. First, the authors contended that those who supported the use of computers by young children had a vested interest in marketing the machines while at the same time the Alliance has strong ties to Waldorf education, a pedagogical approach which focuses on sensory motor learning and regularly does not teach reading systematically until children are in the 3rd or 4th grades of school.

The second contradiction concerns their either faith or lack of faith in research concerning curricular tools. The Alliance criticized the lack of research to support claims that computers can enhance early childhood learning contexts and cited research where it specifically did not (classrooms in which drill and practice software were blamed for poor test results in the basic skills). This was somewhat ironic since at the same time they made contentious claims expressing their own viewpoint which were not supported by any research at all. Near the end of the report they stated "... there is absolutely no evidence that a lack of computer technology in elementary school poses any threat at all to a child's development." (p. 87) Yet many of the tools of the early childhood curriculum they support, have no foundation in research. Certainly, there are no studies *either* which examine the effect that lack of jigsaws, blocks or collage pose to a child's development - which serve to indicate the futility of asking such questions.

To be sure, there are uses of technology which are not effective or appropriate, but same is true of any curricular material. So it is important to know *how* to use the curricular material. In addition, there is a lot of low quality software on the market which doesn't afford many opportunities for learning. Even so, this fact cannot justify the condemnation of *all* software.

Thirdly, though the Alliance attacks the misallocation of funds toward the use of technology, the paltry amount given toward early childhood cannot be compared with the general misallocation of society's resources in America. How many citizens question the amount of foreign aid allocations, or the billions of dollars spent on fighter aircraft or missiles, to the detriment of American children who are homeless, have poor nutrition and whose schools are devoid of adequate funds. Certainly, in American society which according to the The State of America's Children (Edelman, 2000) is number one in medical technology yet one in six have no health insurance; number one in millionaires yet 20% of children are poor and at risk of malnutrition; number one in military yet over 80,000 children have been killed by guns since 1979; any attack on the misallocation of funds must be examined in the context of incredible misallocations national resources.

The publicity that the report received was considerable and worrying. Each year those teacher educators who prepare students to become early childhood professionals come to SITE to discover ways in which they might extend and improve their practice in order to ensure that teachers of the 21st century are confident and competent in the use of instructional technology. In this way children in our classes are provided with opportunities to become effective learners in *new and dynamic* ways. We believe that the use of instructional technology enhances teaching and learning opportunities for young children and can cite research to support our viewpoints, including our own.

This year, the presentations in this section all review and consider important issues related to the use of instructional technology by teachers and learners.

The paper by Ragan considers the ways in which the use of computers is appropriate in a pre school environment and highlights what knowledge teachers of young children need in order to design environments that are characterized by the appropriate use of computers when necessary. The notion of competency in terms of technological fluency is an integral part of this discussion as well as the clear articulation of what knowledge and skills are needed for exemplary teaching and learning with instructional technology.

Bell and Crawford ask us to consider levels of comfort with technology for preservice students, since they contend that confidence and competence with technological devices, and the ways in which they may be integrated into teaching and learning contexts is an important pedagogical skill for the information age. They suggest that computer literacy is only developed in supportive environments when both children and teachers are afforded with opportunities to explore and problem solve in versatile ways. They continue the dialog in their second paper by considering the use of technologies in a variety of different educational contexts such as museums, after school programs and learning centers. Bell and Crawford contend that when children are given autonomy and control over their learning in interactive displays they are more likely to return to engage with it and other displays. They suggest that such contexts for learning with technology provide exemplars for learning in diverse environments and should inform they ways in which we organise teacher education courses that are related to curriculum applications both in school and in out of school contexts.

Next, Christina Han examines the attitude of principals to the use of instructional technology by young children. Principals are key people in terms of the provision and support of computers in schools and Han discusses the results of her survey with principals in Hong Kong which elucidate the key features of computer use in their schools.

He and Zhang provide a variety of examples of interactive learning contexts for teachers. They contend that the use of instructional technology with students can enhance their attitude to learning in a positive way and that this has a beneficial effect on the education process. Their results indicate that the use of instructional technology can assist in raising students' abilities in abstract thinking, analysis and synthesis of ideas and when practiced in a context of exploration can yield additional benefits associated with becoming autonomous learners.

Nancy Yost explores the use of videoconferencing with kindergarten aged children. Her project involved two classes who became involved in a weather project. The two teachers included a range of technologies for the successful sharing of ideas and communication and the paper discusses the issues and outcomes of the interesting project.

References

Alliance for Childhood (2000). Fool's Gold: A Critical Look at Computers in Childhood. College Park, MD: Alliance for Childhood. Also available at: http://www.allianceforchildhood.net/projects/computers/computers_reports.htm

Edelman, M. W. (2000). The State of America's Children. Washington, DC: Children's Defense Fund.

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Young Children and Technology: Building Computer Literacy

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Abstract: Building upon the young child's prior knowledge and developmental level, computer literacy must be addressed early in each child's educational career. A comfort level or disposition is important to develop for both young children and as well as early childhood teachers, which is why the importance of instructional technology is stressed within the pre-service teacher's educational experience.

Preservice Teacher Preparation

Pre-service teachers focus an immense amount of time on the classroom experience, as well they should. The learning opportunities associated with real-world, student-centered classroom environments should be strongly emphasized during the methodological design and development of the preservice teacher's training. Individuals preparing to be early childhood teachers, generally are offered a wide variety of experiences working with young children. These experiences range from simple observation in pre-primary and primary grade classrooms to taking full responsibility for successful, authentic learning experiences for young children during the final stages of their preparation. Students experience tutoring individual children in content-oriented skills, facilitating learning experiences for young children in small groups, as well as planning and implementing educational activities for as many as two dozen young learners in self-contained classroom. Significant challenges arise for these pre-service teachers. Planning lessons and managing relatively large groups of young, dynamic learners, aligning authentic educational experiences with mandated objectives, and promoting application of skills and knowledge in relevant ways for the purposes of student assessment are just a few of the major concerns.

Pre-service teachers should develop dispositions that they are decision makers and have a genuine part in developmentally appropriate classroom activities. Integrating technology into the pre-service teacher's training must occur so that they will have developed a well-rounded set of skills when taking responsibility for their own classroom. The support of the early childhood and instructional technology faculty members offer the preservice teachers a supportive environment through which to design, develop, discuss and revise a lesson plan. Such a learning experience offers the preservice teacher the opportunity to think through the real-world process of integrating instructional technologies in appropriate and successful manners.

Integrating Technology

In the last fifteen years, early childhood teacher educators have moved from wary speculation of the appropriateness of instructional technology in pre-primary and primary grade classrooms to a greater understanding of the operations and integration of technologies into daily classroom practices (Anselmo & Zinck, 1987). With current public interest in effective early childhood instruction at a high level, it is appropriate to prepare the next generation of teachers to use technologies with young children. Currently, pre-service teachers bring varied experiences with technologies to their course work and experiences. Yet, the trend toward heighten awareness and positive dispositions toward technologies among pre-service teachers is apparent.

Planning and Implementation

The opportunity to develop an understanding of the early childhood classroom environment adds to the preservice teacher's conceptual framework, which in turn aids the preservice teacher in further developing a repertoire of skills that offer opportunities towards the integration of technology. The integration of technology into the young child's learning environment offers experiences that may not otherwise be available, and supportive environments offered by the early childhood and instructional technology faculty members aid the preservice teachers in further developing the necessary skills associated with a superior repertoire of experiences.

Pre-service early childhood teachers should be encouraged to view instructional technology as not simply a means of delivery of learning experiences, but a means for young children to represent their understandings and to creatively express their interpretations of the world. (Charlesworth, 1997) It has long been held among early childhood educators that children should learn through "hands-on" instruction of three-dimensional materials. Integrating technologies with those fundamental "hands-on" experiences should be evident in lesson planning. This blend of experiences should nurture individual learning styles, promote autonomy in young learners and to augment typical classroom assessment strategies.

Interpreting the scope and sequence of early childhood curriculum in relation to individual child development will compel pre-service teachers to balance expectations with individual learning needs, as well as the context of the community. Clearly, effective early childhood education does not take place in a social or cultural vacuum. Lesson plans that are developmentally appropriate will reflect an understanding of instructional expectations, child development and community. (Lubeck, 1998) Does the use of instructional technologies in early childhood classroom influence this delicate and ever-changing balance? Using computers or other interactive technologies with young children will not fundamentally change effective classroom practices. Teachers that consistently and creatively use technologies, model a disposition toward new learning contexts, methods and information. Young children will interpret these experiences and develop their own understandings and dispositions toward instructional technologies. If a climate of acceptance is fostered in early childhood classrooms and is evident in pre-service teachers' dispositions, lesson planning and daily implementation, then young children will be influenced by these authentic and meaningful experiences. Ultimately, pre-service teachers should view instructional technologies as a means of fostering a sense of independent practice, collaborative learning relationships among peers and empowering our youngest learners to independently interact with various media and gain new understandings.

Summary

The components of appropriate and effective early childhood classrooms must now include emerging technologies specifically for young children. Also, the definition of the early childhood classroom teacher as "nurturer-facilitator" will be altered as children gain independence and a broadening worldview through their experiences with technologies. Lesson planning for developmentally appropriate classrooms will assuredly become more complex in the coming years, yet the opportunity awaits for more dynamic classroom experiences for young children, growing autonomy for young individuals, and expanding the horizons of information for young children will yield notable benefits for students, as well as professional satisfaction for those teachers that develop well-planned learning activities.

References

Anselmo, S. & Zinck, R.A. (1987). Computers for young children? Perhaps. *Young Children. 42*(3), 22-27.

Charlesworth, R. (1997). Mathematics in the developmentally appropriate integrated curriculum. In C.H. Hart, D.C. Burts, and R. Charleworth (Eds.), *Integrated curriculum and developmentally appropriate practice: Birth to age eight.* Albany, NY: SUNY Press.

Lubeck, S. (1998). Is developmentally appropriate practice for everyone? *Childhood Education.* 74(5), 283-292.

Integrating Technology into the Young Child Lesson Plan

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Abstract: The support of the early childhood and instructional technology faculty members offer the teacher candidates a supportive environment through which to design, develop, discuss and revise a lesson plan. Such a learning experience offers the teacher candidate the opportunity to think through the real-world process of integrating instructional technologies in appropriate and successful student-centered manners.

Introduction

The integration of technology within the young child educational environment can present significant levels of difficulty for teacher candidates, as well as master teachers with numerous years of experience. The conceptual framework pertaining to the appropriate and successful implementation and successful, appropriate integration of technology within a learning environment can grow exponentially when the teachers integrating technology have a nurturing, supportive environment available through which to think through such a difficult task. Further, the support of university faculty and instructional designers adept at the appropriate and successful implementation of technology lends an environment wherein the educator can develop a level of comfort with the technology while developing the skills and conceptual framework necessary to integrate technology into a lesson plan. An environment that emphasizes a nurturing, supportive environment for the educator will also maintain such an environment when the implementation of technology reinvents itself within the young child learning environment. The modeling associated with instructional technology within a learning environment is of utmost necessity.

Teacher Candidates and the Young Child

Teacher candidates focus an immense amount of time on the classroom experience, as well they should. The learning opportunities associated with real world, student-centered classroom environments should be strongly emphasized during the methodological design and development of the preservice teacher's training. Students experience tutoring individual children in content-oriented skills, facilitating learning experiences for young children in small groups, as well as planning and implementing educational activities for as many as two dozen young learners in self-contained classroom. Significant challenges arise for these teacher candidates. Planning lessons and managing relatively large groups of young, dynamic learners, aligning authentic educational experiences with mandated objectives, and promoting application of skills and knowledge in relevant ways for the purposes of student assessment are just a few of the major concerns.

Instructional Technology

Teacher candidates should develop dispositions that they are decision makers and have a genuine part in developmentally appropriate classroom activities. Integrating technology into the teacher candidate's training, more specifically supporting the appropriate instructional design associated with designing a lesson plan, must occur so that they will have developed a well-rounded set of skills when taking responsibility for their own classroom. A significant opportunity may be realized through the integration of technology into lesson planning for early childhood classrooms. The support of the early childhood and instructional technology faculty members offer the preservice teachers a supportive environment through which to design, develop, discuss and revise a lesson plan. Such a learning experience offers the preservice teacher the opportunity to think through the real-world process of integrating instructional technologies in appropriate and successful manners.

In the last fifteen years, early childhood teacher educators have moved from wary speculation of the appropriateness of instructional technology in pre-primary and primary grade classrooms to a greater understanding of the operations and integration of technologies into daily classroom practices (Anselmo & Zinck, 1987). With current public interest in effective early childhood instruction at a high level, it is appropriate to prepare the next generation of teachers to use technologies with young children. Currently, teacher candidates bring varied experiences with technologies to their course work and experiences. Yet, the trend toward heightened awareness and positive dispositions toward technologies among teacher candidates is apparent.

Planning and Implementation

Where in the milieu of teacher education courses does the early childhood preservice teacher have the opportunity to integrate technology in an appropriate and successful manner? Of course, the requisite instructional technology course is emphasized as a core requirement, but what of the integration of instructional technology within the learning environment? The focus of learner-centered educational environments must be emphasized, and the technology must be integrated in an appropriate and successful manner. The opportunity to develop an understanding of the early childhood classroom environment adds to the preservice teacher's conceptual framework, which in turn aids the preservice teacher in further developing a repertoire of skills that offer opportunities towards the integration of technology.

Pre-service early childhood teachers should be encouraged to view instructional technology as not simply a means of delivery of learning experiences, but a means for young children to represent their understandings and to creatively express their interpretations of the world. (Charlesworth, 1997) It has long been held among early childhood educators that children should learn through "hands-on" instruction of three-dimensional materials. Integrating technologies with those fundamental "hands-on" experiences should be evident in lesson planning. This blend of experiences should nurture individual learning styles, promote autonomy in young learners and to augment typical classroom assessment strategies.

Conclusions

Issues surrounding pre-service teacher training, creating understandings of the importance of comprehensive lesson plans for early childhood classrooms and implementation of those plans in effective and developmental classroom settings abound. The components of appropriate and effective early childhood classrooms must now include emerging technologies specifically for young children. Also, the definition of the early childhood classroom teacher as "nurturer-facilitator" will be altered as children gain independence and a broadening worldview through their experiences with technologies. Lesson planning will assuredly become more complex in the coming years, yet the opportunity awaits for more dynamic classroom experiences for young children, growing autonomy for young individuals, and expanding the horizons of information for young children will yield notable benefits for students, as well as professional satisfaction for those teachers that develop well-planned learning activities.

References

Anselmo, S. & Zinck, R.A. (1987). Computers for young children? Perhaps. *Young Children. 42*(3), 22-27.

Charlesworth, R. (1997). Mathematics in the developmentally appropriate integrated curriculum. In C.H. Hart, D.C. Burts, and R. Charleworth (Eds.*), Integrated curriculum and developmentally appropriate practice: Birth to age eight*. Albany, NY: SUNY Press.

Computer Science for Children

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Abstract: This work shows a propose of teaching computer science for children. It is intended that the "Information Technology Teaching" sharpens the critical sense and capacitate students to learn not only to use currents technologies, but to understand how it works. To find out which Computer Science Topics are more suitable to teach children, it was realized a quiz, answered by Computer Science and Information Technology teachers which thought disciplines. A solid basis to the practice of Computer Science has the objective to develop the demanded abilities to think, to express clearly and precisely, to answer problems and create concepts.

Introduction

Many efforts are being developed to use today's technologies into the teaching-learning process. These efforts are aimed at the use and classification of educational software products, distance communication techniques, the use of multimedia and virtual reality resources to aid teaching, and also in the construction of computer environments that could change the educational paradigm, though from all known papers up until know there is none focusing on the basic Computer Science concepts involved.

Between all the aspects involved during the learning process, the development of logical reasoning has fundamental importance, thus it is proposed that the teaching of fundamental concepts of Computer Science could enhance the basic school learning and develop today's demanded abilities.

This article is organized in three sections: the discussion of teaching concepts, the aspects of work in the teaching of computer science or children and the final conclusions.

Teaching Concepts

According with Menezes and Diverio (1999) the computer theory is very important to the Computer Science, because it gives a right theory support requested to a correct and great learning of the science involved on computers, creates the development of a logical and formal thinking, and also, introduces fundamental concepts that are developed in other areas.

To find out which Computer Science Topics are more suitable to teach children, (Fernandes and Menezes, 2000) it was realized a quiz, answered by Computer Science and Information Technology teachers which thought disciplines like: Software Engineering, Data Bases, Programming Languages, Math and General Systems Theory, in many public and private institutions of Brazil.

It was asked, independent of the application to answer in an intuitive and objective way which are the basic fundaments of Computer Science. The identified concepts where separated and summed in relation to the quantities of answers.

From all the concepts cited, the top ones where: Algorithms, Programming, Formal Languages and Automatons, Computability, Complexity, Formalisms and Machines. It is noticed that those comprehend the basic formation in the Computer Science area.

It is intended that the "Information Technology Teaching" sharpens the critical sense and capacitate students to learn not only to use this technologies, but to understand how it works.

This vision is corroborated by many authors such as on (Esmin, 1999) and (Silveira, 1997) in which there is evidence that the traditional methods of teaching math bring the student to use most of the time to elaborate calculations as opposed to build concepts and develop abstract reasoning.

Therefore, as math does not teach how to manipulate a calculator, the teaching of Computer Science cannot be limited to be a training or to teach how to use a tool, like a specific text editor. Because if something changes in this type of editor this training must be restarted. Additionally as it does not fit in this context, the teaching of typing and shorthand writing.

Aspects of Work

After identified the fundamental concepts of computer science it is necessary to study how they will be introduced and how to approach them in conformity with the existing disciplines. We are studying on the history of education and how today's disciplines where introduced to the actual school curriculum for to be based

History is the understanding of the transformations made by men during time. Pedagogy is the art and the science of teaching, or the action of men when transmitting its knowledge. It is focused on the man in its whole and it is centered on the formation of thought. Thus Pedagogy in the teaching of Computer Science can help the formation of computational though, use other's science methods, and identify and eliminate learning obstacles. The path to the teaching of Computer Science must be worried on the solution of problems and must be centered on the student's experience to act in a specific knowledge domain.

Understand and study the history of computer is before all understand the evolution of mathematics. The result of building techniques that allowed us to calculate in the past, for example, area and tangent coincides with the technological development of mankind. Thus the first year of Computer Science must be based on the teaching of mathematics, for example: basic in logical math and conditional idea of Computer Science.

Conclusions

The data collected with the teachers on the institutions researched shows the basic requirements for Computer Science, what mainly comprehend the basic formation in the Computer Science area.

These concepts must be worked in a multidisciplinary matter, focused in mathematics. Thus, algorithms are used for development of calculus, logic′ notion, of theory of set etc.

The transformation of these concepts in useful applications is of fundamental importance, bringing motivation to children for the computer science′ study.

References

Boyer, C. B. (1991). *A History of Mathematics*. Broklin, New York: John Wiley & Sons.

Diverio, T. & Menezes, P. B. (1999). *Teoria da Computação: Máquinas Universais e Computabilidade*. Porto Alegre, RS: Sagra Luzzato.

Fernandes, C. S. & Menezes P. B. (2000). A Propose of Teaching Computer Science for Children. In: *International Conference on Engineering and Computer Education*. São Paulo.

Esmin, A. A. (1999). O que um Aluno de Ensino Médio deve Conhecer de Computação? Uma Proposta de Currículo. In: *Anais do XIX Congresso Nacional da Sociedade Brasileira de Computação.* (pp. 787-793). Rio de Janeiro, 1999.

Silveira F. A. & Costa A. C. (1997). O MATHEMATICA em uma experiência com Alunos de 2 Grau. In: *Anais do VIII Simpósio Brasileiro de Informática na Educação*. (pp. 849-842). São José dos Campos, 1997.

Technology and Character Education of the Younger Generation

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Abstract: This paper intends to provide a variety of examples for teachers to recognize the possibility of utilizing technology to create a student-centered interactive learning environment and to show how some high schools in Shanghai, China have been successful in cultivating in their students healthy personalities and strong characters, so as to produce a generation of young people who are ready to contribute to their society. The presentation will include a variety of ways in which to apply technology to create this beneficial learning environment, which will not only enhance students' learning of basic knowledge and skills within subject areas, but also to enrich their self awareness and capability to strive for success.

The Impact of a Technological Learning Environment on Character Education of the Younger Generation is significant. Discussions centered on character education, spiritual growth, and moral development continue to punctuate the educational landscape. Indeed, throughout history, the question of how the environment impacts each child's growth has always been an important issue among the educators. From the ancient Chinese philosopher, Confucius, to modern educators in China and all over the world has been the belief that the environment makes children who they are when they grow up. Chinese folk wisdom says that children living near the sea learn how to fish, whereas those living in the mountains learn how to gather logs for fire. In recent years, those schools able to afford the costs are building an environment in which modern technology reinforces teaching and learning, and therefore provides a measurable contribution to character education.

The Internet learning environment provides limitless opportunities for students to access useful and interesting information, and encourages them to search for and discover the unknown. While still relatively new, the Internet has long since outgrown its novelty, and is now seen as a crucial tool for fast access of timely information. Navigation through the World Wide Web is facilitated through search engines connected with each other making available vast amounts of highly focused information, especially when used through effective keyword searches.

In Shanghai, at QiBao High School, a private school, there are three laboratories with a total of 168 computers with full access to the Internet. In addition, there is an electronic reading room in the library and networked computers in each classroom. All the science labs and school offices are networked with LAN (Local Area Network) and WAN (wide area network). This well-planned electronic infrastructure provides students with opportunities to access the Internet whenever necessary to search for new information, to discover new solutions to problems, or to communicate with someone in another other part of the world. Indeed, for students at this high school, utilizing networked technology has become part of their daily lives.

In 1999, Qibao High School students were given an opportunity to develop an open-ended theme-study unit. Students were divided into 72 project groups, and utilized the Internet not only to select their themes but also to search out the necessary information and to determine effective modes of approach to solve the problems. This special project and the students' learning experiences were recognized by the city government to serve as a model and high schools across the country have been encouraged to follow this model.

Multimedia learning environments and a variety of computer software has enhanced students' interest both in science and in the humanities. When placed in this active learning environment, these students show a heightened interest in their coursework, even in the traditional science and humanities courses that have often had difficulty in cultivating student interest. The curious mind and the desire to discover have led to great scientific inventions and truth, as well as providing greater insights into our own humanity. It is our conviction that making full use of the information-technology environment, as a catalyst for promoting students' characters is one of the important strategies.

Jianping High School in Shanghai has more than ten teaching laboratories, and the school administration requires all teachers to utilize at least two computer software packages in their teaching every semester. Qibao High School has hosted five multimedia technology workshops that provided training for more than 200 teachers. In addition, it held four contests for multimedia projects; some of the resulting multimedia teaching tools were impressive enough to have been published by Baida Electronic Publishing House.

Distance-learning and online courses make it possible to create a student-centered learning environment, therefore enhancing the production of personnel with creativity. The student-centered teaching model utilizes situational learning, collaboration, and communication, all of which help to encourage students' creativity and then to flesh out this creativity in real-world situations. In this environment, students are actively constructing their knowledge through multimedia technology, while teachers are the organizers, the facilitators, and promoters. This is the model that will produce the next generation who can meet the challenges in a world whose technical and social landscape is changing at an ever-increasing rate.

A learning environment that applies computer-aided instruction (CAI) can also train students for high-level thinking. Internet and multimedia learning environments provide opportunities for students to research and discover. Students are an active part of the learning process. CAI also provides situational learning in which students search the problematic situation, form the problem, and derive their own solutions. Therefore, students have the practice to recognize how the relevant phenomena and workable strategies finally lead to problem solving.

Information technology utilized in the classroom brings a variety of rich cultures from all over the world into a virtual global village and provides opportunities for creating a new culture, one that enhances each student's ability to analyze and critique. Internet and multimedia environments have already helped to create this culture that nurtures the students in their ability to analyze, make connections between classroom learning and real world applications, to construct their own knowledge, and to think critically.

The open learning atmosphere invites students to participate in interactive networked learning activities and therefore to develop and turn students from having a mere presence in a society to having the ability to serve the society. The use of instructional technology can help students in their training of high level thinking, therefore encourage them to have healthy personality and characters. The use of instructional technology can increase students' desire for learning and therefore enrich their experience in discovery. The use of instructional technology can widen students' view of knowing, therefore help them to build a solid foundation for basic knowledge and skills. The use of instructional technology can help raise students' abilities in abstract thinking, analyzing facts into constituent parts and synthesizing diverse knowledge into a coherent whole. The use of instructional technology can provide new opportunities for students to practice their skills in experimenting with new concepts. The use of instructional technology can train students to be self-regulated learners.

Technology in Early Childhood: A Model for Teacher Training

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Abstract: Changing perspectives for the use of technology in early childhood education lack explicit standards, based on a sound theoretical and empirical foundation, to generate changes in teacher practice and student learning. Funded by the university system and working in partnership with PK-16 area school districts and community-based childcare centers, this project developed technology standards for young children and the teachers who work with them and used those standards to develop competencies that define what young children and their teachers need to know and be able to do. These competencies were then integrated into pre-service teacher coursework and piloted in a workshop series offered at a local childcare center. The data collected from this pilot is now being used to develop a workshop series for early childhood professionals in the region to be applied collaboratively in early childhood settings. Anticipated outcomes include changes in teacher beliefs about and skills in technology, technology-enriched early childhood classrooms, more equitable access to technology for all young children, greater continuity between the preschool and elementary years, and enhanced student achievement.

Introduction

In partnership with local childcare centers, public school districts, Head Start programs, and neighborhood family resource centers, the UW-Green Bay Professional Program in Education was awarded a 3-year grant for the development of an on-site Early Childhood Teacher Preparation Program that matches program competencies with PK-12 school and community needs in a collaboratively supported, community-based model. Students now engage in performance-based learning in community-based early childhood settings with culturally, linguistically, and ability-diverse young children and their families. They receive mentoring support from master teachers, accessing course content through WebCT core modules. The project created an innovative response to the national call to reform teacher preparation and additionally provided an opportunity to improve student achievement by recognizing that quality child care is and must be a part of a system of learning that impacts child development. UW-Green Bay Early Childhood Program course content has been converted into clearly defined competencies. These competencies are now being cross-referenced with the high standards developed by the state of Wisconsin and early childhood professional organizations, and adapted to respond to the diverse and changing needs of the young children and their families in the community.

Missing from this process were technological standards from which to develop competencies in the area of technology in early childhood curriculum. The use of technology with young children and in early childhood settings has been controversial, with strong concerns being expressed about whether it is developmentally-appropriate and compatible with the learning needs and styles of young children. However, previously held beliefs about the limited abilities of very young children are now being challenged, and current research on young children and technology reports that integrated technology activities can increase student learning and achievement. Children from earliest infancy are reported to form categories (Gelman, 1996) and encode concepts in the form of 9 new words per day by 18 months of age (Carey, 1978). They are also reported to use those categories to extend knowledge (Carey, 1985). Computer activities have been shown to enhance the development of these early cognitive competencies when they integrated into the curriculum, *and* coupled with relevant off-computer activities. Cognitive gains in significantly more areas are reported (Haugland, 1992). How young children are asked to use software also affects the development of their conceptual skills (Clements & Natasi, 1993). Outcomes are more positive when they are assigned open-ended tasks or projects requiring problem-solving rather than left to explore freely (Lemerise, 1993). Socially, young children are reported to spend nine times as much time talking to peers during computer time than when doing puzzles (Muller & Perlmutter, 1985), spend 95% of that talking time discussing the work (Genishi, et al., 1985), and exhibit greater peer teaching and helping when using computers (Clements & Natasi, 1992). Computers appear to serve as catalysts for social interaction rather than isolating children, as once believed. To be effective, young children need to learn to use technology in new ways - for exploration, creative problem solving, and self-guided instruction –and the teachers who work with them need the knowledge and skills to effectively integrate technology into the curriculum and use it to support social interaction.

Access to technology is also poor in early childhood settings and for the diverse families they serve. It is reported (Coley et al., 1997) that children attending low-income and high-minority schools have less access to most types of technology. With technology now permeating learning at all levels and in all areas of development, standards in the area of technology at the early childhood level and their application in the early childhood curriculum are critical to establish quality and continuity between the early childhood and elementary years and address issues of equitable access. While acknowledging and respecting differences, *all* young children need exposure to a common body of knowledge and skill that includes technology so they can be challenged to reach their full potential.

In response to these needs, this project identified standards and competencies for the children and for the teachers who work with them that recognized that the appropriate use of technology differs for preschool age children. Additionally, opportunities were provided or are being developed for teachers to gain the knowledge, and develop and apply the skills and positive attitudes needed to create technology-enriched early childhood classrooms in developmentally-appropriate ways and share that with the diverse families they serve.

The Project

The collaborative development and implementation of a competency, performance, and technology-enhanced early childhood teacher preparation program and the existence of a strong University/community partnership for the improvement of student learning, provided a strong and innovative collaborative base in which to identify and implement these missing standards in technology. The following project goals and activities drove the design and implementation of the model:

GOAL 1: This project will develop appropriate educational technology standards for young children and for those who teach them, based on the premise that the appropriate use of technology differs for preschool age children.

The development of these standards was guided by a Developing a Curriculum (DACUM) process. A workgroup was identified to select participants for the DACUM and gather existing research/ resources to support the process.

Fourteen early childhood and technology professionals from across the state gathered to identify what preschool children should know and be able to do with technology before they enter elementary school AND what teachers should know and be able to do with technology in early childhood settings. The end-product of the DACUM workshop was a chart listing essential job duties and tasks of teachers working with young children in the area of technology. Before conversion into outcome/competency statements, it was important to have consensus on the views of those in the early childhood and technology professions from the region. To this end, we asked an additional 84 early childhood/technology professionals in the state to complete a verification survey to validate the importance and the frequency of use for each task identified by our panel of experts.

GOAL 2: Working in collaboration with teachers, librarians, and other experts from the community, the UW-Green Bay faculty will use the DACUM standards to identify competencies appropriate for integration into the early childhood minor coursework as well as activities requiring pre-service teachers to implement multimedia technology practices into early childhood classrooms and disseminate to parents.

Through a series of collaborative workgroups, the identified DACUM standards were translated into essential technology competencies for early childhood pre-service teacher mastery, cross-referenced to the National Association for the Education of Young Children (NAEYC), framed by the Wisconsin Department of Public Instruction performance-based licensure standards, and linked to Wisconsin's Model Academic Standards. They were then integrated into each early childhood course offering along with performance-based multimedia assessment projects for application in early childhood settings and with families of young children. The completed standards and assessments will become part of the Early Childhood Curriculum Core in fall 2001. In addition to providing essential competency development for pre-service teachers, this integration will provide collaborative support to early childhood cooperating teachers interested in and/or attempting to integrate technology into their curriculum and help disseminate the standards to more early childhood classroom teachers.

GOAL 3: Educators and other professionals working with young children will be provided an opportunity to become familiar with the standards, learn or improve their knowledge and skills in using technology to enhance curriculum with young children, and apply that knowledge in their work settings.

The development of a workshop series was the planned outcome for Goal 3. The original objectives within this goal and identified for the training included (a) developing proficiency in using the equipment, (b) selecting appropriate software, (c) facilitating the active use of technology in the classroom, (d) using technology to support socialization and language, integrating technology across the classroom curriculum, and (e) designing an integrated unit that incorporates technology. These objectives aligned with what was being identified and reported in the current research on the use of technology with young children .

To further inform the development and design of the workshop series, a pilot training was offered to a local childcare center. Staff members completed a technology proficiency survey (see Table 1) and were interviewed to determine individual and group skill levels and training needs. The information gathered from the interview process identified a number of variables common to most early childhood programs that had the potential to negatively influence the application and long-term maintenance of technology knowledge and skills. Resources for equipment and training costs, for example, were limited. With most staff lacking 4-year degrees and having limited proficiency in technology, it became apparent that all workshop objectives could not be met in one workshop series. In addition, the consistent integration of technology into early childhood classrooms would be challenging, given high staff turnover and staffing crisis issues.

The development of technological literacy emerged from the surveys and interviews as the primary need of early childhood providers, and a pilot training was designed that responded to the realities and constraints of preschool settings. At the request of the director and staff, trainings were scheduled once a week in the evening for 3 hours for a period of 5 months, for a total of 20 sessions or 60 hours. The primary goal was to disengage participants from their anxiety and empower and motivate them to comfortably engage young children in technology through questioning, exploration and risk-taking. Three components were identified: technological foundations and awareness building, identification of developmentally-appropriate applications, and application and evaluation. Time and resources required the integration of these 3 components within each session. The major focus of each session was on the development of a basic foundation in technological literacy – terminology, understanding how the equipment works, and how to use the equipment. Focus areas included (a) email, (b) the internet, (c) word processing, (d) spread sheets, (e) data entry, (f) data bases, (g) scanning, (h) desktop publishing , (i) file management, and (j) digital image acquisition, management, and manipulation. At the beginning of the first session, a ½ hour facilitated discussion on the meanig of developmentally-appropriate practice took place to provide a context for the technology knowledge and skills that were to be introduced. At the end of each session, participants were given an "application assignment" to use in their classrooms and asked to find (develop, create) additional developmentally-appropriate ways to use the skill(s) introduced that week. A "Sharing Back" took place at the beginning of all other sessions to perpetuate the

A standards-based Workshop Series is now being developed in collaboration with early childhood community professionals, UW-Green Bay faculty, and technology consultants from PK-16 schools. Data collected from the pilot training, the DACUM competencies, and the current research will all be used to design the training. Resources will not allow for 60 hours of training, as offered in the pilot, but will be more substantive than most early childhood professional development opportunities. With research reporting that less than 10 hours of in-service teacher training can have a negative effect (Ryan, 1993) and that hands-on experience and in-depth exposure supports generalization and maintenance in the classroom (Wright, 1994), the decision has been made to have an "Opening Conference" of 6 hours followed by six 4-hour modules distributed over 3 months for a total of 30 hours of computer lab training. Program design, including module content and format, will be done collaboratively, and content modules will be selected based on the pilot results and designed to provide a basic foundation of technological literacy unique to the participants. Module formats will vary, but again include lecture/discussion, small group projects, demonstrations, and hands-on activities.

An initial cohort of 30-35 participants from early childhood programs will be recruited through the partnership to participate. Family daycare providers, center-based daycare staff, administrators, and Head Start and preschool program staff will be invited to attend together, to facilitate interaction among professionals and support a collaborative commitment to the process. Participants may register for 3 credits but they will complete an additional 15 hours of site-based application in fall 2001, culminating in a "Showcase Poster Session" in which teacher-developed units will be presented. All workshop offerings will be held in the daytime, and stipends will be available to hire substitutes for those working in childcare settings who register for the full 30-hour program.

Table 1 Pilot Survey

User Survery	No Skills	Beginner	Intermediate	Advanced
Basic Computer Operation	2	5	3	6
End-User Technology Terminology	8	5	3	0
Email Use (Send, Receive, Attach)	1	10	4	1
File Management (local and network)	5	8	3	0
Desktop Publishing	8	4	4	0
Internet (Effective information research)	1	11	3	1
Word Processing	0	6	6	4
Speadsheet	10	6	0	0
Database	12	4	0	0
Digital Imaging Acquistion, manipulation and management	9	6	1	0
Selecting appropriate software (early childhood)	5	10	1	0
(Technology Integration) Facilitating the use of technology within the classroom	8	8	0	0
(Technology Integration) Designing integrated instructional units	14	2	0	0
(Technology Integration) Supporting socialization and language	12	4	0	0
Integration of technology across the curriculum	12	2	2	0

GOAL 4: The results, both product and process, will be disseminated to a wide array of early childhood professionals to use as resources to support the further development of technology-enriched early childhood classrooms.

Project outcomes will be shared with early childhood professionals in a variety of ways at the local, state and national level to support the generalization and maintenance of the technology knowledge, skills and attitudes developed in this project. The final "Showcase Poster Session" will provide workshop participants an opportunity to share the results of their multimedia projects with UW-Green Bay faculty and invited professionals from throughout the region, including the 62 school districts who are participants in the UW-Green Bay Institute for Teaching and Learning Partnership. Workshop participants and pre-service teachers will also be asked to share the standards with the parents of the young children they work with in ways that respond to the diverse characteristics of those families.

Dissemination to a wider audience is or has taken place through presentations at various local, state and national conferences by UW-Green Bay faculty and interested workshop participants, and the development and maintenance of a worldwide web site of project activities linked to the UW-system is in progress. The Workshop Series will be self-sustaining and continue to be offered for credit through UW-Green Outreach and Extension., the website updated on a continuing basis, and the competencies taught within the Education Program Sequence. Funding support to purchase equipment for early childhood settings continues to be sought from business organizations in the community.

Assessment

Throughout the project, both formative and summative evaluation data is being gathered. Following completion of the DACUM, a statewide survey was sent to 80-100 early childhood professionals for verification of the validity of each standard generated. Those statistics are now being analyzed to determine which standards match what is presently working for teachers in classrooms and what is of interest to and being mastered by the young children in those classrooms. A second verification will be done by the workshop participants at the completion of the series and comparisons made.

Pre and post assessment measures were administered to participants in the pilot training. Similar pre and post measures will be designed and administered to workshop participants for each workshop module and at the completion of the series. Changes in knowledge, attitude, and perceived level of competency will be identified and analyzed to determine if there are significant differences that can be attributed to the pilot training and to the workshop training. The data will also be analyzed to determine if there are significant differences in knowledge, attitude and perceived level of competency between those who received 60 hours of training (pilot training) and those who received 30-45 hours of training (workshop training). Teacher-developed performance assessments with rubrics will be used in the analysis of the Thematic Units developed by workshop participants taking the series for credit. Workshop participants will also be asked to help design an assessment tool to measure the level of technological proficiency of each of the young children in their classrooms. This assessment tool will be administered at the beginning and end of the workshop series to determine changes in level of proficiency for each technology standard for young children.

The competencies selected for inclusion in the early childhood program sequence will be validated against Wisconsin's Academic Standards in the content area of technology for the first grade. Performance-based assessments, with rubrics, will be developed for each identified competency, and measures of change in the level of proficiency for pre-service teachers, cooperating teachers, and students will be identified.

Conclusions

The completion of an initial pilot training was critical in identifying the unique needs of the population for whom this workshop series was to be designed – early childhood providers. Information gathered in the interview process identified numerous constraints specific to early childhood care and education that needed to be taken into consideration when designing the workshop series. Results from the pilot study clearly supported modifying the original workshop series goal and objectives. Initially the series was to be designed to share DACUM generated standards, improve professional's knowledge and skills in applying these technology standards to enhance curriculum with young children, and support application of that knowledge in work settings. It became clear that the overriding goal of this initial workshop series was to establish a basic foundation of technological literacy unique to each participant's personal motivation, ability level, and learning curve. Without establishing this beginning skill and comfort level, learning would not generalize in a sustained way to the work setting. Participants need to first feel confident that they understand how the equipment works, what the terminology is, and how to use it to develop "technology products." Additionally, they need to be able to compare, apply and evaluate their technology products within the context of developmentally-appropriate practice.

Training in basic technology literacy needs to be repeated regularly to address issues staff turnover and maintenance, and additional workshop trainings need to relate these newly learned skills to developmentally-appropriate application within a curriculum framework. The designing of integrated units that incorporate technology, the facilitation of the active use of technology in the classroom in ways that support socialization and language development, and the adaptation of technology to meet the needs of diverse learners cannot be presented until basic technology literacy is in place. These additional trainings will be essential if we are to succeed in providing early childhood professionals with the knowledge, skills and attitudes needed to successfully integrate technology into early childhood daycare and preschool settings.

References

Carey, S. (1978). The child as word learner. In J. Bresnan, G. Miller, & M. Halle (Ed.) *Linguistic theory and psychological reality* (264-293), Cambridge, MA: MIT Press.

Carey, S. (1985). *Conceptual change in childhood.* Cambridge, MA: MIT Press.

Clements, D.H., & Nastasi, B. K. (1992). Computers and early childhood education. In M. Gettinger, S.N. Elliott, & T.R. Kratochwill (Ed.) *Advances in school psychology: Preschool and early childhood treatment directions* (pp. 187-246), NJ: Lawrence Erlbaum Associates.

Clements, D.H., & Nastasi, B.K. (1993). Electronic media and early childhood education. In B. Spodek (Ed.) *Handbook of research on the education of young children* (pp. 251-275), New York: Macmillan.

Coley, R.J., Cradler, J., & Engel, P.K. (1997). *Computers and classrooms: The status of technology in U.S. schools.* Princeton, NJ: Educational Testing Service.

Gelman, S.A. (1996). Concepts and theories. In R. Gelman & T.K. Au (Eds.) *Perceptual and cognitive development*, New York: Academic Press.

Genishi, C., McCollum, P., & Strand, E.B. (1985). Research currents: The interactional richness of children's computer use. *Language Arts*, 62 (5): 526-532.

Haugland, S.W. (1992). Effects of computer software on preschool children's developmental gains. *Journal of Computing in Childhood Education,* 3 (1): 15-30.

Lemerise, T. (1993). Piaget, Vygotsky, & Logo. *The Computing Teacher*, 24-28.

Mulller, A.A., & Perlmutter, M. (1985). Preschool children's problem-solving interactions at computers and jigsaw puzzles. *Journal of Applied Developmental Psychology*, 6: 173-186.

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Lights, Camera, Action: Videoconferencing in Kindergarten

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Abstract: This paper explains a kindergarten project that uses multiple technologies, culminating in daily videoconferencing with another kindergarten. This project took place at a university laboratory school as a demonstration of appropriate use of technology, including videoconferencing, for preservice teachers. As the students prepared for the daily videoconferences, they were engaged in dramatic play, Internet activities, and a field trip to a television station. The project proved to be an exciting experience for the children, extending their understanding of technology and the world.

Introduction

As more and more technology is being included into early childhood program, we continue to struggle what is the most appropriate ways to use it with these young children. A simple search of the archives for the ECEOL Listserv (http://lists.maine.edu/archives/eceol-l.html) will show many conversations over the last several years about whether computers should or should not be included in early childhood classrooms. There are concerns about implementing the use of technology in classrooms that lack basic equipment and materials, is this the best use of monetary resources to benefit the children? The NAEYC position paper about technology and young children (NAEYC, 1999) talks of the balance that is necessary. The paper goes on to suggest ways that technology can be used to support children and allow them the opportunity to explore and collaborate.

Being at a university related laboratory school affords me the opportunity to look at issues and curricular options. For several years, I have looked at ways to appropriately integrate technology into the traditional kindergarten program. This paper will share a series of activities that led up to a successful videoconference partnership with a colleague in Illinois, and her kindergarten children.

Setting the Stage

In January 2000, a colleague and I began looking at ways we could use desktop videoconferencing for our children to visit. I felt strongly that our interactions needed a purpose beyond just talking with each other. After several conversations, we decided to expand on the long-standing tradition of weather reporting in kindergarten classrooms. The project was to occur during the second half of our school year and the children were doing lots of graphing. Both classrooms already graphed the weather for their area, so we decided would expand on this and exchange weather reports between the classrooms. We would encourage the children to look for patterns in the weather between the two locations. We decided to begin in April. This gave me time to prepare the children for the upcoming project.

Kindergartners have trouble understanding the concept of time, and distance. They don't understand how it can be light in our region an dark else where. Likewise, they have difficulty understanding that not everyone experiences the same weather at the same time. We felt that this project would assist with this concept. As I prepared the children for the upcoming videoconference, I located a website with live webcams listed by state (http://cirrus.sprl.umich.edu/wxnet/wxcam.html). I added a responsibility to the classroom meteorologist's daily duties. The meteorologist was to go to the computer before the group meeting, select a state they wanted to look at, and then locate a cam shot that they liked. This page was left up for the children to look at first as a group, then off and on during the morning. The children looked at a map to locate a state if they did not come with one in mind. If necessary I assisted the child in locating the state name on the web site, then left them to explore the different links available in that state. The kindergartners already knew how to navigate back and forth with the arrow buttons. Every day became a new adventure. Where would we go? What would we see?

With this web cam page, we went to Florida and watched a boat skipping over the water, looked at animals waking up in zoos, and watched many sunrises in the west. The children were fascinated with watching dawn coming over a town. They would locate a town covered in darkness, then continually go back an see how it was changing as our morning progressed. They began to understand that daytime in different areas was different from ours. The children also became interested in what else a meteorologist did.

Kindergarten on Tour

To assist with their familiarization with the responsibilities of a meteorologist, I arranged for the children to tour the university television studio, W-IUP. We are fortunate to have a studio located in the same building as our school, so the trip was very easy to do with the children. The university students leading the tour focused on the parts of the studio that were important to the weather person. The children saw the room with the television monitors and the computer mixers. Our tour guides explained how the blue scrim screen worked. We were able to look at the two monitors, one solid blue, the other with the image superimposed on it. We then moved into the studio.

The children explored their images on the monitors with the blue screen to their backs. Then they looked at the monitor where the Bambi movie now played instead of a weather map. They were able to attempt to pat Bambi or Thumper, with their backs to the screen, while looking at the monitors. The college students explained in appropriate terms about the cameras, teleprompter, and set. The children then were given time to explore the set and cameras. Taking turns being behind and before the cameras. The children loved climbing on the cameras, changing the angles and focus, and watching the monitor to see what they had done. On stage, the children were having a great time reporting the local news and weather. While all this was happening, the digital camera was being used to document the trip. These pictures were used to send home a note about our visit, as well as for the children to re-visit the studio.

The Re-enactment

Returning to the classroom, the dramatic play area became our own television studio. A long, low table was the set for the meteorologist. A Kodak desktop videoconferencing camera on a tripod attached to a computer became our version of the large cameras and production room. Two children operated the program on the computer, one child operated the camera, and one or two children were onscreen. A television was placed in the weather station, tuned to the weather station for the children to listen to and watch the meteorologists. Children decided to print the Yahoo weather site to use as a "script" in their studio. The children played for weeks taking turns being the meteorologist, the camera operator, and the production person operating the computer and making mini-movies to share with the class.

Show Time

The time finally arrived to begin videoconferencing with the other classroom. My children were very excited to see this new use of their camera. Because they were not familiar with how the camera worked on a tripod, the kindergartners took turns operating the camera for the daily conferences. The children began to immediately make connections with the other children, seeing similarities between individual children and their names. This excited them, an proved to further involve them in the project. The weather person from each school gave their weather report, and then we would visit. Sometimes the children had questions, other times the teachers guided the conversation. In my room, we were doing daily graphing of a question. Several occasions we asked the other classroom to respond to our question. This gave my children a larger data source to work with. Our graphing question sometimes provoked questions in the other room that they researched later. As the school year moved on we shared many stories, answered many questions about each other, and even shared portions of special programs each class was preparing.

As the teacher, I was concerned with the time we were using to do the project. I sometimes had trouble rationalizing the time from other activities; my kindergarten is a three-hour a day program. We were videoconferencing daily for 10-20 minutes. This seemed like a large piece of my day and was it worth it? But with the questions the children asked, and the development in their understanding of the other children, I would and will do it again. On those occasions when we could not meet because of other commitments, the children always asked why we did not videoconference.

Conclusions

When we began videoconferencing, it was daily and continued for approximately 6 weeks. We had to overcome the dual platform issue with the cameras, by using CUSeeMe software. The project was very exciting for both the children and the teachers. While the picture was not the clearest, and the audio poor, the children were able to make discoveries about the weather and each other.

This project provided an excellent opportunity for my children to construct new understanding of weather in ways not available to them with out the technology. The children had opportunities to look at several types of technology, not just computers. What began as a simple exchange of the weather became an exciting interdisciplinary project combining math, science, social studies, literacy, and communication skills into an authentic and meaningful experience.

References

NAEYC, (1996). *Technology and Young Children -- Ages 3 through 8*, http://www.naeyc.org/resources/position_statements/pstech98.htm

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